Nomination of

Amami-Oshima Island
Tokunoshima Island
Northern Part of Okinawa Island, and
Iriomote Island

for Inscription on
the World Heritage List

GOVERNMENT OF JAPAN
January 2019

Nomination of
Amami-Oshima Island, Tokunoshima Island, Northern Part of Okinawa Island, and Iriomote Island
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GLOSSARY

- Terms used to indicate localities in this document:

  1) Nominated property:

  - The five component parts in four regions included in this serial nomination, i.e. nominated areas on Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island.

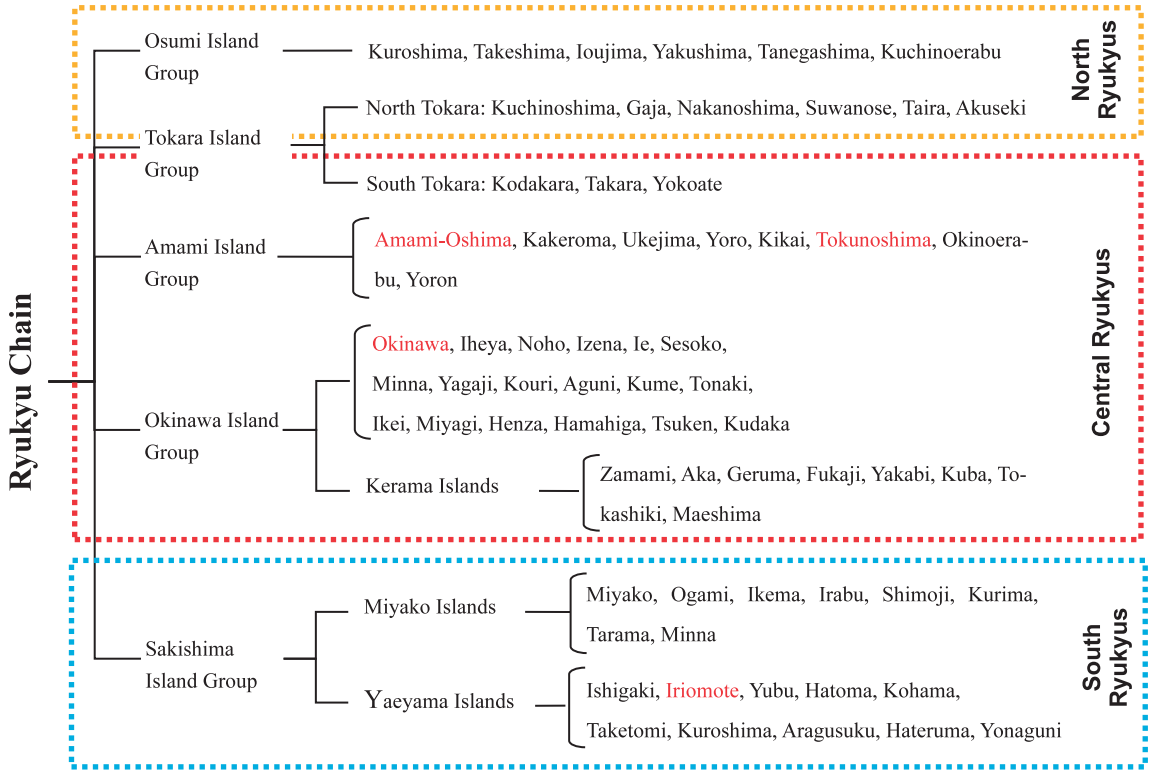
  2) The four regions containing the nominated property:

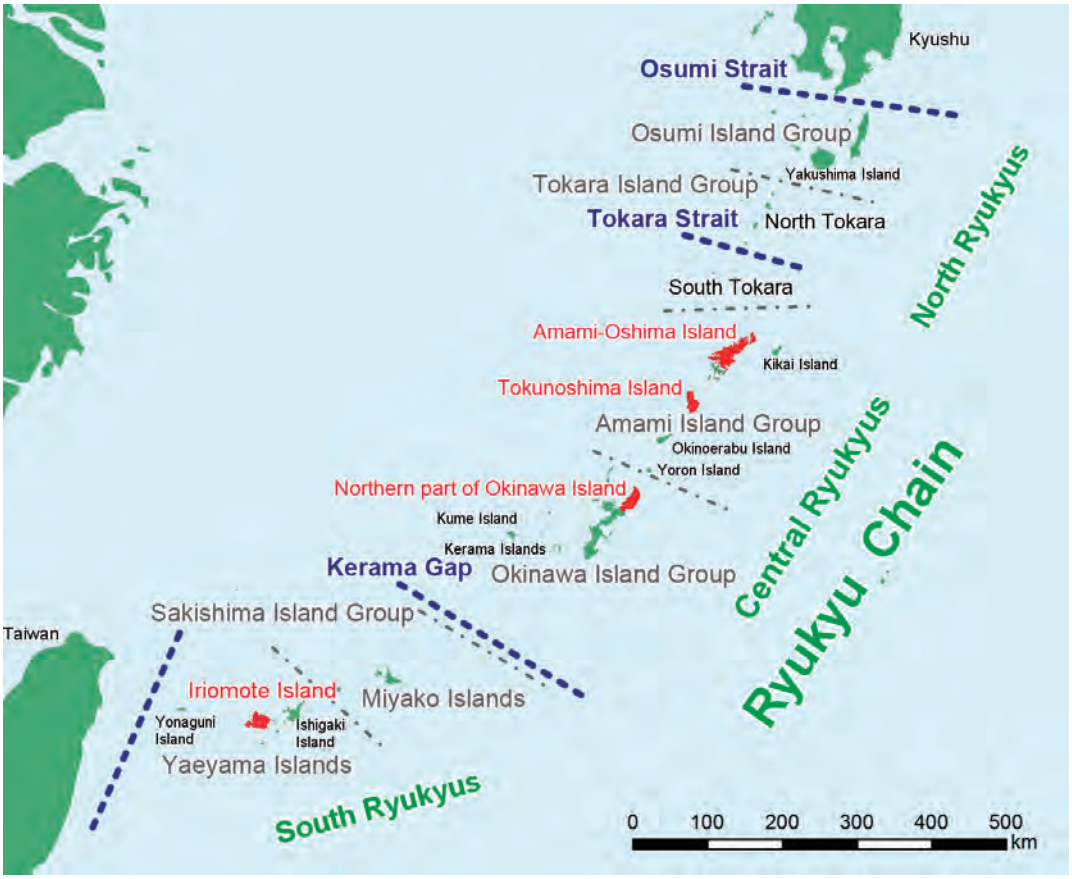
  - The whole area of Amami-Oshima, Tokunoshima and Iriomote Islands, and three Yambaru villages in Okinawa Island. Each region includes the nominated areas, buffer zones and Surrounding Conservation Areas.
  - Three Yambaru villages means the area comprising Kunigami Village, Ogimi Village, and Higashi Village located in the northernmost part of Okinawa Island. Yambaru means the wide forest area in mountains in Okinawa language, and sometimes, it is also written as Yanbaru.

  3) The four islands containing the nominated property:

  - The whole area of Amami-Oshima, Tokunoshima, Okinawa, and Iriomote Islands including the nominated areas, buffer zones, Surrounding Conservation Areas and other areas.

- Names and classification of islands used in this document are shown in a figure on the next page.
- Endemic species in this document refers to a species, whose geographic distribution is confined to Central and/or South Ryukyus unless otherwise specified.
- Relict endemic species refers to an endemic species, whose extant sister lineage (i.e., group of phylogenetically closest relatives) does not occur in the vicinity of the Ryukyu Chain.
- New endemic species refers to an endemic species, whose extant sister lineage (i.e., group of phylogenetically closest relatives) occurs in the vicinity of the Ryukyu Chain.
- Globally threatened species indicate the species listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) on the IUCN Red List.
  - The assessment of IUCN Red List is basically at the species level, but some are assessed at the subspecies level.
  - This nomination document used IUCN Red List of Threatened Species 2018-1 version.
- Japanese threatened species indicate the species listed as CR, EN or VU on the Red List of Japan produced by the Ministry of the Environment (MOEJ Red List).
  - The assessment of MOEJ Red List is usually at the subspecies level. Only plants are assessed at the subspecies and variety levels.
  - This document used the Red List of the Ministry of the Environment (MOEJ Red List) 2018.
- Evolutionarily Distinct and Globally Endangered (EDGE) species refers to species that are selected as highly prioritized to be protected, based on scores calculated according to the amount of unique evolutionary history it represents (Evolutionary Distinctiveness, ED) and its conservation status (Global Endangerment, GE), in the EDGE of Existence programme developed by the Zoological Society of London (ZSL). EDGE species are threatened species that have few or no close relatives in the evolutionary tree. If they become extinct, it means that there will be nothing like them left on earth.





Names and classification of islands used in scientific fields, especially biology (based on Toyama 2014). Red letters indicate the islands in which the nominated property is included.

Executive Summary

State Party

Japan

State, Province or Region

Kagoshima Prefecture and Okinawa Prefecture

Name of Property

Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island

Geographical Coordinates to the Nearest Second

Latitude/longitude of each component part of the nominated property

ID	Name of the component parts		District	Coordinates of the central point	Area of nominated component of the property (ha)	Area of the buffer zone (ha)	Map No. (Annex 6-1)
1	Amami-Oshima Island		Kagoshima Prefecture	N28° 16′ 44.969″ E129° 22′ 41.886″	11,640	14,505	AMA_1 AMA_2 AMA_3 AMA_4
Amami-Oshima Island area (ha)					**11,640**	**14,505**	
2	Tokunoshima Island	(a)	Kagoshima Prefecture	N27° 45′ 48.136″ E128° 58′ 01.962″	1,724	1,813	TOK_2
3		(b)		N27° 51′ 56.053″ E128° 55′ 33.394″	791	999	TOK_1
Tokunoshima Island area (ha)					**2,515**	**2,812**	
4	Northern part of Okinawa Island		Okinawa Prefecture	N26° 43′ 29.212″ E128° 13′ 12.382″	7,721	3,398	NPO_1 NPO_2
Northern part of Okinawa Island area (ha)					**7,721**	**3,398**	
5	Iriomote Island		Okinawa Prefecture	N24° 19′ 34.257″ E123° 48′ 31.486″	20,822	3,594	IRI_1 IRI_2 IRI_3
Iriomote Island area (ha)					**20,822**	**3,594**	
Total area (ha)					**42,698**	**24,309**	

Textual Description of the Boundaries

The nominated property is part of the Ryukyu Chain scattered in an arc, about 1,200 km long, lying in the ocean between the south end of Kyushu of the Japanese Archipelago and Taiwan. It is a serial property consisting of five component parts on four islands: Amami-Oshima Island, Tokunoshima Island, Okinawa Island (in the Central Ryukyus), and Iriomote Island (in the South Ryukyus).

Based on scientific examination, the nominated property which demonstrates Outstanding Universal Value (OUV) for inscription on the World Heritage List is to be limited only to these four islands.

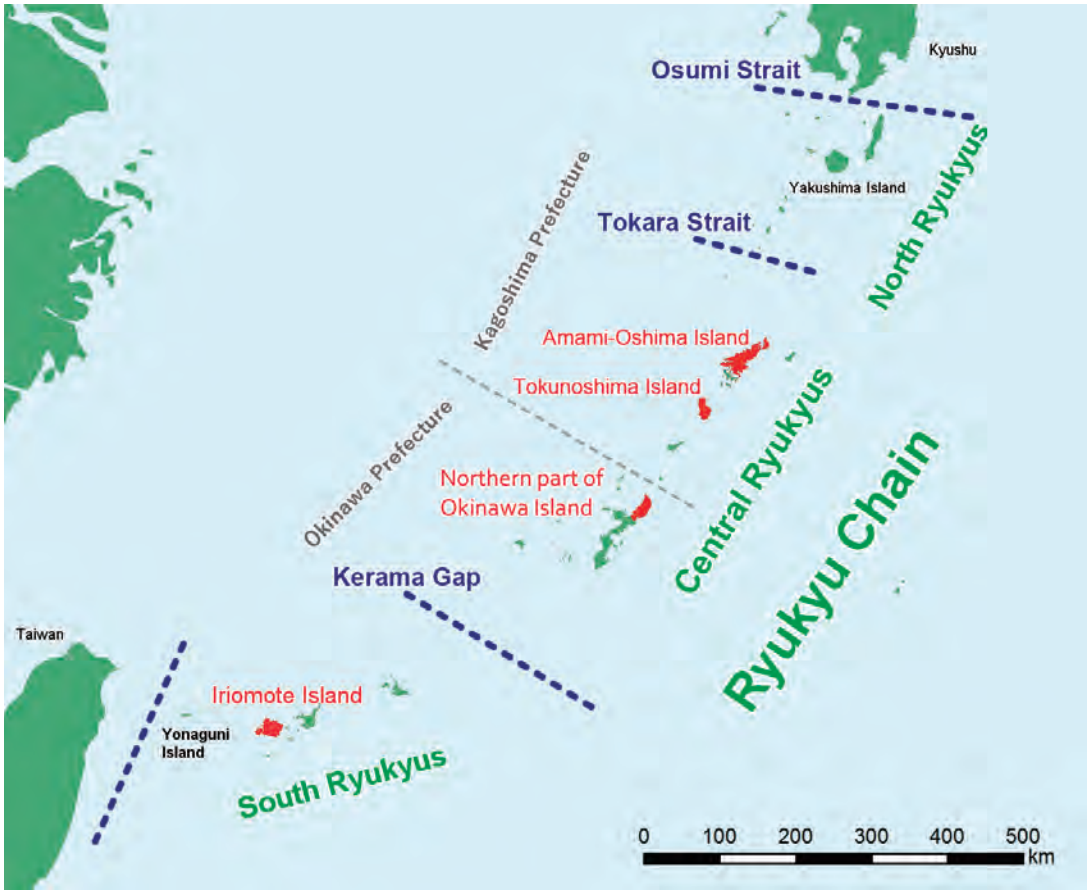
The nominated property is part of the areas strictly protected as the Special Protection Zones or the Class I

Special Zones in the Amamigunto National Park, Yambaru National Park, and Iriomote-Ishigaki National Park and/or the Preservation Zones in the Amamigunto Forest Ecosystem Reserve, Yambaru Forest Ecosystem Reserve and Iriomote Forest Ecosystem Reserve. The nominated property also includes small areas of Class II Special Zone of National Park and/or Conservation and Utilization Zone of Forest Ecosystem Reserve, however, these areas are planned to be upgraded to Class I Special Zone by the end of JFY2019 after the necessary procedures based on relevant laws and regulations, and landowners and stakeholders have already agreed to treat these lands as Class I Special Zone (see Chapter 5, Tables 5-2-1 to 5-2-4, Table 5-3-1, and Table 5-4).

The buffer zones are mainly parts of the areas protected as the Class II Special Zone of the above national parks and/or the Conservation and Utilization Zone of the above Forest Ecosystem Reserves. Further, in some parts of the buffer zones, there are three types of area as follows: 1) Special Protection zones or Class I Special Zones of national parks that are not adjacent to the nominated area; 2) the areas adjacent to the nominated area belonging to the National Forest, public land or the Class III Special Zone of national park, where it is agreed to conduct sustainable forest operations considering biodiversity; 3) Ordinary Zone of national park surrounded by the nominated area and being considered as focused area for conservation activities including countermeasures against invasive alien species (Tables 5-3-2 to 5-3-3).

Mountain stream zone with many endemic and threatened species, Northern part of Okinawa Island
(Photo: MOEJ)

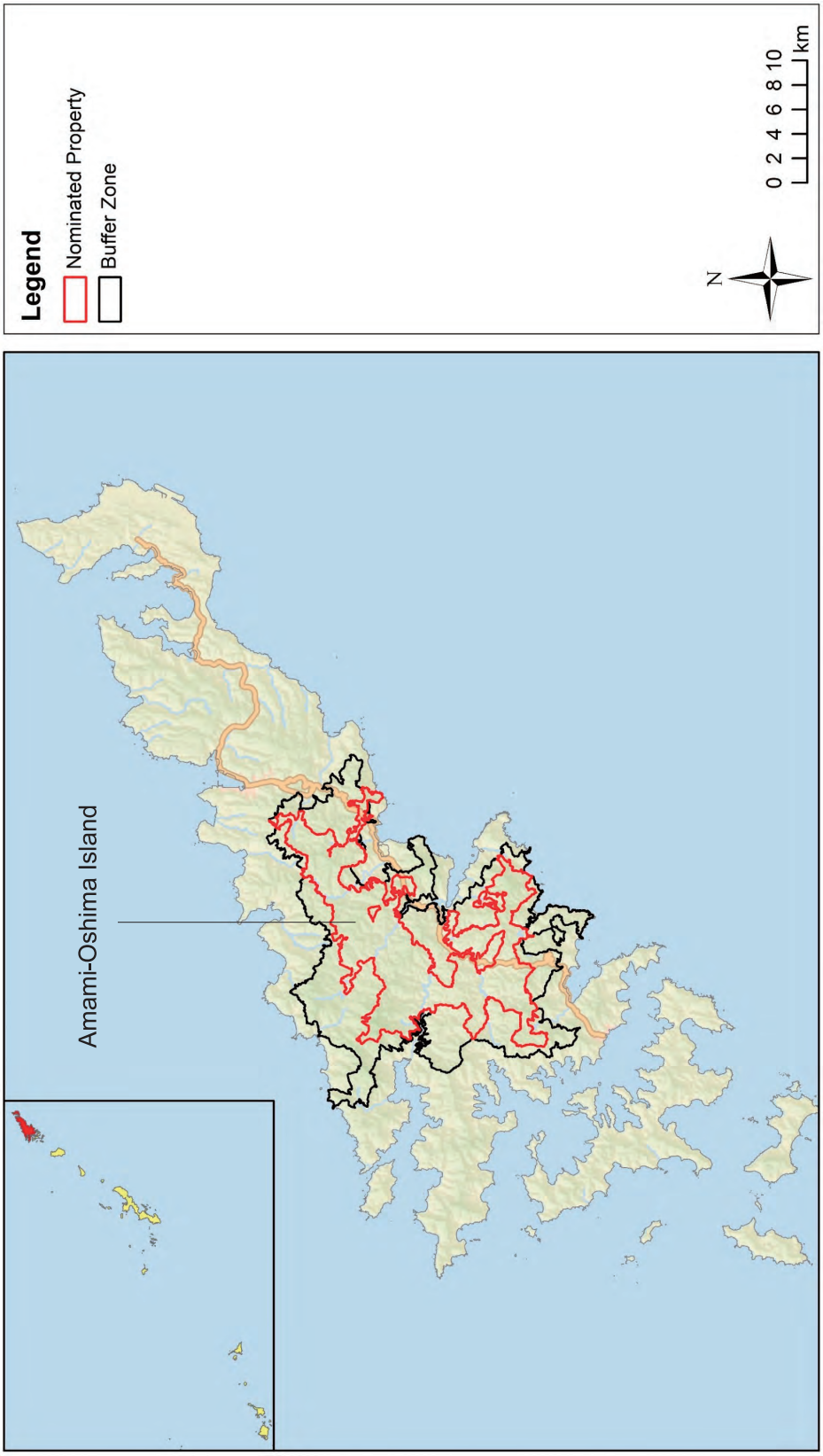
Regional classification of the Ryukyu Chain including the nominated property



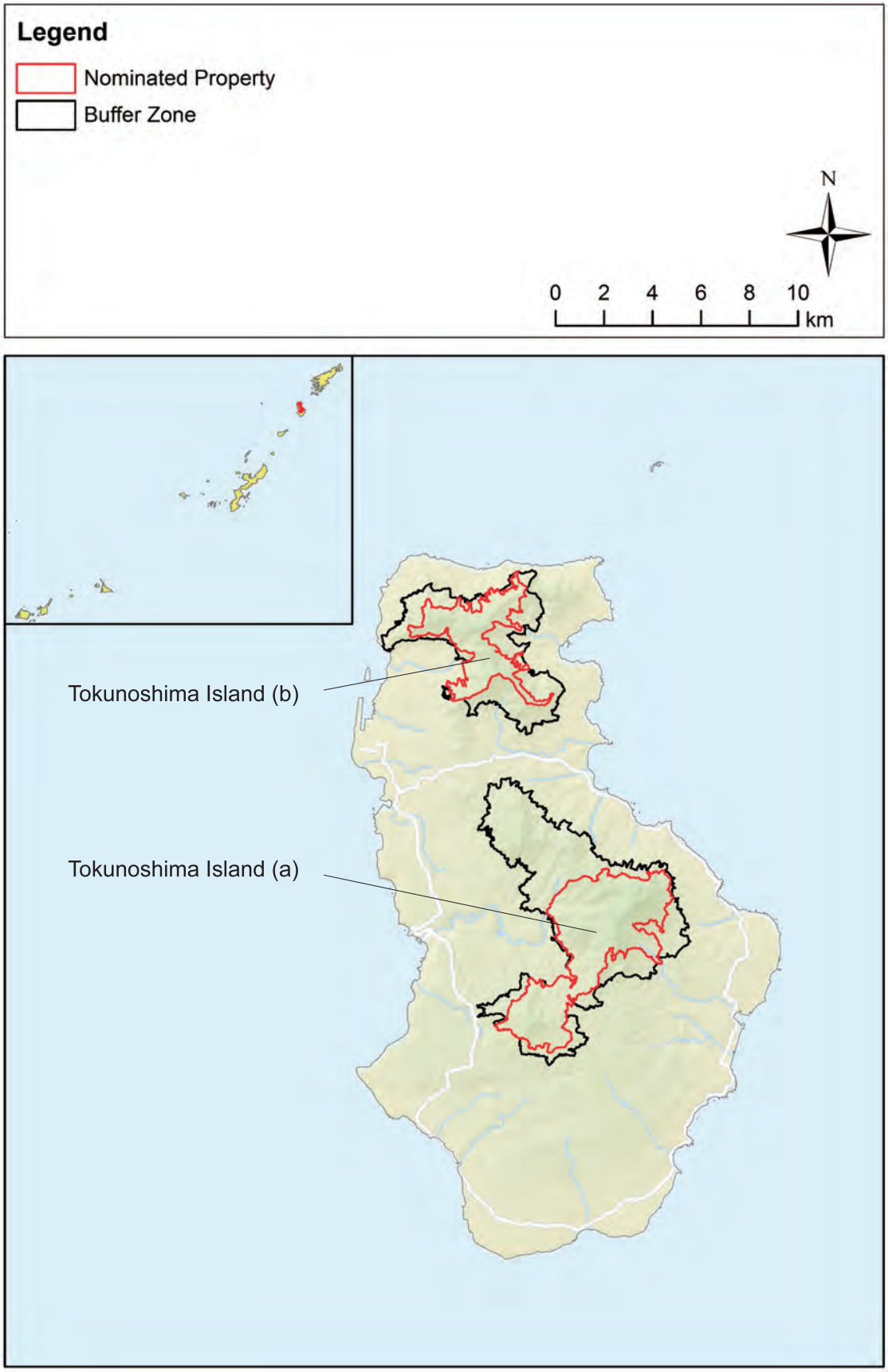
Regional classification of the Ryukyu Chain including the nominated property

Subtropical rainforest, Amami-Oshima Island (Photo: MOEJ)

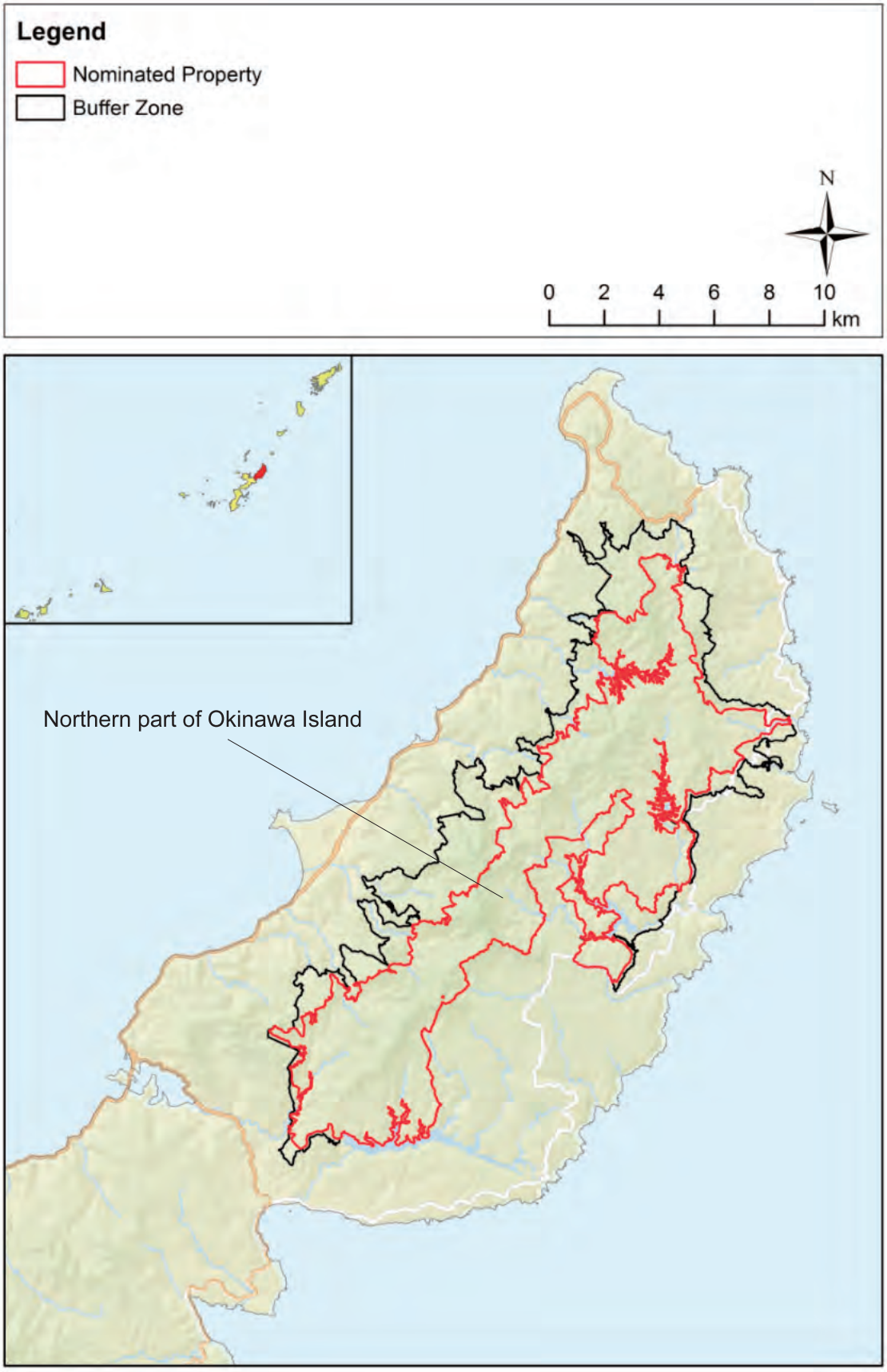
Maps Showing the Boundaries of the Nominated Property and Buffer Zones



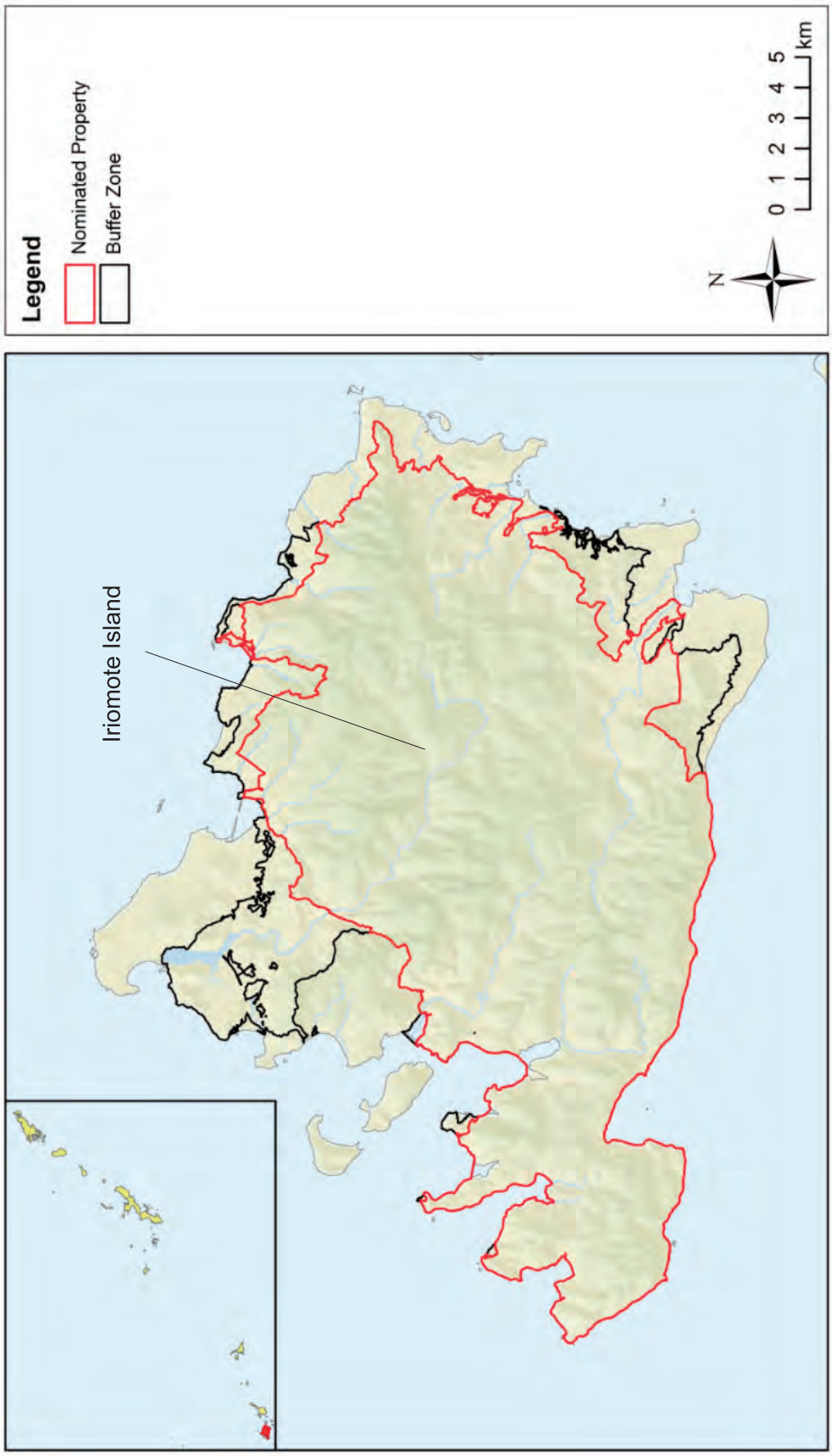
Boundary of the nominated property (Amami-Oshima Island)



Boundary of the nominated property (Tokunoshima Island)



Boundary of the nominated property (Northern part of Okinawa Island)

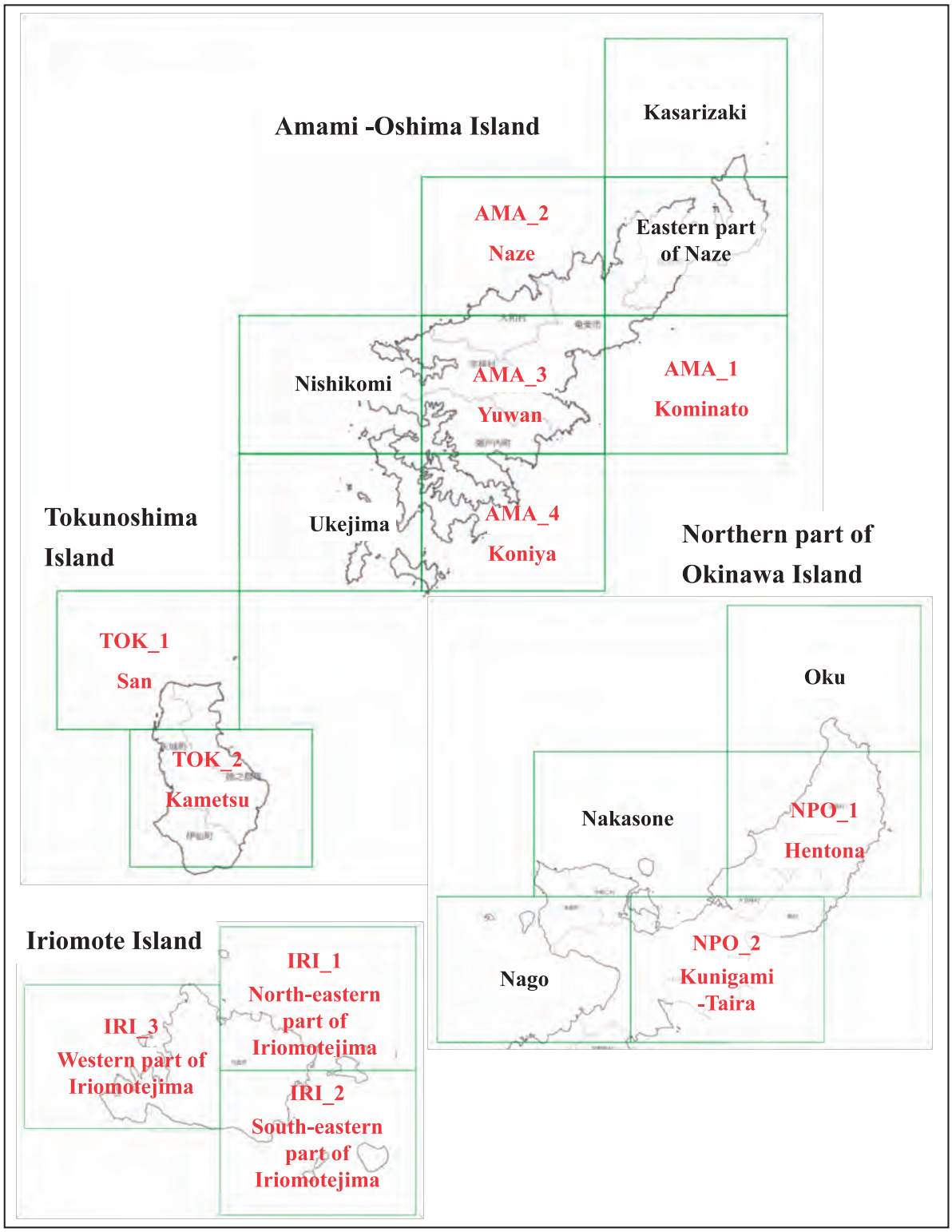


Boundary of the nominated property (Iriomote Island)

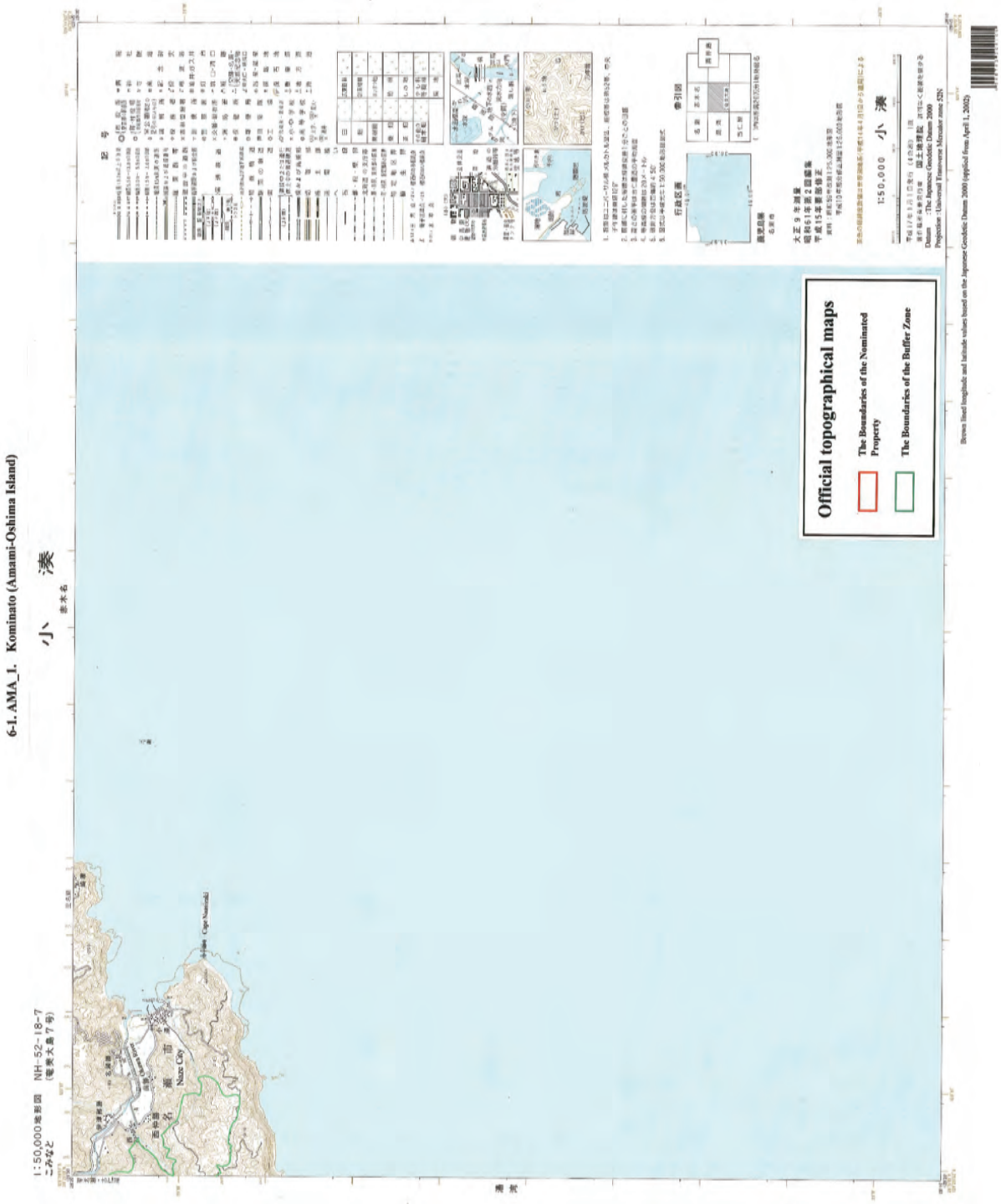
Boundaries of 1:50,000 topographical maps including the nominated property and buffer zones

(Source: Geospatial Information Authority of Japan)

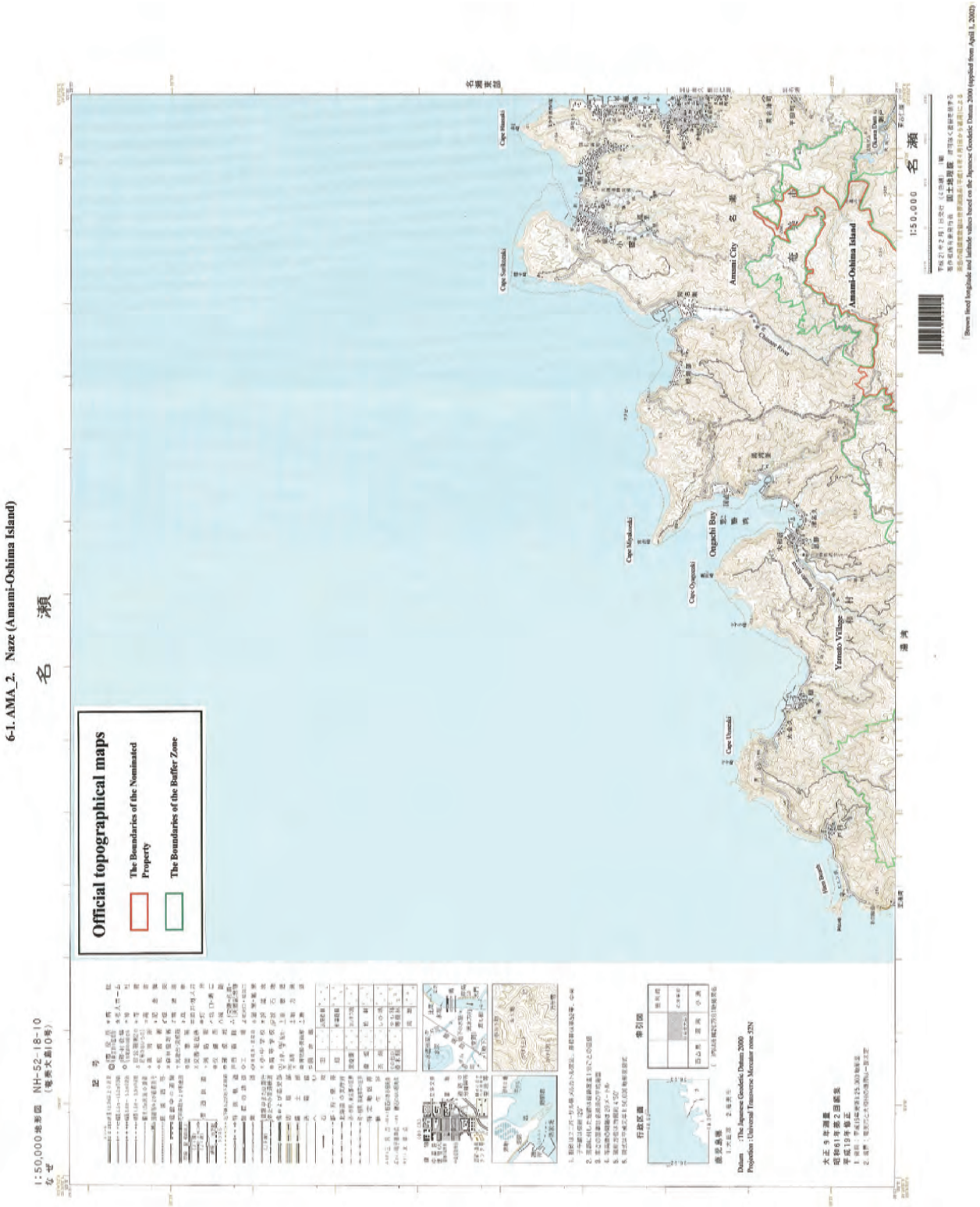
Red letters indicate the map numbers and names in which the nominated property is included.



AMA_1 Kominato (Amami-Oshima Island)

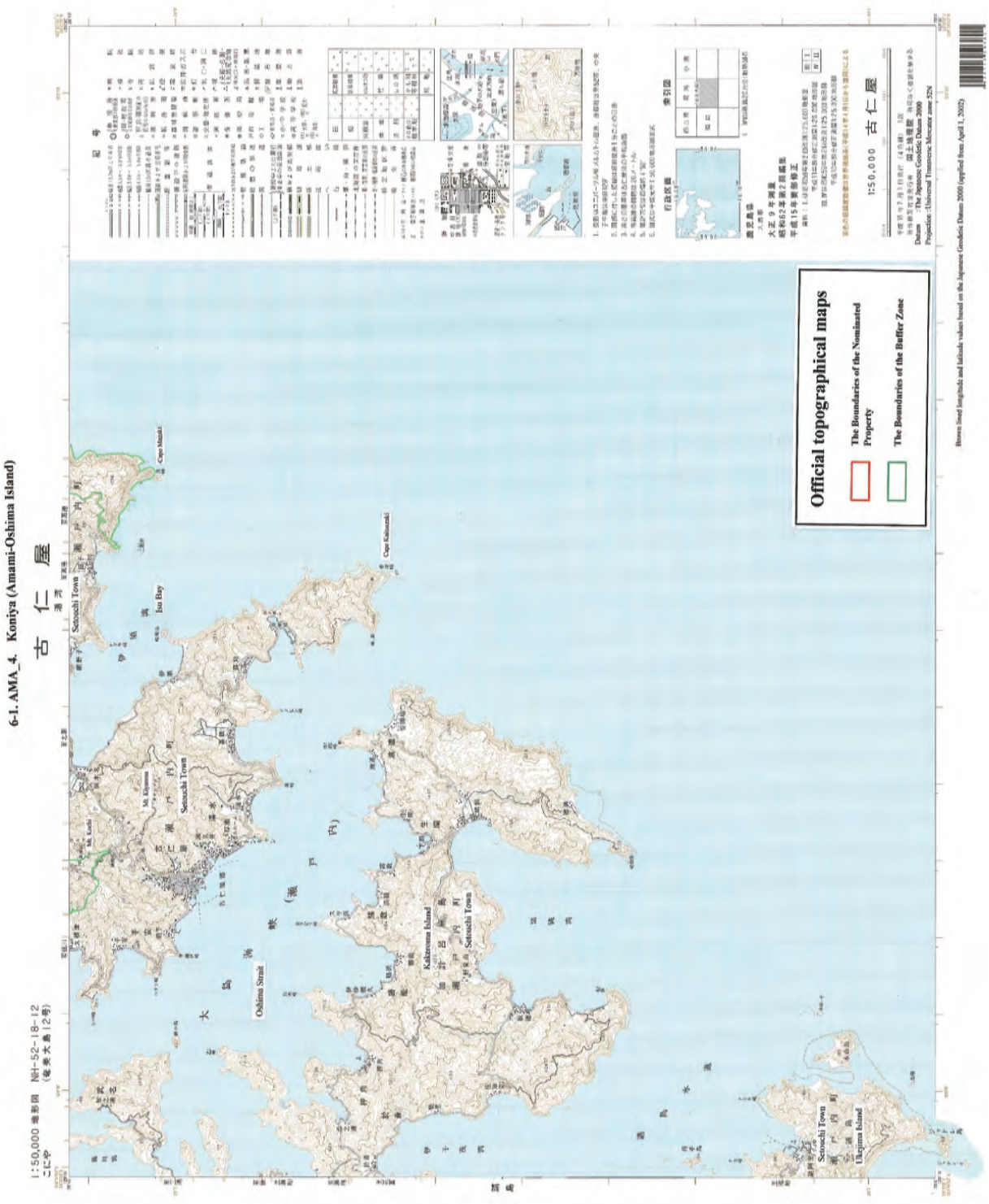


AMA_2 Naze (Amami-Oshima Island)



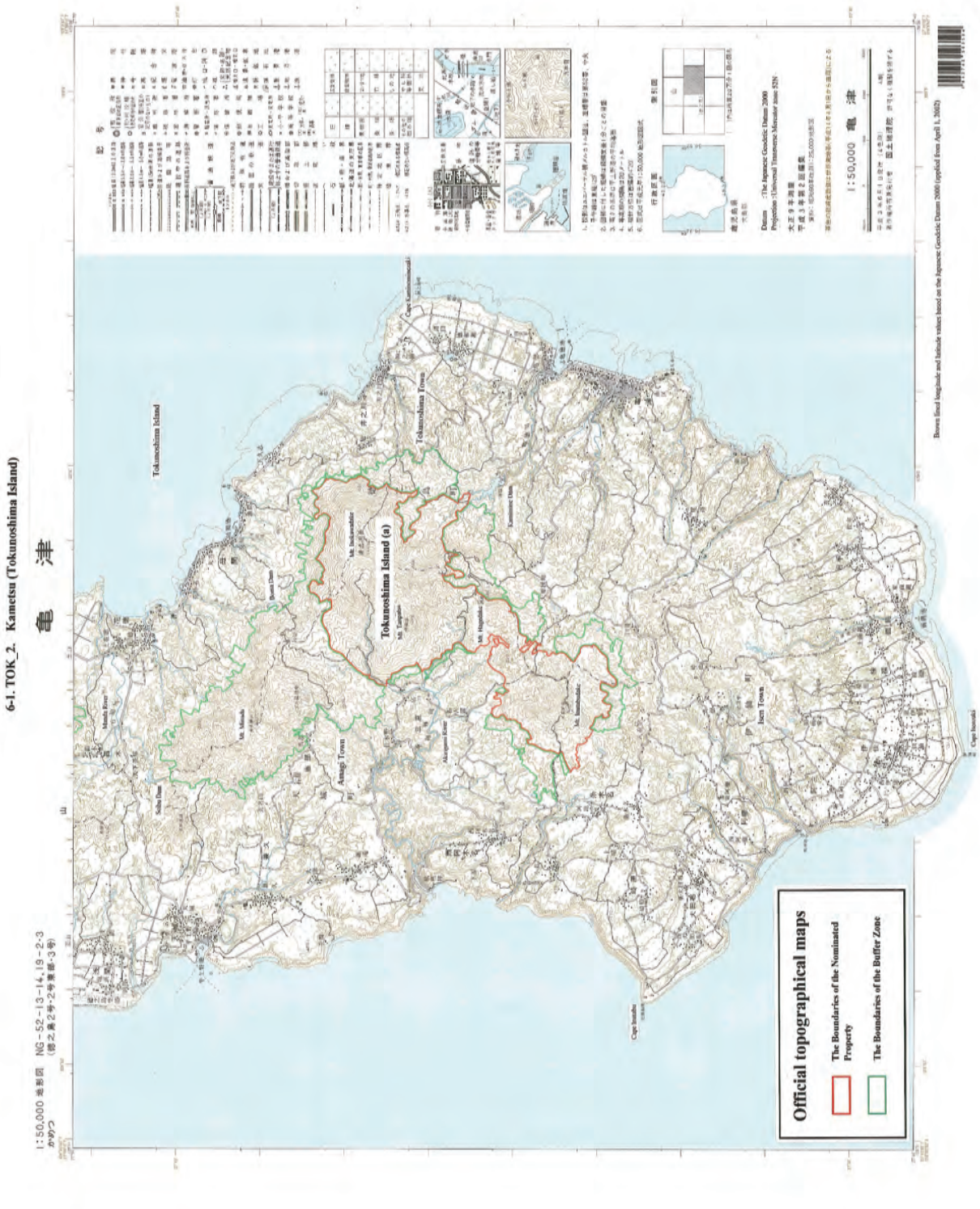
AMA_3 Yuwan (Amami-Oshima Island)

AMA_4　Koniya (Amami-Oshima Island)



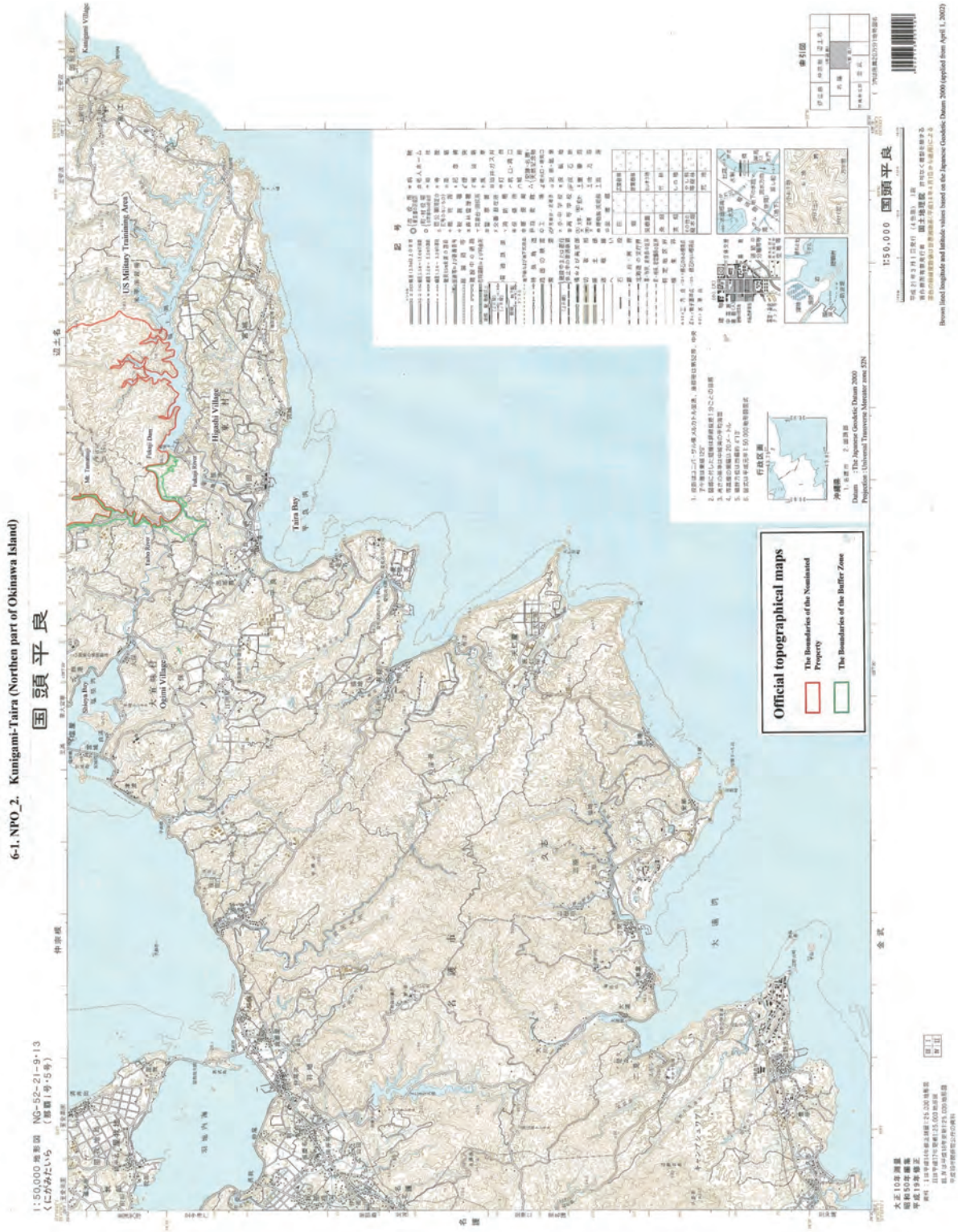
TOK_1 San (Tokunoshima Island)

TOK_2 Kametsu (Tokunoshima Island)

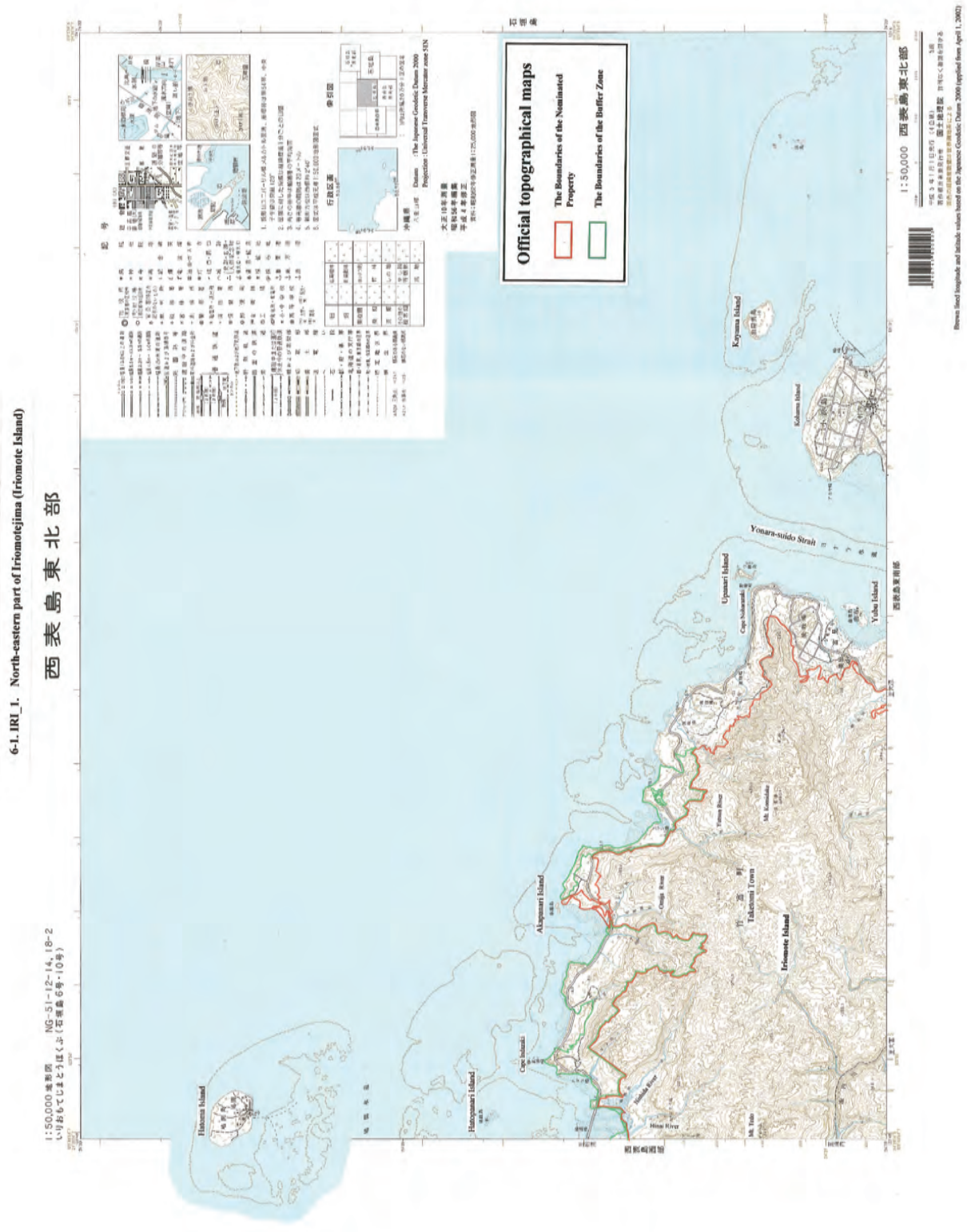


NPO_1 Hentona (Northern part of Okinawa Island)

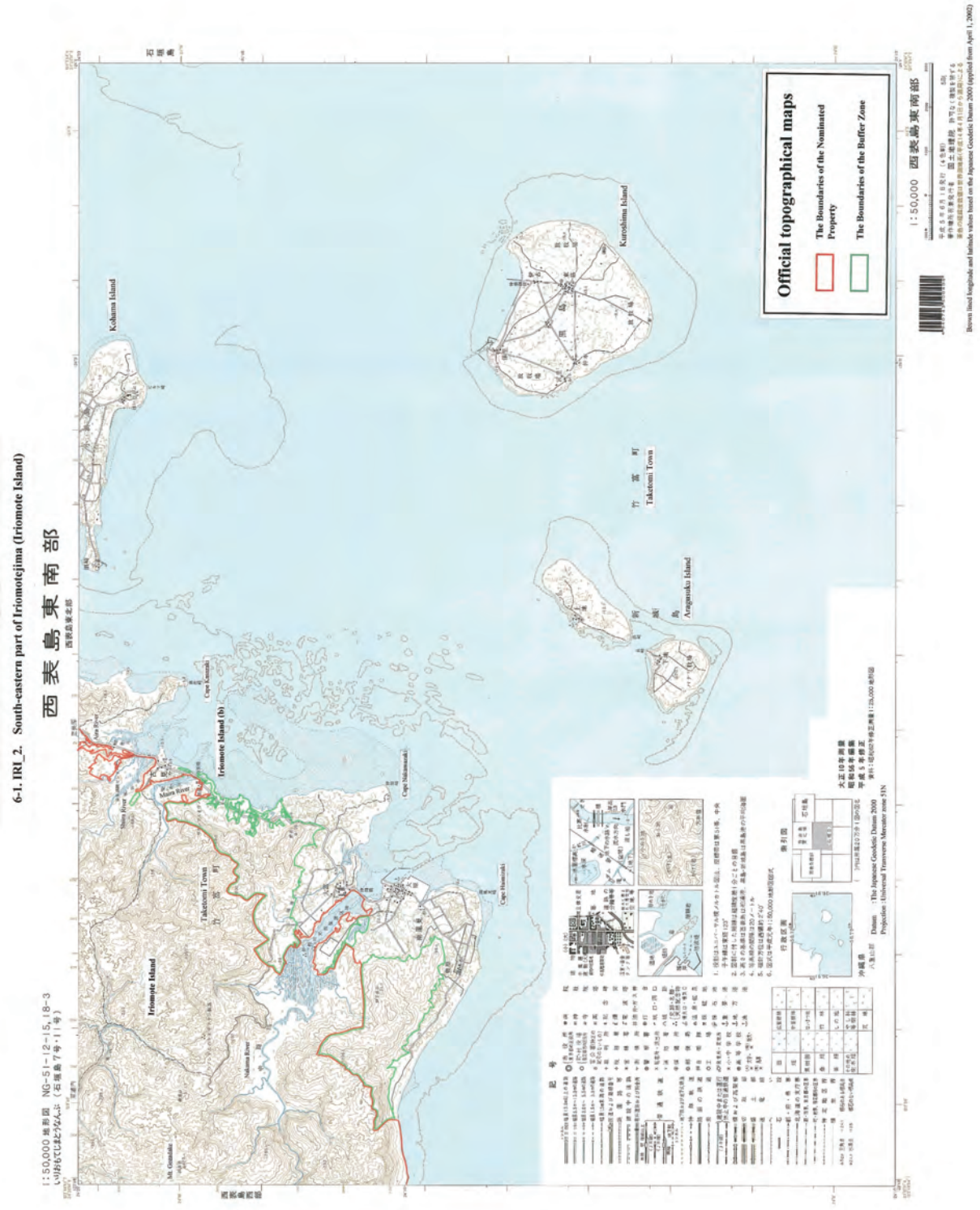
NPO_2 Kunigami-Taira (Northern part of Okinawa Island)



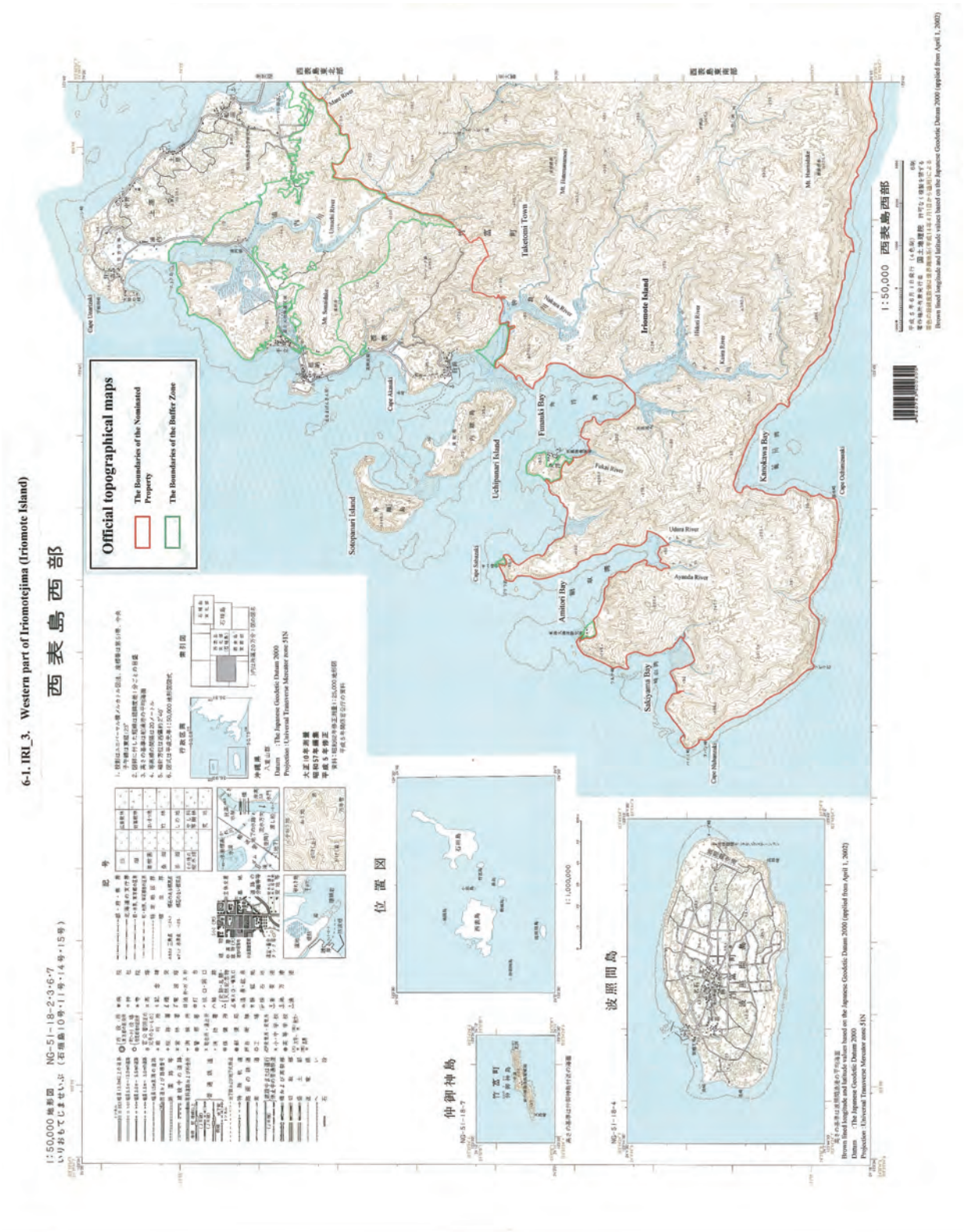
IRI_1 North-eastern part of Iriomotejima (Iriomote Island)



IRI_2 South-eastern part of Iriomotejima (Iriomote Island)



IRI_3　Western part of Iriomotejima (Iriomote Island)



Criteria Under Which Property Is Nominated

Criterion (x): to contain the most important and significant natural habitats for *in-situ* conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation.

Draft Statement of Outstanding Universal Value

a) Brief synthesis

The nominated property is a terrestrial serial site covering 42,698 ha comprised of five component parts in four regions, Amami-Oshima Island, Tokunoshima Island, and the Northern part of Okinawa Island in the Central Ryukyus, and Iriomote Island in the South Ryukyus. The islands of the Central and South Ryukyus are members of the Ryukyu Chain at the southern tip of the Japanese archipelago. Influenced by the Kuroshio Current and the subtropical high-pressure system, the nominated property has a warm and humid subtropical climate and is covered mainly with evergreen broadleaved subtropical rainforests.

The nominated property is the best representative of the Central and South Ryukyus that contain the richest biota in Japan, one of the world's biodiversity hotspots. The nominated property has a large number of species in many taxonomic groups. The property also supports many threatened species and species endemic to the Central and South Ryukyus, and the proportions of those species are high. Further, various examples of evolution of endemic species, especially many examples of relict and/or evolutionarily distinct species, are found in the nominated property.

These features of the biodiversity of the nominated property are all interrelated and derived from the geological history of the Central and South Ryukyus as continental islands. Reflecting its long history of separation and isolation, the terrestrial creatures went through various evolutionary processes and formed unique biota, as observed in many examples of endemic species in non-flying terrestrial vertebrate groups and plants. Also, the Central and South Ryukyus have differences in their patterns of speciation and endemism.

Thus, the nominated property is of overall high global irreplaceability for the protection of unique terrestrial species including many endemic and globally threatened species, and contains the most important and significant natural habitats for *in-situ* conservation of the unique and rich biodiversity of the Central and South Ryukyus.

b) Justification for criteria

Criterion (x)

The four regions containing the nominated property, which together cover less than 0.5% of Japan's land area, support a large proportion of the fauna and flora in Japan. For example, there are 1,819 vascular plants, 21 terrestrial mammals, 394 birds, 36 terrestrial reptiles and 21 amphibians. As a whole, around 57% of the terrestrial vertebrates of the Biodiversity Hotspot of Japan, including 44% of species endemic to Japan as well as 36% of globally threatened vertebrates in Japan, are living in the four regions containing the nominated property. The number and proportion of threatened species are also large in the nominated property, including 95 globally threatened species.

Among those species listed on IUCN Red List of Threatened Species, the Amami rabbit (*Pentalagus furnessi*) lives on Amami-Oshima and Tokunoshima Islands and is the only species in its genus, with no close relatives anywhere in the world. Okinawa rail (*Gallirallus okinawae*), which lives in the Northern part of the Okinawa Island, is one of the non-flying rails that are known to be vulnerable to extinction. Spiny rats form an endemic genus consisting of three species (*Tokudaiada osimensis, T. tokunoshimensis, T. muenninki*) endemic to each of the three regions of the nominated property in the Central Ryukyus. Iriomote cat (*Prionailurus bengalensis iriomotensis*) only inhabits Iriomote Island, "the world's smallest island where wildcats live".

Also, there are abundant examples of diverse speciation and endemic species in the nominated property. For example, 188 species of vascular plants and 1,607 insect species are endemic. Especially, rates of endemism among terrestrial mammals (62%), terrestrial reptiles (64%), amphibians (86%), and inland water crabs (100%) are high. Among these endemic species in the nominated property, there are as many as 20 species identified as Evolutionarily Distinct and Globally Endangered (EDGE) species, including the Okinawa spiny rat (*Tokudaida muenninki*), Ryukyu black-breasted leaf turtle (*Geoemyda japonica*), and Kuroiwa's ground gecko (*Goniurosaurus splendens*) that are ranked in the Top 100 EDGE species.

The species richness, large number and high proportion of threatened species and endemic species, and diverse examples of speciation and unique evolution, are all interrelated and have resulted from the geological history of the Central and South Ryukyus that formed as continental islands. The Ryukyu Chain was part of the Eurasian Continent until the middle Miocene, but it became separated and formed an archipelago of small islands through the development of the Okinawa Trough and three deep straits. The terrestrial creatures there became isolated on small islands and went through the unique processes of evolution. For this reason, in the Central and South Ryukyus, many examples of endemic species are clearly shown in non-flying terrestrial vertebrate groups and plants that were not able to cross the straits with ease.

c) Statement of integrity

The nominated property includes all the elements necessary to express its Outstanding Universal Value as a serial nomination, is of adequate size to ensure the complete representation of its biodiversity values, and does not suffer from adverse effects of development or neglect.

The four regions containing the nominated property consist of mountains and hills and have the intact and contiguous subtropical rainforests with old trees that secure particularly stable habitats for approximately 90% of native species, endemic species and globally threatened species of the Central and South Ryukyus.

The five component parts of the nominated property have substantial size of the intact subtropical forests and other habitats, and form core areas that contain the most important actual and potential distributional areas of endemic species and threatened species that are key attributes expressing the Outstanding Universal Value of this property. Each component has different characteristic endemic and/or threatened species, and the nominated property as a whole represents the unique characteristics of the biota of the Central and South Ryukyus.

The nominated property is under the strictest protection in Japanese system. Key threats to the biota include the

impact of invasive alien species such as small Indian mongoose and cats, wildlife roadkills and the illegal collection of wild rare and threatened species. For these threats, the risks to the nominated property are prevented or mitigated by various measures implemented through collaboration among related administrative organs, private organizations and local communities. In recent years, the tourism industry has developed, and measures towards sustainable tourism use have been started on each island.

d) Statement of authenticity

Not applicable because this nomination does not claim cultural values.

e) Requirements for protection and management

The nominated property is designated as Special Protection Zones or Class I Special Zones of national parks managed by the Ministry of the Environment and/or Preservation Zones of Forest Ecosystem Reserves managed by the Forestry Agency. In addition, the nominated property is designated as National Wildlife Protection Area and Natural Monument Protection Area. The nominated property is thereby protected by the highest-ranked strict protection measures in the Japanese protected area system, and is ensured of adequate management resources and appropriate long-term protection.

The four islands containing the nominated property are inhabited by people, and the places for residents' lives and industrial activities are close to the habitats for endemic species and threatened species. To enable the coexistence of protection of the property and the people's livelihoods, buffer zones were set up mainly in the Class II Special Zone of the national park and/or the Conservation and Utilization Zone of the Forest Ecosystem Reserve, adjacent to the nominated property. In addition, Surrounding Conservation Areas encompassing the nominated property and the buffer zones are designated under the Comprehensive Management Plan to implement conservation through legal or customary means as well as a broader range of conservation and management measures required to counter threats to the nominated property such as invasive alien species and illegal collection of rare and threatened species. Looking at the whole region in which the nominated property is located and setting up three different management categories facilitates the organic management of the nominated property in partnership with many stakeholders.

Some of the endemic species and/or threatened species living in the nominated property, such as the Amami rabbit, three species of spiny rats, Okinawa rail and Iriomote cat, have been designated and legally protected as National Endangered Species and/or National Natural Monuments.

The responsible administrative organs, i.e. the Ministry of the Environment, the Forestry Agency, the Agency for Cultural Affairs, Kagoshima and Okinawa Prefectures, and 12 municipalities, have established the Regional Liaison Committee to facilitate and coordinate their works in the management of multilayered protected areas and the protection of designated species. They manage the nominated property in a consistent manner based on the Comprehensive Management Plan which covers conservation management measures not only in the nominated property but also in the buffer zones and Surrounding Conservation Areas.

Under the Regional Liaison Committee, four sub-local meetings including local stakeholders as members have

been set up, and regional Action Plans were formulated to effectively carry out conservation and management of the nominated property through collaboration and cooperation with the local stakeholders. Also, the Scientific Committee and Local Working Groups comprised of academic experts have been established to provide scientific advice to the conservation and management by administrative organs, and promote adaptive conservation and management in light of scientific knowledge and insight.

Name and Contact Information of Official Local Institution/Agency

Naha Regional Office for Nature Conservation, The Ministry of the Environment

Address: Naha Daiichi Chihou Godochosha, 1-15-15 Higawa, Naha City, Okinawa Prefecture 900-0022

TEL: +81-98-836-6400 FAX: +81-98-836-6401

E-mail: NCO-NAHA@env.go.jp Web address: http://kyushu.env.go.jp/naha/index.html

Kyushu Regional Forest Office, The Forestry Agency

Address: 2-7 Kyomachi-honcho, Nishi-ku, Kumamoto City, Kumamoto Prefecture 860-0081

TEL: +81-96-328-3500 FAX: +81-96-355-389

E-mail: cms_ky@maff.go.jp Web address: http://www.rinya.maff.go.jp/kyusyu/

Mangrove forest, Iriomote Island (Photo: MOEJ)


Amami-Oshima Island
- Endemic and threatenend species representing the island
Asiagomphus amamiensis amamiensis
Luscinia komadori komadori
Pentalagus furnessi
Protobothrops flavoviridis
Neolucanus protogenetivus protogenetivus
Scolopax mira
Tokudaia osimensis
Dinodon semicarinatum
: EDGE species (Zoological Society of London)
: Relict endemic species
: Endemic species (including subspecies, varieties)


★■ Diplothrix legata
■ Myotis yanbarensis
★■ Garrulus lidthi
■ Zoothera dauma major
■ Dendrocopos leucotos owstoni
■ Liparis viridiflora
■ Odorrana splendida
■ Odorrana amamiensis
■ Asarum fudsinoi
■ Viola amamiana
★■ Babina subaspera
■ Cynops ensicauda
★■ Echinotriton andersoni
■ Cardiandra amamiohsimensis
■ : Threatened species (IUCN Red List)
■ : Threatened species (MOEJ Red List)
Photo by Hidetoshi Ota, JWRC, MOEJ


Diplothrix legata
Myotis yanbarensis
Polypodium amamianum
Matrona basilaris japonica
Luscinia komadori namiyei
Pentalagus furnessi
Neolucanus protogenetivus protogenetivus
Scolopax mira
Tokudaia tokunoshimensis
: EDGE species (Zoological society of London)
: Relict endemic species
: Endemic species (including subspecies, varieties)


Tokunohsima Island
- Endemic and threatened species representing the island -
Protobothrops flavoviridis
Goniurosaurus splendens
Odorrana amamiensis
Solenogyne mikadoi
Dinodon semicarinatum
Echinotriton andersoni
Asarum hatsushimae
Pteris formosana
: Threatened species (IUCN Red List)
: Threatened species (MOEJ Red List)
Photo by Shosaku Hattori, Hidetoshi Ota, JWRC, MOEJ


Northern Part of Okinawa Island
Ednemic and threatened species representing the island
Dendrobium okinawense
Luscinia komadori namiyei
Sapheopipo noguchii
Pieris japonica var. koidzumi
Rhipidolestes shozoi
Gallirallus okinawae
Odorrana ishikawae
Odorrana narina
★ : EDGE species (Zoological Society of London)
○ : Relict endemic species
○ : Endemic species (including subspecies, varieties)
■ : Threatened species (IUCN Red List)
■ : Threatened species (MOEJ Red List)
Photo by Hidetoshi Ota, MOEJ


★■ Diplothrix legata
■ Pteropus dasymallus inopinatus
■ Myotis yanbarensis
★■ Tokudaia muenninki
■ Cheirotonus jambar
■ Neolucanus okinawanus
■ Limnonectes namiyei
Protobothrops flavoviridis
★■ Goniurosaurus kuroiwae
■ Cynops ensicauda
■ Babina holsti
Dinodon semicarinatum
★■ Geoemyda japonica
★■ Echinotriton andersoni


Iriomote Island
- Endemic and threatenend species representing the island
Asarum gelasinum
Solenogyne mikadoi
Rhinocypha uenoi
Asiagomphus yayeyamensis
Odorrana supranarina
Elaphe taeniura schmackeri
Scincella boettgeri
Plestiodon kishinouyei
: Relict endemic species
: Endemic Species (including subspecies, varieties)
Photo by JWRC, MOEJ


Pteropus dasymallus yayeyamae
Spilornis cheela perplexus
Ochlodes asahinai
Odorrana utsunomiyaorum
Begonia fenicis
Neolucanus insulicola insulicola
Prionailurus bengalensis iriomotensis
Miniopterus fuscus
Sus scrofa riukiuanus
Cuora flavomarginata evelynae
Takydromus dorsalis
Nidirana okinavana
: EDGE species (Zoological Society of London)
: Threatened species (IUCN Red List)
: Threatened species (MOEJ Red List)

1

Identification of the Property

1. a. Country

1. b. State, Province or Region

1. c. Name of Property

1. d. Geographical Coordinates to the Nearest Second

1. e. Maps and Plans, Showing the Boundaries of the Nominated Property and Buffer Zone

1. f. Area of Nominated Property and Proposed Buffer Zone

Mountains of fresh green, Amami-Oshima Island (Photo: MOEJ)

1. Identification of the Property

1.a. Country

Japan

1.b. State, Province or Region

Kagoshima Prefecture and Okinawa Prefecture

1.c. Name of Property

Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island

1.d. Geographical Coordinates to the Nearest Second

Center of the nominated property:

This is a serial property comprising five component parts in the four regions shown in Table 1-1.

Table 1-1: Latitude, longitude, and area of the nominated property

ID	Name of the component parts		District	Coordinates of the central point	Area of nominated component of the property (ha)	Area of the buffer zone (ha)	Map No. (Annex 6-1)
1	Amami-Oshima Island		Kagoshima Prefecture	N28° 16′ 44.969″ E129° 22′ 41.886″	11,640	14,505	AMA_1 AMA_2 AMA_3 AMA_4
Amami-Oshima Island area (ha)					**11,640**	**14,505**	
2	Tokunoshima Island	(a)	Kagoshima Prefecture	N27° 45′ 48.136″ E128° 58′ 01.962″	1,724	1,813	TOK_2
3		(b)		N27° 51′ 56.053″ E128° 55′ 33.394″	791	999	TOK_1
Tokunoshima Island area (ha)					**2,515**	**2,812**	
4	Northern part of Okinawa Island		Okinawa Prefecture	N26° 43′ 29.212″ E128° 13′ 12.382″	7,721	3,398	NPO_1 NPO_2
Northern part of Okinawa Island area (ha)					**7,721**	**3,398**	
5	Iriomote Island		Okinawa Prefecture	N24° 19′ 34.257″ E123° 48′ 31.486″	20,822	3,594	IRI_1 IRI_2 IRI_3
Iriomote Island area (ha)					**20,822**	**3,594**	
Total area (ha)					**42,698**	**24,309**	

1.e. Maps and Plans, Showing the Boundaries of the Nominated Property and Buffer Zones

Table 1-2 shows a list of maps, including maps of the nominated property and the buffer zones. The nominated property is part of the Ryukyu Chain that is scattered in the form of an arch extending to around 1,200 km in the sea area between the south edge of Kyushu of the Japanese Archipelago and Taiwan. It is a serial property comprising four islands of Amami-Oshima Island, Tokunoshima Island, and Okinawa Island of the Central

Ryukyus, and Iriomote Island of the South Ryukyus (Figures 1-1 and 1-2). The nominated property which demonstrates the Outstanding Universal Value (OUV) for inscription on the World Heritage List is to be limited, in the light of scientific examination, only to these four islands. Figures 1-3 to 1-6 show the boundaries of the nominated property and the buffer zones.

In addition, for this property, "Surrounding Conservation Areas" have been defined as areas surrounding the nominated property and the buffer zones, where necessary efforts and management shall be conducted for maintaining the value of the property (Figures 1-7 to 1-10). The comprehensive management plan has been prepared targeting all of these areas (refer to 5.e. for details).

Table 1-2: List of maps included in this document*

No.	Name (type)	As of	Page
Annex 6-1	Boundary of the nominated property and buffer zone (11 sheets at 1:50,000 topographical maps)	2018	x-xxi (shrunk to A4 size)
	Names and classification of islands used in scientific fields	2018	ii, v
Figure 1-1 and 1-2	Location of the nominated property	2018	4-5
Figure 1-3 to 1-6	Boundary of the nominated property	2018	vi-ix, 6-9
Figure 1-7 to 1-10	Scope of the management plan	2018	10-13
Figure 2-1	Bathymetric map of the area around the nominated property	2018	17
Figure 2-2	Geology of the four islands containing the nominated property	2018	21
Figure 2-9 to 2-12	Vegetation of the nominated property	2018	37-40, Annex 3-1 (for details)
Figure 2-24	Nominated property, US Northern Training Area and returned area	2018	119
Figure 2-27	Expansion and zoning of Yambaru National Park	2018	129
Figure 4-4 to 4-6	Major visitor destinations and number of visitors on the four islands containing the nominated property	2018	200-203
Figure 5-1-1, 5-1-6, 5-1-9, 5-1-14	Boundary of the nominated property (satellite image)	2018	213, 219, 223, 229
Figure 5-1-2, 5-1-7, 5-1-10, 5-1-15	National Park	2018	214, 220, 224, 230
Figure 5-1-3, 5-1-8, 5-1-11, 5-1-16	Forest Ecosystem Reserve	2018	215, 221, 225, 231
Figure 5-1-4, 5-1-12, 5-1-17	National Wildlife Protection Area	2018	216, 226, 232
Figure 5-1-5, 5-1- 13, 5-1-18	Natural Monument	2018	217, 227, 233

* For the reduction scales of maps not otherwise specified, refer to the scale on each map.

1.f. Area of Nominated Property and Proposed Buffer Zone

Area of the nominated property:	42,698	ha
Area of the buffer zones:	24,309	ha
Total:	67,007	ha

Refer to Table 1-1 for the area of each component part.

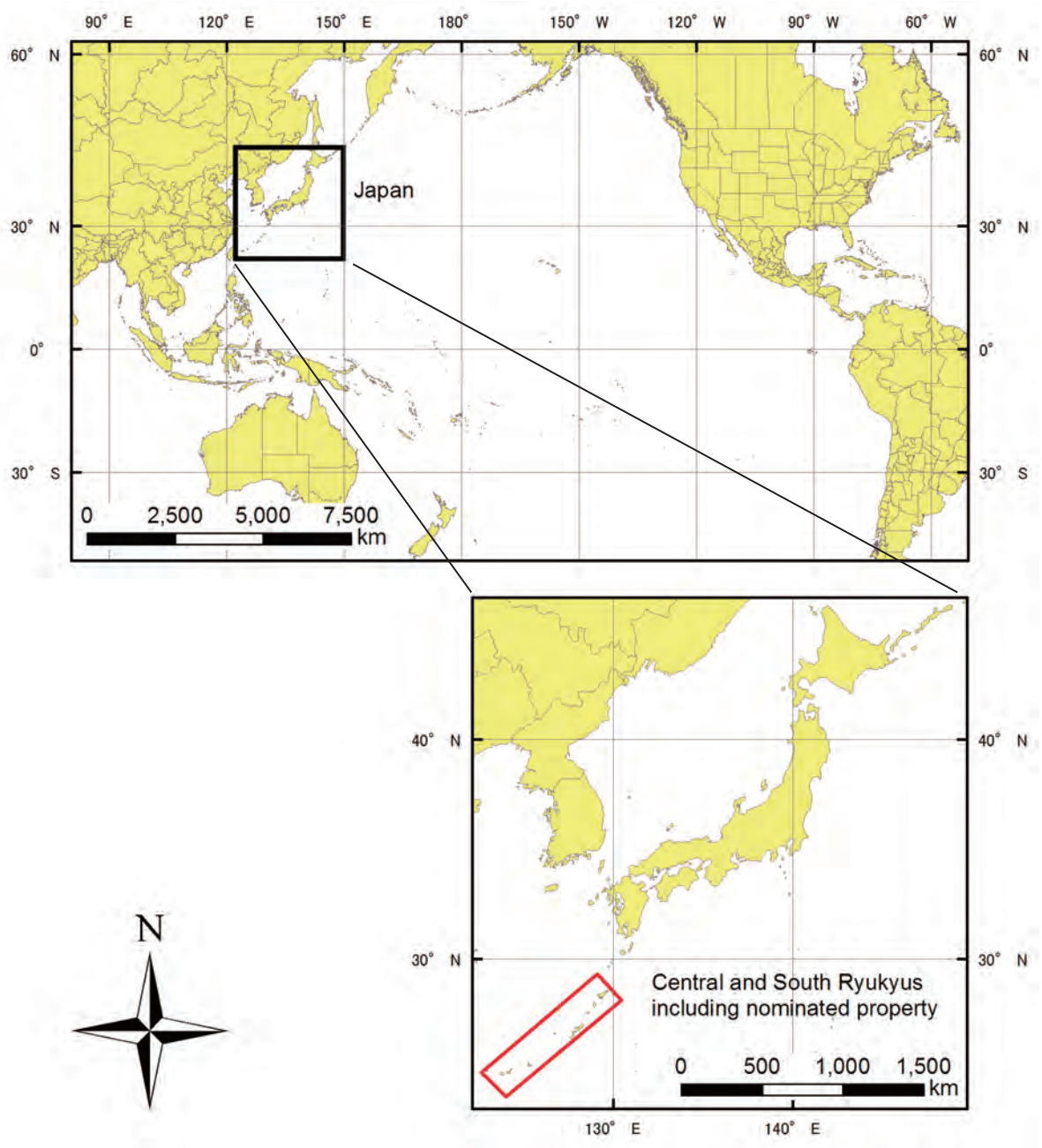


Figure 1-1: Location of the nominated property (global and domestic)

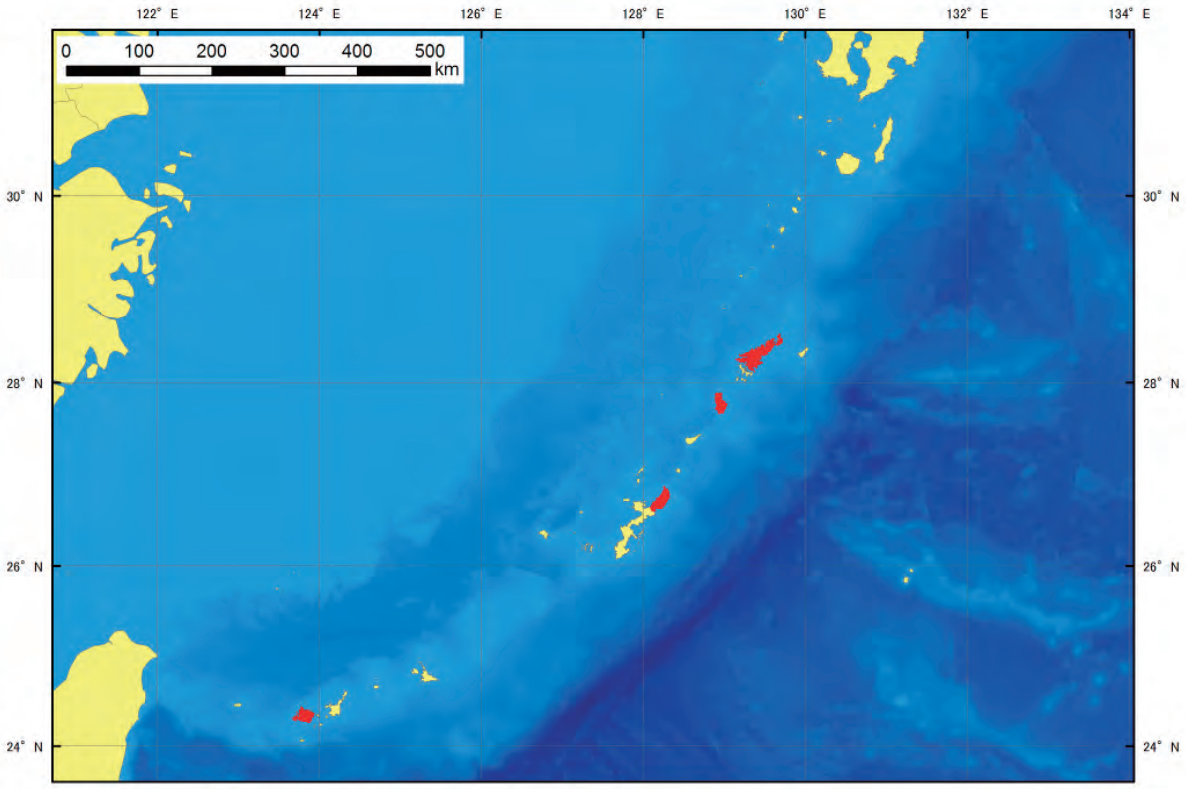


Figure 1-2: Location of the four regions of the nominated property in the Ryukyu Chain

Mountain range of evergreen broadleaved forests, Amami-Oshima Island (Photo: MOEJ)

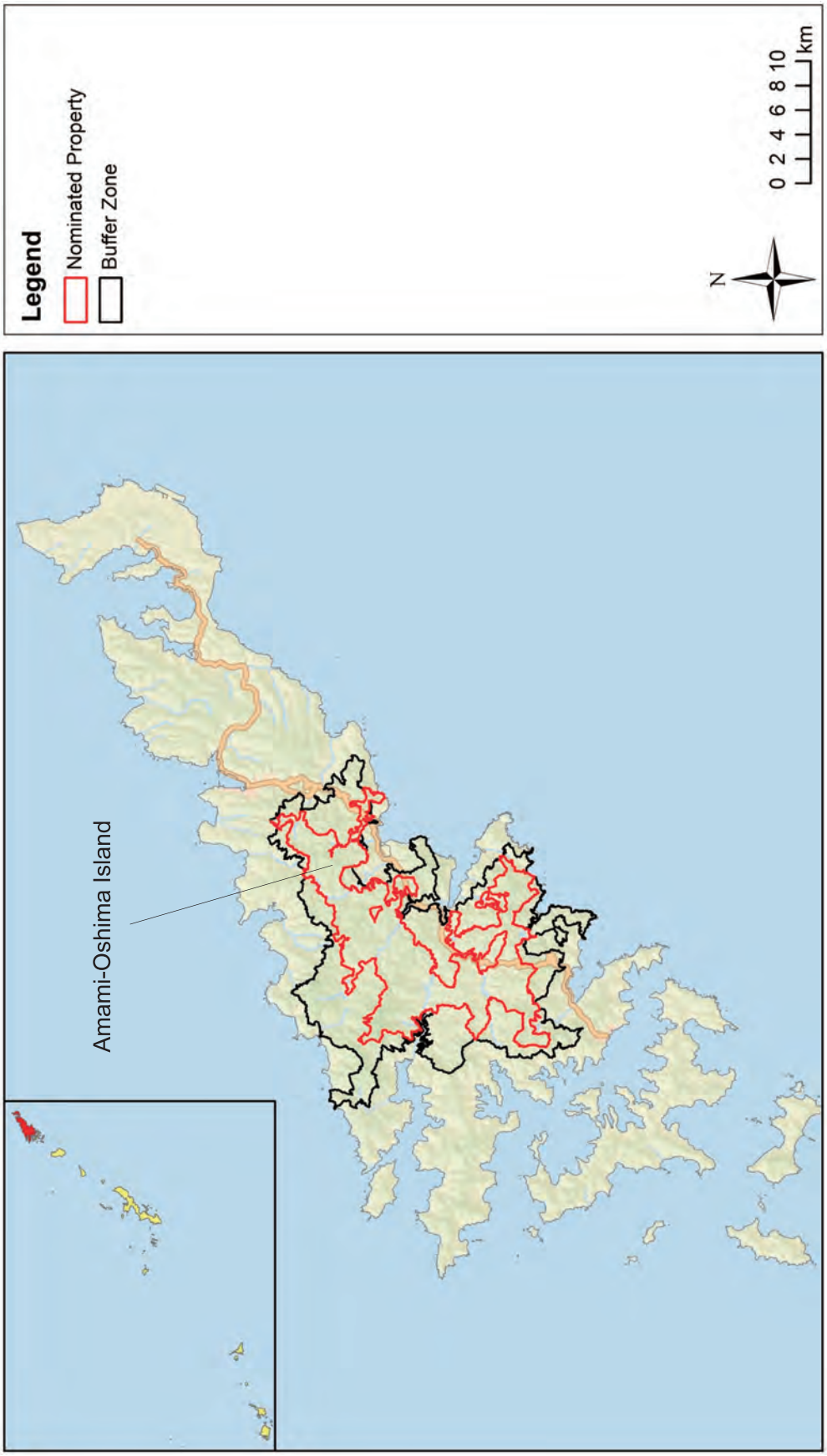


Figure 1-3: Boundary of the nominated property (Amami-Oshima Island)

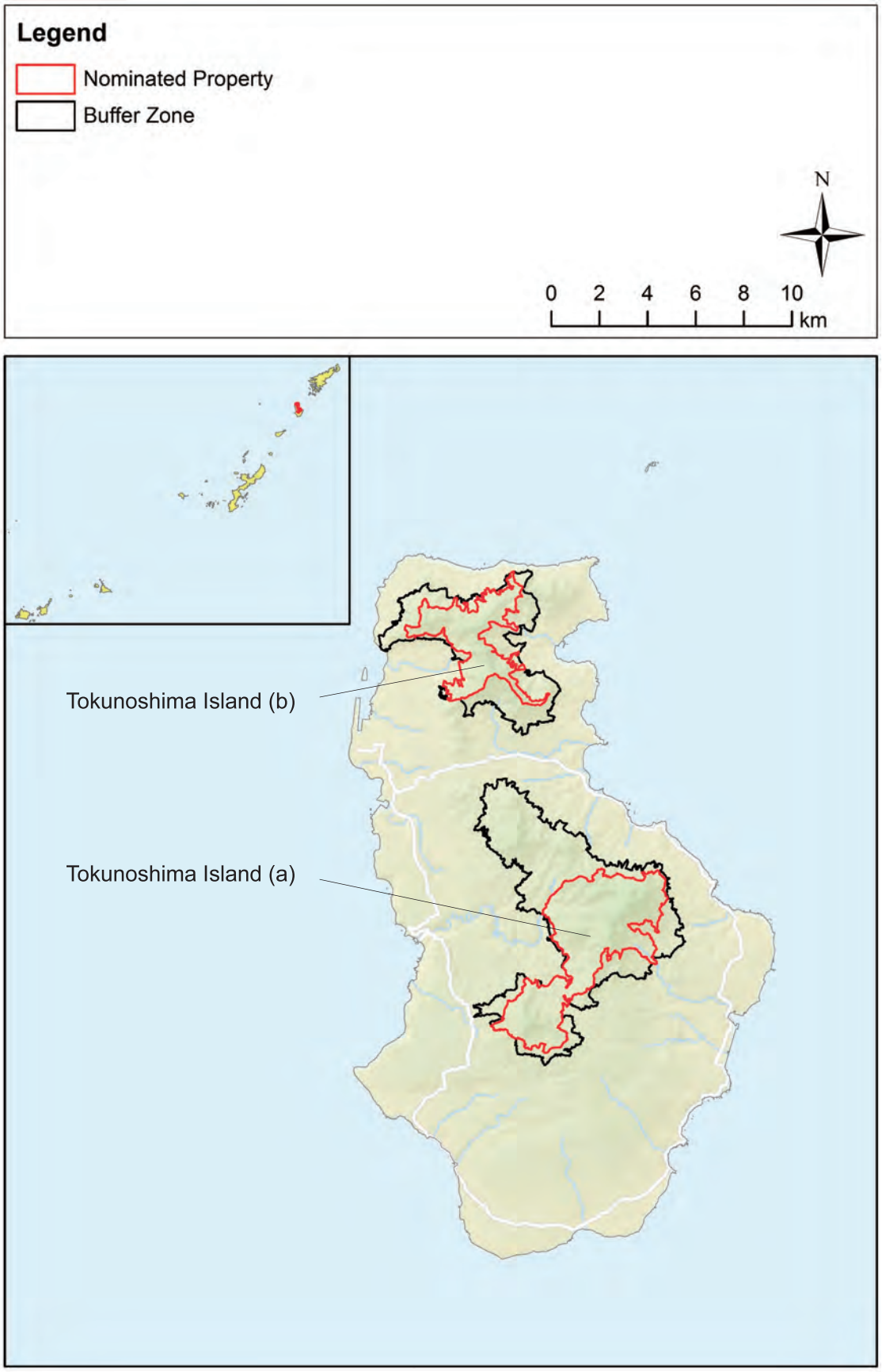


Figure 1-4: Boundary of the nominated property (Tokunoshima Island)

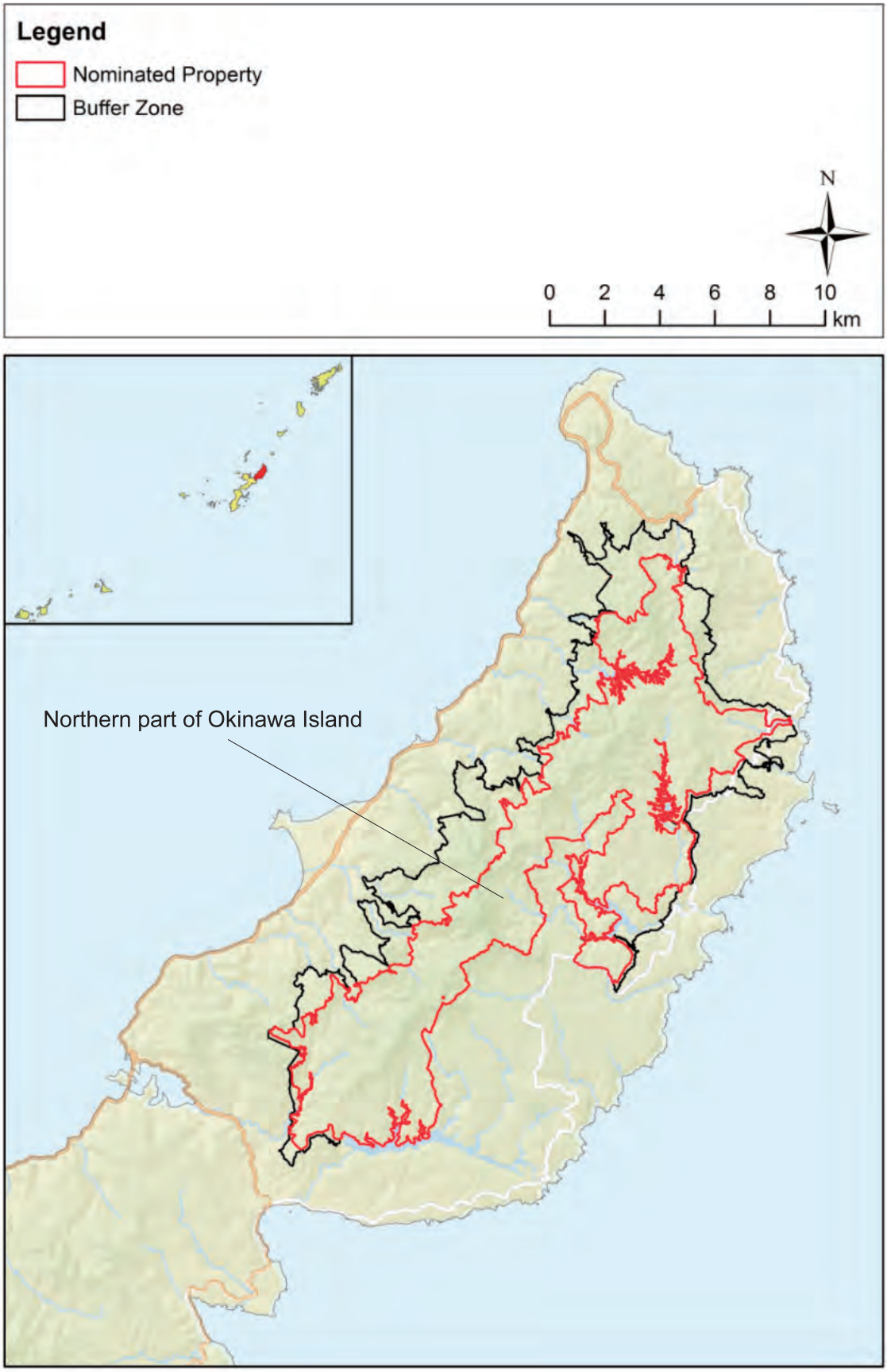


Figure 1-5: Boundary of the nominated property (Northern part of Okinawa Island)

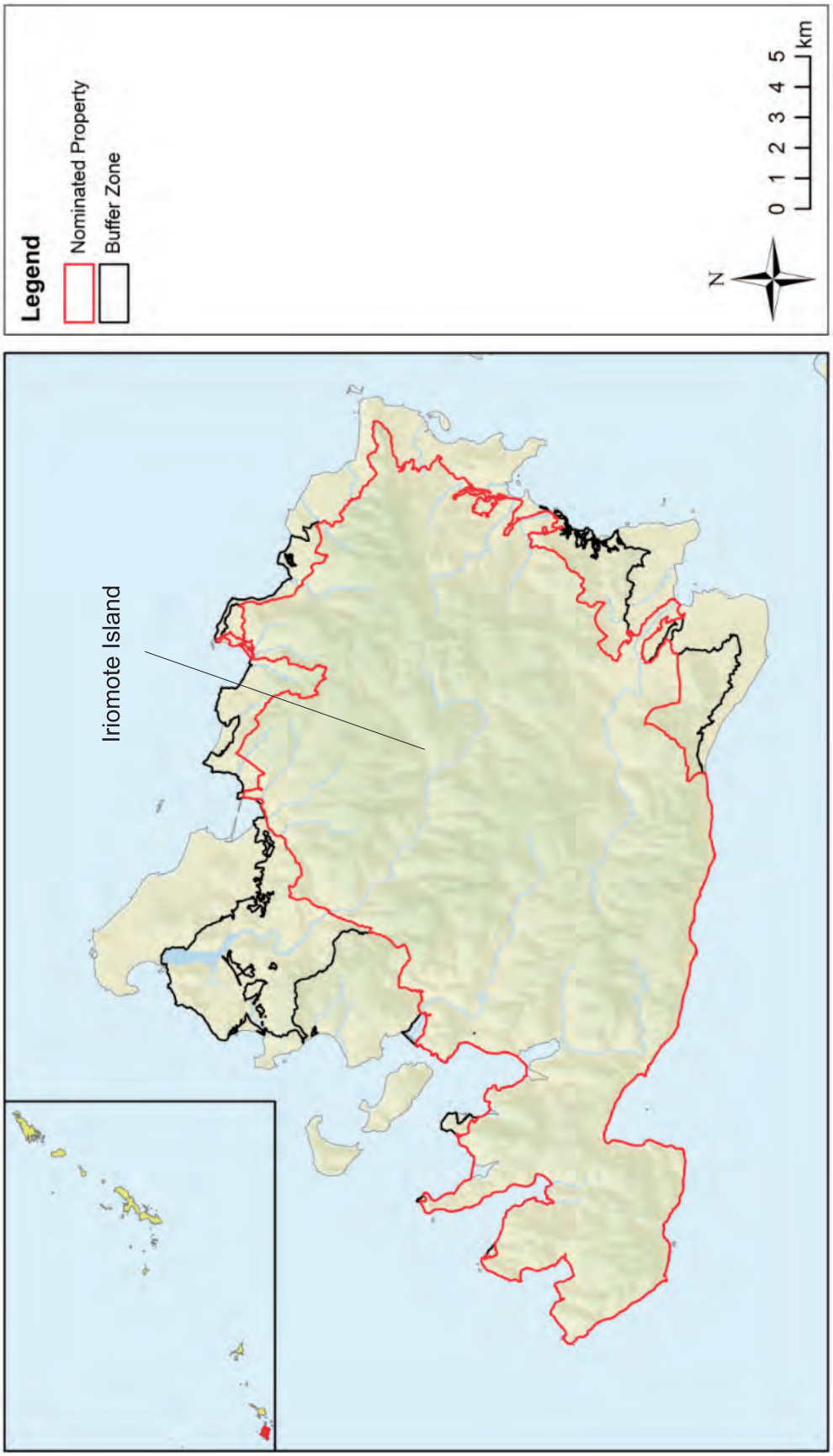


Figure 1-6: Boundary of the nominated property (Iriomote Island)

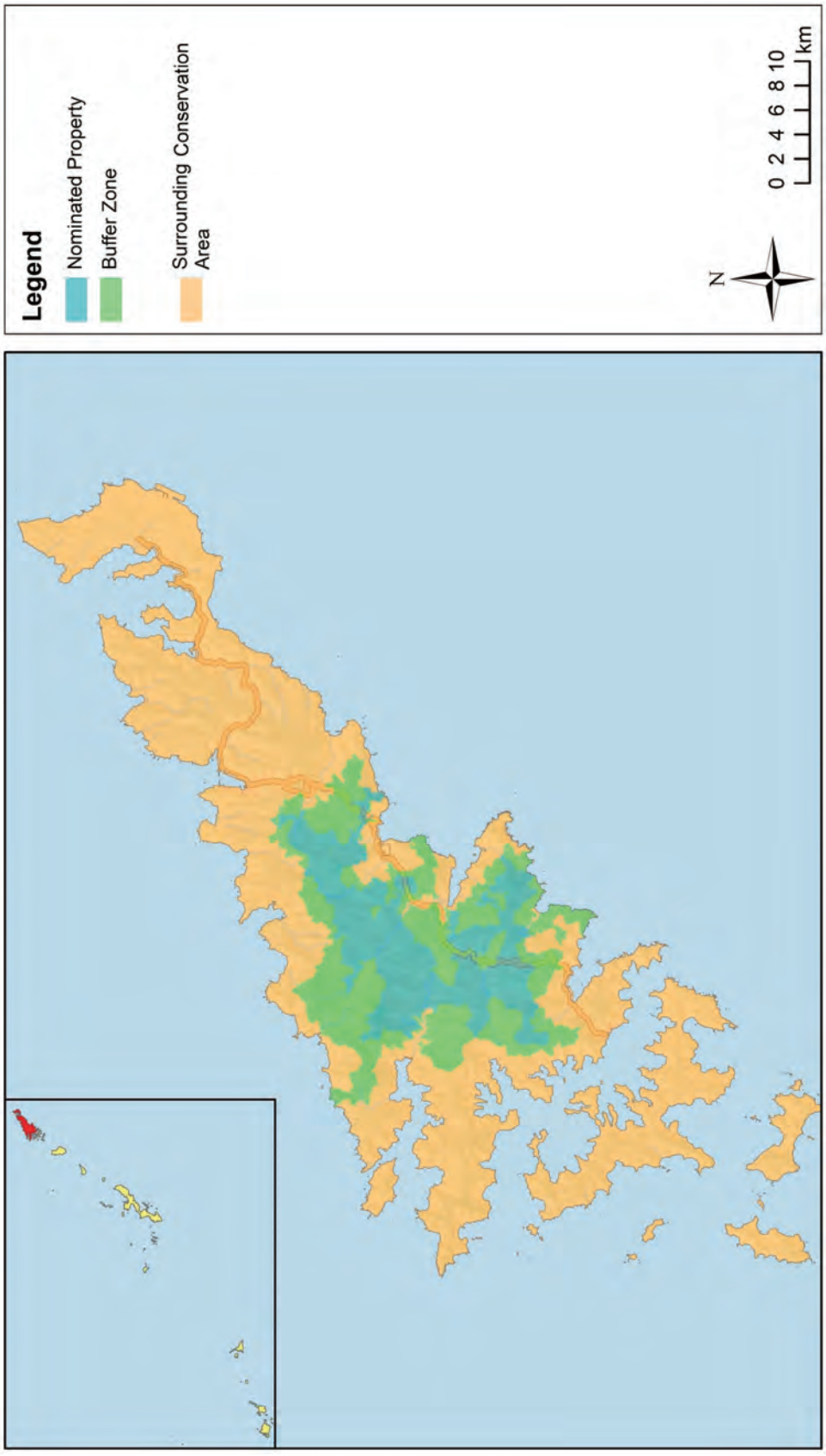


Figure 1-7: Scope of the management plan (Amami-Oshima Island)

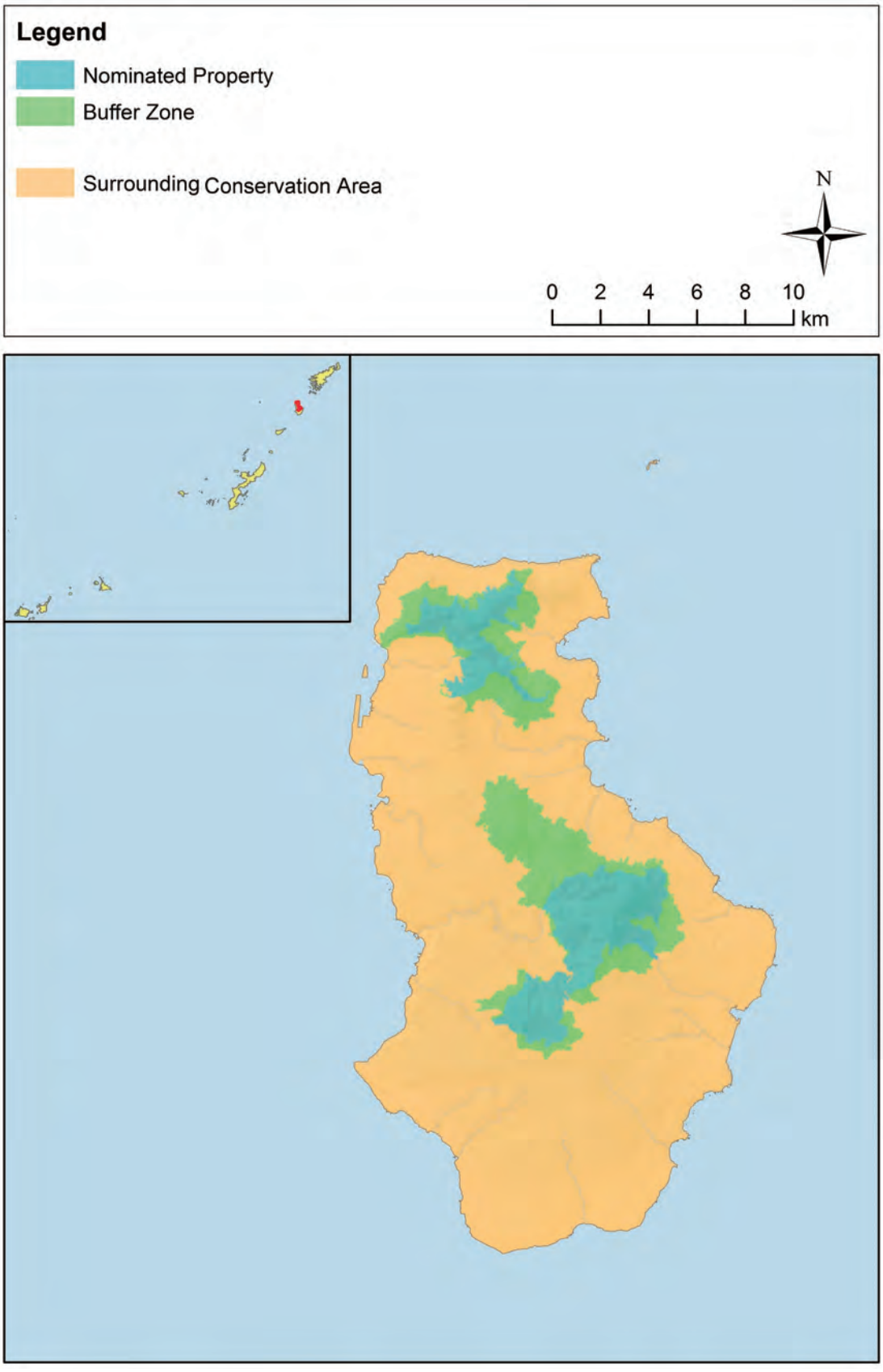


Figure 1-8: Scope of the management plan (Tokunoshima Island)

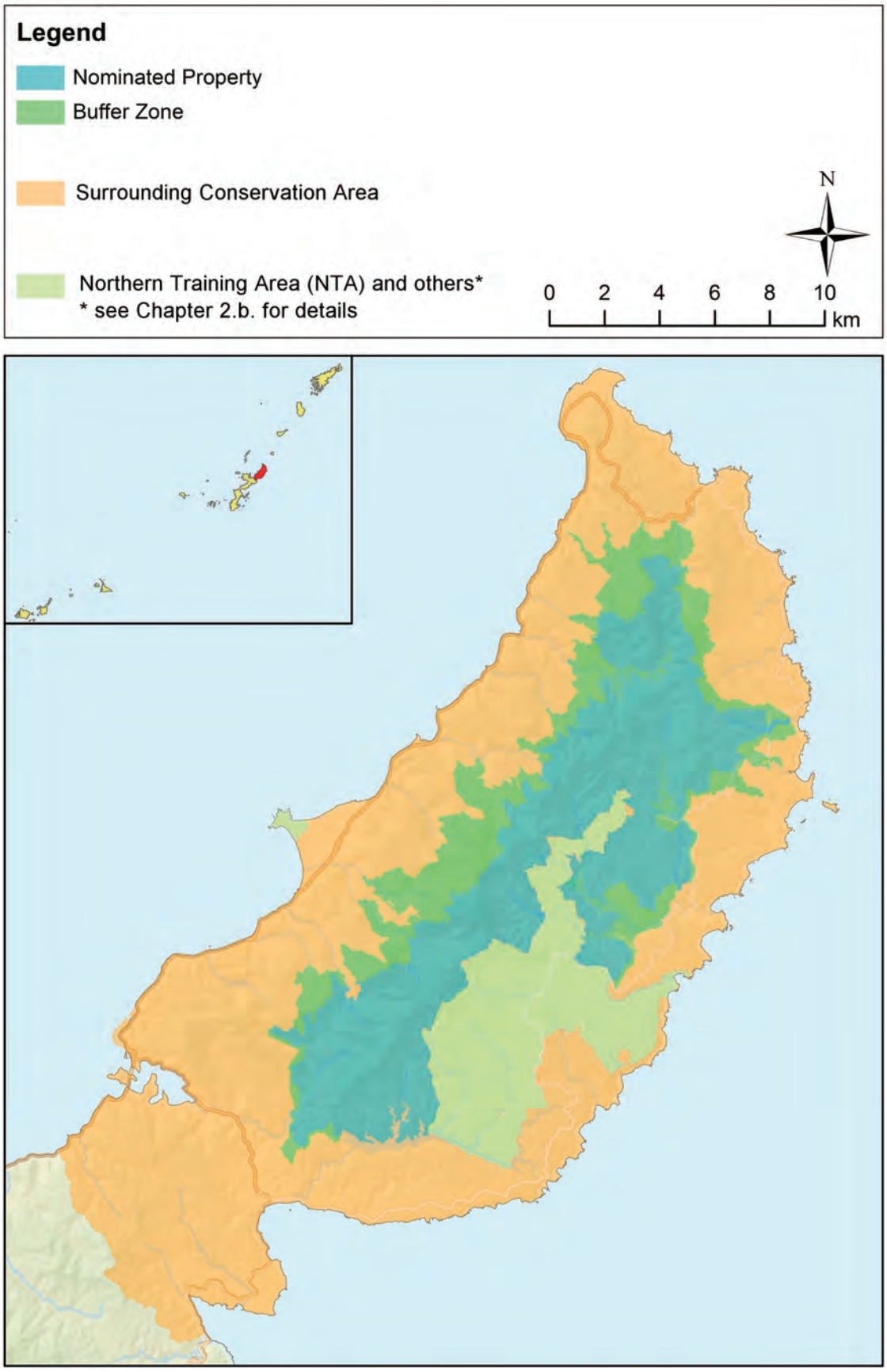


Figure 1-9: Scope of the management plan (Northern part of Okinawa Island)

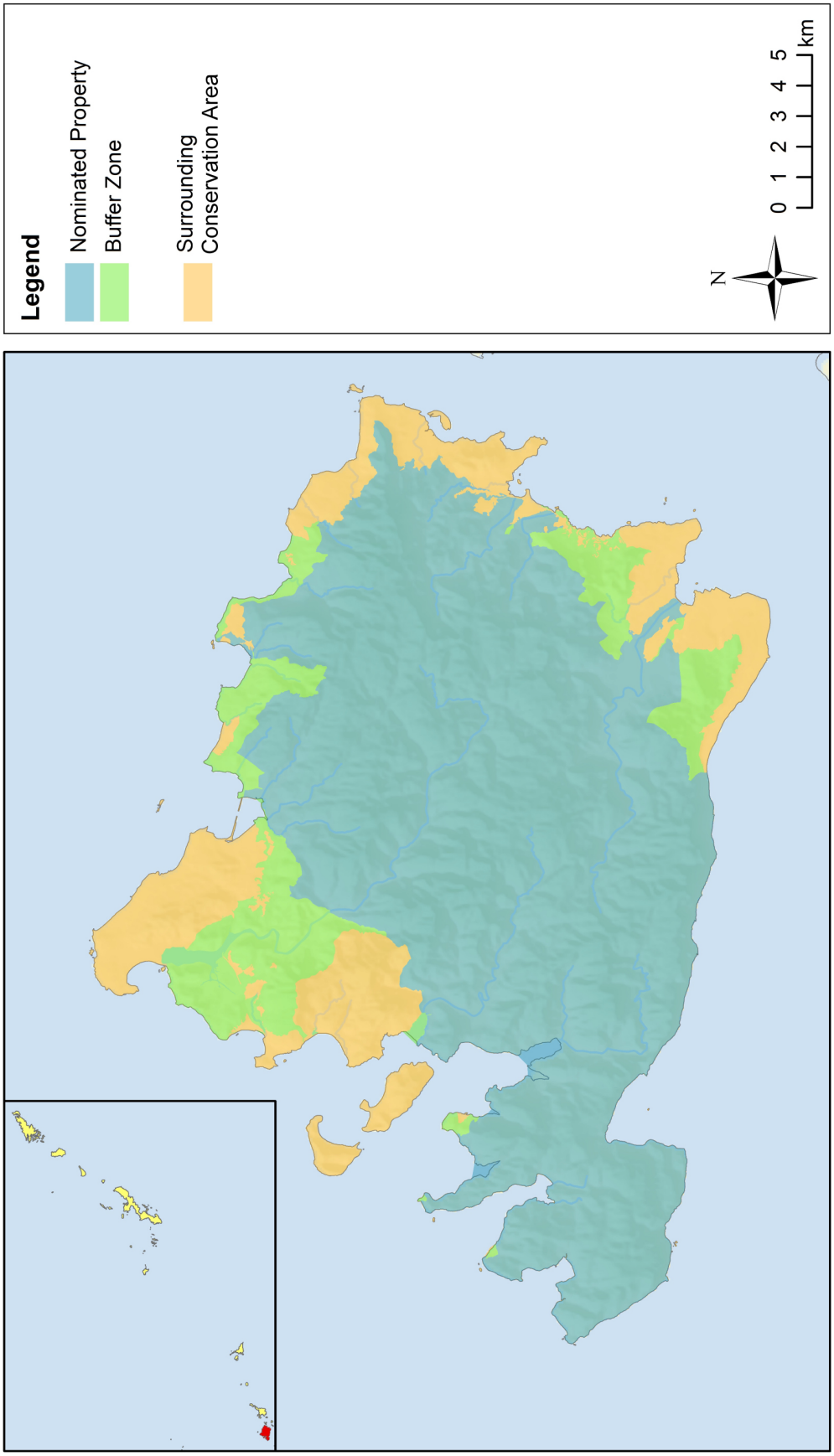


Figure 1-10: Scope of the management plan (Iriomote Island)

Tree fern (*Cyathea lepifera*) (Photo: Japan Wildlife Research Center)

2

Description

2. a. Description of Property

2. b. History and Development

View from the summit of Mt. Inokawadake, Tokunoshima Island (Photo: MOEJ)

2. Description

2.a. Description of Property

2.a.1. Overview of the natural environment of the nominated property

2.a.1.1. Geology and geography

2.a.1.1.1. Geology and geography of the Ryukyu Chain

The nominated property is part of the Ryukyu Chain comprising more than 900 large and small islands, including about 70 inhabited islands, scattered in an arc, about 1,200 km long, lying in the sea areas between the south end of mainland Kyushu and Taiwan. It consists of four islands: Amami-Oshima Island and Tokunoshima Island in the Amami Island Group, Okinawa Island in the Okinawa Island Group, and Iriomote Island in the Sakishima Island Group (Figure 1-1 to 1-6).

Although the World Geographical Scheme for Recording Plant Distributions (Brummitt 2001) uses the name Nansei-shoto for this area, Nansei-shoto is not actually equal to the Ryukyu Chain. The Daito Islands and other islands whose formation process is different are excluded from the Nansei-Shoto Islands to make for the Ryukyu Chain. How we call these islands is not necessarily uniform (Mizutani 2009; Ajiro et al. 2009), but this document calls the so-called Ryukyu island arc the Ryukyu Chain (see page ii), following the names and classification proposed to be used in scientific papers (Toyama 2014 partially altered). Located at the boundary of the Eurasian Plate and the Philippine Sea Plate, the Ryukyu Chain is thought to have been generated by tectonic deformation associated with the subduction of the Philippine Sea Plate under the Eurasian Plate in Ryukyu Trench that happened sometime after the late Miocene (Machida et al. 2001; Hase 2010). Located in an arc from the Pacific Ocean side to the continental side are the Ryukyu Trench (5,000–7,000 m deep), Ryukyu outer arc slope, Ryukyu non-volcanic outer arc swell, Ryukyu volcanic inner arc swell, Okinawa Trough (1,000–2,000 m deep), and continental shelf (less than 200 m deep), forming a typical arc-trench system (Figure 2-1). The nominated property is part of islands formed on the Ryukyu non-volcanic outer arc.

The north end of the Ryukyu Chain, the Osumi Island Group, is separated from Kyushu by the Osumi Strait, and the south-west end, Yonaguni Island, is separated from Taiwan by the strait west of Yonaguni Island. The Tokara Strait and the Kerama Gap are both more than 1,000 m deep and 50 km wide, dividing the Ryukyu Chain geological structurally (Figure 2-1). These straits (gaps) are known to be effective as the boundaries of biogeography as well (Mizutani 2009). From geological, geomorphological and biogeographical perspectives, the Ryukyu Chain can be divided into three areas: the North Ryukyus, the Central Ryukyus, and the South Ryukyus (see page ii) (Toyama 2014).

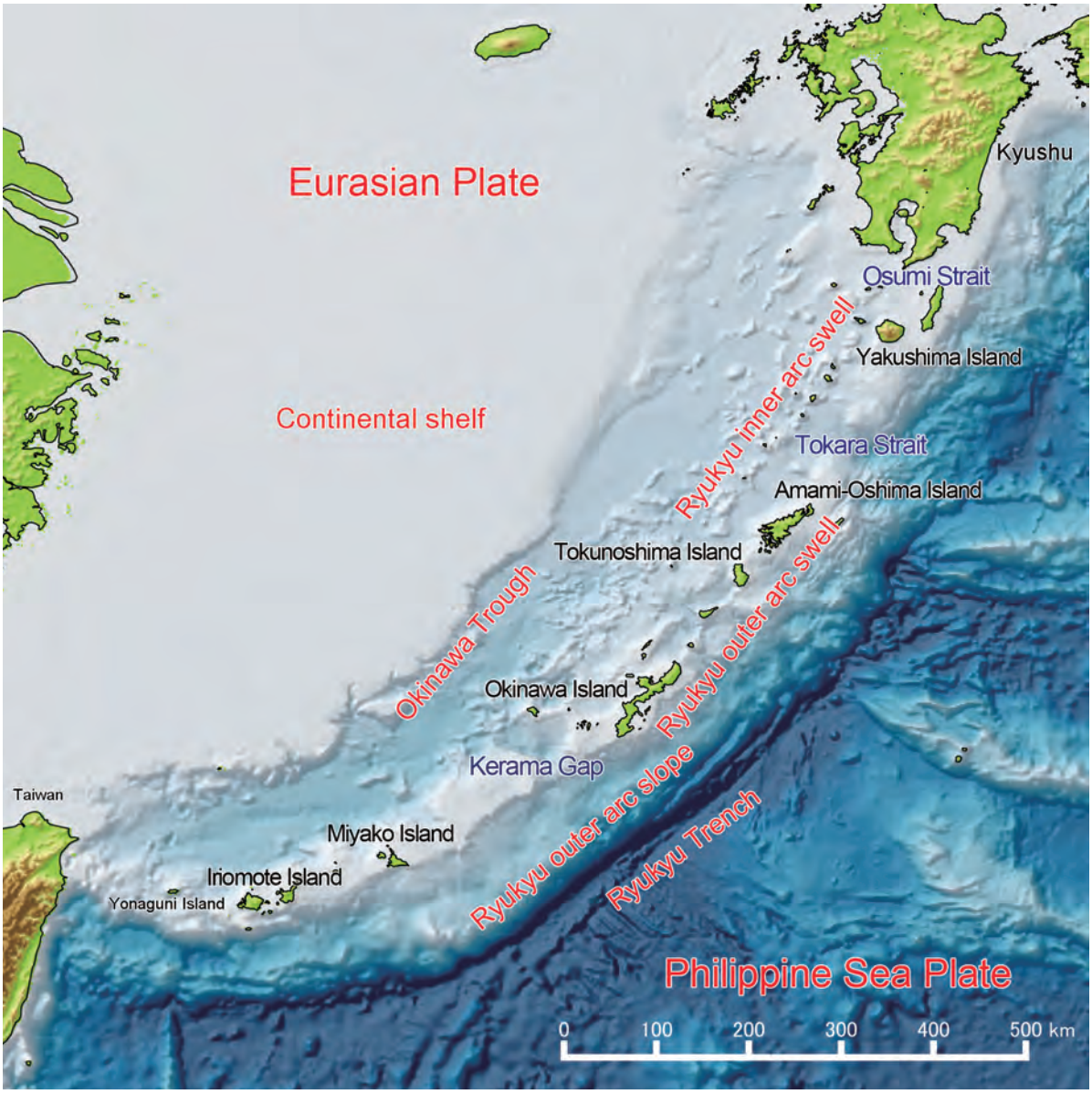


Figure 2-1: Bathymetric map of the area around the nominated property (prepared by using NOAA data)

The terrain of the islands in the Ryukyu Chain can be classified into several types, depending on the geological history, size, and shape. Among others, the islands on the non-volcanic outer arc swell are roughly divided into those with higher altitudes that comprise mountains and hills and those with lower altitudes that are covered with coral reef terraces. The former were formed in older days, and all the four regions containing the nominated property belong to this type. Table 2-1 shows the difference of the geology of the Ryukyu Chain.

Table 2-1: Geology of the Ryukyu Chain

Area	Scope	Surface and basement geology
North Ryukyus	Osumi Island Group, North Tokara	Miocene plutonic rocks Paleogene accretionary complex Miocene shallow-marine sedimentary rocks Neogene to Quaternary volcanic rocks
Central Ryukyus	South Tokara, Amami Island Group, Okinawa Island Group	Cretaceous to Neogene plutonic rocks Jurassic to Paleogene accretionary complex Paleogene fore-arc basin deposits / Pliocene sand and gravel sediments Marine sediments and coral reef limestones since the late Miocene Neogene to Quaternary volcanic rocks
South Ryukyus	Sakishima Island Group (Miyako Islands, Yaeyama Islands)	Triassic to Jurassic metamorphic rocks Jurassic accretionary complex Eocene to Oligocene plutonic rocks Marine sediments and coral reef limestones since the Eocene

2.a.1.1.2. Geology and geography of four islands containing the nominated property

1) Amami-Oshima Island

Amami-Oshima Island is about 200 km south-southwest of Yakushima Island across the Tokara Strait. Amami-Oshima Island is the second largest island in the Ryukyu Chain, behind Okinawa Island. Its general landform is undulating and complex, cut by convoluted valleys, while eroded low-relief surfaces, about 300 m high, spread over the mountain ridges (Machida et al. 2001). Amami-Oshima Island is surrounded by complex ria coasts, and marine terraces and lowlands are rarely found in the island. Marine terraces are focused, if any, in the north-east part of the island, and the east side is tilted because of the uplift since the late Pleistocene (Ikeda 1977).

Amami-Oshima Island is mainly comprised of Mesozoic accretionary complex, and very few Miocene to recent marine sediments and coral reef limestones are found. The nominated property corresponds to the mountains at the center of the island. It is mainly comprised of Cretaceous accretionary complex composed of mudstone, basalt, sandstone, and alternation of sandstone and mudstone (Sakai 2010b).

2) Tokunoshima Island (a) and (b)

Tokunoshima Island is located about 45 km south-west of Amami-Oshima Island. The central to north part of the island is the mountain area while the south to west part is dominated by low-lying slopes and well-developed marine terraces.

The gently sloping area surrounding the mountains consists of not only bedrocks but also middle Pleistocene sedimentary rocks (coral reef complex deposits) at the height lower than 210 m (Yamada et al. 2003). The nominated property corresponds to the mountains in the central to north area, where Cretaceous accretionary complex composed of slate, sandstone and basalt, and late Cretaceous to Palaeocene plutonic rocks (granites) that intruded into the accretionary complex are exposed (Kawano and Kato 1989; Kawano and Nishimura 2010; Saito et al. 2010). Most accretionary complex has been subject to contact metamorphism due to the intrusion of granites and thus difficult to be eroded. That is thought to be why they have remained as mountains (Saito et al. 2010).

3) Okinawa Island

Okinawa Island is located about 100 km south-west of Tokunoshima Island. Stretching from north and south, Okinawa Island is the largest island in the Ryukyu Chain. In the north area of the island, mountains and marine terraces are widely distributed and Paleogene and older bedrocks are exposed. In addition, limestone blocks, which are accretionary complexes formed during the era from the Jurassic to Cretaceous periods, are widely distributed in the Motobu Peninsula and scattered in small scales around the northwest part leading to Cape Hedo, the northernmost part of the island. Geographic features of cone karst that are specific to subtropical and tropical zones develop in these areas (Takami et al. 1999; Sakai 2010b; Takeuchi 2010; Iwata 2012; Yamashita et al. 2016). The south area of the island is comprised of late Miocene to recent sedimentary rocks and Quaternary coral reefs and shelf deposits. Many marine terraces are seen in this area, but they are located at lower altitudes and became emergent later than those in the north area (Machida et al. 2001).

The nominated property corresponds to the mountain area in three Yambaru villages located in the north part of the island. Its general landform is undulating, and valleys are highly convoluted. The main ridge line, the altitude of about 400 m, runs from north-east to south-west, and its peak, Mt. Yonahadake with an altitude of 503 m, is the highest place in Okinawa Island. There are several steps of marine terraces at the height lower than the altitude of 240 m (Koba 1980). The bedrocks of the nominated property are mostly comprised of Mesozoic to Eocene accretionary complex, including black schist, phyllite, sandstone, and alternation of sandstone and mudstone.

4) Iriomote Island

Iriomote Island is about 400 km southwest of Okinawa Island. The whole island constitutes a low relief surface, 300–450 m high, except for the east end. Rivers such as the Urauchi River and the Nakama River erode the mountains, where the low relief surface is located, forming deep gutter-shaped valleys. Large brackish water area where mangrove forests occur is developed at the river mouths because of the tides. The south side of this mountainous island are sea cliffs while there are lowlands near river mouths and marine terraces in the north to southeast part of the island (Machida et al. 2001). Its geology is older in the east area and younger toward the northwest area.

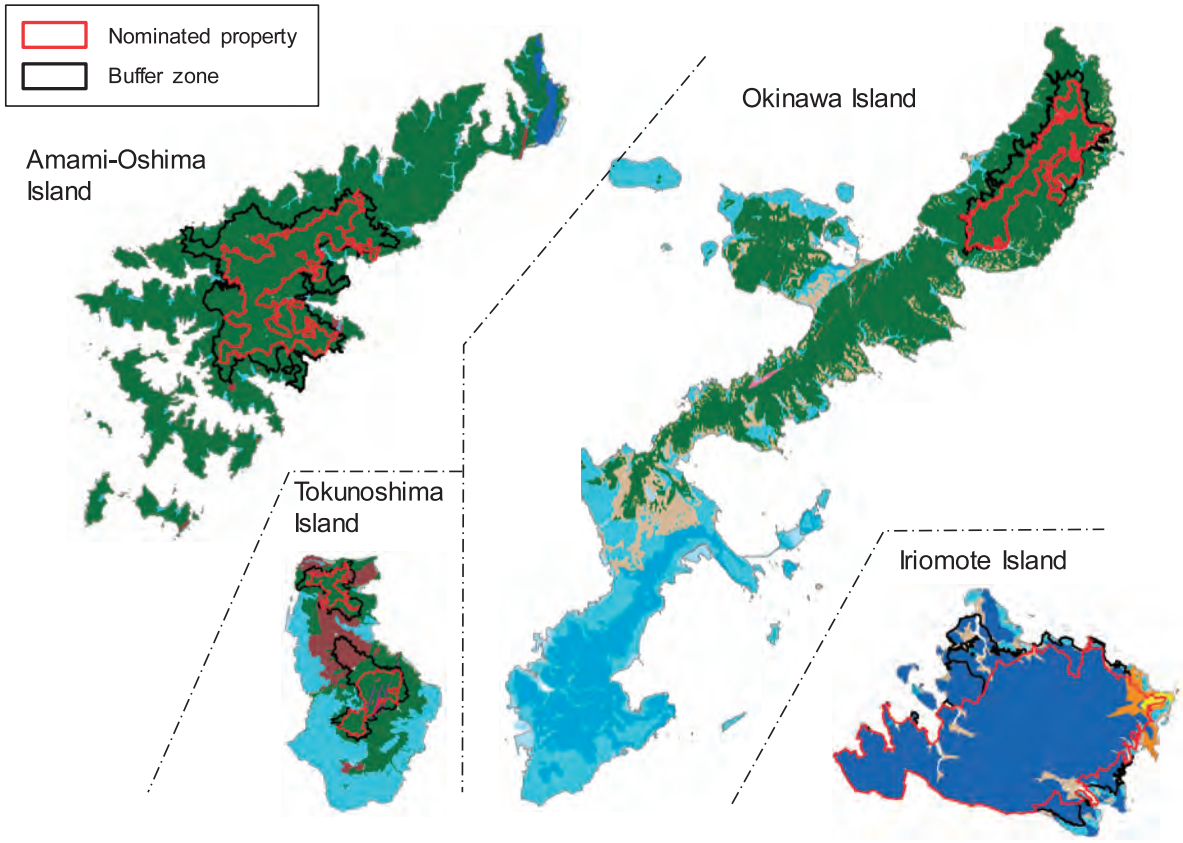
The nominated property corresponds to most of the mountains in the island. Its surface geology is dominated by Miocene shallow-marine or terrestrial sedimentary rocks—mostly conglomerate, sandstone, mudstone, and alternation of sandstone and mudstone, and between those are found coal seam and sandy limestone (Nakagawa et al. 1982; Kaneko 2007; Iryu and Matsuda 2010). At the northeast corner, Triassic to Jurassic metamorphic rocks and Eocene shallow marine sediments and volcanic rocks are exposed on a small scale (Nakagawa et al. 1982; Kaneko 2007). Also, terraces in the north to southeast area are comprised of Pleistocene sedimentary rocks (Nakagawa et al. 1982).

Table 2-2: Area of the four islands containing the nominated property and their highest altitudes

	Area of island	Peak
Amami-Oshima Island	71,235 ha	694 m (Mt. Yuwandake)
Tokunoshima Island	24,785 ha	645 m (Mt. Inokawadake)
Okinawa Island	120,696 ha	503 m (Mt. Yonahadake)
Iriomote Island	28,961 ha	470 m (Mt. Komidake)

Source: Statistical reports on the land area by prefectures and municipalities in Japan, 2015 by Geospatial Information Authority of Japan

Sea cliff of Ryukyu limestone, Tokunoshima Island (Photo: MOEJ)



Island	Classification	Legend (Colors correspond to the map above)
Amami-Oshima Island	Plutonic rocks	Eocene plutonic rocks
	Accretionary rocks	Mesozoic accretionary complex
	Sedimentary rocks	Eocene sedimentary rocks
		Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene terrace/sand dune deposits
Tokunoshima Island	Plutonic rocks	Ultramafic rocks
		Cretaceous to Palaeocene plutonic rocks
	Accretionary complex	Cretaceous accretionary complex
	Sedimentary rocks	Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene sand dune deposits
Okinawa Island	Volcanic rocks	Oligocene volcanic rocks
		Miocene volcanic rocks
	Accretionary complex	Mesozoic to Eocene accretionary complex
	Sedimentary rocks	Late Miocene to early Pleistocene sedimentary rocks
		Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene terrace/sand dune deposits
Iriomote Island	Metamorphic rocks	Triassic to Jurassic metamorphic rocks
	Volcanic rocks	Eocene volcanic rocks
	Sedimentary rocks	Eocene to middle Miocene sedimentary rocks
		Middle Miocene to early Pleistocene sedimentary rocks
		Pleistocene to Holocene sedimentary rocks
		Pleistocene to Holocene sand dune/swamp deposits
Over-all	Other	Lake, river, etc.
		Reclaimed land

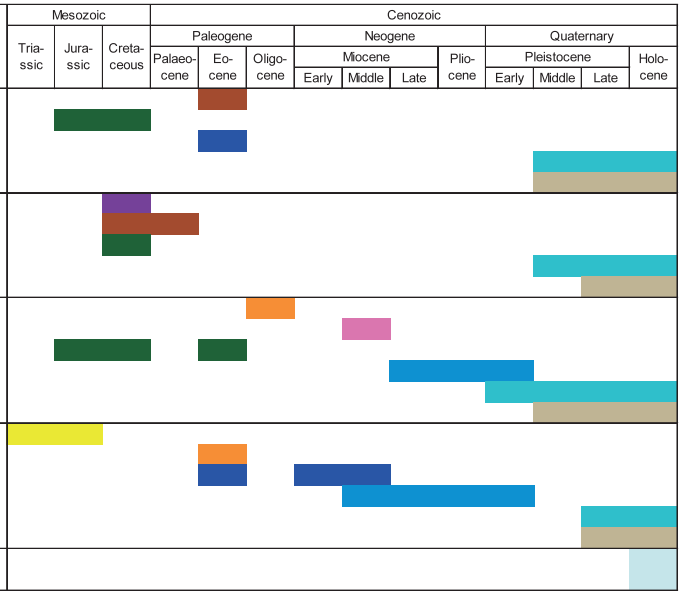


Figure 2-2: Geology of four islands containing the nominated property

This geological map was prepared and adapted based on "1:200,000 Seamless Geological Map of Japan" by Geological Survey of Japan, AIST (https://gbank.gsj.jp/owscontents/index_en.html) and Creative Commons Attribution NoDerivs 2.1 Japan (https://creativecommons.org/licenses/by-nd/2.1/jp/deed.en) as well as Takeuchi 1993; Nakae et al. 2009; Saito et al. 2009; Iryu and Matsuda 2010; Kawano and Nishimura 2010; Nakae et al. 2010; Sakai 2010a, b.

2.a.1.2. Climate

The nominated property belongs to subtropical climate, which has hot summers like those in tropical climate and relatively mild winters. Subtropical climate is characterized by the fact that it is controlled by subtropical high-pressure belts and tropical air masses derived from them, roughly covering the area between 20–30°N and 20–30°S. It is further classified into humid climate and dry climate depending on precipitation. Much of the subtropical part of the world is in the mid-latitude dry zone with low precipitation. Its vegetation is mostly dry, including monsoon forest, savanna, steppe, and desert (Shimizu 2014) (Figure 2-3).

The nominated property is located in the subtropical area, but its climate is called subtropical marine climate, which has precipitation of more than 2,000 mm per year, influenced by the warm Kuroshio Current flowing nearby and monsoons (Figures 2-4 and 2-5). This makes the area a globally rare place where rainforests are found in the subtropical zone.

Figure 2-3: Vegetation landscape of global subtropical areas of the same latitude as the nominated property
(Website of Yambaru Wildlife Conservation Center)

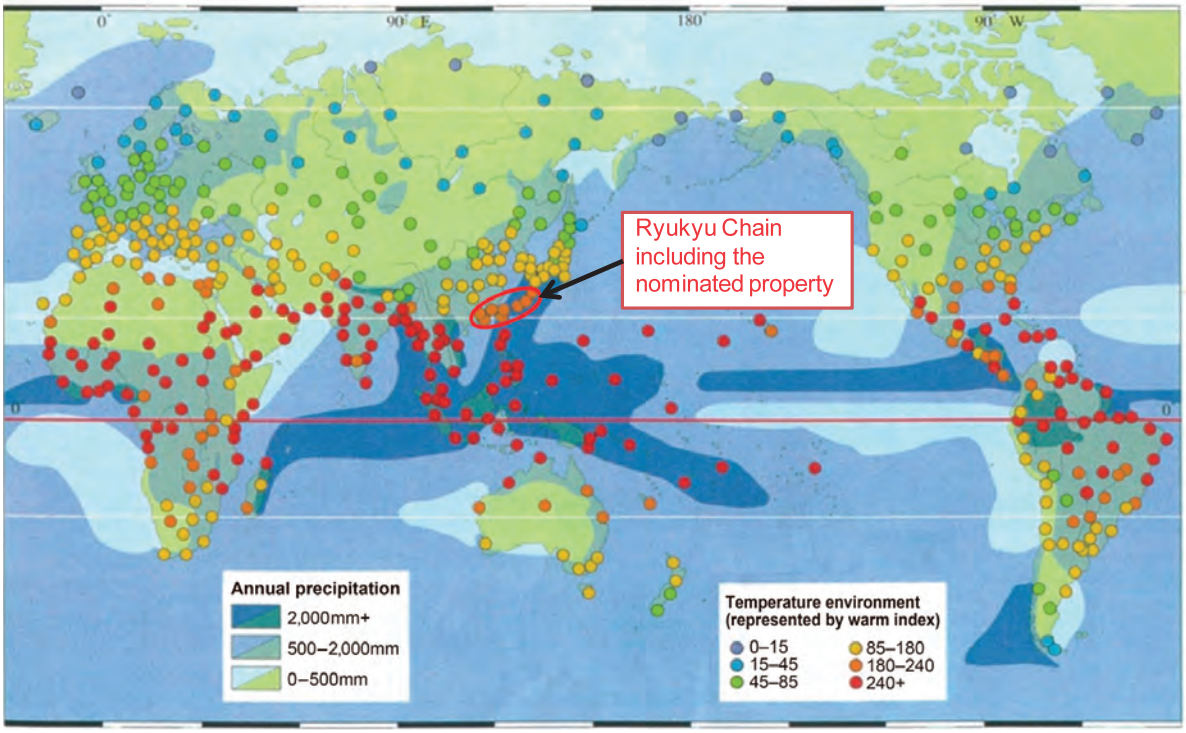


Figure 2-4: Distribution of temperature environment and precipitation on the earth (prepared based on Hotta 1997)
The temperature environment is based on the warm index of Kira (1977).
The index of 180–240 is equivalent to the subtropical zone.

Subtropical rainforest, Iriomote Island (Photo: MOEJ)

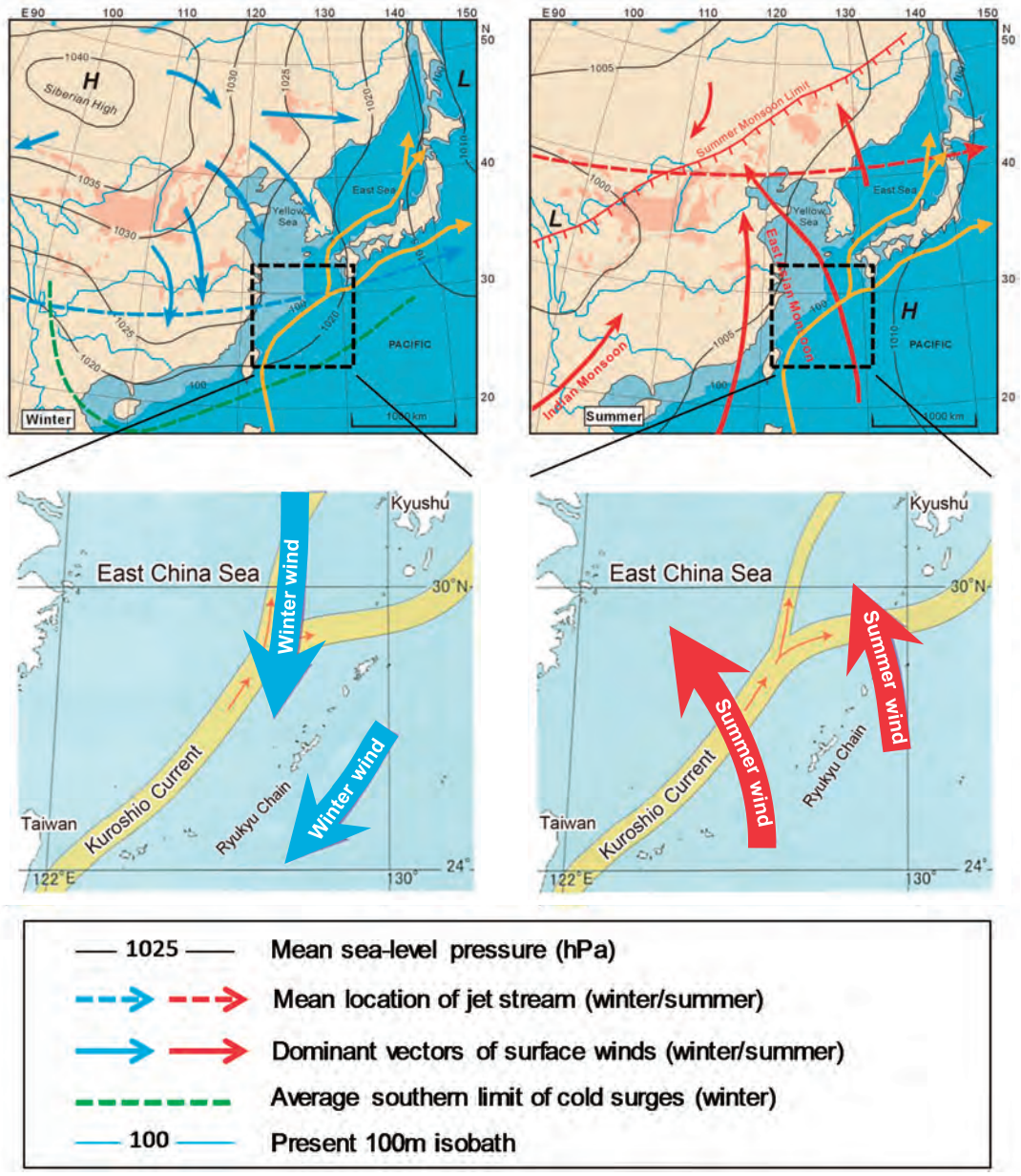


Figure 2-5: Relationship between pressure patterns and monsoons in summer and winter in the nominated property

Left: Pressure pattern in winter; Right: Pressure pattern in summer

Upper: Yi (2011) with added information; Lower: prepared based on Takara and Sasaki (1990)

2.a.1.2.1. Temperature and precipitation

In the nominated property, which is located in the subtropical zone between the tropical and temperate zones, there are six to eight months in a year when the average temperature is over 20°C. Its annual average temperature is 21–24°C. In summer, the average temperature reaches 27–29°C; days with the minimum night-time temperature above 25°C continue for about three months partly because the diurnal range of temperature is small in these islands surrounded by the sea (Yamazaki et al. 1989). Even in winter, the climate is warm with the average temperature of 15–18°C. The annual range of temperature is also small in the nominated property area (Yamazaki et al. 1989). However there is a temperature gradient of 3.5°C between the northern and southern islands in the nominated property in the coldest month (Table 2-3 and Figure 2-6).

It is moist all through the year in the nominated property, with the annual precipitation of 2,000 to 2,900 mm, which is greater than in mainland Japan (Tokyo: 1,600 mm). The rainfall is especially heavy in the rainy season (mid May to late June) and in the typhoon season (July to October); the total precipitation in the rainy and typhoon seasons accounts for about 60% of the annual precipitation (Okinawa Regional Headquarters, JMA 1998). The annual average relative humidity is 74% in Amami-Oshima Island and 79% in Iriomote Island—more than 10 points higher than in mainland Japan (Tokyo: 62%) (Table 2-3 and Figure 2-6).

Table 2-3: Temperature and precipitation in the nominated property; comparison with mainland Japan (Tokyo)

	Amami-Oshima Island	Tokuno-shima Island	Northern part of Okinawa Island	Iriomote Island	Mainland Japan (Tokyo)
Altitude of observation site (m)	2.8	44	232	9.9	25.2
Annual average temperature (°C)	21.8	21.8	20.9	23.8	16.5
Average temperature in the hottest month (°C) *1	28.8	28.4	26.9	28.7	27.5
Average temperature in the coldest month (°C) *1	15.0	15.3	14.7	18.4	6.2
Annual average precipitation (mm)	2,909	1,983	2,556	2,236	1,600
Annual average relative humidity (%) *2	74	–	–	79	62

Source: Japan Meteorological Agency data (1988 to 2017)
*1: The hottest month is July in the nominated property and August in mainland Japan (Tokyo); the coldest month is January.
*2: Depending on the type of observatory, some observation items are not addressed.

Figure 2-6: Average monthly temperature (line chart) and average monthly precipitation (bar chart) in the four regions
Source: Previous meteorological data (1988 to 2017) at http://www.jma.go.jp/jma/indexe.html

2.a.1.2.2. Typhoon

Figure 2-7 shows the birthplaces and tracks of all tropical depressions and storms in the world that have been recorded from the 1850s to 2008. The strongest tropical storms (scales 4–5) occur on the oceans east of the Philippines and around the Mariana Islands, and their tracks are focused on the ocean south of Japan. The nominated property is one of the areas prone to the strong tropical storms[1] (typhoon) in the world.

Figure 2-8 shows the annual number of typhoons occurring and those approaching Japan, and the percentage of those approaching the nominated property since 1951. Although the number of typhoons varies annually, the annual average is 26 (14 to 39) and 12 (4 to 19) of them approach Japan. On average, 7.6 (3 to 15) typhoons approach the nominated property annually—about 30% (13–52%) of the typhoons occurring.

1 Japan Meteorological Agency (JMA) calls tropical storms with the maximum wind speed near its center of 17.2 m/s (34 kn/s) or above taifu [typhoon]. Depending on regions of the world, tropical storms have various names but in any case, the maximum wind speed of 64 kn/s (32.9 m/s) or above is necessary. It is equivalent to what JMA calls "strong taifu."

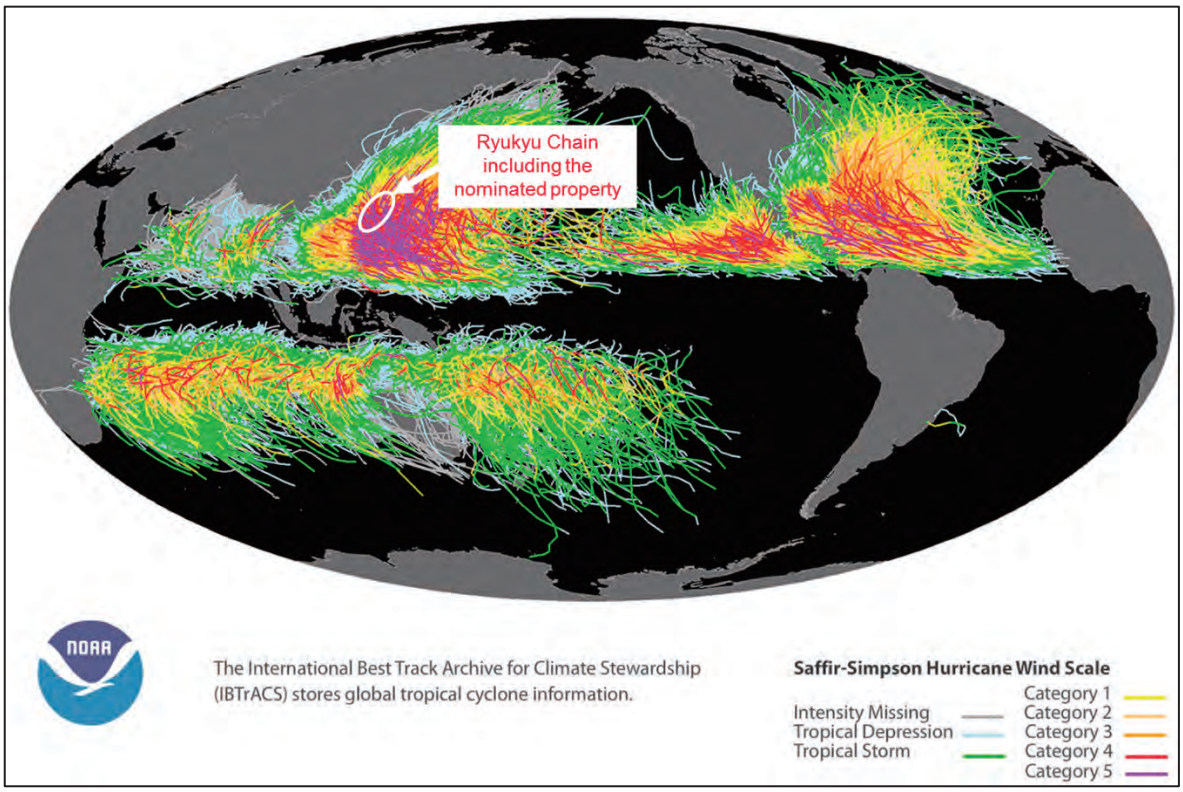


Figure 2-7: Birthplaces and tracks of all tropical storms in the world that have been recorded from the 1850s to 2008

Source: NOAA Climate gov. Tropical Cyclone Trace

https://www.climate.gov/news-features/understanding-climate/tropical-cyclone-tracks

Saffir-Simpson Hurricane Intensity Scale, NASA Earth Observatory (2006).
TD (Tropical Depression): wind speed of 0–38 mph (0–17 m/s)
TS (Tropical Storm): 39–73 mph (17–33 m/s)
Category 1: 74–95 mph (33–42 m/s)
Category 2: 96–110 mph (42–49 m/s)
Category 3: 111–130 mph (49–58 m/s)
Category 4: 131–155 mph (58–69 m/s)
Category 5: 155 mph (69 m/s+)

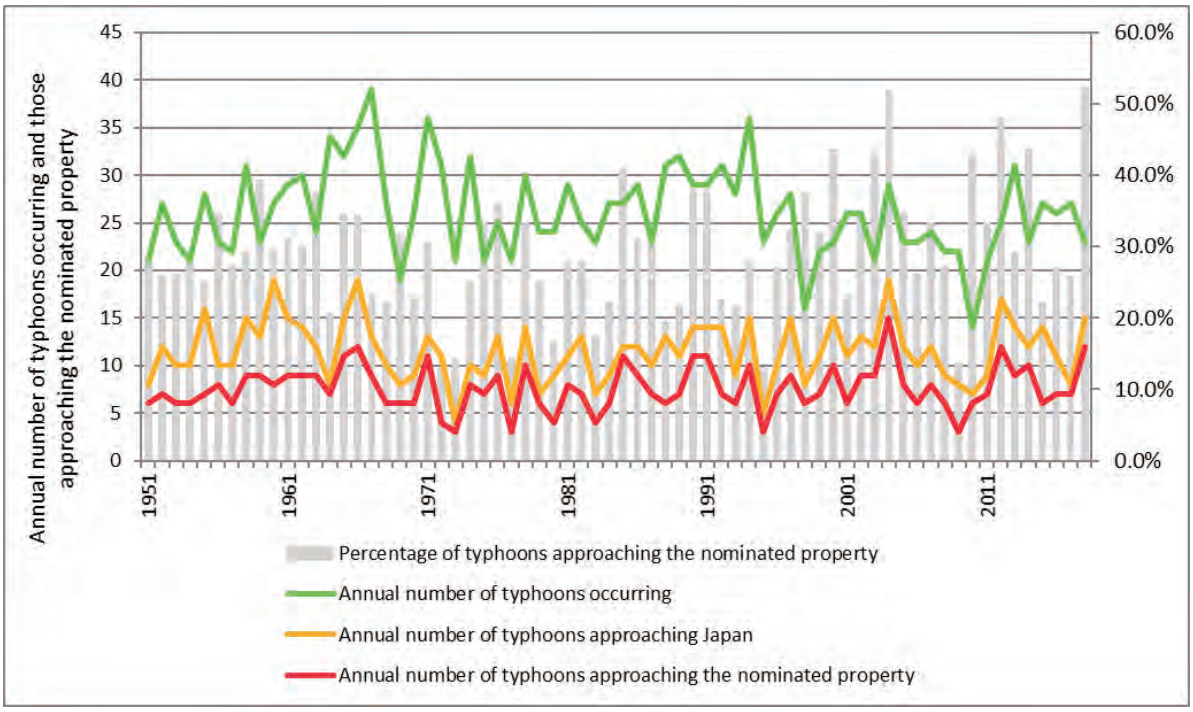


Figure 2-8: Annual number of typhoons occurring and those approaching Japan, and the percentage of those approaching the nominated property from 1951 to October 2018.
Source: Statistics on typhoons at http://www.data.jma.go.jp/fcd/yoho/typhoon/statistics/index.html

Strong tropical storm (typhoon) (Photo: MOEJ)

2.a.1.3. Vegetation

The dominant natural vegetation of the nominated property is mountainous forests—evergreen broadleaved forests developed in the humid subtropical zone. Trees dominating the upper layer include oaks, Ryukyu pines (*Pinus luchuensis*), and laurel trees (Lauraceae); its vegetation landscape is similar to that of evergreen broadleaved forests in the warm temperate zone north of Yakushima Island (Aiba 2011). However it has diverse tree species, including tree ferns, Lasianthus species, some *Ardisia* species growing as tall as semi-tall trees, strangler figs, and palm trees, which are different from those found in forests in the warm temperate zone. On the other hand, the coasts of this area are home to tree species of coastal vegetation in tropical and subtropical regions, including mangroves, Tahitian screwpine *(Pandanus odoratissimus*), tropical almond (*Terminalia catappa*), *Argusia argentea*, and *Hernandia nymphaeifolia* (Hotta 1974; Kira 1989). In this way, the lowlands contain species found in the tropical zone while the mountains contain diverse subtropical evergreen broadleaved trees, including Castanopsis (*Castanopsis sieboldii*) and oak (*Quercus miyagii*). This kind of mixed forest is called the subtropical rainforest in this document (Kira 1976; Aiba 2011).

Many of these southern plants in understory and coastal areas are dispersed relatively quickly; for example, their seeds and spores are carried by wind, ocean currents, and birds. Conversely, the mountainous tall trees like Castanopsis and *Quercus miyagii* are not good at spreading their seeds into distant areas across the sea. They are thought to date back to old times when this area was low in temperature and connected with the continent and mainland Japan by land (Hotta 1974; Kira 1989; Ohno 1997).

2.a.1.3.1. Vegetation of the nominated property

1) Evergreen broadleaved forest

(Photo: MOEJ)

The largest vegetation in the nominated property is the natural and secondary evergreen broadleaved forests, whose tree layers are dominated by Castanopsis. According to Miyawaki (1989), these forests are developed on the non-limestone region and classified phytosociologically as Psychotrio-Castanopsion sieboldii (alliance). The natural forests include Lasiantho-Castanopsietum sieboldii (association) that mainly occurs in Amami-Oshima Island and Tokunoshima Island, Illicio anisati-Castanopsietum sieboldii (association) that widely occurs in mountains in northern and central Okinawa Island, and Adinandro yaeyamensis-Castanopsietum sieboldii (association) seen in mountains in Iriomote Island. The secondary forests include Tarenno-Castanopsietum sieboldii (association). In mesic areas along the valleys, Quercetum miyagii (association) dominated by *Quercus miyagii* occurs in relatively wide areas. On the other hand, in the limestone region, subtropical coastal plants and species specific to the limestone land form another unique plant community, including Fico microcarpae-Pongamietum pinnatae (association) on the raised coral reef as well as Macarango-Bischoffietum (association).

In the nominated property, periodic disturbances caused by frequent typhoon attacks (Figure 2-7 and 2-8) and complex landform where small ridges and valleys occur (see 2.a.1.1.2) help promote the diversification of the environment, making component species in the forests more diversified (Kubota et al. 2004; Yoneda 2016). As an example, research conducted in the forests of Northern part of Okinawa Island dominated by Castanopsis shows that the forests in the nominated property have greater diversity of tree species (Ito 1997) and that the diversity and productivity of woody species is higher in ridges than in valleys and slopes (Kubota et al. 2004). That is probably because ridges are affected powerfully by frequent typhoons and fallen trees create canopy gaps. This helps avoid competition for light between tree species in tall-tree layers and those in subtree layers, enabling various tree species to coexist (Kubota et al. 2004). According to research targeted at the natural forests in Tokunoshima Island, forest floor vegetation in valleys is characterized by herbaceous, fern and climbing plants rather than woody plants; it is thought that disturbances caused by typhoon rains are more intense in valleys than in ridges (Yoneda 2016).

2) Cloud forest

Mt. Yuwandake (694 m) in Amami-Oshima Island is the highest peak in the nominated property, and Tokunoshima Island (a) has Mt. Inokawadake with an altitude of 645 m. The forests of these mountains that are located at the height of 500–600 m or more constitute cloud belts, where sunlight is limited and air humidity is high (Suzuki 1979; Miyawaki 1989) and Arisaemato heterocephali-Castanopsietum sieboldii (association) is found (Suzuki 1979; Miyawaki 1989). On top of the trees are unique epiphytes such as an epiphytic fern (*Polypodium amamianum*), and orchid (*Liparis viridiflora*), and on the humid forest floors, fern plants such as *Bolbitis subcordata* and *Ctenitis subglandulosa* flourish (Miyawaki 1989). Bryophytes are also rich in diversity; for example, there are over 120 species near the peak of Mt. Inokawadake (Onishi et al. 2012).

(Photo: JWRC)

Similarly, on the slopes of Mt. Yonahadake (503 m), the highest peak in Okinawa Island, and Mt. Iyudake (446 m), there are cloud forests whose abundant annual precipitation exceeds 3,000 mm, constituting the *Microlepia hookeriana-Castanopsis sieboldii* community (Niiro 2015). With the tree layers dominated by Castanopsis, these forests are rich with bryophytes, epiphytic and ground orchids, and fern plants, reflecting high air humidity (Miyagi 1990; Makita 1998). Near the peak of Mt. Komidake (469.5 m), the highest peak in Iriomote Island, the *Woodwardia harlandii-Pleioblastus linearis* community occurs. Swept by wind from the coasts, in this area develops *Pleioblastus linearis* forest, which is resistant to wind. The summit area is like a cloud belt, home to *Skimmia japonica* var. *lutchuensis, Woodwardia harlandii, Goodyera foliosa* var. *commelinoides,* and Iriomote false holly (*Osmanthus heterophyllus* var. *iriomotensis*) (Niiro et al. 1974; Shimabukuro 2015).

3) Mountain stream zone

In humid tropical regions, the levels of river waters fluctuate cyclically due to frequent rainfalls. At the upstream and midstream, riverbeds and riversides are flooded periodically for a certain time between high and low water levels. These places are called mountain stream zones, with a difference in water level of 2–3 m in tropical regions. Although the nominated property consists of islands with relatively small water catchment areas, frequent rainfalls allow it to have mountain stream zones with a difference in water level as much as that in tropical regions (Kato 2003).

(Photo: JWRC)

Plants growing in this kind of environment are called rheophytes (Hotta 2002; Kato 2003). They adapt to the unusual environment where they are exposed to torrents during heavy rainfalls and dried during the low-water period (Hotta 2002). Some of them have slender or small leaves so as to reduce resistance to water flow; some stick to rocks with their roots or rhizomes; and some have leaves with fewer trichomes so that muddy water dries quickly (Yokota 1997).

As for the vegetation of mountain stream zones, in Northern part of Okinawa Island and Iriomote Island, the *Lindsaea odorata* var. *japonica-Salvia pygmaea* community is known, in which small and dwarf herbs stick to somewhat shaded rocks. Also, Pileo-Arundetum formosae is seen at waterfalls and cliffs in Iriomote Island, and the *Rhododendron scabrum-Farfugium japonicum* var. *luchuense* community consisting of ericaceous plants and evergreen low trees is seen on the rocks on the riversides in Kunigami Mountains (Miyawaki 1989; Miyagi 1990).

At the upstream and midstream of the Sumiyo River in Amami-Oshima Island are communities dominated by *Rhododendron scabrum* on the rocks. In the nominated property, many rheophytes grow, including *Salvia pygmaea*, *Solenogyne mikadoi*, and *Viola amamiana*. These include a number of threatened plants endemic to the Ryukyu Chain (Hotta 2002; Kawanishi 2016). Many of the rheophytes are thought to have newly evolved in this area, including *Polystichum hancockii* var. *yaeyamense*, *Farfugium japonicum* var. *luchuense*, *Ainsliaea macroclinidioides* var. *oblonga*, and *Eurya emarginata* var. *ryukyuensis* (Yokota 1997).

Ainsliaea macroclinidioides var. *oblonga*
(Photo: JWRC)

4) Mangrove forest

(Photo: MOEJ)

Mangroves mean groups of unique plants growing in muddy wetlands near seashores or river mouths in tropical or subtropical regions that are affected by saltwater (Nakasuga 1995). Their major habitats is tropical Asia, from Southeast Asia to East Asia, the Central and South Ryukyus, which is the northern limit (Miyawaki 1989). In Japan, mangrove forests covering a decent amount of space can be seen only in the Ryukyu Chain in which the nominated property is included. Among them, the mangrove forest at the mouth of the Sumiyo River in Amami-Oshima Island is the most northern. In Iriomote Island, mangrove forests are found at the mouths of the Nakama River, the Urauchi River, and the Shiira River, etc.

Mangrove forests in this area are simpler in species composition and scrubbier in structure than those in tropical Asia (Miyawaki 1989). Those in Amami-Oshima Island are comprised of *Kandelia obovata* and oriental mangrove (*Bruguiera gymnorhiza*), and Iriomote Island has five more species: Asiatic mangrove (*Rhizophora stylosa*), gray mangrove (*Avicennia marina*), black mangrove (*Lumnitzera racemosa*), *Sonneratia alba,* and nipa palm (*Nypa fruticans*). The occurrence of species in the forests varies with frequency and intensity of tides, soil substrate, landform, and salinity (Miyawaki et al. 1983); from riversides toward inner lands, component species gradually change, forming zonal vegetation (Nakanishi 2005). As an example, the Urauchi River in Iriomote Island shows a zone comprising the *Sonneratia alba*, Asiatic mangrove, *Kandelia obovata*, and oriental mangrove communities that develop in this order from the riverside to inland (Nakanishi 2005).

The wetland on the landward side from the mangrove forests in Iriomote Island exhibits a mosaic sequence, in which powder-puff tree (*Barringtonia racemosa*) forests are found in depressions where forest floors are flooded during high tides and rainfalls, and looking-glass tree (*Heritiera littoralis*) forests are found in slightly elevated places that are always above water (Miyawaki 1989).

Back marsh of mangrove forest (Photo: MOEJ)

2.a.1.3.2. Vegetation of four regions containing the nominated property

1) Amami-Oshima Island

In Amami-Oshima Island, an island with relatively high mountains, more than 80% of its whole area is covered with forests. The secondary forests of evergreen broadleaved trees, such as coppice forests of oaks, account for 61% of the island. The Ryukyu pine community accounts for nearly 20%; half of it was created by planting after logging and the other half was regenerated naturally (Yoneda 2016) (Table 2-4).

Ilex dimorphophylla (Photo: MOEJ)

The component part property corresponds to the mountainous backbone running from the Kinsakubaru national forest in the mid-island to Mt. Yuwandake in the southwest, the Kamiya national forest, Mt. Torigamine and Mt. Eboshidake in the southeast. Large, almost natural forests, including Castanopsis forests, are concentrated in this area. In the middle mountainsides is Lasiantho-Castanopsietum sieboldii while at the higher level (around 400 m) Arisaemato heterocephali-Castanopsietum sieboldii develops. The summit area of Mt. Yuwandake, the highest peak in Amami-Oshima Island, makes up wind-swept scrub forests, about 8 m tall, comprised of Ilici dimorphophyllae-Symplocosetum confusae specific to this region; on the mountainside, 300–600 m high, is Arisaemato heterocephali- Castanopsietum sieboldii, which is like a cloud forest. Furthermore, the rocky area with springs is home to the woody fern (*Cyathea lepifera*) community while *Quercus miyagii* is scattered around the mesic areas along the valleys and at the mountain foot.

2) Tokunoshima Island (a) and (b)

Despite being an island with high mountains, Tokunoshima Island has a wealth of arable land, with its mountains full of Castanopsis forests surrounded by raised coral reef terraces. Forests and arable land divide the island area almost into two halves. Most of the forests are evergreen broadleaved forests or secondary Ryukyu pine forests. About 30% of the Ryukyu pine community was created by planting after logging and 70% was regenerated naturally. The *Quercus glauca* var. *amamiana* community is found on the raised limestones in the hilly area (Table 2-4) (Miyawaki 1989; Kagoshima Prefecture 2012; Kyushu Regional Forest Office, Forestry Agency 2012).

Quercus miyagii (Photo: MOEJ)

The component parts correspond to the mountains ranging from Mt. Inokawadake to Mt. Tanpatsu, Mt. Hagedake and Mt. Inutabudake in the south-central (Tokunoshima Island (a)) and the mountains ranging from Mt. Amagidake to Mt. Sasontsujidake in the north (Tokunoshima Island (b)). These mountains are

covered with forests dominated by Castanopsis and other forests. As is the case with Amami-Oshima Island, Lasiantho-Castanopsietum sieboldii is present in the lower mountains while Arisaemato heterocephali-Castanopsietum sieboldii is seen at the higher level. The summit area of Mt. Inokawadake, the highest peak in the island, constitutes wind-swept scrub forests comprised of Ilici dimorphophyllae-Symplocosetum confusae; on the mountainside, 300–600 m high, is Arisaemato heterocephali-Castanopsietum sieboldii, which is like a cloud forest. Near Mt. Amagidake in the north and in Mt. Tanpatsu and Mt. Inutabudake in the south-central, *Quercus miyagii* communities are present (Miyawaki 1989; Kyushu Regional Forest Office, Forestry Agency 2016).

3) Northern part of Okinawa Island

Schima wallichii ssp. *liukiuensis* (Photo: JWRC)

Northern part of Okinawa Island has been traditionally called by local residents "Yambaru," which is said to mean the mountainous region full of forests. Its area is not clearly defined, but this document calls Kunigami Village, Ogimi Village, and Higashi Village in the northern part of Okinawa Island "three Yambaru villages", which keep relatively healthy forests where Okinawa rails (*Gallirallus okinawae*) and many other endemic plant and animal species occur. Both tree species characteristic of the temperate zone and those characteristic of the tropical zone coexist in the forests of these three villages, with Castanopsis being dominant (Table 2-4). In the mountains of three Yambaru villages, especially in the backbone area, forests of over 50 years old with many endemic plants widely occur, providing a unique landscape.

Forests comprise about 80% of the vegetation in three Yambaru villages. Illicio anisati-Castanopsietum sieboldii (evergreen broadleaved plants of natural vegetation) accounts for 41.6% in terms of area; it especially prevails in Kunigami Village, the largest in area of the three villages. Then it is followed by Tarenno-Castanopsietum sieboldii (secondary vegetation of evergreen broadleaved forest) (18.9%) and the Ryukyu pine community (secondary evergreen conifer forest) (12.3%). In addition, on the massifs on the foundation of Paleozoic strata limestones dating back approximately 200 million years develop mixed forests of evergreen broadleaved trees such as *Quercus glauca* var. *amamiana*, *Acer oblongum* var. *itoanum*, etc. and deciduous broadleaved trees such as *Fraxinus floribunda*, wax trees (*Rhus succedanea*), and so on (Ogimi Village Board of Education 1997).

Illicio anisati-Castanopsietum sieboldii widely occurs in the mountain areas with an altitude of above 200 m of Mt. Nishimedake, Mt. Ibudake, Mt. Terukubi and Mt. Yonahadake, all of which are located in the component part. The summit areas of Mt. Yonahadake and Mt. Iyudake constitute cloud forests filled with bryophytes, epiphytic and ground orchids, and fern plants (Niiro 1976; Kyushu Regional Forest Office, Forestry Agency 2007). In the summit areas, wind-swept sites around the ridges, and south-facing dry sites of Mt. Nishimedake and Mt. Ibudake, Ainsliaeo okinawaensis-Pasanietum (association), a scrub forest not more than 6 m tall, is occurring (Miyawaki 1989). In the rivers flowing within evergreen broadleaved forests on the lower mountains

located in the east part of the backbone ranges of the component part, there are well developed rheophytic vegetations that are varied in endemic species and rare species.

4) Iriomote Island

Forests comprise about 90% of the island. The ratio of natural vegetation to island area is the highest in the four regions containing the nominated property, with a lot of mountain stream zones and mangroves growing on it.

Barringtonia racemosa (Photo: MOEJ)

Iriomote Island is widely covered with evergreen broadleaved forests. Adinandro yaeyamensis-Castanopsietum sieboldii accounts for 67% in terms of area. Taking also into account the mangrove forests at the river mouths, about 70% of the island is covered with natural vegetation of evergreen broadleaved trees (Table 2-4).

In the non-limestone region spreading from hills to mountains in the component part, Adinandro yaeyamensis-Castanopsietum sieboldii widely occurs while the mesic areas next to the valleys occur Quercetum miyagii. In some places along the Nakama River where raised limestones are exposed, Macarango-Bischoffietum, etc. is observed and Castanopsis is not dominant. The vale areas downstream of the Nakama River have humid forests dominated by looking-glass tree and powder-puff tree; on the natural banks, riparian forests comprised of Melicopo triphyllae-Persetum thunbergii, etc. develop. At the mouths of the Nakama River and the Shiira River, there are the largest mangrove forests in Japan. Hernandietum sonorae (association) dominated by *Gettarda speciosa* is found on the coastal dunes, and Planchonello-Litseetum japonicae is seen in the wind-swept areas on the coastal cliffs. The valley in the upstream Urauchi River has variously sized waterfalls and cliffs, where the mountain stream side vegetation like Pileo-Arundetum formosae is found (Miyawaki 1989). Around the summit area of Mt. Komidake, the highest peak in Iriomote Island, the *Woodwardia harlandii-Pleioblastus linearis* community exhibits a wind-blown form, 2.5–3 m tall. On the lower mountainside, cloud forests are formed where tall trees such as Castanopsis and epiphytes prevail.

Nipa palm (*Nypa fruticans*) (Photo: MOEJ)

Table 2-4: Percentage of area by vegetation type in the four regions containing the nominated property

	Area (ha)	Percentage (%) of area by vegetation type										Year of vegetation map prepared
		Natural evergreen broadleaved forest	Mangrove forest	Secondary evergreen broadleaved forest	Ryukyu pine community	Secondary deciduous broadleaved forest	Secondary grass-land	Bamboo/ dwarf-bamboo community	Planted forest	Arable land	Other	
Amami-Oshima Island	71,235	6.0	0.1	55.1	19.8	4.8	0.6	0.0	1.0	6.5	6.1	2009
Tokunoshima Island	24,785	3.5	0.0	25.1	16.4	0.9	0.1	0.0	0.2	45.0	8.8	2009
Northern part of Okinawa Island	34,023	41.6	0.0	21.8	12.1	5.8	1.6	0.0	0.9	11.3	4.8	2000-01
Iriomote Island	28,961	67.6	3.0	8.2	9.3	3.4	0.3	0.3	0.3	4.6	3.0	2006

Area of the islands/region is based on the statistical reports on the land area by prefectures and municipalities in Japan, 2015 by the Geospatial Information Authority of Japan. The area of Northern part of Okinawa Island represents the total of three Yambaru villages (Kunigami, Ogimi, and Higashi).
Percentage of area by vegetation type is calculated based on the vegetation surveys in the Sixth and Seventh Rounds of the National Survey on the Natural Environment (1999–) by MOEJ using GIS.

Evergreen broadleaved forest (Photo: MOEJ)

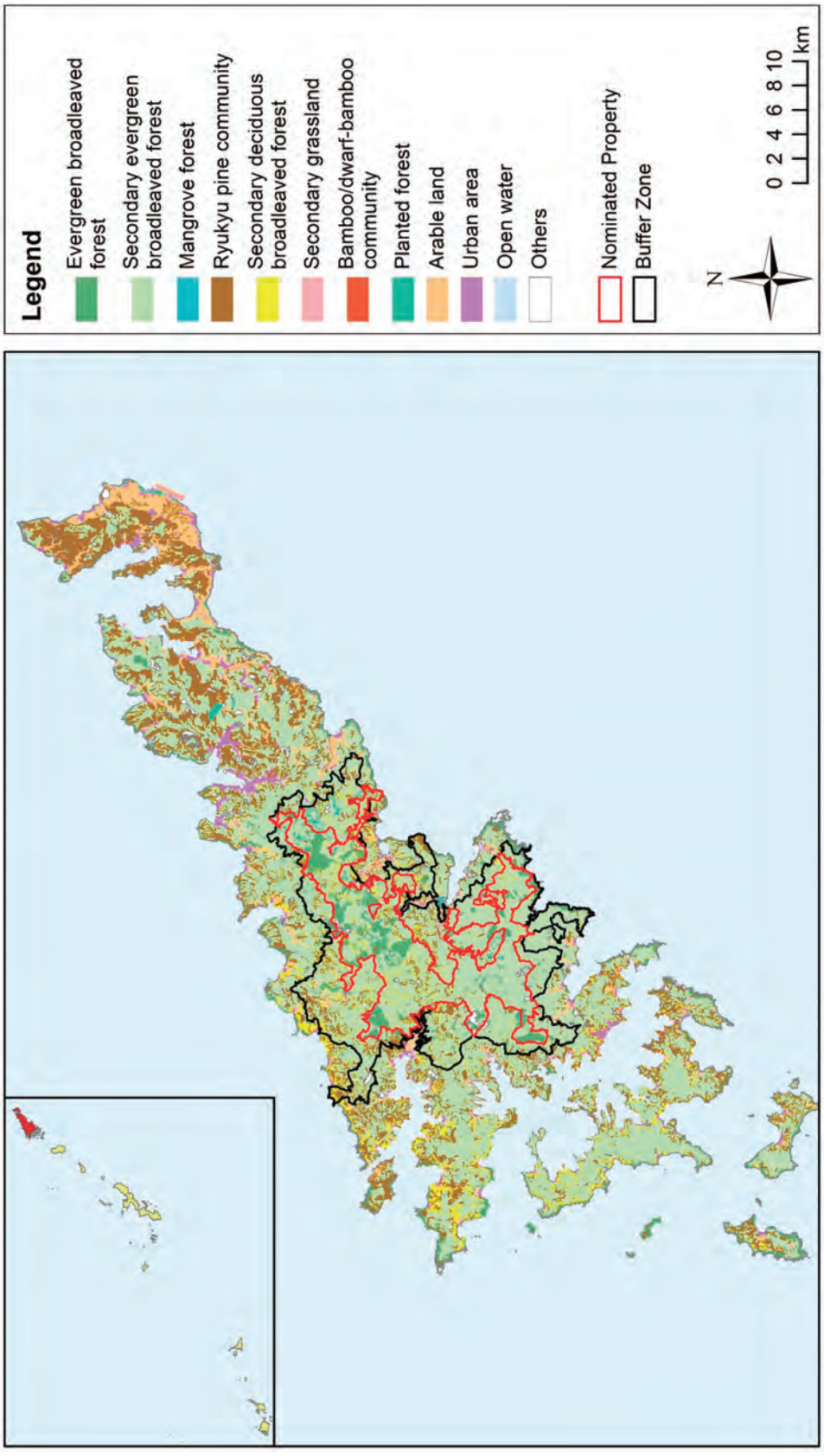


Figure 2-9: Vegetation of the nominated property (Amami-Oshima Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by MOEJ

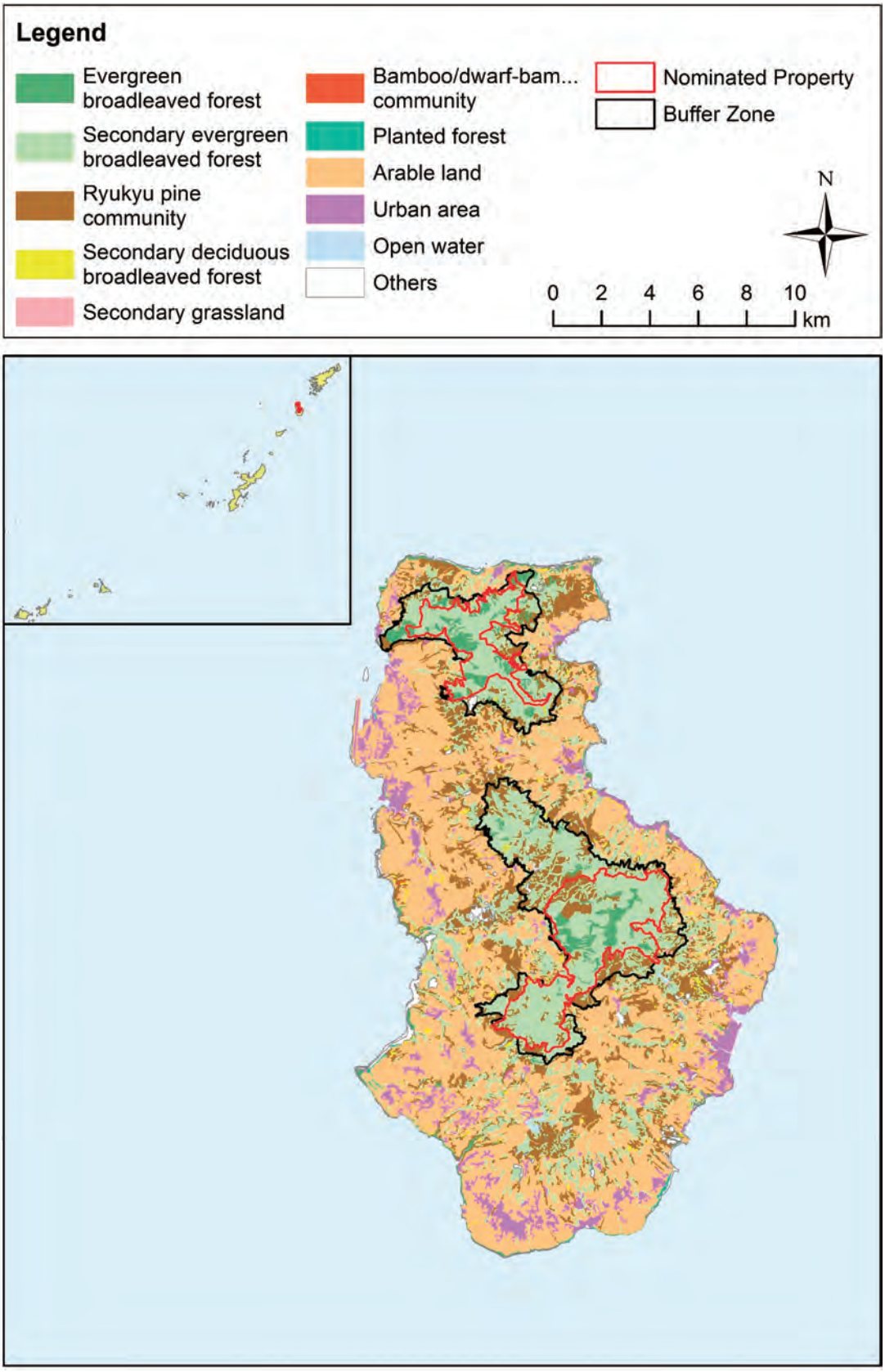


Figure 2-10: Vegetation of the nominated property (Tokunoshima Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by MOEJ

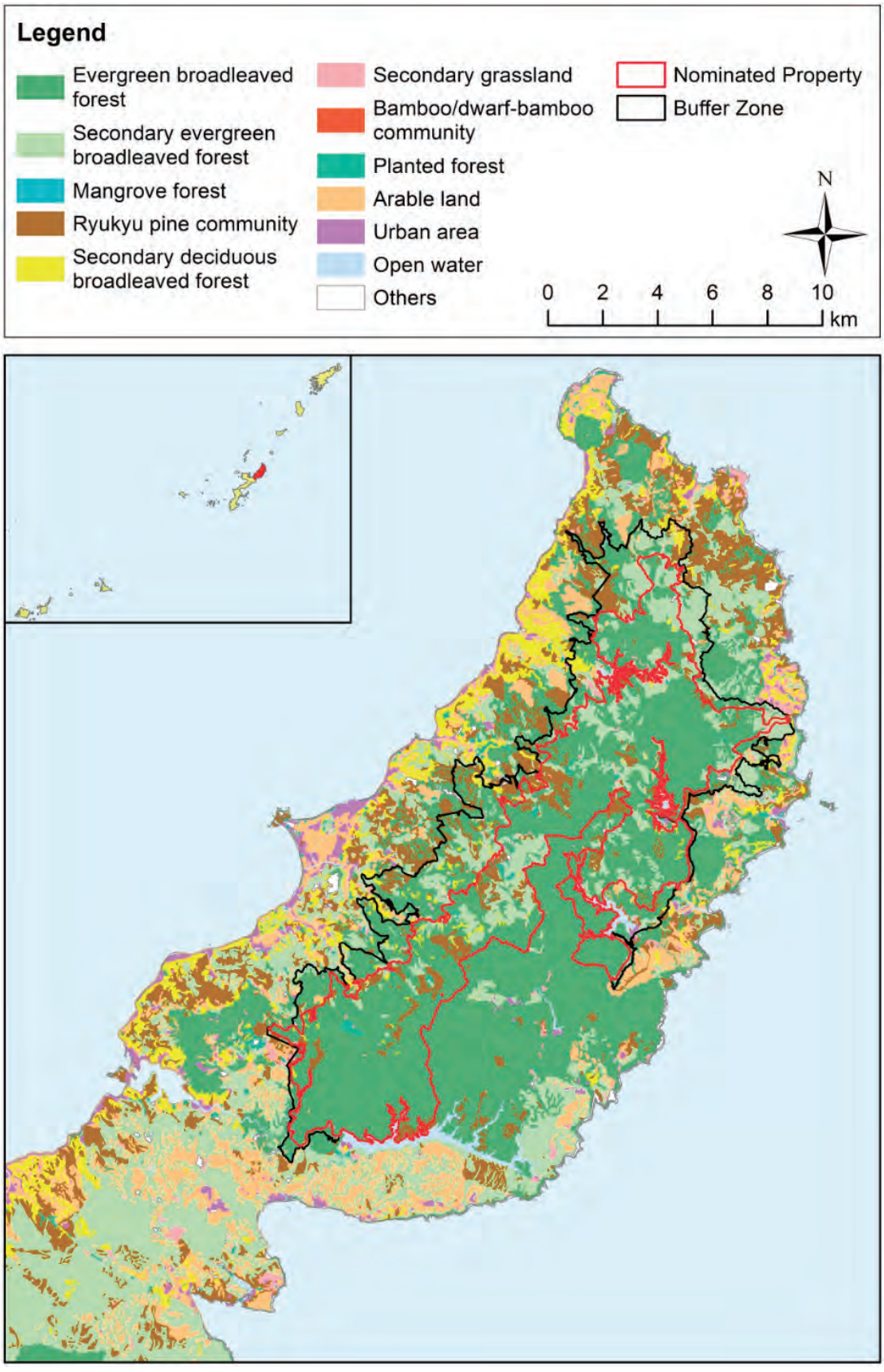


Figure 2-11: Vegetation of the nominated property (Northern part of Okinawa Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by MOEJ

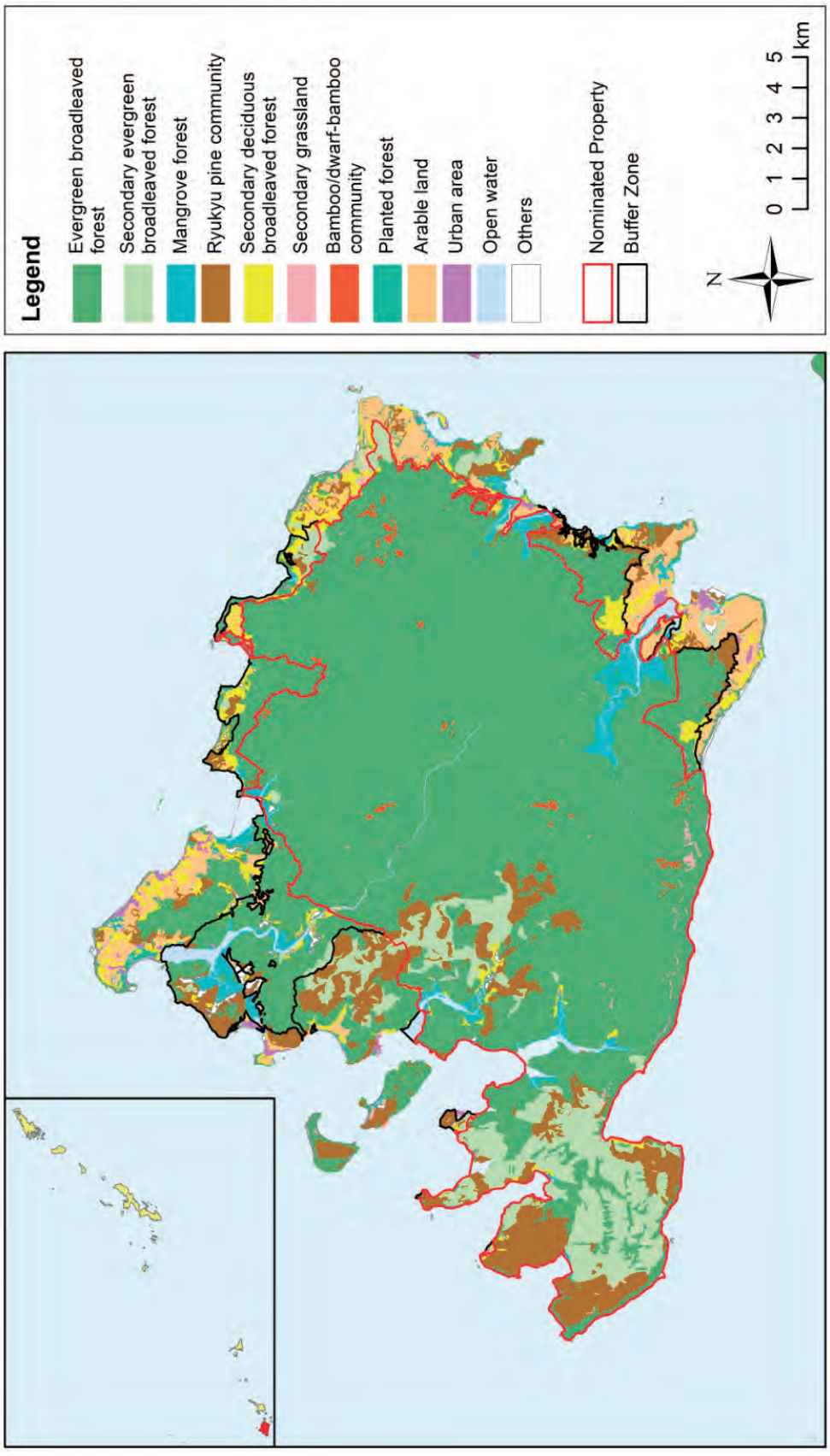


Figure 2-12: Vegetation of the nominated property (Iriomote Island)
The Sixth and Seventh Rounds of the National Survey on the Natural Environment (vegetation surveys) by MOEJ

2.a.2. Biota

The Ryukyu Chain is home to a particularly large number of endemic species and subspecies of non-flying vertebrates, reflecting the formation process of the continental islands, namely, separation and isolation from the continent caused by plate motions, followed by the formation of a land bridge and subsequent fragmentation into islands as a result of periodic sea-level fluctuations between the glacial and interglacial periods (to be detailed in 2.a.3). Studies on distribution patterns of amphibians and reptiles have shown that the herpetofauna in the Central Ryukyus is closer to that of the South Ryukyus and southward than to that of the North Ryukyus (Ota 2000), but the Central and South Ryukyus exhibit different patterns of endemism (Hikida and Ota 1997; Ota 1998; Okamoto 2017). Therefore, many of the non-flying terrestrial vertebrate species inhabiting the Central and South Ryukyus are considered to be of subtropical origin and have many evolutionary sister groups[2] and stem groups in Taiwan and the southeastern part of the Eurasian Continent (Ota 2009).

In addition, the Ryukyu Chain also exhibits characteristics similar to those of the establishment of organisms observed in oceanic islands. Its biota is composed of plants and animals that arrived via different routes and processes, reflecting various geographic and climatic characteristics. These include the following: it is a chain of islands located in the northwestern Pacific Ocean, lying like stepping stones over a stretch of waters extending approximately 1,200 km in parallel to the east coast of the Eurasian Continent; it is washed by the Kuroshio Current, one of the world's major warm ocean currents, which flows northward in the East China Sea; strong typhoons formed over the ocean east of the Philippines frequently hit the archipelago; and it is situated along a migration route for birds travelling a long distance between the Northern and Southern Hemispheres (Figure 2-13, Table 2-5).

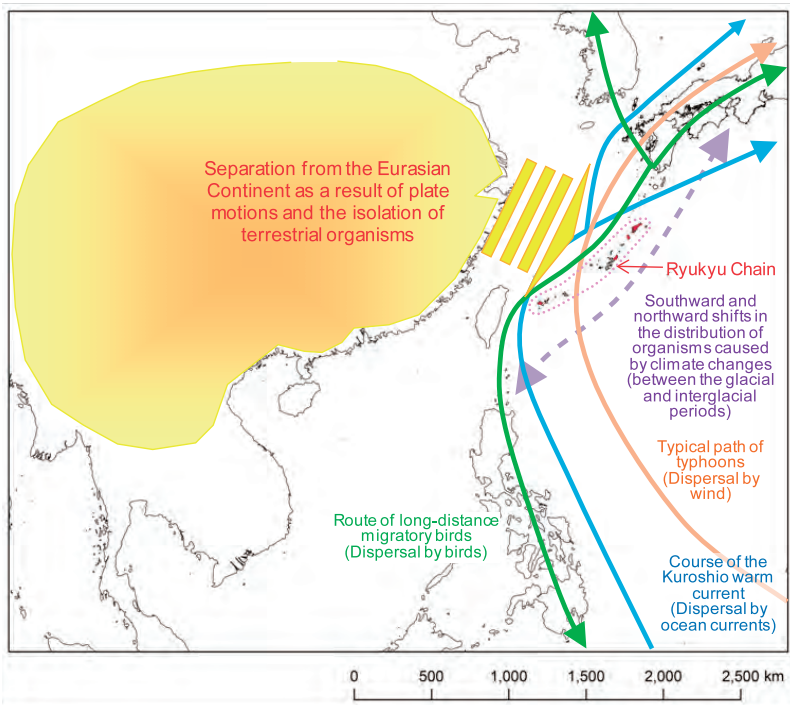


Figure 2-13: Diverse processes of biota development in the nominated property (image)

2 A sister group refers to the closest lineage in a phylogenetic tree. A corimidium denotes the entire body of descendants sharing the oldest sister group.

Table 2-5: Patterns of biological dispersal, etc. associated with biota development in the Ryukyu Chain and examples

Patterns of biological dispersal, etc. in the Ryukyu Chain	Examples
Separation and isolation from the Eurasian Continent caused by plate motions and subsequent speciation on islands	Detailed in 2.a.3. Geological History and Speciation
Entered from the continent across the sea when the sea level declined during the glacial period, and evolved into endemic species	Iriomote cat (*Prionailurus bengalensis iriomotensis*) (Ota 2018), Ryukyu wild boar (*Sus scrofa riukiuanus*) (Yoshikawa et al. 2016)
Entered by flying from the south along the islands, then lost their flight ability and evolved into endemic species	Okinawa rail (*Gallirallus okinawae*) (Matsuoka 2003; Ozaki 2005; Kirchman 2012)
Southward and northward shifts in the distribution of organisms caused by climate changes (between the glacial and interglacial periods) and refuges	・Relicts of temperate species of organisms that migrated southward during the glacial period Asahina's skipper (*Ochlodes asahinai*) (Chiba and Tsukiyama 1996) *Dendranthema crassum*, *Euphorbia sieboldiana* (Hotta 2003), etc. ・Safe refuges for plants of tropical origin that had migrated northward before the glacial period *Begonia fenicis* (Nakamura et al. 2014)
Dispersal by ocean currents such as the Kuroshio	Sakishima tree lizard (*Japalura polygonata ishigakiensis*) (Yang et al. 2018) Weevil (*Pachyrhynchus infernalis*) (Kohama 2015; Tseng et al. 2018) Stick insect (*Megacrania tsudai adan*) (Yamasaki 1991) Nipa palm (*Nypa fruticans*) (Sugai et al. 2015) Asiatic mangrove (*Rhizophora stylosa*) (Ng W. L. et al. 2015) *Kandelia obovata* (Giang et al. 2006) *Entada phaseoloides* (Wakita et al. 2008; Tateishi et al. 2008)
Dispersal by wind such as typhoons	Common rose (*Pachliopta aristolochiae interposita*), Striped blue crow (*Euploea mulciber barsine*), Crimson marsh glider (*Trithemis aurora*), Amber-winged glider (*Hydrobasileus croceus*) (Kohama 2015)
Dispersal by birds such as migratory birds	*Solenogyne mikadoi* (Nakamura et al. 2012) *Lobelia loochooensis* (Kokubugata et al. 2012)

Dendranthema crassum (Photo: MOEJ)

Lobelia loochooensis (Photo: JWRC)

The area of the four regions containing the nominated property together account for only 0.4% of the total land area of the country, which is selected as a biodiversity Hotspot “Japan” by Conservation International. These areas are home to 26% of vascular plant species of the country, 7% of the endemic species of the country, 20% of those listed as threatened on the MOEJ Red List. They are also a habitat for 58% of all of the vertebrates in Japan, 44% of endemic species of Japan (excluding inland water fish), and 30% of species listed as threatened on the IUCN Red List. Also, 21% of the insect species inhabiting Japan and 56% of those threatened as well as 64% of the inland decapod crustacean species inhabiting Japan and 39% of endemic species are found in the regions (see 3.1.b. Table 3-2).

Table 3-2 shows that the four areas containing the nominated property embrace many threatened species and endemic species in the hotspot Japan listed by Conservation International. In addition, the nominated property has been selected as Global 200 and Endemic Bird Areas (EBAs) as priority areas for conservation on a global scale, as well as one of the Alliance for Zero Extinction (AZE) sites and Important Bird Areas (IBAs) as a highly prioritized area for conservation at a regional level (see 3.1.b. Table 3-1).

Meanwhile, the nominated property is situated in a geographically transitional zone between areas where their biotas vary considerably (Motokawa 2000; Ota 2000; Takagi 2009). With regard to these biotas, biogeographical regions and their boundaries from a biogeographical point of view are varied according to their proponents and classifications. For example, biogeographical regions by Udvardy (1975) and terrestrial ecoregions by Olson et al. (2001), which are often used in assessments of natural World Heritages, are based on vegetations. The former categorizes the Central Ryukyus to the old Arctogaea realm and the South Ryukyus to the Indomalayan realm, while the latter categorizes the North Ryukyus to the Indomalayan realm.

Furthermore, according to taxonomical groups, it is suggested respectively that the Watase Line in Tokara Strait divides mammals, reptiles, and amphibians as a boundary between the Palearctic zone and Indomalayan zone (Tokuda 1969), while avifauna is divided by the Hachisuga Line in Kerama Gap (Yamashina 1955). Numata (1969) indicates that the Watase Line in Tokara Strait is a boundary of flora between the Japanese mainland and the Central and South Ryukyus, and it is also an ecological boundary between warm temperate and subtropical zones.

In addition, biohistoric and geographic studies that have adopted recent molecular biological methods suggest that terrestrial fauna of the Central and South Ryukyus were isolated from the neighboring land areas during the period from the late Miocene to Pliocene, and that they are more unique than fauna in Yakushima Island and Taiwan that were physically connected to mainland Kyushu and the continent when the sea level was low during the Pleistocene (see 2.a.3.).

2.a.2.1. Flora

The four regions containing the nominated property are home to 1,819 indigenous species of vascular plants (including subspecies, varieties, and hybrids; hereinafter the same), consisting of 302 species of ferns and 1,517 species of seed plants (calculated based on Annex 3-2-1.) (Table 2-6).

Table 2-6: Numbers of indigenous species of vascular plants (including subspecies, varieties, and hybrids) in the four regions containing the nominated property

	Four regions containing the nominated property	Amami-Oshima Island *1, *2	Tokunoshima Island *2	Northern part of Okinawa Island	Iriomote Island
Psilotales	1	1	1	1	1
Lycopodiales	11	9	6	6	7
Selaginellales	9	6	5	5	7
Equisetales	1	1	0	0	0
Ophioglossales	6	5	2	2	4
Marattiales	2	2	2	1	2
Filicales	269	180	139	183	167
Marsileales	2	2	2	1	2
Salviniales	1	1	0	1	1
Cycadales	1	1	1	1	1
Coniferales	4	4	4	4	3
Magnoliales	29	21	18	20	20
Piperales	4	3	4	3	3
Aristolochiales	18	12	5	1	4
Rafflesiales	1	1	1	0	1
Ranunculales	22	19	14	13	15
Guttiferales	31	19	16	21	23
Malvales	17	14	10	12	14
Papaverales	13	11	8	9	8
Violales	18	11	8	6	9
Cucurbitales	9	8	4	6	5
Caryophyllales	26	12	17	16	20
Polygonales	28	23	12	15	12
Hamamelidales	20	15	9	8	9
Sarraceniales	2	1	1	1	2
Rosales	96	62	54	48	66
Geraniales	3	3	1	1	1
Rutales	22	16	10	14	17
Sapindales	12	9	8	5	8
Celastrales	29	25	19	20	20
Rhamnales	16	14	11	9	13
Oleales	11	9	7	7	6
Umbelliflorae	30	22	16	22	16
Sapindales	34	24	18	20	23
Urticales	50	35	29	32	37
Myricales	1	1	1	1	1
Fagales	10	7	6	6	2
Proteales	1	1	1	1	1

	Four regions containing the nominated property	Amami-Oshima Island *1, *2	Tokunoshima Island *2	Northern part of Okinawa Island	Iriomote Island
Santalales	5	4	4	2	4
Balanophorales	3	2	2	1	2
Euphorbiales	37	26	24	28	28
Haloragales	5	4	1	3	3
Primulales	15	15	13	12	11
Plumbaginales	3	2	2	1	3
Ericales	18	13	6	8	7
Ebenales	19	13	13	16	14
Gentianales	27	17	18	14	15
Rubiales	66	48	41	44	42
Solanales	136	101	66	69	93
Campanulales	8	8	6	5	4
Asterales	91	68	52	51	58
Alismatales	4	3	4	2	3
Hydrocharitales	16	14	6	2	11
Helobiae	15	13	5	2	11
Principes	5	2	2	2	4
Pandanales	5	1	1	1	5
Spathiflorae	19	11	9	8	11
Typhales	2	2	1	1	1
Triuridales	4	3	0	3	1
Liliiflorae	41	34	24	22	21
Iridales	6	5	1	4	2
Microspermae	129	78	47	46	69
Scitamineae	5	3	1	3	3
Commelinales	12	10	8	9	7
Eriocaulales	8	6	4	6	2
Juncales	6	3	2	5	1
Cyperales	114	82	55	64	79
Restionales	1	0	1	1	1
Graminales	134	106	68	91	98
Total	1,819	1,307	957	1,048	1,165

The numbers are based on the Annex 3-2-1 Vascular plants, Species lists of the nominated property.

*1: The numbers for the Amami-Oshima Island include those found on islands in the surrounding area (Kakeroma Island, Ukejima Island, and Yoro Island) because they cannot be distinguished from those of the Amami-Oshima Island based on data contained in source documents.

*2: Those for whose area of distribution is defined simply as the "Amami Island Group" in the source documents are regarded as inhabiting all of the Amami Island Group.

The flora of these regions is considered to have the geological backgrounds and components shown in Table 2-7, reflecting their geological history, climate changes in the past, and geographic conditions such as how the islands are positioned relative to ocean currents (Hatusima 1975). It is believed that the mountain floras of the regions have a high degree of affinity to those of the Eurasian Continent and the main islands of Japan, whereas the floras found in the regions' forest floors, lowlands, and coastal areas are closely related to those found in tropical Asia (Tateishi 1998). The Ryukyu Chain containing the nominated property is located in a subtropical zone, i.e., in between tropical and temperate zones, with a chain of islands extending about 1,200 km from north to south.

Therefore, the distribution pattern of plants is influenced by the temperature gradient between the islands located in the northern part of the archipelago and those in the southern part (see 2.a.1.2.1 and Box 1), and many species have their northern or southern limits in the archipelago (Hotta 2003a, b).

Table 2-7: Factors influencing the floras of the Central and South Ryukyus

Components	Description	Proportion	Examples
(1) Ryukyu-indigenous components that have been in existence since before the formation of the islands	Believed to have been in existence since the age when the present Central and South Ryukyus were part of the east coast of the Eurasian Continent. Many of them are relict endemic species.	Large	*Elatostema oshimense* (Urticaceae); *Vaccinium emarginanum* (Ericaceae); *Platanthera sonoharae* (Orchidaceae); *Polystichum obae* (Dryopteridaceae); Genus *Asarum* (Aristolochiaceae); *Arisaema heterocephalum* (Araceae); etc. (Hatusima 1975, 1980)
(2) Components originated from the southeastern part of the Eurasian Continent	Believed to have travelled from southern China to enter the regions.	Large	*Ophiorrhiza japonica* (Rubiaceae) (Nakamura et al. 2010) Genus *Pieris* (Setoguchi et al. 2008) Genus *Lysimachia* (Kokubugata et al. 2010) Genus *Lysionotus* (Kokubugata et al. 2011)
(3) Components of Palearctic origin	Believed to have survived the last glacial period after arriving the regions by traveling southward from the main islands of Japan during the glacial period from the late Pliocene to the early Pleistocene.	Rather small	*Chrysanthemum crassum, Sigesbeckia glabrescens* (Asteraceae); *Diplomorpha phymatoglossa* (Thymelaeaceae); *Stachyurus praecox* var. *lancifolia* (Stachyuraceae); *Securinega suffruticosa* var. *amamiensis* (Phyllanthaceae); *Sapium japonicum, Euphorbia sieboldiana* var. *amamiana* (Euphorbiaceae); *Solidago yokusaiana* (Asteraceae); *Desmodium podocarpum* subsp. *oxyphyllum* (Fabaceae); *Adenophora triphylla* (Campanulaceae); *Rhamnella franguloides* var. *inaequilatera, Berchemia racemosa* f. *stenosperma* (Rhamnaceae); *Lilium alexandrae* (Liliaceae); etc. (Hatusima 1975; Hotta 2003b; Okuyama 2016)
(4) Components originated from Malaysia	Believed to have arrived the regions after traveling northward from Malaysia. It is believed that most of them were carried in by ocean currents, birds, or winds.	Rather small	*Begonia fenicis* (Begoniaceae); *Nypa fruticans* (Arecaceae); *Rhizophora stylosa, Kandelia obovata* (Rhizophoraceae); *Vitex trifolia* var. *bicolor* (Verbenaceae); *Ixeris laevigata* (Asteraceae); *Fimbristylis umbellaris* (Cyperaceae); *Macodes petola* (Orchidaceae); etc. (Nakamura et al. 2014; Sugai et al. 2016; Ng W. L. et al. 2015; Sheue et al. 2003; Giang et al. 2006; Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture 2006)
(5) Components originated from the Pacific Islands	Believed to have been carried in by ocean currents, birds, or winds.	Very small	*Limnophila fragrans* (Scrophulariaceae) (Hsu et al. 2009)
(6) Components originated from Australia	Believed that seeds have been carried in and dispersed by migratory birds	Very small	*Solenogyne mikadoi* (Asteraceae); *Lobelia loochooensis* (Campanulaceae); etc. (Nakamura et al. 2012; Kokubugata et al. 2012)

Examples of the flora of the Central and South Ryukyus.
Numbers correspond to Table 2-7.

(1) *Platanthera sonoharae* (Photo: MOEJ)

(2) *Ophiorrhiza japonica* var. *amamiana* (Photo: JWRC)

(3) *Euphorbia sieboldiana* (Photo: MOEJ)

(4) *Begonia fenicis* (Photo: MOEJ)

(5) *Limnophila fragrans* (Photo: Masatsugu Yokota)

(6) *Solenogyne mikadoi* (Photo by MOEJ)

Table 2-8: Numbers of endemic and threatened species of vascular plants (including subspecies, varieties, and hybrids) in the four regions containing the nominated property

	Four regions containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	1,819	1,307	957	1,048	1,165
Number of endemic species	189	125	80	73	59
Rate of endemic species (%)	10	10	8	7	5
Number of species listed on IUCN RL (2018)	26	14	8	8	6
Number of species listed on MOEJ RL (2018)	361	193	106	128	180
Rate of species listed on MOEJ RL (%)	20	15	11	12	15

The numbers and calculations are based on the Annex 3-2-1 Vascular plants, Species lists of the nominated property.

Table 2-8 shows the numbers of endemic and threatened species of vascular plants in the four regions containing the nominated property. Out of a total of 1,819 species (including subspecies, varieties, and hybrids) of vascular plants, 189 species (10%) are endemic. The rate of endemic species is moderate, compared to oceanic islands such as Hawaii and the Galápagos Islands, where the rate of endemic plant species ranges from 40% to nearly 80%. However, as explained in the geological history of the regions, in the Central and South Ryukyus, which were an eastern margin of the Eurasian Continent and hence inherited the rich flora of the continent, the number of plant species is much more than that of these oceanic islands. Compared to these oceanic islands that are 5 to 10 times in area, the number of species per square in the four regions containing the nominated property is around 16 times, meaning that diverse plant species inhabit the small islands (Table 2-9). Some of the inherited species have survived only in the regions under isolation (relict endemism) or differentiated into an entirely new endemic species (new endemism) (Hotta 2003a). Recently in the nominated property, new species of vascular plants and their new habitats have been reported (e.g. Abe 2014; Okuyama 2016; Suetsugu 2017; Suetsugu and Nishioka 2017; Suetsugu et al. 2017). The number of species and endemic species may increase, along with advancements in future research.

Asarum tabatanum (Photo: MOEJ)

Table 2-9: Comparisons of the numbers of plant species in the nominated property (a continental island) and major oceanic islands

	Four regions containing the nominated property	Hawaii Islands	Galápagos Islands
Island type	Continental island	Oceanic island	Oceanic island
Land area (km^2)	1,590	16,504	7,856
Number of plant species	1,819	1,110	541
Number of endemic species	189	956	229
Rate of endemic species	10%	86%	42%
Number of species/km^2	1.14	0.07	0.07

The area size of the four regions containing the nominated property is based on Table 2-4. The area and the number of plant species in the Hawaii Islands and Galápagos Islands are in accordance with the nomination documents of the Government of Japan for the Ogasawara Islands to be listed in the World Heritage (2010).

Among the vascular plant species found in the nominated property, 26 species are listed as globally threatened on the IUCN Red List (Tables 2-8 and 2-10). Meanwhile, approximately 7,000 species (including subspecies and varieties) of vascular plants in Japan were assessed for the MOEJ Red List (2018), and 1,786 species (approximately 26%) were determined as threatened. In the four regions containing the nominated property, 360 species (including subspecies and varieties) are listed as threatened (Table 2-8), meaning that 20% of threatened plant species in Japan are found in the four regions that together represent only 0.4% of the total land area of Japan (see 3.1.b. Table 3-2).

A joint study conducted by MOEJ, the National Institute for Environmental Studies, Kyushu University, and other research groups, in which they assessed the extinction risks of species listed on the MOEJ Red List, cited the Central and South Ryukyus along with two of Japan's listed natural heritage sites—the Ogasawara Islands and Yakushima—as areas that are highly non-substitutable in terms of conserving Japanese vascular plant species and have conservation priority (MOEJ 2011; Kadoya et al. 2014) (Figure 2-14). The four regions containing the nominated property are the most important areas among the Central and South Ryukyus, where around 90% of the vascular plants and their endemic species as well as threatened species are distributed (see 3.2.2. Table 3-4).

Polystichum obae (Photo: MOEJ)

Table 2-10: Globally threatened vascular plant species in the four regions containing the nominated property

Family	Threatened species	IUCN RL	MOEJ RL	Distribution and Endemism*1			
				Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Dryopteridaceae	*Dryopteris hasseltii*	EN	–	–	–	●	–
Aristolochiaceae	*Asarum gusk*	CR	CR	●	–	–	–
	A. monodoriflorum	CR	CR	–	–	–	●
	A. pellucidum	CR	CR	●	–	–	–
	A. tabatanum	CR	CR	●	–	–	–
	A. celsum	EN	EN	●	–	–	–
	A. hatsushimae	EN	EN	–	●	–	–
	A. lutchuense	EN	EN	●	●	–	–
	A. nazeanum	EN	EN	●	–	–	–
	A. trinacriforme	EN	EN	●	–	–	–
	A. fudsinoi	VU	VU	●	–	–	–
	A. simile	VU	VU	–	●	–	–
Theaceae	*Eurya zigzag*	CR	CR	–	–	●	–
Violaceae	*Viola amamiana*	CR	CR	●	–	●	–
Saxifragaceae	*Cardiandra amamiohsimensis*	EN	EN	●	–	–	–
	Deutzia yaeyamensis	EN	EN	–	–	–	●
Leguminosae	*Intsia bijuga*	VU	CR	–	–	–	○
Aquifoliaceae	*Ilex liukiuensis*	EN	–	○	○	○	○
Combretaceae	*Terminalia nitens*	VU	CR	–	–	–	○
Compositae	*Aster miyagii*	VU	VU	●	●	●	–
	Solenogyne mikadoi	VU	VU	●	●	●	●
Araceae	*Arisaema kawashimae*	CR	CR	–	●	–	–
	A. heterocephalum	EN	–	●	●	–	–
Burmanniaceae	*Oxygyne shinzatoi*	CR	CR	–	–	●	–
Orchidaceae	*Eulophia taiwanensis*	EN	CR	–	–	○	–
Cyperaceae	*Carex collifera*	CR	CR	–	–	●	–

*1: ○ indicates the distribution on the island, and ● indicates the endemic species.
*2: A synonym, *Ilex uraiensis*, is listed.

Viola amamiana (Photo: MOEJ)

Cardiandra amamiohsimensis (Photo: MOEJ)

Dendrobium okinawense (Photo: MOEJ)

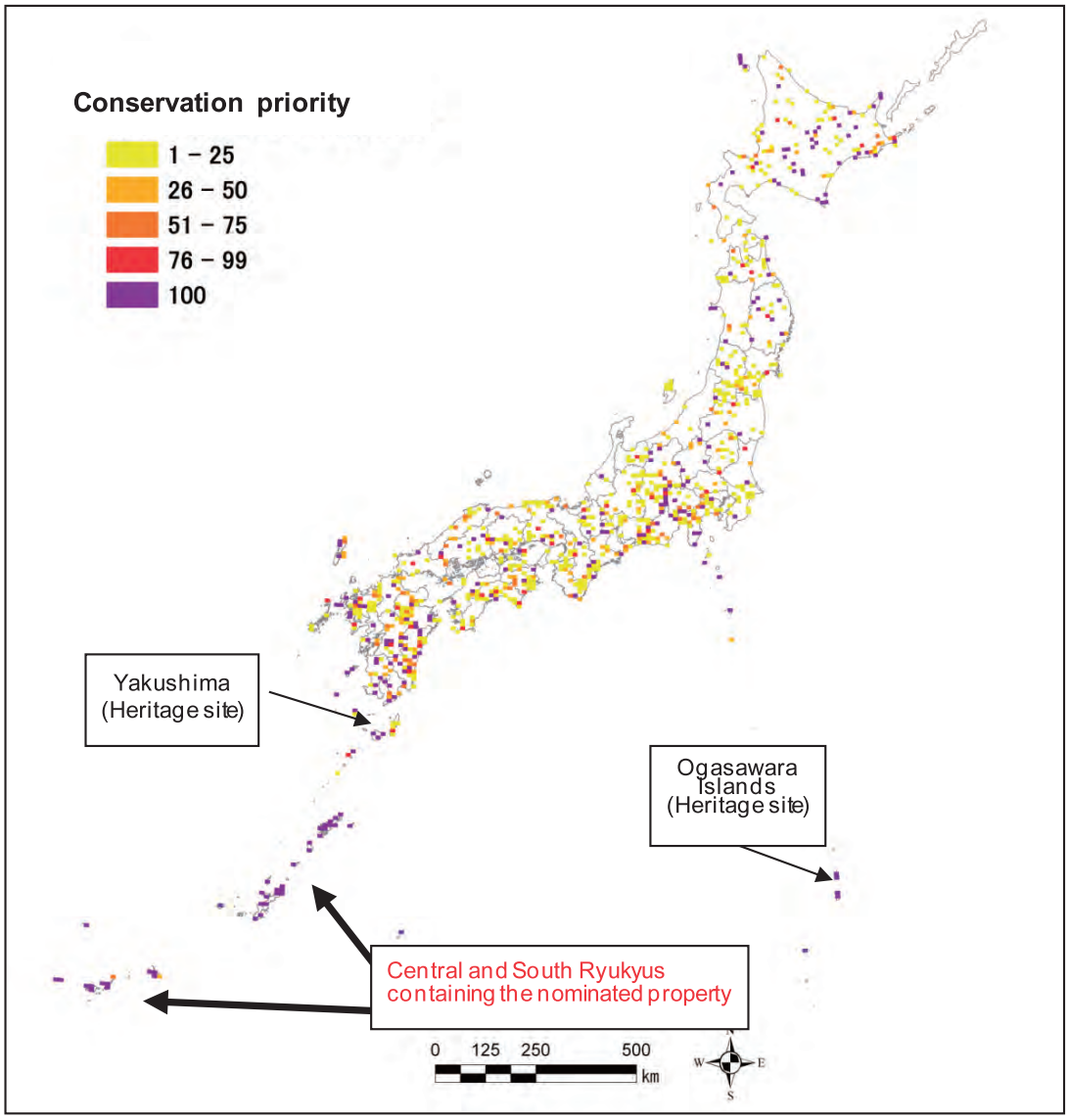


Figure 2-14: Priority areas for conservation of the threatened vascular plant species in Japan (MOEJ 2011)

Conservation priority: The number of times each area was selected as a priority conservation area in an analysis performed 100 times on the 1,219 vascular plant species listed on the MOEJ Red List for which distribution data are available. The value of each grid cell of 10km x 10km represents how many times the corresponding area was selected. The greater value (closer to purple) is considered to suggest the irreplaceability of the place, which indicates the priority areas for conservation.

Arisaema heterocephalum var. majus
(Photo: Shosaku Hattori)

Characteristics of vascular plants according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, 1,307 species are recorded, out of 1,819 vascular plant species found in the four regions containing the nominated property (Table 2-8). Out of these, 125 species are endemic (Table 2-8). As globally threatened species, 14 species are listed on the IUCN Red List, four of which are categorized as CR, seven as EN, and three as VU, including 13 endemic species (Table 2-10).

This component part is a main habitat for many rare species, as well as endemic species and globally threatened species, embracing most parts of evergreen broadleaved natural forests and secondary forests that are close to natural forests, and comprising mountains with cloud belts and rivers with developed mountain stream zones.

According to habitat environments, many plants including the following endemic species and rare species occur.

◆ Forest floors of evergreen broadleaved forests
- *Asarum gusuku, A. pellucidum*, and *A. tabatanum* (all of them are CR), *A. celsum, A. lutchuense, A. nazeanum*, and *A. trinacriforme* (all of them are EN), and *A. fudsinoi* (VU).
  - ➢ These eight species are relict endemic species whose origin came from the continent. These are wild gingers (*Asarum*) that speciated into 14 species in the four islands containing the nominated property. *Asarum lutchuense* is distributed on Amami-Oshima Island and Tokunoshima Island, and seven other species are endemic to Amami-Oshima Island.
- *Arisaema heterocephalum* (EN) is also a relict endemic species whose origin came from the continent.
- *Ilex liukiuensis* (EN) is distributed in south Kyushu and the Ryukyu Chain.

◆ Cloud belts and wind-swept sites nearby mountain peaks
- Endemic species such as *Polypodium amamianum, Ilex dimorphophylla, Lilium alexandrae,* etc. Rare species such as *Liparis viridiflora, Vaccinium amamianum,* etc.

◆ Mountain stream zones and their neighboring rocky stretches and cliffs
- Endemic species such as the Amami violet (*Viola amamiana*, CR), *Cardiandra amamiohsimensis* (EN), *Solenogyne mikadoi* (VU), *Elatostema oshimense, Polystichum obae*, and *Rhododendron scabrum*.

2) Tokunoshima Island (a) and (b)

On Tokunoshima Island, 957 species are recorded among 1,819 vascular plant species found in the four regions containing the nominated property (Table 2-8), and 80 species are endemic (Table 2-8). As globally threatened species, eight species are listed on the IUCN Red List, one of which is categorized as CR, four as EN, and three as VU, including seven endemic species (Table 2-10).

The component parts of Tokunoshima Island (a) and (b) are main habitats for many rare species, as well as endemic species and globally threatened species, embracing most parts of evergreen broadleaved natural forests and secondary forests that are close to natural forests, and especially Tokunoshima Island (a) comprises mountains with cloud belts and rivers with developed mountain stream zones.

According to habitat environments, many plants including the following endemic species and rare species occur.

- ◆ Forest floors of evergreen broadleaved forests
  - Relict endemic species such as *Arisaema kawashimae* (CR), *Asarum hatsushimae* (EN), *As. simile* (VU), and *As. lutchuense* (EN). Endemic species such as *As. leucosepalum, Diplomorpha phymatoglossa, Carex kimurae, Calanthe tokunoshimensis*, etc.
- ◆ Cloud belts and wind-swept sites nearby mountain peaks
  - Endemic species such as *Polypodium amamianum*, *Rubus amamianus*, and *Lilium alexandrae.*
- ◆ Mountain stream zones and their neighboring rocky stretches and cliffs
  - Endemic species such as *Solenogyne mikadoi* (VU).

3) Northern part of Okinawa Island

In Northern part of Okinawa Island, 1,048 species are recorded, out of 1,819 vascular plant species found in the four regions containing the nominated property (Table 2-8). Out of these species, 72 species are endemic (Table 2-8). As globally threatened species, eight species are listed on the IUCN Red List, three of which are categorized as CR, three as EN, and two as VU, including six endemic species (Table 2-10).

This component part is a main habitats for many rare species, as well as endemic species and globally threatened species, embracing most parts of evergreen broadleaved natural forests, and comprising mountains with cloud belts and rivers with developed mountain stream zones.

According to habitat environments, many plants including the following endemic species and rare species occur.

- ◆ Forest floors of evergreen broadleaved forests
  - *Eurya zigzag, Oxygyne shinzatoi*, and *Carex collifera* (all of them are CR), as well as *Dryopteris hasseltii* and *Eulophia taiwanensis* (both are EN) are confirmed in very limited sites within the nominated property.
    - ➢ *O. shinzatoi* is a geobotanically interesting plant belonging to the genus *Oxygyne* that is isolated and distributed only in West Africa and Japan.
    - ➢ *E. taiwanensis* is distributed in Taiwan as well, but in Japan, it is confirmed only in the northern part of Okinawa Island.
  - Endemic species such as *Bredia okinawensis* and *Calanthe lyroglossa. Ilex liukiuensis* (EN).
- ◆ Cloud belts and wind-swept sites nearby mountain peaks
  - Endemic species such as *Dendrobium okinawense.* Rare species such as *Goodyera sonoharae,* and *Woodwardia harlandii*, etc.
- ◆ Mountain stream zones and their neighboring rocky stretches and cliffs
  - Endemic species such as the Amami violet (CR), *Salvia pygmaea*, and *Elatostema suzukii*. Rare species such as *Platanthera sonoharae* and *Ainsliaea macroclinidioides* var. *oblonga*, etc.

4) Iriomote Island

On Iriomote Island, 1,165 species are recorded, among 1,819 vascular plant species found in the four regions containing the nominated property (Table 2-8). Out of these species, 59 species are endemic (Table 2-8). As globally threatened species, six species are listed on the IUCN Red List, one of which is categorized as CR, two as EN, and three as VU, including three are endemic species (Table 2-10). Though Iriomote Island is a small

island, the diversity of its vascular plants is the highest second to that of Amami-Oshima Island.

This component part is a main habitat for many rare species, as well as endemic species and globally threatened species, embracing most parts of evergreen broadleaved natural forests, and consecutive areas from mountains with cloud belts, rivers with mountain stream zones, mangrove areas, and coastal areas.

According to habitat environments, many plants including the following endemic species and rare species occur.

- Forest floors of evergreen broadleaved forests
  - Endemic species such as *Asarum monodoriflorum* (CR), *A. gelasinum*, and *A. yaeyamense*. Rare species such as *Ilex liukiuensis* (EN), etc.
- Cloud belts and wind-swept sites nearby mountain peaks
  - Endemic species such as Ryukyu Japanese skimmia (*Skimmia japonica* var. *lutchuensis*). Rare species such as *Woodwardia harlandii*.
- Mountain stream zones and their neighboring rocky stretches and cliffs
  - Endemic species such as *Deutzia yaeyamensis* (EN), *Solenogyne mikadoi* (VU), *Sphenomeris gracilis*, Yaeyama violet (*Viola tashiroi*) , and *Polystichum hancockii* var. *yaeyamense*. It is the only habitat for *Garnotia acutigluma* in Japan.
- Mangrove areas
  - All seven species among component species of Japanese mangrove forests (refer to Box 1), golden leather fern (*Acrostichum aureum*) that is the only pteridophyte growing in mangrove areas, and so on.
- Coastal areas
  - *Terminalia nitens* (VU) is distributed in the Philippines as well, while *Intsia bijuga* (VU) is widely distributed in tropical regions such as southern China, Southeast Asia, Polynesia, and so on. Seeds of both species are dispersed by currents, and Iriomote Island is the northern limit of their distribution.
- Others
  - Communities of *Satakentia liukiuensis*, a monotypic genus endemic to the Yaeyama Islands, develop on the slopes of lower mountains in the midstream of Nakama River.

Asarum gelasinum (Photo: JWRC)

Box 1. Mangrove forests in the northern and southern parts of the Ryukyu Chain are different in species composition

The influence of the temperature gradient between the northern and southern parts of the Ryukyu Chain on the distribution of plants is typically observed in differences in the species composition of mangrove forests formed by tropical trees and shrubs that are dispersed by ocean currents.

In Asia, the Ryukyu Chain containing the nominated property is about the northern limit of mangrove species. Within the island chain, the most extensive mangrove forests are found on Iriomote Island. Table 2-11 shows seven major species found in mangroves in the Ryukyu Chain.

All of the seven species are distributed on Iriomote Island. However, the more northerly the island, the less species are found with only one species found on Yakushima Island. The difference in temperature between the north and south is believed to be the biggest factor preventing seeds from taking root on the northerly islands even if they manage to get carried by the Kuroshio Current all the way up there (Shimabukuro 1990).

Table 2-11: Major islands of the Ryukyu Chain and the distribution of species composing mangrove forests

	Iriomote Island	Miyako Island	Okinawa Island	Amami-Oshima Island	Yakushima Island
Latitude*	N24˚30′	N24˚45′	N26˚30′	N28˚20′	N30˚20′
Kandelia obovata	○	○	○	○	○
Bruguiera gymnorhiza	○	○	○	○	–
Rhizophora stylosa	○	○	○	–	–
Lumnitzera racemosa	○	○	○	–	–
Avicennia marina	○	○	–	–	–
Sonneratia alba	○	–	–	–	–
Nypa fruticans	○	–	–	–	–

Source: Shimabuku (1990) with some information added.
*: The latitude shown represents the center of the island.

Rhizophora stylosa
(Photo: MOEJ)

2.a.2.2. Fauna

2.a.2.2.1. Terrestrial mammals in the four regions containing the nominated property

It has been confirmed that 22 species of indigenous terrestrial mammals inhabit the nominated property (Table 2-12), accounting for 19% of the total 108 indigenous species found across Japan (calculated based on Annex 3-2-2) (Table 3-2).

Since the four islands containing the nominated property are small with the Okinawa Island, the largest among them, having a land area of 120,696 ha, there are only few species of large- and medium-sized indigenous mammals, i.e., only one species from each of the orders Carnivora, Artiodactyla, and Lagomorpha, and none from Primates. As such, the relatively large proportion of small-sized species such as those belonging to Chiroptera and Rodentia thanks to the limited presence of apex predators and large- and medium-sized species is one of the characteristics of the mammalian fauna of the nominated property.

Table 2-12: Numbers of indigenous terrestrial mammal species in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Insectivora					
Soricidae	2	2	2	1	0
Chiroptera					
Pteropodidae	1 (2)	0	0	1	1
Rhinolophidae	3	1	1	1	1
Hipposideridae	1	0	0	0	1
Vespertilionidae	5	5	5	4	2
Molossidae	1	1	0	0	0
Carnivora					
Felidae	1	0	0	0	1
Artiodactyla					
Suidae	1	1	1	1	1
Rodentia					
Muridae*	5	2	2	3	0
Lagomorpha					
Leporidae	1	1	1	0	0
Total	21 (22)	13	12	11	7

The numbers are based on Annex 3-2-2 Terrestrial mammals, Species lists of the nominated property.
*: The numbers include Ryukyu mouse (*Mus caroli*), a possible alien species (Suzuki 2016).

Out of the 21 species of terrestrial mammals found in the nominated property, 13 species (62%) are endemic. When endemic subspecies such as the Iriomote cat (*Prionailurus bengalensis iriomotensis*) and Ryukyu wild boar (*Sus scrofa riukiuanus*) are included, there are a total of 22 species and subspecies, of which 18 (82%) are endemic to the nominated property, showing a very high rate of endemic species (Table 2-13).

Among the terrestrial mammals found in the nominated property, a total of 11 species and subspecies (52%) are listed on the IUCN Red List as globally threatened, three categorized as CR, seven as EN, and one as VU. (Tables 2-13 and 2-14). Also, a total of 13 species and subspecies (59%) are listed on the MOEJ Red List as Japanese threatened species, three categorized as CR, nine as EN, and one as VU (Tables 2-13 and 2-14). In addition, nine Japanese mammal species are selected as Evolutionarily Distinct and Globally Endangered (EDGE) species by the Zoological Society of London, of which six species accounting for 67% of the total species are distributed in the nominated property (Table 2-14).

Table 2-13: Numbers of endemic/threatened species of terrestrial mammals in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	21 (22)	13	12	11	7
Number of endemic species	13 (18)	8 (10)	8 (10)	7 (9)	3 (6)
Rate of endemic species (%)	62 (82)	62 (77)	67 (83)	64 (82)	43 (86)
Number of species listed on IUCN RL (2018)*	11	7	7	6	3
Rate of species listed on IUCN RL (%)	52	54	58	55	43
Number of species listed on MOEJ RL (2018)*	13	8	8	6	3
Rate of species listed on MOEJ RL (%)	59	62	67	55	43

The numbers are based on Annex 3-2-2 Terrestrial mammals, Species lists of the nominated property.

*: The numbers of those listed on the IUCN Red List are, in principle, based on species-level assessments. However, the Iriomote cat, which has been assessed at a subspecies level, is counted as one species as there are no other subspecies belonging to the same species in the nominated property.

Yanbaru whiskered bat (*Myotis yanbarensis*)
(Photo: MOEJ)

Table 2-14: Globally threatened terrestrial mammal species inhabiting the nominated property

Threatened species	IUCN	MOEJ	EDGE rank*1	Distribution and endemism *2			
				Amami-Oshima Island	Tokuno-shima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Orii's shrew (*Crocidura orii*)	EN	EN	–	●	●	–	–
Ryukyu flying fox (*Pteropus dasymallus*)	VU	–	–	–	–	○	○
Yanbaru whiskered bat (*Myotis yanbarensis*)	CR	CR	–	●	●	●	
Ryukyu bent-winged bat (*Miniopterus fuscus*)	EN	EN	292	●	●	●	●
Ryukyu tube-nosed bat (*Murina ryukyuana*)	EN	EN	–	●	●	●	
Iriomote cat (*Prionailurus bengalensis iriomotensis*)	CR	CR	–	–	–	–	●
Amami spiny rat (*Tokudaia osimensis*)	EN	EN	207	●	–	–	–
Tokunoshima spiny rat (*T. tokunoshimensis*)	EN	EN	198	–	●	–	–
Okinawa spiny rat (*T. muenninki*)	CR	CR	54	–	–	●	–
Ryukyu long-haired rat (*Diplothrix legata*)	EN	EN	260	●	●	●	–
Amami rabbit (*Pentalagus furnessi*)	EN	EN	107	●	●	–	–

*1: The numbers are based on the EDGE species list 2018.
*2: ○ indicates the distribution on the island, and ● indicates the distribution as endemic species (subspecies for the Iriomote cat).

Amami rabbit (*Pentalagus furnessi*) (Photo: MOEJ)

Iriomote cat (*Prionailurus bengalensis iriomotensis*) (Photo: MOEJ)

Ryukyu long-haired rat (*Diplothrix legata*) (Photo: MOEJ)

Okinawa spiny rat (*Tokudaia muenninki*) (Photo: MOEJ)

Characteristics of terrestrial mammals according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, there are 13 species out of 21 terrestrial mammals found in the nominated property (Table 2-13). Out of these, eight are endemic species and two are endemic subspecies (Table 2-13). As globally threatened species, seven endemic species are listed on the IUCN Red List, one species categorized as CR and six species as EN (Table 2-14).

In this component part, the following characteristic terrestrial mammals are distributed.

- Four species, including the Amami rabbit (endemic genus to Amami-Oshima Island and Tokunoshima Island: EN), Amami spiny rat (*Tokudaia osimensis*, endemic genus to the Central Ryukyus, and endemic species to Amami-Oshima Island: EN), Ryukyu long-haired rat (*Diplothrix legata*, endemic genus to the Central Ryukyus: EN), and Ryukyu bent-winged bat (*Miniopterus fuscus*, endemic to the Central and South Ryukyus: EN), are specified as EDGE species.
- Orii's shrew (*Crocidura orii*, EN), the Yanbaru whiskered bat (*Myotis yanbarensis*, CR) dwelling in tree hollows, and Ryukyu tube-nosed bat (*Murina ryukyuana*, EN) inhabit, and these three species are only reported from limited areas including the nominated property.

2) Tokunoshima Island (a) and (b)

On Tokunoshima Island, there are 12 species out of 21 terrestrial mammals found in the nominated property (Table 2-13). Out of these species, eight are endemic species and two are endemic subspecies (Table 2-13). As globally threatened species, seven endemic species are listed on the IUCN Red List, one species categorized as CR and six species as EN (Table 2-14).

In these component parts, the following characteristic terrestrial mammals are distributed.

- Tokunoshima Island is the smallest in area among the four islands containing the nominated property, but is the second highest in the number of terrestrial mammal species after Amami-Oshima Island.
- The Tokunoshima spiny rat *(Tokudaia tokunoshimensis*, EN, EDGE species), which is endemic to this island is distributed. Also, there are endemic species and globally threatened species that are common with the ones in abovementioned Amami-Oshima Island, such as the Amami rabbit, Ryukyu long-haired rat, Ryukyu bent-winged bat, Orii's shrew, Yanbaru whiskered bat, and Ryukyu tube-nosed bat.

3) Northern part of Okinawa Island

In Northern part of Okinawa Island, there are 11 species out of 21 terrestrial mammal species found in the nominated property (Table 2-13). Out of these species, seven are endemic species and three are endemic subspecies (Table 2-13). As globally threatened species, six endemic species are listed in the IUCN Red List, two species categorized as CR and four species as EN (Table 2-14).

In this component part, the following characteristic terrestrial mammals are distributed.

- The Okinawa spiny rat (*Tokudaia muenninki*, CR, EDGE species), which is endemic to Okinawa Island is

distributed. Also, there are endemic and globally threatened species that are common with the ones in the Amami-Oshima Island and Tokunoshima Island, such as the Ryukyu long-haired rat, Ryukyu bent-winged bat, Yanbaru whiskered bat, and Ryukyu tube-nosed bat.

  - The Yanbaru whiskered bat and Ryukyu tube-nosed bat are tree hollow-dwelling bats that were discovered in the northern part of Okinawa Island for the first time in 1996. Since they need large-diameter trees, they are only reported from limited sites in the northern part of Okinawa Island including the nominated property.

- As a different point from Amami-Oshima Island and Tokunoshima Island, *Pteropus dasymallus inopinatus*, which is an endemic subspecies of Ryukyu flying fox (*P. dasymallus*, VU), inhabits the area.

4) Iriomote Island

On Iriomote Island, there are seven species out of 21 terrestrial mammal species found in the nominated property (Table 2-13). Out of these species, three are endemic species and three are endemic subspecies (Table 2-13). As globally threatened species, three species are listed on the IUCN Red List, one species categorized as CR, one species as EN, and one species as VU. Out of these, two are endemic species and subspecies (Table 2-14).

In this component part, the following characteristic terrestrial mammals are distributed.

- Characteristics of Iriomote Island that are different from the other three islands are the following points: it has a small number of terrestrial mammal species, with five species being bat species, other than the Iriomote cat (CR) endemic to this island and Ryukyu wild boar (*Sus scrofa riukiuanus*) endemic to Central and South Ryukyus ; carnivora species inhabit only there in the nominated property, and it is the smallest island in the world where wildcats live (refer to 2.a.4.).
- The Ryukyu bent-winged bat (EN), which is common endemic species with the other three islands, is specified as an EDGE species.
- As a similar point with Northern part of Okinawa Island, *P. dasymallus yayeyamae*, which is an endemic subspecies of Ryukyu flying fox (VU), inhabits the island.

2.a.2.2.2. Birds in the four regions containing the nominated property

A total of 394 species of birds from 71 families and 22 orders are recorded as inhabiting the four regions containing the nominated property (Table 2-15). With those accounting for 62% of all avian species in Japan, a total of 633 species from 81 families and 24 orders (Table 3-2), it is fair to say that the nominated property can be described as having a very rich avifauna (calculated based on Annex 3-2-3).

Table 2-15: Numbers of indigenous species of birds in the four regions containing the nominated property*

(The numbers in the parentheses include subspecies.)	Nominated property	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Anseriformes	30 (32)	26 (28)	14	18	26 (27)
Podicipediformes	4	4	2	2	3
Phaethontiformes	2	1	0	0	1
Columbiformes	7 (10)	5	3	4 (5)	6 (8)
Gaviiformes	2	2	2	0	0
Procellariiformes	9	7	3	1	5
Ciconiiformes	2	1	1	1	2
Suliformes	7 (8)	7 (8)	3	2	5
Pelecaniformes	25	19 (20)	12 (13)	15	22 (23)
Gruiformes	16 (17)	11 (12)	8 (9)	7	10 (11)
Otidiformes	1	0	0	1	0
Cuculiformes	6	3	3	4	5
Caprimulgiformes	1	1	1	1	1
Apodiformes	3	3	3	3	3
Charadriiformes	91 (92)	83 (84)	58	36	69
Accipitriformes	21 (22)	16	8	8 (10)	18 (19)
Strigiformes	8 (10)	6 (8)	4	2 (3)	7 (8)
Bucerotiformes	1	1	1	1	1
Coraciiformes	6	4	3	3	6
Piciformes	4 (6)	3	1	2	1
Falconiformes	6 (7)	4	2	4	6 (7)
Passeriformes	142 (170)	108 (123)	64 (69)	80 (88)	114 (127)
Total	394 (436)	315 (338)	196 (203)	195 (207)	311 (332)

The numbers are based on Annex 3-2-3 Bird, Species lists of the nominated property.

*: Information on the distribution of species and subspecies by island is not necessarily consistent because the preciseness of the information varies depending on the literature (e.g., species level versus subspecies level).

As for the migratory status of birds recorded in the four regions containing the nominated property, migratory birds—i.e., summer visitors, winter visitors, and other passage migrants—and vagrants make up the vast majority of the avifauna. Meanwhile, resident birds, totaling 49 species (63 species and subspecies), account for approximately 11% (Figure 2-15). Factors behind this include that the Central and South Ryukyus, which are a chain of islands lying like stepping stones over the sea area between the southern tip of Kyushu and Taiwan, serve as a safe route for migratory birds traveling between the Northern and Southern Hemispheres, and that the island chain, which has a subtropical climate and is warm even in winter, is abundant in insects and amphibians, providing sufficient food for birds (Okinawa Wild Bird Research Association 2002).

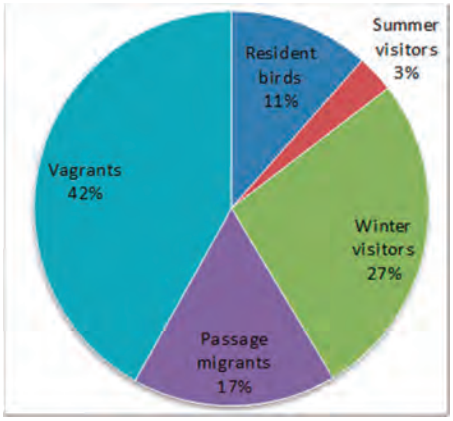


Figure 2-15: Migratory status of birds recorded in the four regions containing the nominated property

Japan has a total of 11 endemic species of birds (Takagi 2007) and five of them inhabit the nominated property. Among them, the Ryukyu robin (*Luscinia komadori*) is also found on the Danjo Islands, Nagasaki Prefecture (Kyushu), but the remaining four—i.e., the Amami jay (*Garrulus lidthi*), the Amami woodcock (*Scolopax mira*), the Okinawa woodpecker (*Sapheopipo noguchii*), and the Okinawa rail—are endemic to Central and South Ryukyus containing the nominated property (Table 2-16). However, Hoyo et al. (2016) defined seven endemic subspecies as independent species, including the white-backed woodpecker (*Dendrocopos leucotos owstoni*), Amami thrush (*Zoothera dauma major*), *Pericrocotus divaricatus tegimae, Otus elegans elegans, Poecile varius olivaceus, Luscinia komadori namiyei*, and *Ficedula narcissina owstoni,* which are listed as subspecies in the Ornithological Society of Japan (2012). In addition, as a result of genetic structure analyses of 234 Japanese birds, Saitoh et al. (2015) extracted 24 species as candidates for cryptic species that are specific to the Japanese Islands and their neighboring areas, and suggested that 10 populations, including six populations in the nominated property, were possibly Japanese endemic species. The number of endemic species may increase in the nominated property, by reviewing the categories of Japanese birds in the coming period. Because of the inhabitation of those endemic species of birds, the islands lying between Kyushu and Taiwan, including the nominated property, are listed as Endemic Bird Area (EBAs) by BirdLife International under the name of "Nansei Shoto."

Among the species of birds found in the four regions containing the nominated property, 12 species are globally threatened species listed on the IUCN Red List (2018), two as CR, five as EN, and five as VU, while 36 species and subspecies are Japanese threatened species listed on the MOEJ Red List, four categorized as CR, 11 as EN, and 21 as VU (Table 2-16). All of the four species that are endemic to the nominated property are globally threatened species listed on the IUCN Red List. Of these, three are classified as EDGE species (Table 2-17), accounting for 50% of six EDGE species endemic to Japan.

Table 2-16: Numbers of endemic/threatened species of birds in the four regions containing the nominated property*1

(The numbers in the parentheses include subspecies)	Four regions containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of species	394 (436)	315 (338)	196 (203)	196 (208)	311 (332)
Resident birds	49 (63)	42	38 (36)	38 (40)	44 (46)
Migratory birds (summer/ winter visitors and passage migrants)	167 (178)	158 (166)	127 (134)	96 (107)	155 (165)
Vagrants	178 (195)	115 (130)	31 (33)	60 (61)	112 (121)
Number of endemic species *2	4 (30)	2 (12)	1 (7)	3 (12)	0 (17)
Rate of endemic species (%) *2	8 (48)	5 (29)	3 (19)	8 (30)	0 (37)
Number of species listed on IUCN RL (2018) *3	12	10	6	4	8
Rate of species listed on IUCN RL (%)	6	5	4	7	4
Number of species listed on MOEJ RL (2018) *3	36	25	15	19	29
Rate of species listed on MOEJ RL (%)	15	12	9	13	14

The numbers are based on Annex 3-2-3 Birds, Species lists of the nominated property.

*1: Information on the distribution of species and subspecies by island is not necessarily consistent because the preciseness of the information varies depending on the literature (e.g., species level versus subspecies level, inconsistent migratory status between species and subspecies levels).

*2: The numbers and rates of endemic species are those of resident birds.

*3: The numbers exclude vagrants.

Okinawa rail (*Gallirallus okinawae*) (Photo: MOEJ)

Okinawa woodpecker (*Sapheopipo noguchii*) (Photo: MOEJ)

Table 2-17: Globally threatened species of birds inhabiting or visiting the four regions containing the nominated property

Species	IUCN	MOEJ	EDGE rank[*1]	Migratory status[*2]	Distribution and Endemism[*3]			
					Amami-Oshima Island	Tokuno-shima Island	Northern part of Okinawa Island	Iriomote Island
Common pochard (*Aythya ferina*)	VU	–	–	Wv	○	○	–	○
Japanese night heron (*Gorsachius goisagi*)	EN	VU	–	Wv/Pm	○	–	○	○
Chinese egret (*Egretta eulophotes*)	VU	–	–	Pm	○	–	–	○
Black-faced spoonbill (*Platalea minor*)	EN	EN	–	Wv	○	○	–	○
Okinawa rail (*Gallirallus okinawae*[*4])	EN	CR	346	Rb	–	–	●	–
Amami woodcock (*Scolopax mira*)	VU	VU	421	Rb[*6]	●	●	●	–
Far eastern curlew (*Numenius madagascariensis*)	EN	VU	–	Wv	○	○	–	○
Great knot (*Calidris tenuirostris*)	EN	–	–	Pm	○	○	–	○
Spoon-billed sandpiper (*Eurynorhynchus pygmeus*)	CR	CR	–	Pm/Wv	○	–	–	○
Saunders's gull (*Larus saundersi*)	VU	VU	–	Wv	○	○	–	○
Okinawa woodpecker (*Sapheopipo noguchii*[*5])	CR	CR	–	Rb	–	–	●	–
Amami jay (*Garrulus lidthi*)	VU	–	506	Rb	●	–	–	–

*1: The numbers are based on the EDGE species list 2018.
*2: Migratory status: Rb indicates resident birds (which inhabits the area throughout the year); Wv indicates winter visitor (which overwinters in the area); Pm indicates passage migrant (which visits the area on the way of migrating between breeding and wintering grounds). The migratory status is assessed for the whole Central and South Ryukyus and does not necessarily correspond to each island.
*3: ○ indicates the distribution on the island, and ● indicats the distribution as endemic species.
*4: Following Ornithological Society of Japan (2012), *Gallirallus okinawae* is provided as the scientific name of the Okinawa rail but *Hypotaenidia okinawae* (Hoyo et al. 2016) is used on the IUCN Red List.
*5: Likewise, *Sapheopipo noguchii* is provided as the scientific name but *Dendrocopos noguchii* (Hoyo et al. 2016) is used on the IUCN Red List.
*6: The Amami woodcock, which has been confirmed to be breeding in the Amami-Oshima Island and its nearby islands as well as in the Tokunoshima Island, visits the Kikai Island, the Okinoerabu Island, the Okinawa Island, and the Kerama Islands in winter.

Amami jay (*Garrulus lidthi*) (Photo: MOEJ)

Amami woodcock (*Scolopax mira*) (Photo: MOEJ)

Characteristics of avifauna according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, 315 species out of 394 birds found in the four regions containing the nominated property have been confirmed (Table 2-16). There are 42 resident birds that stay throughout the year, with two endemic species and 10 endemic subspecies according to the Ornithological Society of Japan's categories (2012) (Table 2-16). As globally threatened species, 10 species are listed on the IUCN Red List, one as species categorized as CR, four species as EN, and five species as VU, out of which two species are endemic resident birds, and others are winter visitors that winter in the lower lands and seacoasts nearby the nominated property, as well as passage migrants (Table 2-17).

In this component part, the following characteristic birds are distributed.

- The Amami woodcock (*Scolopax mira*, VU) that is specified as an EDGE species, the Amami jay (*Garrulus lidthi*, VU) that is an EDGE species and relict endemic species distributed only on Amami-Oshima Island and its neighboring isolated islands, and endemic subspecies such as the white-backed woodpecker and Amami thrush, inhabit the island as resident birds.
- Subspecies of the ruddy kingfisher (*Halcyon coromanda bangsi*), Japanese paradise flycatcher (*Terpsiphone atrocaudata illex*), and others migrate and breed as summer visitors.

2) Tokunoshima Island (a) and (b)

There are 196 species confirmed in Tokunoshima Island, out of 394 birds found in the four regions containing the nominated property (Table 2-16). Thirty-eight resident bird species inhabit the island throughout the year, with one endemic species and six endemic subspecies among them (Table 2-16). As globally threatened species, six species are listed in the IUCN Red List, three categorized as EN and three as VU, out of which one species is an endemic resident bird, in addition to winter birds that winter in the lower lands and seacoasts nearby the nominated property, as well as passage migrants (Table 2-17).

In these component parts, the following characteristic birds are distributed.

- Resident birds, such as the Amami woodcock (VU) specified as an EDGE species, inhabit the island.
- Subspecies of the ruddy kingfisher, Japanese paradise flycatcher, and others migrate and breed as summer visitors.

3) Northern part of Okinawa Island

In Northern part of Okinawa Island, 196 species are confirmed out of 394 birds in the four regions containing the nominated property (Table 2-16). Thirty-eight resident bird species inhabit the area throughout the year, with three endemic species and 12 endemic subspecies among them (Table 2-16). As globally threatened species, four species are listed in the IUCN Red List, one categorized as CR, two as EN, and one species as VU, out of which three species are endemic resident birds, in addition to one wintering visitor/ passage migrant (Table 2-17).

In this component part, the following characteristic birds are distributed.

- The Okinawa rail (EN) and Amami woodcock (VU) that are specified as EDGE species, resident birds such

as the Okinawa woodpecker (*Sapheopipo noguchii*, CR), etc. inhabit the area.

- Subspecies of the ruddy kingfisher, Japanese paradise flycatcher, and others migrate and breed as summer visitors.

With regard to the Japanese night heron (*Gorsachius goisagi*, EN) that breeds almost only in Japan, their injured individuals are frequently protected on their way to wintering grounds such as Southeast Asia and Taiwan, which indicates a possibility that Okinawa Prefecture including the nominated property is important for them as stopovers (Wildlife Department, Nature Conservation Bureau, MOEJ, 2016).

4) Iriomote Island

On Iriomote Island, 311 species are confirmed out of 394 birds in the four regions containing the nominated property (Table 2-16). Though Iriomote Island is the second smallest in area size (28,961 ha) among the four islands containing the nominated property, it is confirmed that the number of bird species is almost the same as that of Amami-Oshima Island (71,235 ha), which is around 2.5 times as large as Iriomote Island. This is because that there are many kinds of winter visitors and passage migrants, and that there are many vagrants due to its close distance to the continent (Table 2-16). There are 44 species of resident birds that inhabit the island throughout the year, of which 17 are endemic subspecies. As globally threatened species, eight endemic species are listed in the IUCN Red List, one species categorizes as CR, four species as EN, three species as VU (Table 2-17).

In this component part, the following characteristic birds are distributed.

- There are resident subspecies endemic to the Yaeyama Islands, including the crested serpent eagle (*Spilornis cheela perplexus*), emerald dove (*Chalcophaps indica yamashinai*), Japanese wood pigeon (*Columba janthina stejnegeri*), Japanese pygmy woodpecker (*Dendrocopos kizuki orii*), brown-eared bulbul (*Hypsipetes amaurotis stejnegeri*), varied tit (*Poecile varius olivaceus*), Japanese tit (*Parus minor nigriloris*). There also are endemic subspecies that are common with the other three islands, including the Oriental turtle dove (*Streptopelia orientalis stimpsoni*), collard scops owl (*Otus lempiji pryeri*), barred buttonquail (*Turnix suscitator okinavensis*).
- Eight globally threatened species are wintering visitors and passage migrants during the winter season, including the spoon-billed sandpiper (*Eurynorhynchus pygmeus*, CR), black-faced spoonbill (*Platalea minor*, EN). They are confirmed in the coastal areas of the property and tidal flats at river mouths, but their frequency is not so high.

Crested serpent eagle (*Spilornis cheela perplexus*)
(Photo: MOEJ)

2.a.2.2.3. Terrestrial reptiles in the four regions containing the nominated property

A total of 72 indigenous species (82 species and subspecies) of terrestrial reptiles from 15 families and two orders are distributed across Japan (calculated based on Annex 3-2-4). The nominated property is home to 36 species (38 species and subspecies) or 50% of the national total (Tables 3-2 and 2-18), serving as a major habitat for terrestrial reptiles in Japan.

Table 2-18: Numbers of indigenous species of terrestrial reptiles in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Testudines					
Geoemydidae	3	0	0	1	2
Squamata Lacertilia					
Eublepharidae	2	0	1	1	0
Gekkonidae	4	3	3	3	2
Agamidae	1 (2)	1	1	1	1
Scincidae	7	3	3	3	3
Lacertidae	2	1	1	1	1
Serpentes					
Typhlopidae*	1	1	1	1	1
Pareatidae	1	0	0	0	1
Xenodermatidae	2	1	1	1	1
Colubridae	8	3	3	3	5
Elapidae	2 (3)	1	1	1	1
Viperidae	3	2	2	2	1
Total	36 (38)	16	17	18	19

The numbers are based on Annex 3-2-4 Terrestrial reptiles, Species lists of the nominated property.
*: The numbers include the Brahminy blind snake (*Indotyphlops braminus*), a possible alien species (Ota et al. 2004).

The nominated property is very rich in endemic species of terrestrial reptiles. Out of the total 36 species of terrestrial reptiles distributed in the nominated property, 23 species (64%) are endemic. As those terrestrial reptiles are under an ongoing process of differentiation and speciation among different islands, the nominated property hosts extremely rich endemism with a total of 33 species and subspecies (87%) endemic to the nominated property (Table 2-19).

Among those distributed in the nominated property, eight species (22%) are globally threatened species listed on the IUCN Red List (2018), five categorized as EN and three as VU, of which six species are classified as EDGE species (Table 2-20), accounting for 55% of the total EDGE species of terrestrial reptiles in Japan.

Meanwhile, a total of 13 species and subspecies (35%) are listed as threatened on the MOEJ Red List (2018), one species categorized as EN and 12 species and subspecies as VU (Tables 2-19 and 2-20). Many of those threatened species primarily inhabit relatively moist evergreen broadleaved forests (Ota 2000), and such environments are preserved in good conditions in the nominated property.

Table 2-19: Numbers of endemic/threatened species of terrestrial reptiles in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	36 (38)	16	17	18	19
Number of endemic species	23 (33)	10 (11)	11 (12)	13 (14)	8 (16)
Rate of endemic species (%)	64 (87)	63 (69)	65 (71)	72 (78)	42 (84)
Number of species listed on IUCN RL (2018)	8	1	2	3	4
Rate of species listed on IUCN RL (%)	22	6	12	17	21
Number of species listed on MOEJ RL (2018)	13	2	3	5	7
Rate of species listed on MOEJ RL (%)	34	13	18	28	37

The numbers are based on the Annex 3-2-4 Terrestrial reptiles, Species lists of the nominated property.

Table 2-20: Globally threatened species of terrestrial reptiles inhabiting the nominated property

Threatened species	IUCN	MOEJ	EDGE rank*1	Distribution and Endemism*2			
				Amami-Oshima Island	Tokuno-shima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Asian brown pond turtle*3 (*Mauremys mutica*)	EN	–	–	–	–	–	○
Yellow-margined box turtle (*Cuora flavomarginata*)	EN	VU*4	–	–	–	–	○
Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)	EN	VU	47	–	–	●	–
Banded ground gecko (*Goniurosaurus splendens*)	EN	EN	172	–	●	–	–
Kuroiwa's ground gecko (*G. kuroiwae*)	VU	VU*5	74	–	–	●	–
Kishinoue's giant skink (*Plestiodon kishinouyei*)	VU	VU	547	–	–	–	●
Barbour's blue-tailed skink (*P. barbouri*)	VU	VU	564	●	●	●	–
Sakishima grass lizard (*Takydromus dorsalis*)	EN	VU	295	–	–	–	●

*1: The numbers are based on the EDGE species list 2018.
*2: ○ indicates the distribution on the island, and ● represent the distribution as endemic species.
*3: The Yaeyama pond turtle (*M. m. kami)*, a subspecies, is included.
*4: The Yaeyama yellow-margined box turtle (*C. f. evelynae*), a subspecies, is categorized as VU.
*5: The Kuroiwa's ground gecko (*G. k. kuroiwae*), a subspecies, is categorized as VU. The subspecies inhabiting the islands near the Okinawa Island outside the nominated property include *G. k. toyamai* (CR), *G. k. yamashinae* (CR), *G. k. orientalis* (EN) and *G. k. sengokui*.

Characteristics of reptiles according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, there are 16 species out of 36 reptiles found in the nominated property (Table 2-19). Out of them, 10 are endemic species and one is an endemic subspecies (Table 2-19). As globally threatened species, one endemic species (VU) is listed on the IUCN Red List (Table 2-20).

In this component part, the following characteristic reptiles are distributed.

- Endemic species are all unique to the Central Ryukyus. The habu viper (*Protobothrops flavoviridis*) and Ryukyu odd-tooth snake (*Dinodon semicarinatum*) are the apex predators on this island where carnivora are not distributed. The Japanese coral snake (*Sinomicrurus japonicus japonicus*) is an endemic subspecies on Amami-Oshima Island and Kakeroma Island, and it is on the halfway of speciation between islands. The Barbour's blue-tailed skink (*Plestiodon barbouri*, VU) is specified as an EDGE species.

2) Tokunoshima Island (a) and (b)

On Tokunoshima Island, there are 17 species out of 36 reptiles found in the nominated property (Table 2-19). Among these species, 11 species are endemic species (Table 2-19). As globally threatened species, two endemic species are listed on the IUCN Red List, one categorized as EN and one as VU (Table 2-20).

In the component parts (a) and (b), the following reptiles are distributed.

- The reptile species are almost the same as the ones in Amami-Oshima Island. However, the banded ground gecko (*Goniurosaurus splendens*, EN), which is an EDGE species not distributed on Amami-Oshima Island, is found in these component parts. The Okinawa coral snake (*S. japonicus boettgeri*) is also distributed on this island in common with the Okinawa Island Group.

3) Northern part of Okinawa Island

In Northern part of Okinawa Island, there are 18 species out of 36 reptiles found in the nominated property (Table 2-19). Out of these species, 13 species are endemic species (Table 2-19). As globally threatened species, three endemic species are listed on the IUCN Red List, one categorized as EN and two as VU (Table 2-20).

In this component part, the following characteristic reptiles are distributed.

- The reptile species are quite similar to the ones on Amami-Oshima Island and Tokunoshima Island of the Central Ryukyus. The Barbour's blue-tailed skink (VU), an EDGE species, and the Okinawa coral snake, a common endemic to Tokunoshima Island, inhabit this component part.
- Meanwhile, it is characterized by a distribution of the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*, EN), which is an EDGE species, and Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*). Both of these two species are endemic to the Okinawa Island Group and are not distributed on Amami-Oshima Island and Tokunoshima Island.

4) Iriomote Island

On Iriomote Island, there are 19 species out of 36 reptiles found in the nominated property (Table 2-19). Out of

these, eight are endemic species and eight are endemic subspecies (Table 2-19). As globally threatened species, four species are listed on the IUCN Red List, three species categorized as EN and one species as VU (Table 2-20). Reflecting the geological history of this area, it is characteristic that eight endemic species are all endemic to the South Ryukyus, and all eight endemic subspecies have their sister subspecies in neighboring Taiwan.

In this component part, the following characteristic reptiles are distributed.

- The Yaeyama grass lizard (*Takydromus dorsalis*, EN) and Kishinoue's giant skink (*Plestiodon kishinouyei*, VU) that are specified as EDGE species inhabit this component part.
- It is also characterized by the fact that the Yaeyama pond turtle (*Mauremys mutica kami*), an endemic subspecies of the Asian brown pond turtle (*M. mutica*, EN), and the Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*), an endemic subspecies of the Yellow-margined box turtle (*C. flavomarginata*, EN), inhabit the island.

Habu viper (*Protobothrops flavoviridis*) (Photo: Hidetoshi Ota)

2.a.2.2.4. Amphibians in the four regions containing the nominated property

A total of 74 indigenous species (79 species and subspecies) of amphibians from nine families and two orders have been recorded in Japan (calculated based on Annex 3-2-5). The nominated property is home to 21 species (22 species and subspecies) or 28% of the national total (Table 3-2). Those belonging to the order Anura include one species from the family Hylidae, 11 species from the family Ranidae, two species from the family Dicroglossidae, four species (five species and subspecies) from the family Rhacophoridae, and one species from the family Microhylidae, together accounting for more than half (54%) of those indigenous to Japan, i.e., 39 species from seven families within the order Anura. Meanwhile, those belonging to the order Caudata include only two species from the family Salamandridae and none from the family Hynobiidae, which has an extremely large number of species on the main islands of Japan (Table 2-21).

Because of the scarcity of inland water bodies, small islands in general do not provide a desirable habitat for amphibians, which require sizable water bodies to breed (in egg-laying and larval stages). However, the Central and South Ryukyus harbor a rich amphibian fauna thanks to the formation and presence of moist, subtropical rainforests, which is attributable to the influence of the monsoon climate, typhoons, ocean currents, and other unique conditions not seen in other regions located at the same latitude.

Table 2-21: Numbers of indigenous species of amphibians found in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Caudata					
Salamandridae	2	2	1	2	0
Anura					
Hylidae	1	1	1	1	0
Ranidae	11	4	2	4	3
Dicroglossidae	2	0	0	1	1
Rhacophoridae	4 (5)	2	2	2	3
Microhylidae	1	1	1	1	1
Total	21 (22)	10	7	11	8

The numbers are based on the Annex 3-2-5 Amphibians, Species lists of the nominated property.

Amphibians inhabiting the nominated property show extremely high endemism with 18 species (19 species and subspecies) or 86% of the total species being endemic to the nominated property (Table 2-22).

Out of the total 21 species (22 species and subspecies) of amphibians inhabiting the nominated property, 12 species (57%) are listed as EN on the IUCN Red List (2018). Five species have been selected as EDGE species, and all of the Japanese EDGE amphibian species inhabit the nominated property (Table 2-23). Meanwhile, 10 species (45%) are listed on the MOEJ Red List (2018), six categorized as EN and four as VU. The nominated property is serving as a major habitat for those threatened species of amphibians, as it preserves evergreen broadleaved forests with relatively moist floors, an ideal habitat for most of the species (Ota 2000).

Table 2-22: Numbers of endemic and threatened species of amphibians in the nominated property

(The numbers in the parentheses include subspecies)	Nominated property	Component parts			
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	21 (22)	10	7	11	8
Number of endemic species	18 (19)	9	6	10	5
Rate of endemic species (%)	86 (86)	90	86	91	63
Number of species listed on IUCN RL (2018)	12	5	2	6	3
Rate of species listed on IUCN RL (%)	57	50	29	55	38
Number of species listed on MOEJ RL (2018)	10	4	2	5	2
Rate of species listed on MOEJ RL (%)	45	40	29	45	25

The numbers are based on the Annex 3-2-5 Amphibians, Species lists of the nominated property.

Table 2-23: Globally threatened species of amphibians inhabiting the nominated property

Threatened species	IUCN	MOEJ	EDGE rank[*1]	Distribution and Endemism[*2]			
				Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island
Anderson's crocodile newt (*Echinotriton andersoni*)	EN	VU	592	●	●	●	–
Sword-tailed newt (*Cynops ensicauda*)	EN	–	–	●	–	●	–
Amami tip-nosed frog (*Odorrana amamiensis*)	EN	VU	–	●	●	–	–
Amami Ishikawa's frog (*O. splendida*)	EN	EN	–	●	–	–	–
Greater tip-nosed frog (*O. supranarina*)	EN	–	–	–	–	–	●
Okinawa Ishikawa's frog (*O. ishikawae*)	EN	EN	425	–	–	●	–
Utsunomiya's tip-nosed frog (*O. utsunomiyaorum*)	EN	EN	–	–	–	–	●
Okinawa tip-nosed frog (*O. narina*)	EN	VU	–	–	–	●	–
Otton frog (*Babina subaspera*)	EN	EN	499	●	–	–	–
Holst's frog (*B. holsti*)	EN	EN	–	–	–	●	–
Yaeyama harpist frog (*Nidirana okinavana*[*3])	EN	VU	550	–	–	–	●
Namie's frog (*Limnonectes namiyei*)	EN	EN	463	–	–	●	–

*1: The numbers are based on the EDGE species list 2018.
*2: ○ indicates the distribution on the island, and ● indicates the distribution as endemic species.
*3: On the IUCN Red List, the scientific name of the Yaeyama harpist frog is given as "*Babina okinavana*" and it is stated that the species also inhabits Taiwan. However, it is treated as "*Nidirana okinavana*" that belongs to a separate genus in Herpetological Society of Japan (2017).

Characteristics of the amphibia fauna according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, there are 10 species out of 21 amphibians found in the nominated property (Table 2-22). Among these species, nine species are endemic species (Table 2-22). As globally threatened species, five endemic species (all are EN) are listed on the IUCN Red List (Table 2-23).

In this component part, the following characteristic amphibians are distributed.

- The sword-tailed newt (*Cynops ensicauda*, EN) is an endemic species that is common with Northern part of Okinawa Island, and Anderson's crocodile newt (*Echinotriton andersoni*, EN), which is specified as an EDGE species, is an endemic species that is common with Tokunoshima Island and Northern part of Okinawa Island.
- Amami Ishikawa's frog (*Odorrana splendida*, EN) is endemic to Amami-Oshima Island and the Otton frog (*Babina subaspera*, EN), an EDGE species, is endemic to Amami-Oshima Island and its neighboring Kakeroma Island, with their respective sister species distributed in Northern part of Okinawa Island.
- Tip-nosed frogs (*Odorrana*) have speciated into four species in the four islands containing the nominated property, including the Amami tip-nosed frog (*Odorrana amamiensis*) distributed in this component part.

2) Tokunoshima Island (a) and (b)

On Tokunoshima Island, there are seven species out of 21 amphibian species found in the nominated property (Table 2-22). Among these, six species are endemic (Table 2-22). As globally threatened species, two endemic species are listed on the IUCN Red List, both of which are categorized as EN (Table 2-23).

In the component parts (a) and (b), the following characteristic amphibians are distributed.

- The amphibians in the component parts (a) and (b) share common species with Amami-Oshima Island, excluding three species of the sword-tailed newt, Amami Ishikawa's frog, and Otton frog.
- Common species with Amami-Oshima Island include the Amami tip-nosed frog (EN) and Anderson's crocodile newt (EN), which is an EDGE species.

3) Northern part of Okinawa Island

In Northern part of Okinawa Island, there are 11 species out of 21 amphibian species found in the nominated property (Table 2-22). Among these, 10 species are endemic (Table 2-22). As globally threatened species, six endemic species are listed in the IUCN Red List, all are categorized as EN (Table 2-23).

In this component part, the following characteristic amphibians are distributed.

- The sword-tailed newt (EN) is an endemic species that is common to Amami-Oshima Island, and Anderson's crocodile newt (EN), an EDGE species, is an endemic species that is common to Amami-Oshima Island and Tokunoshima Island.
- The Okinawa Ishikawa's frog (*Odorrana ishikawae*, EN) and Namie's frog (*Limnonectes namiyei*, EN) that are endemic to Okinawa Island, as well as Holst's frog (*Babina holsti*, EN) that is endemic to the Okinawa Island Group, are specified as EDGE species.
    - As for Okinawa Ishikawa's frog and Holst's frog, their respective sister species are distributed on Amami-Oshima Island.
- The Okinawa tip-nosed frog (EN) is an endemic species to Okinawa Island among the abovementioned tip-nosed frogs.

4) Iriomote Island

On Iriomote Island, there are eight species out of 21 amphibians found in the nominated property (Table 2-22). Out of these species, five species are endemic (Table 2-22). As globally threatened species, three endemic species are listed on the IUCN Red List, all are categorized as EN (Table 2-23).

In this component part, the following characteristic amphibians are distributed.

- Salamandridae species distributed in the Central Ryukyus are not distributed here.
- Only two species, the Ryukyu kajika frog (*Buergeria japonica*) and Okinawa narrow-mouthed toad (*Microhyla okinavensis*), are common to the nominated three islands in the Central Ryukyus, and three out of five endemic species are endemic to the South Ryukyus.
- Among the abovementioned tip-nosed frogs, the greater tip-nosed frog (*Odorrana supranarina*, EN) and Utsunomiya's tip-nosed frog (*O. utsunomiyaorum*, EN) are distributed.
- The Yaeyama harpist frog (*Nidirana okinavana*, EN) is specified as an EDGE species.

Herpetofauna of the nominated property

Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)
(Photo: MOEJ)

Amami Ishikawa's frog (*Odorrana splendida*)
(Photo: MOEJ)

Yellow-margined box turtle (*Cuora flavomarginata*)
(Photo: JWRC)

Namie's frog (*Limnonectes namiyei*) (Photo: MOEJ)

Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*)
(Photo: MOEJ)

Anderson's crocodile newt (*Echinotriton andersoni*)
(Photo: MOEJ)

2.a.2.2.5. Inland water fish in the four islands containing the nominated property

A total of 568 indigenous species of fish from 99 families and 25 orders have been recorded as inhabiting the inland waters of the four islands containing the nominated property (Yoshigo 2014). However, more than half of these species are marine vagrants, which accidentally entered the area. Those include the following (Table 2-24):

- Freshwater fish, which are confined to freshwater throughout their lives: nine species (1%)
- Diadromous fish, which regularly migrate between rivers and the sea during certain periods of their life cycle: 53 species (9%)
- Brackish water fish, which spend their lives in and around brackish water bodies except for the planktonic stage: 130 species (23%)
- Peripheral fish, which mainly inhabit the sea but spend part of their lives in inland waters: 75 species (13%)
- Marine vagrants, which mainly inhabit the sea but accidentally enter inland water habitats: 301 species (53%)

Thus, it is considered that a total of 267 species from 57 families and 18 orders, which exclude marine vagrants, represent the true ichthyofauna of the inland waters of the four islands containing the nominated property.

Table 2-24: Number of indigenous species of fish in the inland waters of the four islands containing the nominated property (classified by life form)[*1]

	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island[*2]	Okinawa Island	Iriomote Island
Freshwater fish	9	7	2	9	5
Diadromous fish	53	38	14	44	48
Brackish water fish	130	68	18	85	120
Peripheral freshwater fish	75	41	0	63	73
Marine vagrants	301	67	4	177	226
Total	568	221	38	378	472

*1: The numbers are based on the Annex 3-2-6 Inland water fishes, Species lists of the nominated property.
*2: The species inhabiting Tokunoshima Island have not been fully surveyed and considered as lacking sufficient information. The number of species may increase as relevant studies make progress.

Only nine species of freshwater fish inhabit the four islands containing the nominated property. In main islands of Japan, Taiwan, the Philippines, and Indonesia, large populations of freshwater fish—such as those belonging to the families of Cyprinidae, Siluridae, and Cobitidae—are found in inland waters. In contrast, the nominated property is characteristic in that while it has few such species, many species of brackish water and marine fish are found in freshwater bodies (Table 2-24).

One reason behind the formation of this unique ichthyofauna of inland waters is the characteristics of rivers in the nominated property, which are mostly short and steep. When swollen, those rivers flow rapidly in their entire length, making it difficult for freshwater fish species—those that do not tolerate any salinity—to inhabit. Also, in the Central and South Ryukyus, rivers with tidal areas forested by mangroves as well as seagrass beds and coral reefs in adjacent sea areas are preserved in relatively good conditions, providing secure habitats for many species of diadromous fish, peripheral fish, brackish water fish, and so forth (Tachihara 2003).

Although diadromous fish and brackish water fish can disperse through the sea, they require freshwater in certain stages or periods of their life cycle. Therefore, they are able to inhabit only those islands with sizable rivers. It is assumed that the smaller the number of inhabitable islands, the greater is the distance between habitats and the more likely are those species to be geographically isolated from one another (Mukai 2010). In the four islands containing the nominated property, a total of 14 endemic species and subspecies are distributed, namely, the Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*), one species each from the genera *Carassius* and *Monopterus*, and 11 species of gobies (Sakai et al. 2001; Nakabo 2013).

Among the inland water fish inhabiting the four islands containing the nominated property, six species and subspecies are listed on the IUCN Red List (2018) as globally threatened species (Tables 2-25 and 2-26). Meanwhile, a total of 69 species and subspecies are listed on the MOEJ Red List (2018), 41 species and subspecies categorized as CR, 16 species as EN, and 14 species as VU, accounting for 41% of the total 167 threatened species of inland water fish in Japan (Tables 3-2 and 2-25). In particular, 58% of those categorized as CR inhabit the four islands containing the nominated property, making those islands home to large populations of many rare species of inland water fish.

Swamp eel (*Monopterus* sp.) (Photo: MOEJ)

Freshwater goby (*Rhinogobius* sp. BB) (Photo: MOEJ)

Table 2-25: Numbers of endemic/threatened species of inland water fish in the four islands containing the nominated property*1

(The numbers in the parentheses include subspecies)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Okinawa Island	Iriomote Island
Number of indigenous species	267	154	34	201	246
Number of endemic species	13 (14)	9 (10)	2	10	9
Rate of endemic species (%)	5	6	6	5	4
Number of species listed on IUCN RL (2018) *2	6	5	1	4	5
Number of species listed on MOEJ RL (2018)	69	37	5	43	62
Rate of species listed on MOEJ RL (%)	26	24	15	21	25

The numbers are based on the Annex 3-2-6 Inland water fishes, Species lists of the nominated property.
*1: Marine vagrants are excluded.
*2: Assessments for the IUCN Red List are conducted at a species level. However, the Ryukyu ayu-fish, which has been assessed at a subspecies level, is counted as one species because there are no other subspecies belonging to the same species in the nominated property.

Table 2-26: Globally threatened species of inland water fish inhabiting the four islands containing the nominated property

Threatened species	IUCN	MOEJ	Life cycle*1	Distribution and Endemism*2			
				Amami-Oshima Island	Tokuno-shima Island	Northern part of Okinawa Island	Iriomote Island
Japanese eel (*Anguilla japonica*)	EN	EN	D	○	○	○	○
Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*)	EN	CR	D	●	–	(●)*3	–
Spotted seahorse (*Hippocampus kuda*)	VU	–	B	○	○	○	○
Okinawa seabream (*Acanthopagrus sivicolus*)	VU	–	P	○	–	○	○
Stiphodon imperiorientis	VU	CR	D	●	–	●	●
Pink whipray (*Himantura fai*)	VU	–	P	–	–	–	○

*1: D indicates diadromous fish, B indicates brackish water fish, and P indicates peripheral freshwater fish
*2: ○ indicates the distribution on the island, and ● indicates the distribution as endemic species.
*3: The distribution on the Okinawa Island is a result of the reintroduction of the species from the Amami-Oshima Island.

Characteristics of inland water fish according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, 154 species out of 267 inland water fish found in the four islands containing the nominated property are confirmed (Table 2-25). There are seven freshwater fish species, while there are many fish species utilizing inland water areas in their life cycle, such as 38 species of diadromous fish, 68 species of brackish water fish, and 41 species of peripheral fish (Table 2-24). Out of these, there are 10 endemic species and subspecies (Table 2-25). As globally threatened species, in addition to diadromous fish, such as the Ryukyu ayu-fish (EN), Japanese eel (*Anguilla japonica*, EN), and *Stiphodon imperiorientis* (VU), one species from brackish water fish and peripheral fish, respectively, are listed on the IUCN Red List, both of which are categorized as VU (Table 2-26).

Since many places in Amami-Oshima Island are geographically featured by steep mountains closely facing coastal areas, there are short and steep rivers, other than main rivers that are relatively long and with high biodiversity, such as Sendai River, Sumiyo River, and Yakugachi River flowing into the east coast as well as Kawauchi River flowing into Yakeuchi Bay in the west.

This component part embraces main parts of Sendai River, Sumiyo River, and Yakugachi River, and most parts of Kawauchi River, which makes it a habitat for inland water fish, including endemic and threatened species, and mainly freshwater fish and diadromous fish. In addition, due to the location of the nominated property's forests in the upper stream basin, the maintenance of habitat environments for many species living in the lower stream basin has been secured.

In this component part, the following characteristic inland fish are distributed.

- Freshwater fish: *Carassius* sp., *Monopterus* sp., and *Rhinogobius* sp.YB that are all endemic to the Central and South Ryukyus.
- Diadromous fish: Ryukyu ayu-fish and *Rhinogobius* sp. MO that are endemic to the Central Ryukyus; and *Stiphodon imperiorientis* that is endemic to the Central and South Ryukyus.
- Brackish water fish: *Parioglossus caeruleolineatus* that is endemic to Amami-Oshima Island; *Acanthogobius insularis* that is endemic to the Central Ryukyus; and *Silhouettea* sp. A and *Luciogobius ryukyuensis* that are endemic to the Central and South Ryukyus.

2) Tokunoshima Island (a) and (b)

On Tokunoshima Island, 34 out of 267 inland water fish species found in the four islands containing the nominated property are confirmed (Table 2-25). There are as few as two freshwater fish species, while there are 14 species of diadromous fish and 18 species of brackish water fish (Table 2-24). Out of these species, two species are endemic (Table 2-25). As globally threatened species, diadromous Japanese eel is listed on the IUCN Red List as EN (Table 2-26). Compared to the other three Islands, information on inland water fish is lacking in these component parts, however, the number of species may increase as relevant studies make progress.

Since Tokunoshima Island is geographically dominated by steep mountains closely facing the coastal areas in the north, and mountain peripherals in the south are surrounded by limestone plateaus comprising uplifted coral reefs, there are many short and steep rivers. The component part of Tokunoshima Island (a) includes Akirigami River, the longest river in Tokunoshima Island, and a part from the source to the upper stream of its branch, making it a habitat for inland water fish species including endemic and threatened species, mainly freshwater fish and diadromous fish. In addition, due to the location of the nominated property's forests in the upper stream basin, the maintenance of habitat environments for many species in the lower stream basin has been secured. The component part of Tokunoshima Island (b) only includes the head of the small-scale Minato River that flows into the west.

In the component parts (a) and (b), the following characteristic inland fish are distributed.

- Freshwater fish: *Rhinogobius* sp.YB that is endemic to the Central and South Ryukyus.
- Diadromous fish: *Rhinogobius* sp. MO that is endemic to the Central Ryukyus.

3) Northern part of Okinawa Island

In Northern part of Okinawa Island, 201 out of 267 inland water fish species found in the four inlands containing the nominated property are confirmed (Table 2-25). There are as few as nine freshwater fish species, while there are 44 species of diadromous fish, 85 species of brackish water fish, and 63 species of peripheral fish (Table 2-24). Out of these species, 10 species are endemic (Table 2-25). As globally threatened species, in addition to diadromous Japanese eel (EN) and *Stiphodon imperiorientis* (VU), one species each from brackish water and peripheral fish species are listed on the IUCN Red List, both of which are categorized as VU (Table 2-26).

Since this component part is geographically dominated by steep mountains closely facing to coastal areas, there are many short and steep rivers. It embraces basins from sources to upper streams of main rivers of the western part, such as Taiho River, Takazato River, Hiji River, Yona River, and Benoki River, as well as basins from sources to midstream of main rivers of the eastern part, such as Gachi River, Fungawa River, Aha River, and Fukuji River, making it a habitat for inland water fish including endemic and threatened species, mainly freshwater fish and diadromous fish. In addition, due to the location of the nominated property's forests in the upper stream basin, the maintenance of habitat environments for many species in the lower stream basin has been secured.

In this component part, the following characteristic inland fish are distributed.

- Freshwater fish: *Rhinogobius* sp. BB that is endemic to the Central Ryukyus; and *Carassius* sp., *Monopterus* sp., and *Rhinogobius* sp.YB that are all endemic to the Central and South Ryukyus.
- Diadromous fish: *Rhinogobius* sp. MO that is endemic to the Central Ryukyus and *Stiphodon imperiorientis* that is endemic to the Central and South Ryukyus.
- Brackish fish: *Acanthogobius insularis* that is endemic to the Central Ryukyus; and *Luciogobius ryukyuensis* and *Parkraemeria ornata* that are endemic to the Central and South Ryukyus.

4) Iriomote Island

On Iriomote Island, 246 out of 267 inland water fish species found in the four islands containing the nominated

property are confirmed (Table 2-25). There are as few as five freshwater fish species, while there are 48 species of diadromous fish, 120 species of brackish water fish, and 73 species of peripheral fish (Table 2-24). Among these species, nine species are endemic (Table 2-25). As globally threatened species, in addition to diadromous Japanese eel (EN) and *Stiphodon imperiorientis* (VU), one brackish water species and three peripheral species are listed in the IUCN Red List, all of which are categorized as VU (Table 2-26).

Iriomote Island is a small island, with diverse water systems, including relatively long and calm large-scale rivers such as Urauchi River (approximately 19 km), Nakama River (approximately 14 km), and Nakara River (approximately 9 km), as well as middle-scale rivers such as Kuira River, Maira River, Shiira River, Aira River, Hinai River, etc. Mangrove forests are formed at mouths of these rivers and brackish waters in downstream basins. Especially, like in the Urauchi River, there are rivers where the range of brackish waters are extended to a nearly half the distance from the river mouth. Based on these conditions of the rivers, the inland water fish in Iriomote Island is characterized by more numbers of brackish water and peripheral fish species than the ones in the other three islands. This component part embraces most parts of major rivers, such as Nakama River, Nakara River, Kuira River, Shiira River, Aira River, and Hinai River, form their sources to mouths, as well as Urauchi River from its source to midstream. It serves as a habitat for inland water fish including endemic and threatened species, mainly freshwater fish and diadromous fish, together with many other brackish water and peripheral fish species.

In this component part, the following characteristic inland fish are distributed.

- Primary freshwater fish: *Carassius* sp., *Monopterus* sp., and *Rhinogobius* sp.YB that are all endemic to the Central and South Ryukyus.
- Diadromous fish: *Stiphodon imperiorientis* that is endemic to the Central and South Ryukyus.
- Brackish fish: *Callogobius* sp. A and *Eviota ocellifer* that are endemic to Iriomote Island; and *Parkraemeria saltator, Silhouettea* sp. A, and *Luciogobius ryukyuensis* that are all endemic to the Central and South Ryukyus.

Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*)
(Photo: MOEJ)

2.a.2.2.6. Insects in the four islands containing the nominated property

Azuma et al. (2002) provides a comprehensive view of the insect fauna of the Central and South Ryukyus. A number of species and subspecies have been described and recorded after its publication. Still, there are some insect groups to be studied taxonomically, while some areas to be surveyed which may offer more information. The number of insect species in the nominated property is expected to increase as there are many findings reported by amateurs.

A total of 6,153 species (6,452 species and subspecies) of insects inhabit the four islands containing the nominated property (Table 2-27). Among the insect fauna, the order Coleoptera (beetles), such as Yanbaru long-armed scarab beetle (*Cheirotonus jambar)*, has the largest number of indigenous species totaling 1,929 species (2,127 species and subspecies), followed by the order Lepidoptera (moths and butterflies), such as *Papilio ryukyuensis*, at 1,221 species (1,239 species and subspecies), together accounting for roughly half of the total indigenous species (Table 2-27).

Based on surveys on the distribution of some 7,500 species of insects in the Central and South Ryukyus, Azuma (2013) showed that those of Indomalayan origin are the largest group accounting for 39.8%, followed by those indigenous to the Central and South Ryukyus at 26.7% and those indigenous to Japan and found also in the main islands at 13.2%, while those of Palearctic origin account for only 5.5%. This tendency is particularly conspicuous in moths/butterflies as well as in beetles (Kohama 2015).

Yanbaru long-armed scarab beetle (*Cheirotonus jambar*) (Photo: MOEJ)

Endemic stag beetle (*Neolucanus okinawanus*) (Photo: MOEJ)

Orange oakleaf (*Kallima inachus eucerca*) (Photo: MOEJ)

Pithecops corvus ryukyuensis (Photo: MOEJ)

Table 2-27: Numbers of insect species on the four islands containing the nominated property*1

(The numbers in the parentheses include subspecies)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island*2	Okinawa Island	Iriomote Island
Archaeognatha	4	4	0	3	1
Thysanura	7	4	0	6	2
Ephemeroptera	14	6	0	11	9
Odonata	84 (92)	46 (48)	35	49 (50)	64 (66)
Plecoptera	15	5	4	10	4
Blattaria	33 (35)	17	9	17	25
Mantodea	7	4	5	7	7
Isoptera	14 (17)	5 (6)	2	10 (11)	10 (12)
Orthoptera	149 (153)	94	51	99 (101)	95 (96)
Phasmida	10	6	4	6	6
Dermaptera	11	4	0	8	4
Psocoptera	10 (16)	7 (9)	0	5 (8)	5 (7)
Mallophaga	3	3	0	0	0
Anoplura	2	2	0	2	2
Thysanoptera	58 (70)	23 (25)	0	43 (52)	27 (31)
Homoptera	467 (476)	223 (224)	86 (88)	359 (363)	262 (267)
Heteroptera	384 (389)	195 (196)	97	278 (282)	280 (283)
Neuroptera	56	17	4	35	28
Coleoptera	1,929 (2,127)	1,087 (1,121)	372 (385)	1,041 (1,073)	872 (902)
Strepsiptera	8	3	1	2	7
Hymenoptera	752 (785)	410 (414)	138 (140)	455 (460)	313 (316)
Mecoptera	1	1	0	0	0
Diptera	872 (874)	436 (438)	50	545	295
Trichoptera	41	15	1	31	5
Lepidoptera	1,221 (1,239)	637 (640)	150 (151)	802 (804)	747 (751)
Total	6,153 (6,452)	3,254 (3,306)	1,009 (1,027)	3,824 (3,887)	3,070 (3,126)

*1: The numbers are based on the Annex 3-2-7 Insects, species lists of the nominated property. The numbers provided above do not include those for which the definition of the geographic area of distribution does not include the names of islands (simply stating the Amami Island Group, the Okinawa Island Group, the Yaeyama Islands, etc.). Therefore, the actual numbers of species are greater than those listed above.

*2: The species inhabiting Tokunoshima Island have not been fully surveyed and considered as lacking sufficient information. The number of species may increase as relevant studies make progress.

The four islands containing the nominated property are home to a total of 1,607 endemic insect species, accounting for 26% of the total insect species inhabiting the islands. Those insect species are under an ongoing process of differentiation and speciation among different islands, resulting in the significant presence of subspecies endemic to each island, which is one of the characteristics of the Central and South Ryukyus. The number of species and subspecies totals 2,002, accounting 31% of total species and subspecies (Table 2-28).

Table 2-28: Numbers of endemic/threatened insect species on the four islands containing the nominated property*1

(The numbers in the parentheses include subspecies)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Okinawa Island	Iriomote Island
Number of indigenous species	6,153 (6,452)	3,254 (3,306)	1,009 (1,027)	3,824 (3,887)	3,070 (3,126)
Number of endemic species	1,607 (2,002)	695 (838)	173 (242)	740 (906)	650 (792)
Rate of endemic species (%)	26 (31)	21 (25)	17 (24)	19 (23)	21 (25)
Number of species listed on IUCN RL (2018) *2	20	5	3	10	7
Number of species listed on the MOEJ RL (2018)[*3]	37	20	14	19	19

*1: The numbers are based on the Annex 3-2-7 Insects, Species lists of the nominated property. The numbers provided above do not include those for which the definition of the geographic area of distribution does not include the names of islands (simply stating the Amami Island Group, the Okinawa Island Group, the Yaeyama Islands, etc.). Therefore, the actual numbers of species are greater than those listed above.

*2: Assessments for the IUCN Red List are, in principle, conducted at a species level. However, no species-level assessment data are available for some dragonflies and damselflies, as they have been assessed only at a subspecies level. Therefore, the numbers of species shown above are the numbers of subspecies. Meanwhile, the assessment of *Rhipidolestes okinawanus* was conducted in 1996 and the geographic area of distribution is simply defined as "Nansei Shoto." Therefore, it is believed that this includes three species and two subspecies, which were subdivided from *Rhipidolestes okinawanus* in and after 2005.

*3: The numbers represent the sum of threatened species categorized as CR, EN, and VU. Assessments for the MOEJ Red List are, in principle, conducted at a subspecies level.

Seven insect species, the Yanbaru long-armed scarab beetle and six species of stream dragonflies and damselflies, are listed on the IUCN Red List (2018) and the number goes up to 20 when those assessed at a subspecies level are included (Tables 2-28 and 2-29). Meanwhile, the MOEJ Red List (2018), for which some 32,000 species (including subspecies) of insects in Japan have been assessed, lists 363 species (approximately 1%) as threatened (Table 3-2). Among those inhabiting the four islands containing the nominated property, 37 species and subspecies of insects are designated as threatened (Tables 3-2 and 2-28), meaning that those islands, which together represent only 0.4% of the total land area of Japan, are home to 10% of the national total.

Damselfly (*Matrona basilaris japonica*) (Photo: MOEJ)

Damselfly (*Rhinocypha uenoi*) (Photo: MOEJ)

Table 2-29: Globally threatened species of insects inhabiting the four islands containing the nominated property

Threatened species	IUCN	MOEJ	Distribution and Endemism*1			
			Amami-Oshima Island	Tokuno-shima Island	Northern part of Okinawa Island	Iriomote Island
Matrona basilaris japonica	EN*2	–	●	●	●	–
Rhinocypha uenoi	EN	–	–	–	–	●
Rhipidolestes okinawanus	EN*4	–	●	●	●	–
Coeliccia flavicauda masakii	EN*2	–	–	–	–	●
C. ryukyuensis amamii	EN*3	–	●	●	–	–
C. ryukyuensis ryukyuensis	EN*3	–	–	–	●	–
Asiagomphus amamiensis amamiensis	EN*2	–	●	–	–	–
A. amamiensis okinawanus	EN*2	–	–	–	●	–
A. yayeyamensis	EN	–	–	–	–	●
Stylogomphus ryukyuanus asatoi	EN*3	–	–	–	●	–
S. shirozui watanabei	EN*3	–	–	–	–	●
Chlorogomphus brunneus brunneus	EN*3	–	–	–	●	–
C. okinawensis	EN	VU	–	–	●	–
Planaeschna ishigakiana ishigakiana	EN*3	–	–	–	–	●
P. ishigakiana nagaminei	EN*3	–	●	–	–	–
P. risi sakishimana	EN*2	–	–	–	–	●
Sarasaeschna kunigamiensis	EN	–	–	–	●	–
Hemicordulia mindana nipponica	EN*2	VU	–	–	–	○
Macromia kubokaiya	EN	–	–	–	●	–
Cheirotonus jambar	EN	EN	–	–	●	–

*1: ○ indicates the distribution on the island, and ● indicates the distribution as endemic species.
*2: Assessed at a subspecies level for the IUCN Red List (categorized as LC at a species level).
*3: Assessed only at a subspecies level for the IUCN Red List.
*4: The distribution is simply defined as "Nansei Shoto" and the assessment was conducted in 1996. It may include the following species and subspecies that were subdivided from *Rhipidolestes okinawanus* in and after 2005: *Rhipidolestes aculeatus*, *R. shozoi*, *R. amamiensis amamiensis*, and *R. amamiensis tokunoshimensis*.

Characteristics of insect fauna according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, 3,254 species (3,306 species and subspecies) are recorded out of 6,153 insects (6,452 species and subspecies) found in the four islands containing the nominated property (Table 2-28). Out of these species, 695 species (838 species and subspecies) are endemic (Table 2-28). As globally threatened species, five endemic Odonata species and subspecies that inhabit mountain stream zones are listed on the IUCN Red List, all of which are categorized as EN (Table 2-29).

This component part embraces most of the aged evergreen broadleaved forests and mountain stream zones that are the main habitats for these endemic and threatened species.

In this component part, the following characteristic insects are distributed.

- Out of stag beetle (*Neolucanus*) species which have speciated into four species and two subspecies between the islands of the Central and South Ryukyus, the tree hollow-dwelling *N. protogenetivus* that depends on aged evergreen broadleaved forests is endemic to Amami-Oshima Island and Tokunoshima Island. Its speciation from *N. p. hamaii*, an endemic subspecies to Ukejima Island that is a neighboring isolated island, is ongoing.
- *Copris brachypterus,* a species of scarab beetles, is endemic to Amami-Oshima Island and Tokunoshima Island, and depends on feces of the Amami rabbit.

2) Tokunoshima Island (a) and (b)

On Tokunoshima Island, 1,009 species (1,027 species and subspecies) are recorded out of 6,153 insects (6,452 species and subspecies) found in the four islands containing the nominated property (Table 2-28). Out of these species, 173 species (242 species and subspecies) are endemic (Table 2-28). As globally threatened species, three endemic Odonata species and subspecies that inhabit mountain stream zones are listed on the IUCN Red List, all of which are categorized as EN (Table 2-29). Compared to the other three islands, information on insects is lacking in Tokunoshima Island, however, the number of species may increase as relevant studies make progress.

The component parts of Tokunoshima Island (a) and (b) embrace most of the old evergreen broadleaved forests and mountain stream zones that are the main habitats for endemic and threatened species.

In this component part, the following characteristic insects are distributed.

- *N. progenetivus,* a species of stag beetles, endemic to Amami-Oshima Island and Tokunoshima Island.
- *C. brachypterus,* a species of scarab beetles, endemic to Amami-Oshima Island and Tokunoshima Island.

3) Northern part of Okinawa Island

On Okinawa Island, 3,823 species (3,887 species and subspecies) are recorded out of 6,153 insects (6,452 species and subspecies) found in the four islands containing the nominated property (Table 2-28). Out of these species, 739 species (906 species and subspecies) are endemic (Table 2-28). As globally threatened species, the Yanbaru

long-armed scarab beetle, and nine Odonata species and subspecies that inhabit mountain stream zones are listed on the IUCN Red List, all of which are endemic and categorized as EN (Table 2-29).

This component part embraces most parts of aged evergreen broadleaved forests and mountain stream zones that are the main habitats for endemic and threatened species.

In this component part, the following characteristic insects are distributed.

- Out of *Neolucanus* species which have speciated into four species and two subspecies between the islands of the Central and South Ryukyus, the tree hollow-dwelling *N. okinawanus* that depends on aged evergreen broadleaved forests is endemic to the Okinawa Island Group.
- The Yanbaru long-armed scarab beetle was identified to be a relict endemic species, whose closest relative is distributed in a region from south China to Vietnam as a result of molecular phylogenetic analyses (Hosoya and Araya 2010). Similar to *N. okinawanus*, this species is tree hollow dwelling and its depends upon aged evergreen broadleaved forests.

4) Iriomote Island

On Iriomote Island, 3,070 species (3,126 species and subspecies) are recorded out of 6,153 insects (6,452 species and subspecies) found in the four islands containing the nominated property (Table 2-28). Out of these species, 650 species (792 species and subspecies) are endemic (Table 2-28). As globally threatened species, seven Odonata species and subspecies that inhabit mountain stream zones are listed on the IUCN Red List, all of which are categorized as EN. Six of these species are endemic (Table 2-29).

This component part embraces most parts of aged evergreen broadleaved forests and mountain stream zones that are the main habitats for endemic and threatened species.

In this component part, the following characteristic insects are distributed.

- Out of *Neolucanus* species which have diverged into four species and two subspecies between the islands in the Central and South Ryukyus, *N. insulicola insulicola* is endemic to Iriomote Island and Ishigaki Island. This is a nocturnal beetle species depending on aged evergreen broadleaved forests and dwelling in hollows of old Ryukyu pines (*Pinus luchuensis*), and its speciation from *N. i. donan*, which is an endemic subspecies in the neighboring Yonaguni Island, is on-going. According to molecular phylogenetic analyses, they are closer to *N. maximus* in Taiwan and south China than *N. progenetivus* and *N. okinawanus* in the Central Ryukyus.
- Out of *Neolucanus* species, *N. insularis* is diurnal and identified to be phylogenetically different from the other three species (Hosoya and Araya 2006).

2.a.2.2.7. Inland water decapod crustaceans in the four islands containing the nominated property

A total of 73 indigenous species of inland water decapod crustaceans have been recorded in Japan (Hayashi 2011). The four islands containing the nominated property harbor 47 species of them, accounting for 64% of the national total (Tables 3-2 and 2-30).

Table 2-30: Numbers of indigenous species of inland water decapod crustaceans in the four islands containing the nominated property

	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Okinawa Island	Iriomote Island
Atyidae	18	6	6	13	14
Palaemonidae	14	2	2	11	11
Alpheidae	1	0	0	1	0
Potamidae	10	3	3	5	3
Varunidae	4	3	1	3	3
Total	47	14	12	33	31

The numbers are based on the Annex 3-2-8 Inland water decapod crustaceans, Species lists of of the nominated property.

Out of the total of 47 indigenous species of inland water decapod crustaceans found in the four islands containing the nominated property, 15 species or 32% are endemic. In particular, those of the family Potamidae are endemic, which inhabit freshwater and land, are unable to disperse through the sea because their eggs and larvae cannot survive in seawater (Shokita 1996), and thus all of the 10 species (100%) belonging to this family are endemic. Five of the Potamidae species are listed as threatened on the MOEJ Red List (2018) (Tables 3-2 and 2-31).

Table 2-31: Numbers of endemic/threatened species of inland decapod crustaceans in the four islands containing the nominated property

(Potamidae species in the parentheses)	Four islands containing the nominated property	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
Number of indigenous species	47 (10)	14 (3)	12 (3)	33 (5)	31 (3)
Number of endemic species	15 (10)	3 (3)	3 (3)	6 (5)	7 (3)
Rate of endemic species (%)	32 (100)	21 (100)	25 (100)	18 (100)	23 (100)
Number of species listed on IUCN RL (2018)	0	0	0	0	0
Number of species listed on MOEJ RL (2018)*	5	1	1	4	0
Rate of species listed on MOEJ RL (%)	11	7	8	12	0

The numbers are based on the Annex 3-2-8 Inland water decapod crustaceans, Species lists of the nominated property.

Characteristics of the inland water decapod crustaceans according to component parts of the nominated property

1) Amami-Oshima Island

On Amami-Oshima Island, 14 species out of 47 inland water decapod crustacean species found in the four islands containing the nominated property have been confirmed, including six species of Atyidae, two species of Palaemonidae, three species of Potamidae, and three species of Varunidae (Table 2-30). Three species of Potamidae are endemic, such as *Geothelphusa obtusipes* and *Amamiku amamensis* that are endemic to Amami-Oshima Island and Tokunoshima Island, and *Geothelphusa sakamotoana* that is endemic to the Central Ryukyus.

This component part embraces main parts of Sendai River, Sumiyo River, and Yakugachi River, and most parts of Kawauchi River, which makes it a habitat for inland water decapod crustaceans, including these endemic species.

2) Tokunoshima Island (a) and (b)

On Tokunoshima Island, 12 species out of 47 inland water decapod crustacean species found in the four islands containing the nominated property have been confirmed, including six species of Atyidae, two species of Palaemonidae, three species of Potamidae, and one species of Varunidae (Table 2-30). As is the case with Amami-Oshima Island, three species of Potamidae are endemic, such as *Geothelphusa obtusipes* and *Amamiku amamensis* that are endemic to Amami-Oshima Island and Tokunoshima Island, and *Geothelphusa sakamotoana* that is endemic to the Central Ryukyus.

The component part of Tokunoshima Island (a) includes Akirigami River, the longest river in Tokunoshima Island, and a part from the source to upper stream of its branch, making it a habitat for inland water decapod crustaceans including these endemic species. The component part of Tokunoshima Island (b) only includes the head of the small-scale Minato River that flows into the west.

3) Northern part of Okinawa Island

On Okinawa Island, 33 species out of 47 inland water decapod crustacean species found in the four islands containing the nominated property have been confirmed, including 13 species of Atyidae, 11 species of Palaemonidae, one species of Alpheidae, five species of Potamidae, and three species of Varunidae (Table 2-30).

This component part embraces basins from sources to upper streams of main rivers of the western part, such as Taiho River, Takazato River, Hiji River, Yona River, and Benoki River, as well as basins from sources to midstream of main rivers of the eastern part, such as Gachi River, Fungawa River, Aha River, and Fukuji River, making it a habitat for inland water crustaceans including these endemic species.

In this component part, the following characteristic inland water decapod crustaceans are distributed.

- *Caridina okinawa*, an endemic fresh water shrimp species of Atyidae, is only recorded in a cave located in central Okinawa Island.
- As for Potamidae species, *Candidiopotamon okinawense* is an endemic to Northern part of Okinawa

Island; *Geothelphusa grandiovata* and *G. tenuimanus* are endemic to Okinawa Island; *G. aramotoi* is endemic to the Okinawa Island Group; and *G. sakamotoana* is endemic to the Central Ryukyus.

- Out of these species, *G. tenuimana* and *G. sakamotoana* are well adapted to terrestrial life away from waters. They are important species to study the adaptive evolution of inland water decapod crustaceans accompanying their migration from water areas to land areas (Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture 2017).

4) Iriomote Island

On Iriomote Island, 31 species out of 47 inland water decapod crustacean species found in the four islands containing the nominated property have been confirmed, including 14 species of Atyidae, 11 species of Palaemonidae, three species of Potamidae, and three species of Varunidae (Table 2-30). Though Iriomote Island is a small island, river systems are well developed to embrace the second largest number of inland water decapod crustaceans after Okinawa Island. There are endemic species, including three species of Atyidae, one species of Palaemonidae, three species of Potamidae.

This component part embraces most parts of major rivers, such as Nakama River, Nakara River, Kuira River, Shiira River, Aira River, and Hinai River, form their sources to mouths, as well as Urauchi River from its source to midstream brackish water area.

In this component part, the following characteristic inland water decapod crustaceans are distributed.

- A fresh water shrimp species *Neocaridina iriomotensis*, a fresh water prawn species *Macrobrachium shokitai*, and a fresh water crab species *Geothelphusa fulva* are endemic to Iriomote Island.
  - *M. shokitai* is a land-locked freshwater prawn and characterized by its life cycle where it starts benthic life upon its hatching from an egg completely without an infant floating period (Morokita 1996).
- A fresh water shrimp species *Caridina macrodentata*, *Neocaridina brevirostris*, and a fresh water crab species *Geothelphusa minei* are endemic to Iriomote Island and Ishigaki Island.

Freshwater crab (*Ryukyum yaeyamense*)
(Photo: MOEJ)

2.a.3. Geological history and speciation

2.a.3.1. Geological history

The current landform of the nominated property is considered to have been developed through the processes described below (Figure 2-16).

1) Period when it was part of the Eurasian Continent: Before middle Miocene (before around 12 Ma)

During the Cretaceous and Palaeogene, the current Ryukyu Arc was located at the eastern edge of the Eurasian Continent and formed a part of the continent. The subduction of the oceanic Pacific plate beneath the Eurasian plate from the southeast caused the formation of accretionary complex (Machida et al. 2001) and metamorphic rocks and the intrusion of granite (Kawano and Nishimura 2010; Nishiyama 2010). Then, in the Eocene, the spreading of the Philippine Basin eventually brought the Philippine Sea plate and the Eurasian plate together. Yet, no plate subduction had occurred at that time and crustal movements are considered to have been inactive (Machida et al. 2001).

2) Formation of Island Arc—Separation from Continent: Late Miocene to early Pleistocene (around 12 Ma to 2 Ma)

During this period, a series of large-scale crustal movements occurred, which transformed an area on the continent's margin into an island arc. First, around 6 Ma or 10 Ma, the Philippine Sea plate, which had made no major movements until then, began to subduct beneath the Ryukyu Trench (Kamata and Kodama 1993; Machida et al. 2001). This subduction caused the Okinawa Trough to start opening between the late Miocene and the early Pleistocene, leading to the formation of the Ryukyu Arc (Miki et al. 1990; Kamata and Kodama 1993; Machida et al. 2001; Iryu and Matsuda 2010; Gungor et al. 2012; Osozawa et al. 2012; Gallagher et al. 2015). It is considered that in this process, the Tokara Strait and the Kerama Gap were formed, separating the North Ryukyus and Central Ryukyus, as well as the Central Ryukyus and South Ryukyus, respectively. In the southern side of the Ryukyu Trench, orogenic activities due to the collision of plates started to form Taiwan island (Teng 1990, 1996; Seno 1994; Hsu and Sibuet 1995; Huang et al. 1997, 2006; Liu et al. 2000; Seno et al. 2000; Sibuet and Hsu 2004). Taiwan island was temporarily connected to the South Ryukyus during that process, and it was separated by the formation of the strait west of Yonaguni Island. However, there are a number of different theories, primarily from biogeographical perspectives (Kizaki and Oshiro 1977, 1980; Ota 1998, 2002, 2005, 2009, 2012; Ota and Takahashi 2006; Koizumi et al. 2014; Yoshikawa et al. 2016; Okamoto 2017), as to when and in what order these individual events occurred, which have yet to be clarified sufficiently.

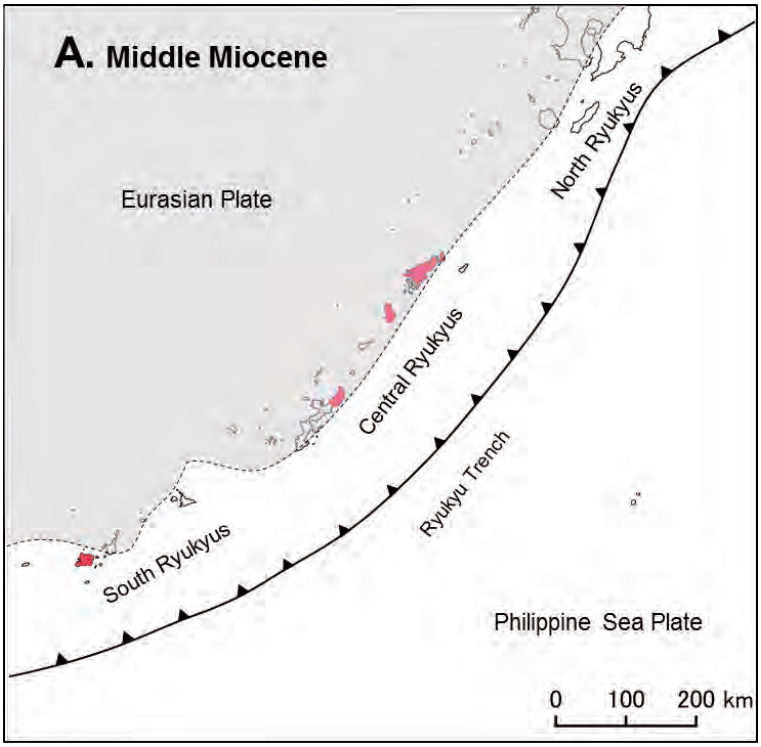
3) Period of repetitive conjunctions and separations of neighbouring islands due to changes in sea surface: early Pleistocene to late Pleistocene (around 2 million to 12 thousand years ago)

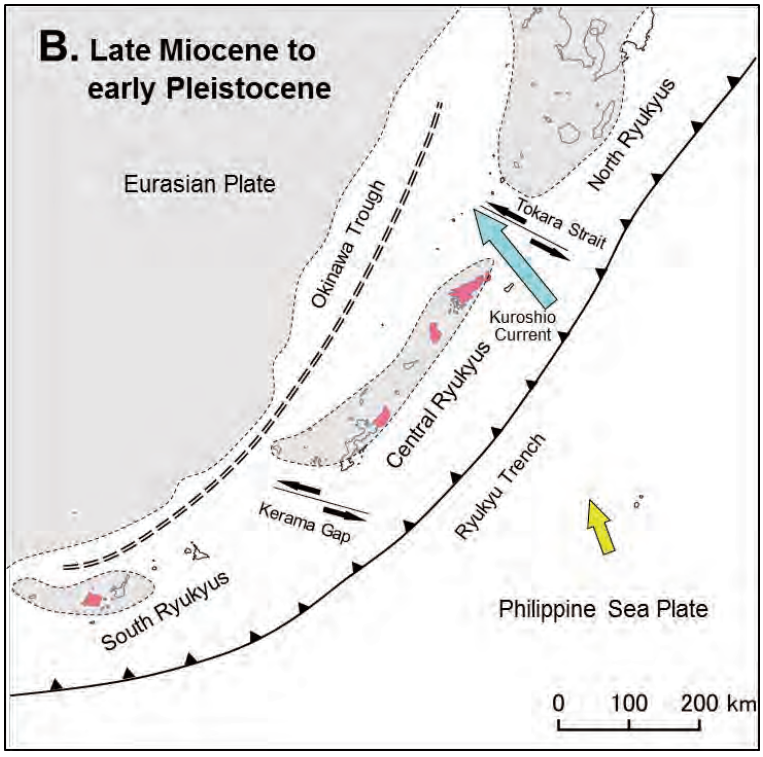
A group of neighbouring islands that constitute the Ryukyu Chain were repeatedly joined together and separated from each other during the Pleistocene due to sea surface changes associated with the glacial-

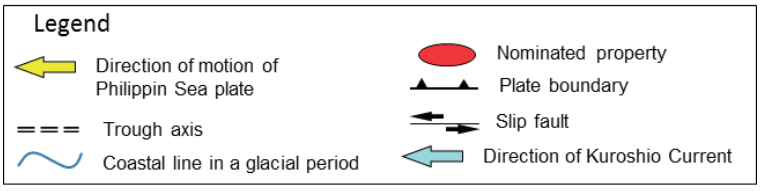
interglacial cycles of the period.

By around 1.8 Ma, the Kuroshio Current began to flow into the back arc side (East China Sea) of the Ryukyu Arc through the strait west of Yonaguni Island, which increased depth (Iryu et al. 2006), and then into the Pacific Ocean through the Tokara Strait. Consequently, the Central and South Ryukyus became isolated from Taiwan and the North Ryukyus by the fast-flowing Kuroshio Current. At the same time, the effect of the warm Kuroshio Current, as well as the discontinuation of the sedimentation of clastics from the continent as a result of the opening of the Okinawa Trough, led to the formation of coral reefs around many islands in the Central and South Ryukyus from around 1.71 to 1.39 Ma (Iryu et al. 2006; Saito 2009; Iryu and Matsuda 2010).

Ria coast of the Oshima Strait, Amami-Ohisma Island (Photo: JWRC)


A. Middle Miocene
Eurasian Plate
North Ryukyus
Central Ryukyus
Ryukyu Trench
South Ryukyus
Philippine Sea Plate
0 100 200 km


B. Late Miocene to early Pleistocene
Eurasian Plate
Okinawa Trough
North Ryukyus
Tokara Strait
Kuroshio Current
Central Ryukyus
Ryukyu Trench
Kerama Gap
South Ryukyus
Philippine Sea Plate
0 100 200 km


Legend
Direction of motion of Philippin Sea plate
Trough axis
Coastal line in a glacial period
Nominated property
Plate boundary
Slip fault
Direction of Kuroshio Current

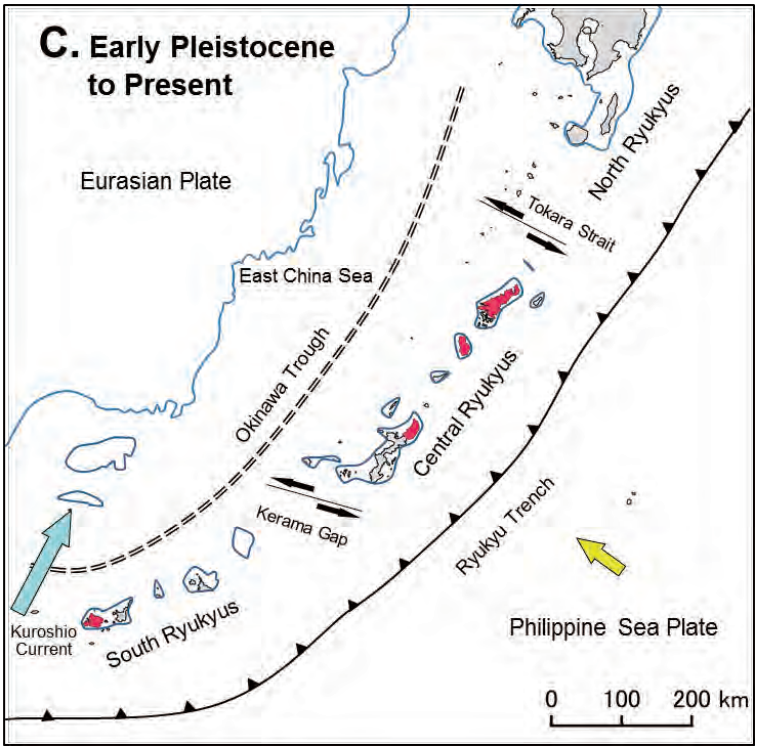


Figure 2-16: Historical development of Ryukyu Arc

The figure was prepared by referring to the following: Koba, 1992; Kamata and Kodama, 1994; Park et al., 1998; Kamata, 1999; Machida et al., 2001; Inoue, 2007; Saito et al., 2009; Hase, 2010; Nishiyama, 2010; Kawano and Nishimura, 2010; Sakai, 2010 a, b; Takeuchi, 2010; Iryu and Matsuda, 2010; Isozaki et al., 2011; Gungor et al., 2012; Gallagher et al., 2015, and Iryu's personal communications 2016.

A: Before middle Miocene (Before 12 Ma)

From the Cretaceous to early Miocene, the Ryukyu Arc was located on the eastern margin of the Eurasian Continent and formed a part of the continent. The subduction of the plate led to the formation of accretionary complex and metamorphic rocks, as well as intrusion of granite providing the bedrock of the Ryukyu Arc. The current Ryukyu Arc was located on the eastern margin of the continent. While the North and Central Ryukyus were subaerial, the South Ryukyus were partly subaerial and surrounded by shallow water.

B: Late Miocene to early Pleistocene (around 12 to 2 Ma)

The Philippine Sea plate moved north-northwest and began to subduct in the Ryukyu Trench. This opened the Okinawa Trough and resulted in the formation of the island arc. Furthermore, the Tokara Strait, Kerama Gap, and the strait west of Yonaguni Island formed, and the Central and South Ryukyus were separated from the continent.

In the southern side of the Ryukyu Trench, orogenic activities due to the collision of plates started to form Taiwan island that was moved away to north-northwest along with the movement of the Philippine Sea Plate. Taiwan island was temporarily connected to the South Ryukyus during that process, and it was separated by the formation of the strait west of Yonaguni Island.

The strait west of Yonaguni Island was not as wide as it would later become and the Kuroshio Current began to flow into the back arc side through the Tokara Strait around 4 Ma or later.

C: Early Pleistocene to Present (around 2 Ma onwards)

The Philippine Sea plate changed its direction to the northwest. Approximately 1.8 Ma, expansion of the strait west of Yonaguni Island allowed the Kuroshio Current to flow into the back arc side. As a result, coral reefs grew around a number of Central and South Ryukyu islands starting from around 1.71 to 1.39 Ma. In addition, the glacial-interglacial cycles caused repetitive sea regressions and transgressions.

Having been connected to the Eurasian Continent under the sea level during the glacial age, Taiwan island was pushed away to the current location and separated from the South Ryukyus.

2.a.3.2. Geological history and speciation of terrestrial fauna

The Ryukyu Chain is considered to have once been part of the edge of the Eurasian Continent and later divided into the North Ryukyus, Central Ryukyus, and South Ryukyus by channels, straits, etc. The terrestrial biota of the North Ryukyus (Palearctic) is distinctly different from those of the Central and South Ryukyus, which are separated by the Tokara Strait as a distribution boundary that is known to be the Watase Line. There is also more than a slight difference in biota between the Central Ryukyus and South Ryukyus.

The terrestrial biota of the nominated property has two characteristics. The first is the richness of its relict endemic species that have ancestor species once widely distributed across the continent and the mainland of Japan, but which can now be found only on the Ryukyu Chain. Their speciation reflects the nominated property's geological history of being formed as continental islands. There are also the new endemic species that have further speciated after having been isolated on the Ryukyu Chain. The second charcteristic is the difference in the pattern of endemism between the Central Ryukyus and the South Ryukyus on individual islands or island groups. Table 2-32 shows the speciation patterns on Amami-Oshima Island, Tokunoshima Island, and Northern part of Okinawa Island (Central Ryukyus) and on Iriomote Island (South Ryukyus) within the nominated property based on molecular phylogenetic analyses of typical terrestrial species and the distribution of closely-related species.

1) The Central Ryukyus—Relict endemic lineages

(Amami-Oshima Island, Tokunoshima Island, and Northern part of Okinawa Island)

1)-1. Relict endemic lineages

In view of the results of molecular phylogenetic analyses and the distribution of closely-related species, it is considered that the terrestrial fauna of the Central Ryukyus became isolated from those of the Eurasian Continent, the North Ryukyus, and the South Ryukyus at least by the late Miocene (around 12–5 Ma) during the course of the transformation of the continent's eastern periphery into a group of islands, and continued to remain in the isolated state (Okamoto 2017). In the fauna of the Central Ryukyus, some species and their closely-related species, which had initially been distributed on the continent and neighbouring areas, gradually became extinct due to the emergence of new predators and competitors, making the remaining species endemic to the Central Ryukyus. These species are relict endemic species in that they do not have any conspecific or congeneric species in the neighbouring North and South Ryukyus, but only in remote places such as the Eurasian Continent. This relict endemism is particularly evident in flightless terrestrial animals. Representative species of this pattern, including the Amami rabbit (*Pentalagus furnessi*) on Amami-Oshima and Tokunoshima Islands, are listed in Table 2-32.

While most of the listed species became isolated on the Central Ryukyus during the late Miocene, the ground geckoes (*Goniurosaurus*; described below) on Tokunoshima Island, Okinawa Island, and other neighbouring islands and the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*) in Northern part of Okinawa Island have more ancient origins and are considered to have already been separated from their relatives on the continent species due to geographical and environmental reasons in the period from the Palaeocene to the Eocene (around 56–34 Ma), before the separation of the Central Ryukyus from the

continent (Honda et al. 2014; Okamoto 2017; Liang et al. 2018).

The relict endemism is also seen among avian species with flight ability. Some molecular phylogenetic analyses and morphological analyses have shown that the Amami jay (*Garrulus lidthi*), a species endemic to Amami-Oshima Island, is remotely related to the Eurasian jay (*G. glandarius*) occurring in a vast region from mainland Japan to the Eurasian Continent, and its closest relative is the black-headed jay (*G. lanceolatus*) found in a narrow area around the Himalayas (Kajita et al. 1999). It is considered that the common ancestor of the Amami jay and the black-headed jay had once been distributed in a wider area than today, but in later days, its distribution became limited to Amami-Oshima Island and the Himalayan region for some reason, and the populations that remained and survived in these two regions have evolved in their own way (Kajita et al. 1999). This theory is supported by the fact that the fossils of the Amami jay have been found in a wider area of the Ryukyu Chain (Matsuoka 2000).

Amami jay (*Garralus lidthi*) (Photo: MOEJ)

Box 2. Amami rabbit (*Pentalagus furnessi*)

The Amami rabbit, a member of the rabbit family (Leporidae), is a monotypic genus endemic to Amami-Oshima Island and Tokunoshima Island. The lack of its closely related species seems attributable to its early phylogenetic differentiation. Fossils of the genus *Pentalagus* have also been found in Okinawa Island from the 1.7 to 1.3 Ma and 0.4 Ma strata (Ozawa, 2009).

The subfamily Leporinae has 11 genera in the world, including the Amami rabbit. Matthee et al. (2004) estimates that the Amami rabbit and its allied genera (*Oryctolagus, Bunolagus,* etc.) diverged from each other approximately 9.44 Ma ± 1.15 Ma (Figure 2-17). This is consistent with the palaeogeography explanation that Amami-Oshima Island and Tokunoshima Island had been part of the Eurasian Continent during the middle- to late Miocene, but became separated from the continent in the Pliocene. From a palaeontological point of view, the ancestor of this species is considered to be the fossil species (genus) *Pliopentalagus*, whose fossils were previously found in Eastern Europe but recently in the Eurasian Continent's Yangtze River basin (Tomida and Jin 2002).

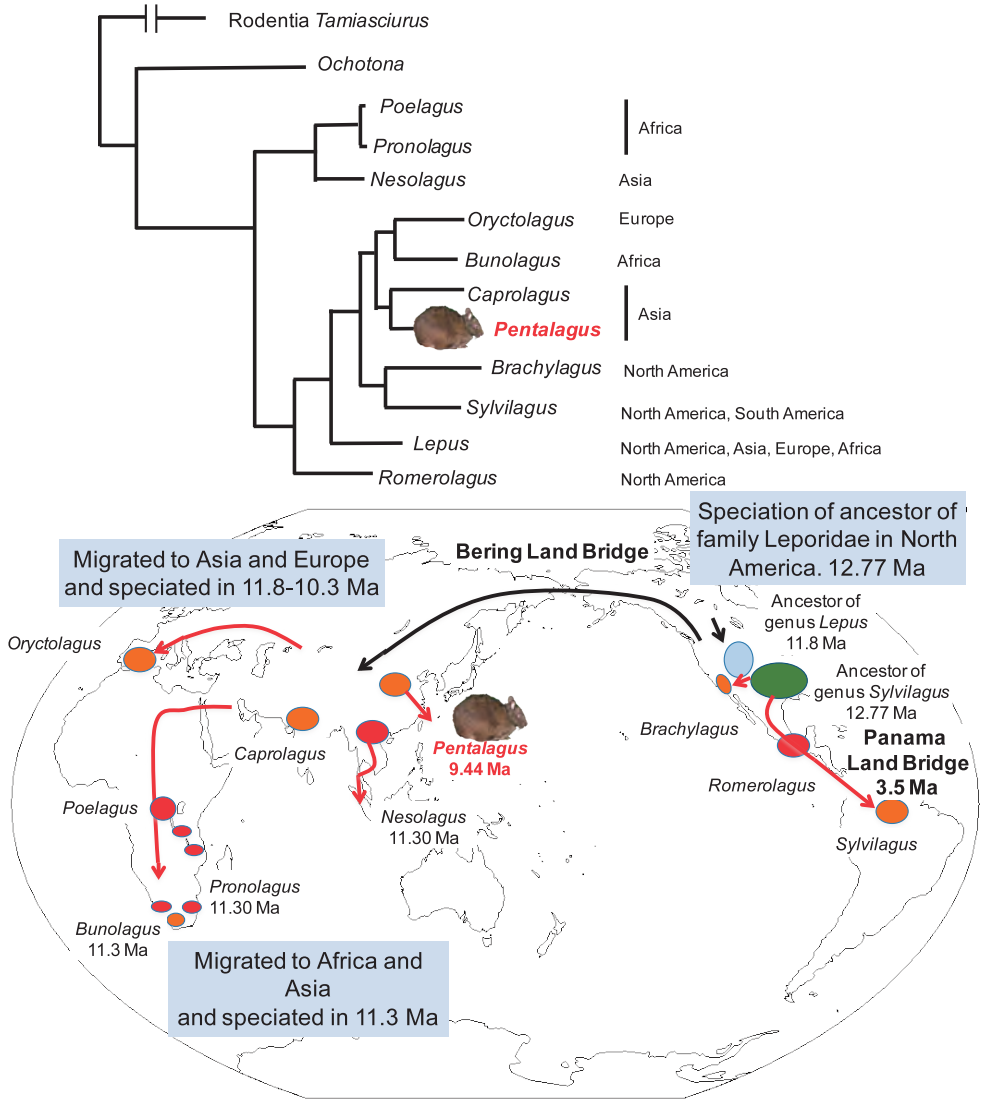


Figure 2-17: Phylogenetic tree of Leporidae based on the molecular phylogenetic analyses with morphological and biogeographic information (above), and the origin and speciation processes of *Oryctolagus* (below). (based on Yamada 2017. Illustrated from Matthee et al. 2004; Robinson and Matthee 2005).

1)-2. Relict endemic and new endemic lineages

It is considered that climate changes and associated sea surface changes from around the late Pliocene (around 3.6-2.6 Ma) to the Pleistocene (around 2.6–0.012 Ma) caused repeated connections and separations of the neighbouring islands, resulting in a divided distribution of species and advances in speciation on individual islands, which facilitated evolution to new endemic species and subspecies. In particular, some relict endemic lineages in the Central Ryukyus diverged further and evolved in the Amami Island Group and Okinawa Island Group. Table 2-32 shows three species in the spiny rats (*Tokudaia*) and other typical species.

It should be noted that the divergence of the ground geckoes (*Goniurosaurus*) in the Central Ryukyus dates back even further. As a result of molecular phylogenetic analyses, it was found that their ancestor species had already diverged from a group of related continental species due to geographical and environmental reasons at least from Upper Cretaceous to Eocene (around 82 to 42 Ma), when the Ryukyu Chain had still been part of the Eurasian Continent. The banded ground gecko (*Goniurosaurus splendens*) on Tokunoshima Island and the Kuroiwa's ground gecko (*G. kuroiwae*) on the Okinawa Island Group diverged from the early to late Miocene (around 22.4 Ma to 7.8 Ma), when most of the Central Ryukyus species are considered to have been isolated from their continental kin, resulting in later differentiation of subspecies on Okinawa Island and surrounding islands from late Miocene to Pliocene (around 7.2 to 2.8 Ma) (Honda et al. 2014; Okamoto 2017; Liang et al. 2018).

Such relict and new endemic lineages suggest that the biota of the Central Ryukyus has been segregated for an extended period of time.

Otton frog (*Babina subaspera*), Amami-Oshima Island (Photo: MOEJ)

Holst's frog (*Babina holsti*), Northern part of Okinawa Island (Photo: MOEJ)

Box 3. Three spiny rat species belonging to the genus *Tokudaia*

The genus *Tokudaia* has only three species—the Amami spiny rat (*T. osimensis*) on Amami-Oshima Island, the Tokunoshima spiny rat (*T. tokunoshimensis*) on Tokunoshima Island, and the Okinawa spiny rat (*T. muenninki*) in the northern part of Okinawa Island. All of these three species are endemic to their respective islands (Ohdachi et al. 2015). They were initially described as a single species of spiny rat under the name of *T. osimensis* (Abe 1933), and later classified into different species according to their range island, based on the results of morphology, karyology, and molecular phylogeny (Tsuchiya et al. 1989; Suzuki et al. 1999; Kaneko 2001; Endo and Tsuchiya 2006).

Phylogenetic analyses of IRBP genes suggest that the genus *Tokudaia* diverged from the allied genus *Apodemus* and other species of the Murinae linage around 8 Ma to 6.5 Ma (Sato and Suzuki 2004) and evolved into a distinct taxon as a result of being isolated on the Central Ryukyus and becoming a relict species endemic to the group of islands. At the same time, differences exist within these three species in terms of karyotype and karyomorph. For example, the karyotype of Tokunoshima spiny rats, Amami spiny rats, and Okinawa spiny rats is 2n=45, 2n=25, and 2n=44, respectively (Tsuchiya et al. 1989). As to their divergence dates, it was found that Okinawa spiny rats diverged from the ancestral lineage about 2.5 Ma, while Tokunoshima spiny rats and Amami spiny rats branched out from the lineage about 1 Ma (Murata et al. 2010, 2012). Based on the study results, it appears that these three new endemic species speciated as they were isolated from each other, along by the separation of Okinawa and Tokunoshima Islands and following separation of Tokunoshima and Amami-Oshima Islands, on the three islands within the Central Ryukyus.

In addition, the genus *Tokudaia* has a unique sex-determining mechanism. Usually, mammals have either XX or XY sex chromosomes. However, Amami spiny rats and Tokunoshima spiny rats do not have a Y chromosome, and have the XO/XO sex chromosome type in both sexes (Honda et al. 1977, 1978). Okinawa spiny rats are thought to have an XX/XY system, but their X and Y chromosomes are not clearly distinct from each other (Tsuchiya et al. 1989). Furthermore, Tokunoshima spiny rats and Amami spiny rats have lost their Sry gene along with the Y chromosome (Murata et al. 2010, 2012; Figure 2-18). The Y chromosome of these two species is considered to have been lost when a new sex-determining gene appeared and a part of the Y chromosome was translocated to the X chromosome (Murata and Kuroiwa 2011). Because of their sex-chromosome structure different from that of normal mammalian, their sex-determining mechanism has received a great deal of interest from researchers and a number of studies have been initiated.

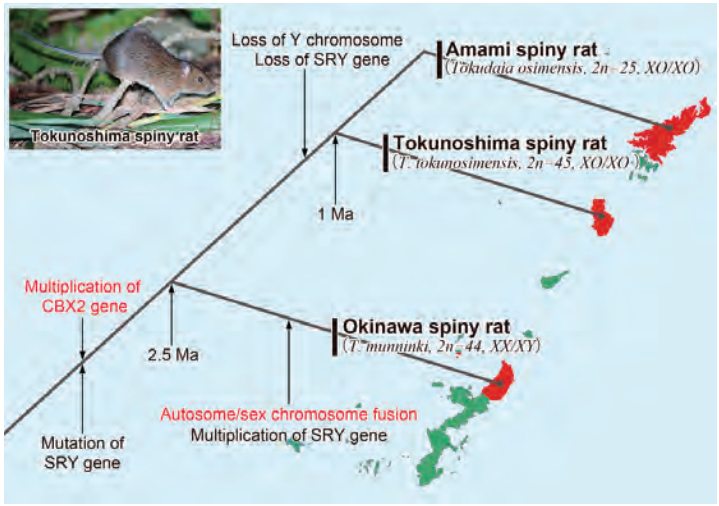


Figure 2-18: Genus *Tokudaia's* speciation and evolution of sex chromosomes and Sry/CBX2 genes
(Prepared based on Murata et al. 2012)

2) South Ryukyus—New endemic lineages between the Eurasian Continent, etc.

(Iriomote Island)

As described in 1) above, considering the results of molecular phylogenetic analyses and the distribution of closely-related species, the terrestrial fauna on the South Ryukyus appear to have been formed through their isolation from their counterpart in the Eurasian Continent, and temporary connection with Taiwan island which emerged above the sea surface due to orogenic activities during the Pliocene (around 5–2.6 Ma) after the South Ryukyus was separated from the Central Ryukyus in the late Miocene (Shen 1994; Shih et al. 2009; Shih and Ng 2011; Okamoto 2017). From this background, many species and subspecies are observed in the fauna of the South Ryukyus, including Yaeyama yellow-margined box turtle and Kishinoue's giant skink, whose relatives are found in Taiwan and the eastern continent than in the Central Ryukyus (Ota 1998; Ota 2012) (Table 2-32).

Unlike other terrestrial animals on the South Ryukyus, the Iriomote cat (*Prionailurus bengalensis iriomotensis*) and Ryukyu wild boar (*Sus scrofa riukiuanus*) are thought to have crossed the sea from the continent to reach the South Ryukyus at the time of declined sea level during the last glacial age of Pleistocene (Ota, 2018). Molecular phylogenetic analyses indicate that the Iriomote cat diverged from the leopard cat (*P. b. chinensis*) distributed in south China and Taiwan during a relatively recent period of the late Pleistocene (around 90,000 years ago), and that it has close relatives in the far eastern part of the continent, the Korean Peninsula, and Tsushima Island (Tamada et al., 2008). As for the Ryukyu wild boar, which is distributed in the four islands containing the nominated property and Ishigaki Island, molecular phylogenetic analyses suggest that it is phylogenetically far from the wild boars (*S. s. leucomystax*) in the mainland Japan, and that it speciated from its closest relative in the southeast part of the continent (Vietnam) around 50,000 years ago at the latest (Yoshikawa et al. 2016).

3) New endemic lineages across Central and South Ryukyus

(Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island)

On the Central and South Ryukyus, there are a number of lineages of endemic species that have speciated within the respective regions. Table 2-32 shows such typical species including the group of tip-nosed frogs that belong to the genus *Odorrana*. These species represent a combination of geographic variations of speciation described above in 1) and 2). The existence of these speciation variations explains well that the biota of the South Ryukyus was isolated from that of the Central Ryukyus in older times and isolated from those of Taiwan and the eastern part of the Eurasian Continent in more recent times.

Similar examples are observed in plants. As representative examples, there is wild ginger (*Asarum*) that has speciated into 14 endemic species in the four regions containing the nominated property. Out of these species, nine species[1] are distributed on Amami-Oshima Island and Tokunoshima Island, among which five

1 The species list included in the Appendices to this nomination identified 11 species on Amami-Oshima Island and Tokunoshima Island. However, due to different taxonomical interpretations, the quoted reference describes nine species, by incorporating *Asarum nazeanum* and *A. tabatanum* into *A. celsum*.

species are endemic to Amami-Oshima Island, three species endemic to Tokunoshima Island, and one species is endemic to both islands (Matsuda et al. 2017). Recent molecular phylogenetic analyses have clarified that eight endemic species have common ancestors and speciated inside Amami Island Group. These endemic species are considerably different in external forms such as flowers, while it is difficult to differentiate them from DNA data as they have not been divided genetically yet. On the other hand, there are almost no signs of crossbreeding among species, and their units as species are maintained in a reproductive sense. It is thought that these species are maintained through differentiating forms of flowers, pollinators, blooming timings, and so on (Matsuda et al., 2017).

As an exception, Ishigaki blue-tailed skink (*Plestiodon stimpsonii*) in the South Ryukyus has closely-related species in the North Ryukyus (Kuchinoshima Island, the Tokara Island Group). Molecular phylogenetic analyses found that this case was a long-distance dispersal event driven by the Kuroshio Current during the early period of the Pleistocene (around 1.8–1.4 Ma) (Kurita and Hikida 2014; Okamoto 2017).

With regard to the tree lizard (*Japalura polygonata*), it looks like an example of the speciation by the segmentation between islands, as four subspecies of tree lizards are distributed in different islands scattered from the Central Ryukyus, via the South Ryukyus, to Taiwan. However, according to Yang et al. (2018) that conducted molecular phylogenetic analyses, it is thought that this species entered respective islands by moving up the Ryukyu Chain to north by the Kuroshio Current, and speciated into endemic subspecies in respective destinations as a result of such current dispersal.

As to a link between the flora and the geological history of these islands, analysis of 1,815 species of seed plants in the Ryukyu Chain identified floristic speciation between the North, Central, and South Ryukyus on the whole (Nakamura et al. 2009; Nakamura 2012), and it is suggested that not only the geological history of the formation of the gaps (straits) between the islands but also modern environmental factors such as the influence of the distance between the islands and their different sizes must be taken into account in understanding the floristic speciation patterns on the Central and South Ryukyus (Nakamura et al. 2009). Furthermore, analyses of 513 species of woody plants within the Ryukyu Chain indicated that, when the phylogenetic relationships between the islands are considered, the most significant impact on the inter-island differences in species composition is the geographical distance between the Tokara Strait and the islands, and that such differences are reflected in the phylogenetic structure of the present-day flora of the individual islands (Kubota et al. 2011).

Box 4. Tip-nosed frogs (*Odorrana*)

Endemic species of frogs belonging to the genus *Odorrana* include the Amami tip-nosed frog (*Odorrana amamiensis*) on Amami-Oshima Island and Tokunoshima Island (Central Ryukyus); the Okinawa tip-nosed frog (*O. narina*) on Okinawa Island; and the Utsunomiya's tip-nosed frog (*O. utsunomiyaorum*) and the greater tip-nosed frog (*O. supranarina*) on Iriomote Island and Ishigaki Island (South Ryukyus). In Taiwan, the Taiwan odorous frog (*O. swinhoana*), a species that is morphologically similar to the frogs above, is distributed (Figure 2-19).

Mitochondrial DNA (mtDNA) analyses showed that tip-nosed frogs' ancestral species, which had been distributed in the continent, including the Ryukyu Chain, were separated from the continent during the late Miocene (12.3–5.4 Ma). They then divided into the two lineages of the Central Ryukyus and the Southern Ryukyu from the late Miocene through the early Pliocene (9.3–4.1 Ma) (Matsui et al. 2005). It is considered that greater tip-nosed frogs diverged from the Central Ryukyus lineage in the early Pliocene, and that Amami tip-nosed frogs and Okinawa tip-nosed frogs speciated from the same lineage in later days. In the meantime, the South Ryukyus' Utsunomiya's tip-nosed frogs appear to have speciated in the Pleistocene (Matsui et al. 2005). Greater tip-nosed frogs are considered to have entered the South Ryukyus, where Utsunomiya's tip-nosed frogs had already existed, in the Pleistocene (Matsui 2005). While Utsunomiya's tip-nosed frogs occur in mountain and forest stream areas, greater tip-nosed frogs' habitat extends to downstream areas, up to near the border between mountains and plains (Toyama and Ota 1990; MOEJ 2014). It is estimated that the coexistence of these two species in the South Ryukyus is made possible as they coevolved to avoid ecological competition, through gradual changes in their body sizes, namely, one became smaller while the other became larger, responding to the abovementioned differences in entering periods and segregation of their habitats (Matsui 1994).

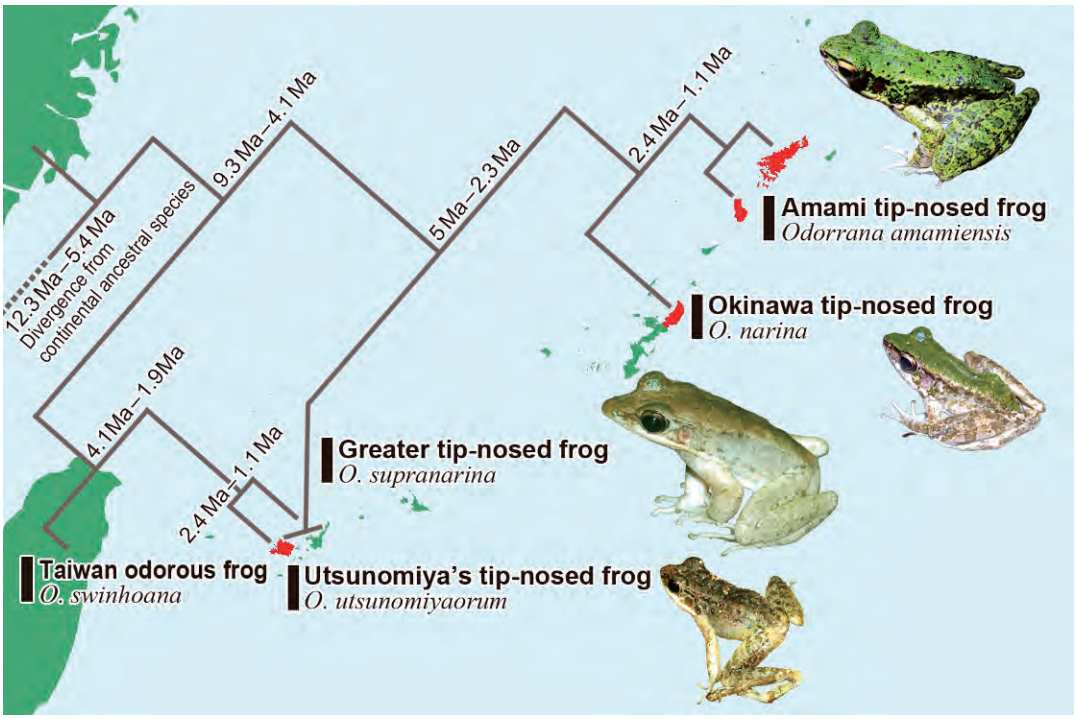


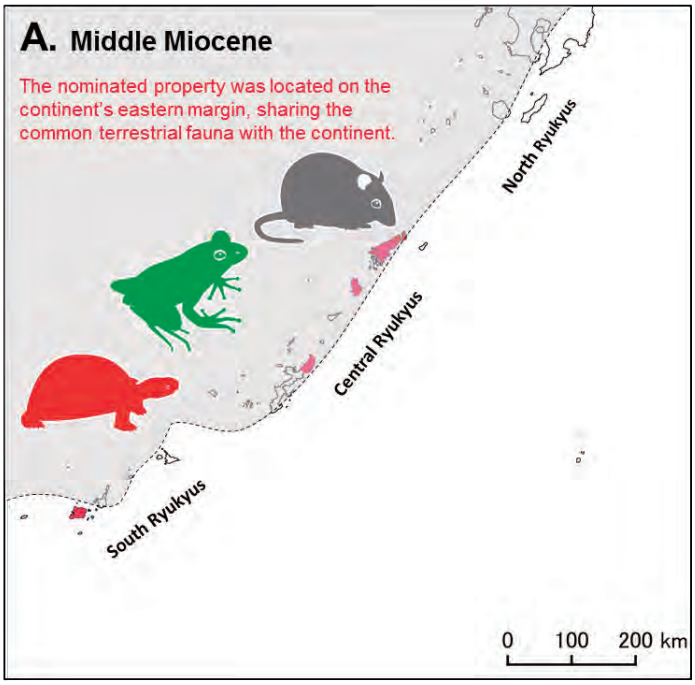
Figure 2-19 Distribution and phylogenetic relationships of Okinawa tip-nosed frogs
Prepared based on Matsui et al. 2005.

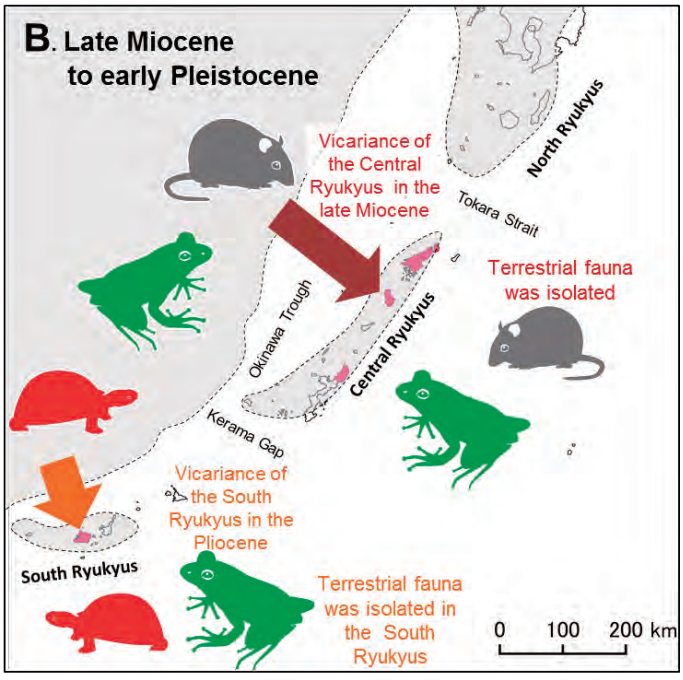
Figure 2-20 shows the Ryukyu Chain's position in the palaeogeographical map and biological dispersion estimated from the nominated property's geological history (see 2.a.3.1.) and the speciation patterns of terrestrial animals on the Central and South Ryukyus.

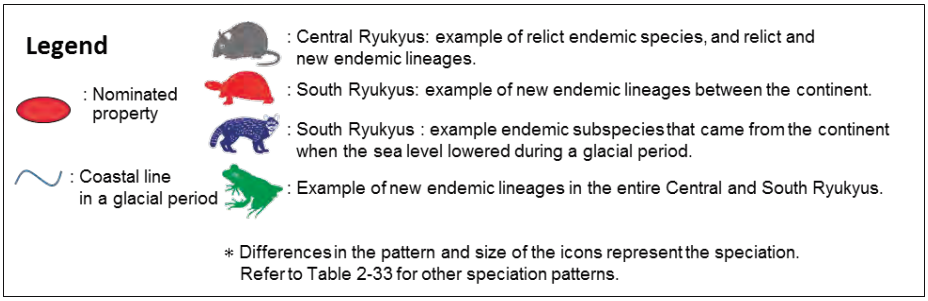
Table 2-32: Central and South Ryukyus' speciation patterns and typical terrestrial animal species on nominated property

Central Ryukyus				
Amami Oshima Island	**Tokunoshima Island**	**Northern part of Okinawa Island**	**Distribution of closest sister lineage**	**Period of divergence from sister lineage** (1Ma=one million years ago)
1)-1. Relict endemic lineages				
Amami rabbit (*Pentalagus furnessi*)		–	Eurasian Continent	10.6–8.3Ma (*Oryctolagus* and *Bunolagus*)
Ryukyu long-haired rat (*Diplothrix legata*)			Eurasian Continent	3–4 Ma (*Rattus*)
Amami jay (*Garrulus lidthi*)	–	–	Himalayas	Unknown
–	–	Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)	Southern China	56.4–33.9 Ma
Hime habu viper (*Ovophis okinavensis*)			Taiwan	14–5 Ma
Barbour's blue-tailed skink (*Plestiodon barbouri*)			Mainland Japan	14–5.5 Ma
Sword-tailed newt (*Cynops ensicauda*)	–	Sword-tailed newt (*C. ensicauda*)	Mainland Japan	10–6.4 Ma
Anderson's crocodile newt (*Echinotriton andersoni*)			Southern China	8.5–5.5Ma
–	–	Namie's frog (*Limnonectes namiyei*)	Taiwan	Unknown
–	–	Yanbaru long-armed scarab beetle (*Cheirotonus jambar*)	Southern China	Unknown
1)-2. Relict endemic and new endemic lineages				
Amami spiny rat (*Tokudaia osimensis*)	Tokunoshima spiny rat (*T. tokunoshimensis*)	Okinawa spiny rat (*T. muenninki*)	Eurasian Continent	8–6.5 Ma (*Apodemus*)
–	Banded ground gecko (*Goniurosaurus splendens*)	Kuroiwa's ground gecko (*G. kuroiwae*) (4 subspecies in nearby islands)	Southern China	82–42 Ma (Congeneric species)
Amami coral snake (*Sinomicrurus japonicus japonicus*)	Okinawa coral snake (*S. japonicus boettgeri*)		Taiwan	Unknown
Amami Ishikawa's frog (*Odorrana splendida*)	–	Okinawa Ishikawa's frog (*O. ishikawae*)	Eurasian Continent	18–7.9 Ma (Other species on the continent)
Otton frog (*Babina subaspera*)	–	Holst's frog (*Babina holsti*)	Unknown	Unknown
Amami brownn frog (*Rana kobai*)		Okinawa brown frog (*R. ulma*)	Tsushima	Unknown
2) New endemic lineages between the Eurasian Continent, etc.				
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
3) New endemic lineages across the entire Central and South Ryukyus				
Amami tip-nosed frog (*Odorrana amamiensis*)		Okinawa tip-nosed frog (*O. narina*)	South Ryukyus	12.3–5.4 Ma (Central/South/Taiwan vs. Continent)
Habu viper (*Protobothrops flavoviridis*) (South Tokara: Tokara habu viper (*P. tokarensis*))			South Ryukyus, Taiwan, Southern China	17–6 Ma (Central vs. South/Taiwan)
Oshima blue-tailed skink (*Plestiodon oshimensis*)		Okinawa blue-tailed skink (*P. marginatus*)	South Ryukyus	7.3–3 Ma (Central vs. South)
Green grass lizard (*Takydromus smaragdinus*)			South Ryukyus	18–5 Ma (Central vs. South/Taiwan/Continent)
Stag beetle (*Neolucanus protogenetivus protogenetivus*) (Ukejima Is.: *N. protogenetivus hamaii*)		Stag beetle (*N. okinawanus*)	South Ryukyus	Unknown
Funnel web spider (*Macrothele amamiensis*)		–	South Ryukyus	ca. 10.4 Ma (Central/South/Taiwan vs. Continent) ca. 9.3 Ma (Central vs. South/Taiwan)

South Ryukyus			Literature
Iriomote Island	**Distribution of closest sister lineage**	**Period of divergence from sister lineage** (1 Ma=one million years ago)	
1)-1. Relict endemic lineages			
–	–	–	Matthee et al. (2004), Robinson and Matthee (2005)
–	–	–	Suzuki et al. (2000)
–	–	–	Kajita et al. (1999)
–	–	–	Okamoto (2017)
–	–	–	Okamoto (2017)
–	–	–	Okamoto (2017)
–	–	–	Tominaga et al. (2014)
–	–	–	Honda et al. (2012)
–	–	–	Emerson and Berrigan (1993)
–	–	–	Hosoya and Araya (2010)
1)-2. Relict endemic and new endemic lineages			
–	–	–	Sato and Suzuki (2004), Murata et al. (2012)
–	–	–	Liang et al. (2018)
–	–	–	Okamoto (2017)
–	–	–	Kuramoto et al. (2011)
–	–	–	Tominaga et al. (2014)
–	–	–	Matsui (2011), Eto and Matsui (2014)
2) New endemic lineages between the Continent etc.			
Iriomote cat (*Prionailurus bengalensis iriomotensis*)	Taiwan and Southern China	0.09 Ma	Tamada et al. (2008)
Yaeyama pond turtle (*Mauremys mutica kami*)	Taiwan and Southern China	7.3–4.4 Ma	Okamoto (2017)
Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*)	Taiwan and Southern China	3–1.8 Ma	Okamoto (2017)
Sakishima beauty snake (*Elaphe taeniura schmackeri*)	Taiwan and Southern China	Unknown	Okamoto (2017)
Kishinoue's giant skink (*Plestiodon kishinouyei*)	Taiwan and Southern China	5–1.5 Ma	Okamoto (2017)
Sakishima smooth skink (*Scincella boettgeri*)	Taiwan	8–4.1 Ma	Okamoto (2017)
Iwasaki's slug snake (*Pareas iwasakii*)	Taiwan	4.2-1.6 Ma	Ota, from You et al. (2015)
Owston's green treefrog (*Rhacophorus owstoni*)	Taiwan	Unknown	Ota (1998)
3) New endemic lineages across the entire Central and South Ryukyus			
Utsunomiya's tip-nosed frog (*Odorrana utsunomiyaorum*) Greater tip-nosed frog (*O. supranarina*)	Taiwan	9.3–4.1 Ma (Central vs. South/Taiwan)	Matsui (1994)
Sakishima habu viper (*Protobothrops elegans*)	Taiwan/Southern China	ca. 3 Ma (South vs. Taiwan)	Okamoto (2017)
Ishigaki blue-tailed skink (*Plestiodon stimpsonii*)	Taiwan/Southern China	5–1.5 Ma (South vs. Taiwan/ Continent)	Brandley et al. (2011, 2012)
Yaeyama grass lizard (*Takydromus dorsalis*) (Miyako Is.: Miyako grass lizard (*T. toyamai*))	Southern China	9–2.9 Ma (South vs. Continent)	Okamoto (2017)
Stag beetle (*Neolucanus insulicola insulicola*) (Yonaguni Is.: *N. insulicola donan*)	Taiwan/Southern China	Unknown	Hosoya and Araya (2006)
Funnel web spider (*Macrothele yaginumai*)	Taiwan	ca. 8.3 Ma (South vs. Taiwan)	Su et al. (2016)


A. Middle Miocene
The nominated property was located on the continent's eastern margin, sharing the common terrestrial fauna with the continent.
North Ryukyus
Central Ryukyus
South Ryukyus
0 100 200 km


B. Late Miocene to early Pleistocene
Vicariance of the Central Ryukyus in the late Miocene
North Ryukyus
Tokara Strait
Terrestrial fauna was isolated
Okinawa Trough
Central Ryukyus
Kerama Gap
Vicariance of the South Ryukyus in the Pliocene
South Ryukyus
Terrestrial fauna was isolated in the South Ryukyus
0 100 200 km


Legend
: Nominated property
: Coastal line in a glacial period
: Central Ryukyus: example of relict endemic species, and relict and new endemic lineages.
: South Ryukyus: example of new endemic lineages between the continent.
: South Ryukyus : example endemic subspecies that came from the continent when the sea level lowered during a glacial period.
: Example of new endemic lineages in the entire Central and South Ryukyus.
* Differences in the pattern and size of the icons represent the speciation. Refer to Table 2-33 for other speciation patterns.

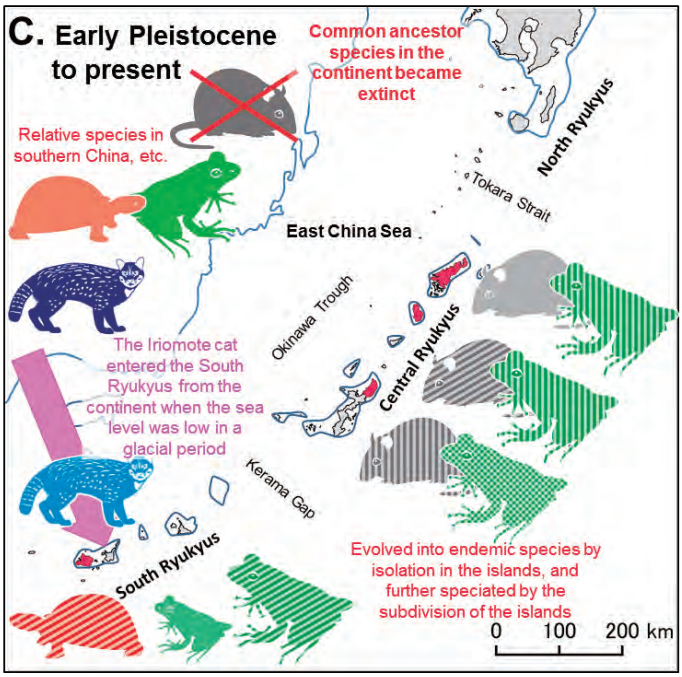


Figure 2-20: Ryukyu Chain's ancient geography and biological trends (Estimates)

The figures were prepared based on the following: Hypothesis established by Kizaki and Oshiro (1977), which is based on the geology and biological fossil information; hypothetical paleogeographic maps of the Nansei-Shoto Islands, which were estimated based on the comprehensive information about the phylogeography of the reptile and amphibian lineages (Ota 1998); findings of recent molecular biology (Tokuda 1969; Sato and Suzuki 2004; Shih et al. 2006, 2009, 2011; Tamada et al. 2008; Koizumi et al. 2014; Yoshikawa et al. 2016; Okamoto 2017; Ota 2018), findings of fossilology (Ota 2013, Ikeda et al. 2016; Nishioka et al. 2016), and findings of geology (Koba 1992; Kamata and Kodama 1994; Hsu and Silbuet 1995; Huang et al. 1997, 2006; Park et al. 1998; Kamata 1999; Machida et al. 2001; Inoue 2007; Sato et al. 2009; Kawano and Nishimura 2010; Hase 2010; Iryu and Matsuda 2010; Nishiyama 2010; Sakai 2010 a, b; Takeuchi, 2010; Isozaki et al. 2011; Gungor et al. 2012; Gallagher et al. 2015; and Iryu's personal communications 2016).

A: Before middle Miocene (Before around 12 Ma)
The current Ryukyu Chain including the nominated site was apparently located on the eastern margin of the Eurasian Continent and shared a common terrestrial biota.

B: Late Miocene to early Pleistocene (around 12 to 2 Ma)
(1) The Okinawa Trough started to expand and separated Central and South Ryukyus from the continent. During late Miocene (around 12 to 5 Ma), the Tokara Strait and Kerama Gap were formed, which separated Central Ryukyus and its neighboring land area, including Kyushu, North Ryukyus, and South Ryukyus. This resulted in the isolation of terrestrial biotas, such as the Amami rabbit, spiny rats, ground geckos, habu vipers, tip-nosed frogs, and inland water decapod cructaceans.
(2) In the Pliocene (around 5 to 2.6 Ma), the South Ryukyus was separated from the continent, which resulted in the isolation of its terrestrial biotas, such as the Yaeyama yellow-margined box turtle, Kishinoue's giant skink, Sakishima habu viper, and tip-nosed frogs.

C: Early Pleistocene to present (around 2 Ma onwards)
(1) The terrestrial organisms that shared ancestor species with those on the Central Ryukyus became extinct gradually on the continent, leaving a relict and endemic terrestrial biota in the Central Ryukyus.
(2) Sea level changes associated with climate changes (glacial-interglacial cycles) caused repeated connections and separations among neighbouring islands. As a consequence, these islands' biological distribution was fragmented and island-specific speciation was accelerated in the Central Ryukyus and South Ryukyus.
(3) As relative species of the Iriomote cat and Ryukyu wild boar are distributed in the continent, it is thought that these specie have entered the South Ryukyus from the continent by crossing the sea when the sea level lowered during a glacial period and the distance between the South Ryukyus and the Eurasian Continent was shortened to a minimal level (around 0.09 to 0.05 Ma).

2.a.4. Adaptive evolution of animals in island ecosystems

In the nominated property, the Central and South Ryukyus have certain differences in the existence of high-level predators as a component of the islands' ecosystems. High-level predators, such as carnivorous mammals and large-sized resident raptors, have not existed at all or been absent for a long period of time on Amami-Oshima Island, Tokunoshima Island, and the northern part of Okinawa Island of the Central Ryukyus. The biological communities, which contain a number of relict endemic species, have created a unique ecosystem topped by large-sized snakes, with animals having evolved in an adaptive way ecologically and behaviorally. On the other hand, Iriomote Island of the South Ryukyus has Iriomote cats, the only carnivore in the nominated property. The scale of the Island's environment is considered to be too small to allow medium-sized carnivores to live for a long period of time, but it is observed the cats have evolved to adapt to such a small-scale island environment ecologically and morphologically.

1) Central Ryukyus—Mammals, birds, and reptiles adapted to ecosystems without high-level predators and evolved in a unique way

Ryukyu odd-tooth snake (*Dinodon semicarinatum*), one of the apex predators of the Central Ryukyus, including Amami-Oshima, Tokunoshima Islands and the northern part of Okinawa Island (Photo: Hidetoshi Ota)

On Amami-Oshima Island, Tokunoshima Island, and the northen part of Okinawa Island in the Central Ryukyus, the absence of carnivores and large raptors has helped habu vipers (*Protobothrops flavoviridis*), which grow up to about 2 m long, and Ryukyu odd-tooth snakes (*Dinodon semicarinatum*) to establish themselves as the apex predators in the ecosystem by growing to the largest body size in their genus (Mori and Moriguchi 1988; Hamanaka et al. 2014). Nocturnal animals living on the ground, the Amami rabbit (endemic to Amami-Oshima Island and Tokunoshima Island) and three species of the spiny rats (endemic to Amami-Oshima Island, Tokunoshima Island, and northern part of Okinawa Island) are highly exposed to the risk of encountering a habu, but have adapted in a way to avoid such risk of the habu (Hattori, 2002). For example, Amami rabbits excavate a birthing burrow on a steep slope, and feed themselves and defecate feces in a rocky field or riverside with a good and wide view of surrounding areas. Spiny rats jump a vertical distance of approximately 50 cm to dodge an attack of a habu. Thanks to this ability, spiny rats are rarely included in habus' prey animals (Hattori 2002). On the other hand, Ryukyu odd-tooth snakes, a species that has a nocturnal habit similar to habus, rarely prey on mammals, as is the case with other species of the genus *Dinodon*. However, their stomach contents often consist of a variety of other reptiles (including habus) and birds (Mori and Moriguchi 1988; Hamanaka et al. 2014). Further, on sandy beaches on the northern part of Okinawa Island and peripheral remote islands, the Ryukyu odd-tooth snakes exhibit a distinctive behavior; they eat hatchlings and eggs of sea turtles that come up to the beach for oviposition. This quite exceptional behaviour for a snake constitutes a part of the food web and material cycle that is unique to the islands (Mori et al. 1999; Sato 2015).

The Okinawa rail (*Gallirallus okinawae*), a species endemic to the northern part of Okinawa Island, is considered to be flightless from an anatomical perspective in view of their wings' structure and muscles (Kuroda 1993; Kuroda 1995). On Okinawa Island, fossils of rails have been found in geological strata from around 18,500 years ago, indicating that these rails had shorter legs and might have had higher flight ability than modern Okinawa rails (Matsuoka 2000; Ozaki 2005). Considering the fact that the barred rail (*G. torquatus*), a relative species distributed in the Philippines and Indonesia, has flight ability, it is believed that ancestral species that flew to Okinawa Island from the south tens of thousands of years ago may have gradually acquired the ability to run on the ground and ultimately transformed themselves into the current-day Okinawa rails (Matsuoka 2003; Ozaki 2005; Kirchman 2012). Factors that facilitated this process include: the lack of indigenous carnivores on Okinawa Island who could have acted as a dominant predator; the diverse biota in subtropical evergreen broadleaved forests; the abundance of small animals on the ground that can provide a prey; and other conditions that have made it possible to have enough food even for flightless birds (Ozaki 2005).

The Okinawa woodpecker (*Sapheopipo noguchii*), a species endemic to northern part of Okinawa Island, flies down to the ground and digs arthropods lurking in the ground to feed their chicks (Kinjo 1997; Kotaka et al. 2006). There have been a number of reports concerning woodpeckers that have adapted to capture ants and forage on the ground. However, no woodpeckers other than the Okinawa woodpecker, have been reported to dig and peck underground arthropods as their main diet. This is considered to be one of the most critical adaptive behaviours by the Okinawa woodpecker, which allowed the species to survive on the island with only limited areas of forests but no carnivorous mammalian predators (Kotaka et al. 2009, Kotaka 2011).

2) South Ryukyus—Iriomote cat, a high-level predator that has adaptively evolved in small-scale ecosystems on the island

In general, the smaller the island's area, the smaller its food chain pyramid becomes and the lesser the number of high-level predators such as Carnivora (Holt, 2009). Iriomote Island in the South Ryukyus covers an area of only 28,961 ha, far smaller than overseas islands inhabited by related species belonging to the Felidae family (Imaizumi 1994; Table 2-33) and too small for medium-sized carnivores to inhabit for a long period of time. However, the Iriomote cat, the only Carnivora living in the islands of the Central and South Ryukyus containing the nominated property, inhabit this island, which is known as the "world's smallest island as a habitat for any wildcat species"

Iriomote cat (*Prionailurus bengalensis iriomotensis*), the only Carnivora in the nominated propery (Photo: MOEJ)

While most of the similar-sized Felidae animals in the world prey on small rodents as their principal food supply (Watanabe and Izawa 2003; Nakanishi and Izawa 2015), the only rodent currently existing in Iriomote Island is an alien species of black rat. Iriomote cats do feed on a limited number of mammals, such as the indigenous flying fox and black rat, but other than these, this species has enabled itself to inhabit the small island by changing its use of various taxa of animals, including birds, reptiles, amphibians, insects and crustaceans, according to the cycle of the seasons. So far, as many as approximately 80 species of prey animals have been identified (Nakanishi and Izawa 2015), indicating Iriomote cats' extremely wide variety of feeding habits compared to other species in the Felidae family (Sakaguchi and Ono 1994; Watanabe and Izawa 2003). Their frequently used feeding grounds include forest edges, lowlands, riverside, wetlands, tidal flats, and other water-rich areas that are abundant in small animals and rich in diversity among other locations on the island (Sakaguchi 1994; Watanabe et al. 2002; Ishiga 2018). They also use mangrove forests, areas surrounding agricultural lands and coastal areas (Okinawa Prefecture 2006; MOEJ 2014). In the mountain areas in the central part of the island, complicated water systems have developed that nurtures rich biota. According to the recent studies, the Iriomote cat is seen in such mountainous areas at about the same frequency as in lowlands (Kyushu Regional Office, Forestry Agency 2011; Nakanishi et al. 2013). It is also confirmed that it uses mountainous areas as a breeding ground (Nakanishi and Izawa 2014).

It is notable that, on Iriomote Island, there are eight species of frogs that have different breeding times and thereby can serve as a year-round source of prey for Iriomote cats. Another point is that the island's estimated annual average of biomass derived from frogs (11,460 g/ha) is much larger than those of Latin American tropical forests (781 g/ha to 1,150 g/ha) (Watanabe and Izawa 2005; Watanabe et al. 2005), providing an important source of food for Iriomote cats (Nakanishi and Izawa, 2016a). The Iriomote cat has been positioned as a subspecies of the leopard cat from molecular phylogenetic analyses. However, it was described as a new species of a new genus based on its cranial shape when it was first discovered, since its morphological characteristics are quite different from other subspecies (Leyhausen and Pfleiderer 1997). For example, there are differences especially in lower jawbones relating to prey species and mastication, between the Iriomote cat that eats large frogs and reptiles with hard scales as its main prey, and the Tsushima leopard cat (*Felis bengalensis euptilura*; distirbuted on Tsushima Island, Nagasaki Prefecture) that eats small rodents as main prey, similar to the continental leopard cat (Nakanishi and Izawa 2009, 2016b).

The reason why the Iriomote cat has been able to survive for more than 90,000 years (Tamada et al. 2008) on such a small island is because of its adaptive evolution, biologically and morphologically, by expanding its scope of activity and food habits, rather than following the normal behavior of cat species, that is exclusively hunting small rodent animals in forests. It is an exceptional example for cat species to utilize amphibians and reptiles, especially frogs in high rates, as prey (Izawa and Watanabe 2006). It is a considerably different point, compared to other leopard cat subspecies inhabiting Tsushima Island, Thailand, Indonesia, and so on (Inoue 1972; Rabinowitz 1990; MOEJ and Nagasaki Prefecture 1997; Watanabe 2009, etc.) (Figure 2-21).

The factors that have allowed Iriomote cats to have an extremely extended range of habitat and source of preys and enabled them to adapt to the small-scale insular environment is considered that the existence of a wet and humid environment such as sub-tropical rainforests, highly-developed river systems, and back marsh at the mouth of those

rivers provide habitats to the Island's abundant and diverse wildlife as potential prey.

Table 2-33: Main islands inhabited by leopard cat (*Prionailurus bengalensis*) subspecies

Island	Island area (ha)	subspecies
Iriomote Island	28,961	Prionailurus bengalensis iriomotensis
Tsushima Island	69,644	P. b. euptilurus
Busuanga Island	ca. 89,000	P. b. heaneyi
Nias Island	404,800	P. b. smatranus
Cebu Island	446,700	P. b. rabori
Bali island	541,600	P. b. javanensis
Panay island	1,201,100	P. b. raboi
Negros island	1,307,400	P. b. raboi
Palawan Island	1,218,800	P. b. heaneyi
Taiwan	3,598,000	P. b. chinensis

Source: Area surveys by the Geospatial Information Authority of Japan for areas of Iriomote and Tsushima Islands. Areas of foreign islands are based on the ISLAND DIRECTORY of UNEP (http://islands.unep.ch/isldir.htm).

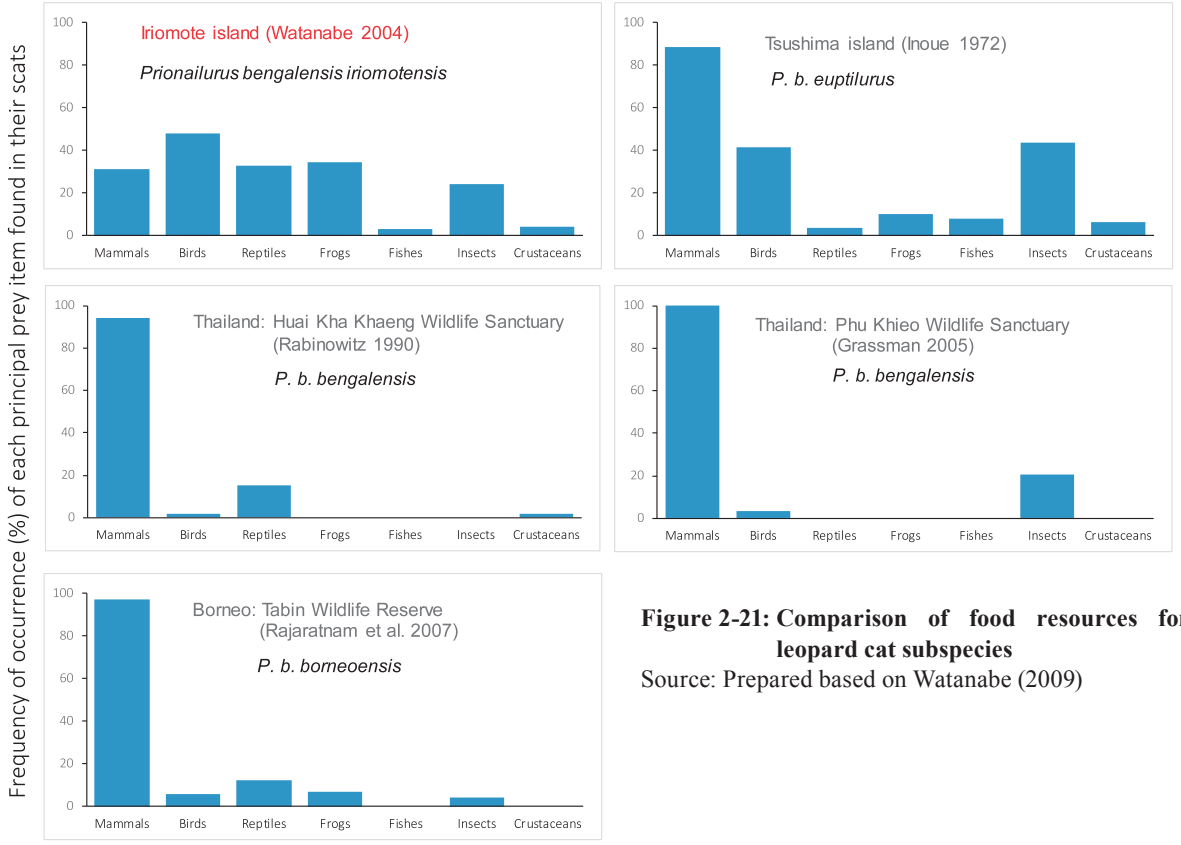


Figure 2-21: Comparison of food resources for leopard cat subspecies
Source: Prepared based on Watanabe (2009)

2.a.5. Utilization of natural resources

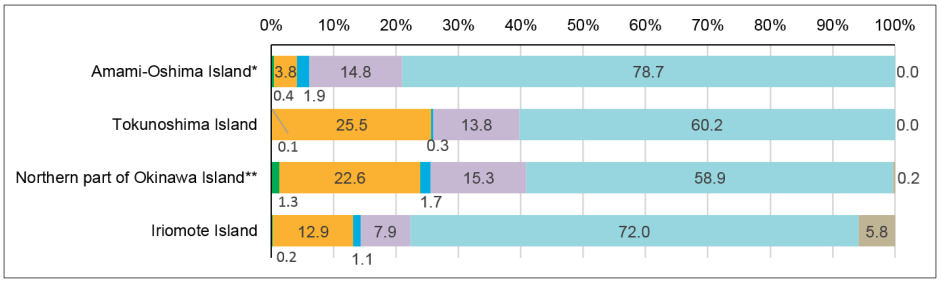
The four regions containing the nominated property are all inhabited. Table 2-34 shows the numbers of residents.

Table 2-34: Populations and numbers of households in four regions containing the nominated property

Name of island (region)	Population	Number of households	Year of survey	Sources
Amami-Oshima Island*1	61,256	28,029	2016	1)
Tokunoshima Island	23,497	10,468	2016	1)
Northern part of Okinawa Island*2	10,039	4,987	2016	2)
Iriomote Island	2,402	1,289	2016	3)

Sources: 1) Kagoshima prefecture Oshima Branch Office. (2017); 2) Statistics Bureau, Ministry of Internal Affairs and Communications (2016); 3) Taketomi Town (2016)
*1: includes Kakeroma Island, Ukejima Island, and Yoro Island
*2: Three Yambaru villages

Figure 2-22 illustrates the number and percent distribution of the working population by industry in the four regions containing the nominated property. All of the four nominated islands (region) have a low percentage of workers in the primary industry; i.e. 6.0% (1,661 people) for Amami-Oshima Island, 26.0% (2,865 people) for Tokunoshima Island, 25.5% (1,158 people) for northern part of Okinawa Island, and 14.3% (189 people) for Iriomote Island. In the primary industry, agriculture has the largest share of workers across all the islands. The overview of each of the agriculture, forestry, and fishery sectors is shown below.



	Amami-Oshima Island*	Tokunoshima Island	Northern part of Okinawa Island**	Iriomote Island
Forestry	103	14	59	3
Agriculture	1,039	2,814	1,024	171
Fishery	519	37	75	15
Secondary Industry	4,096	1,521	696	105
Tertiary Industry	21,757	6,645	2,670	953
Others	0	0	11	77
Total	27,630	11,039	4,535	1,324

Figure 2-22: Rate of population by industry (above) and actual number (below) in the four regions containing the nominated property

Source: 2010 census by the bureau of statistics, ministry of internal affairs and communications ("Employed Person by Age Group, 15 Years-Old and Over")
*Including peripheral islands of Kakeroma, Uke, and Yoro. ** Three Yambaru villages.

2.a.5.1. Agriculture

Among the four regions containing the nominated property, Tokunoshima Island has a certain area of arable land in the flat land at the foot of the mountains located at the centre of the island. However, the other three regions have vast forest areas and only limited areas for cultivation (Table 2-35).

Table 2-35: Arable land area of four regions including nominated property

	Island Area (ha)	Paddy Field (ha)	Farmland (ha)	Total (ha)	Arable Land (%)
Amami-Oshima Island*	82,107	58	2,112	2,172	2.6
Tokunoshima Island	24,785	2	6,880	6,882	27.8
Northern part of Okinawa Island	34,023	16	1,355	1,371	4.0
Iriomote Island	28,961	89	565	654	2.3

Land area data for the islands and regions was collected from the Land Area by Island and the Land Area by Municipality sections of the 2015 Statistical Reports on the Land Area by Prefectures and Municipalities in Japan by the Geospatial Information Authority of Japan. The figure for northern part of Okinawa Island shows a total area of the three Yambaru villages.
Arable land area was calculated, based on the results of the cultivated acreage survey by the Ministry of Agriculture, Forestry and Fisheries of Japan (2015) for Amami-Oshima Island, Tokunoshima Island and the nortern part of Okinawa Island; and on FY2015 Yaeyama Digest by Okinawa Prefectural Government Yaeyama Office for Iriomote Island.
*: Amami-Oshima includes Kakeroma Island, Ukejima Island, Yoro Island and other peripheral islands.

2.a.5.2. Forestry

1) Amami-Oshima Island and Tokunoshima Island

Forest area of Amami Island Group accounts for 66% (81,370 ha) of the Island Group's total area (124,049 ha) (Oshima Branch Office, Kagoshima Prefecture 2017), and about 98% (779,478 ha) of the forest area is distributed on the Amami-Oshima Island and Tokunoshima Island including the nominated property. The rate of forest area to land area of Amami-Oshima Island and the Tokunoshima Island are about 84% and 44%, respectively. One of the characteristics of these forests is that most of them are privately-owned forests (about 67% and 58%, respectively) (Table 2-36).

Logging for timber production is not implemented within the nominated property. Forest operations in the buffer zones are allowed only within the scope authorized under the Natural Parks Act.

2) Northern part of Okinawa Island and Iriomote Island

Okinawa Island's forest area accounts for 46% (56,897 ha) of the Island's total area (124,363 ha) (Forests Management Division, Department of Agriculture, Forestry, and Fisheries, Okinawa Prefecture 2016), and about 54% (30,790 ha) of the forest area is distributed in the northern part of Okinawa Island containing the nominated property (three Yambaru villages). The forest area of the northern part of Okinawa Island accounts for about 91% of the total area. One of the characteristics of these forests is that most of them are municipal forests (31%) (Table 2-36).

Partly for historic reasons, forests in the three Yambaru villages including the nominated property have been

used as the basis of the Okinawa Prefecture's forestry industry (see 2.b.2.2). The Okinawa Prefecture developed the "Policy for the Promotion of the Yambaru Model Forestry," a policy for treating the forests of the three Yambaru villages, with the aim of promoting the Yambaru-type forest and forestry industries, which combines an environment-friendly sustainable forest management (SFM) system, the recirculating forest products use via the life cycle and environment-conscious nature experience activities. Logging for timber production is not implemented within the nominated property. In addition, Okinawa Prefecture obtained a forest certificate of the Sustainable Green Ecosystem Council (SGEC) in October 2017, for the purpose of conserving forest environments and conducting sustainable forest management in some forests that are managed by the Prefecture in the northern part of Okinawa Island. As of November 2018, forest areas of approximately 3,500 ha are certified forests. Forest operations in the buffer zones are allowed only within the scope authorized under the Natural Parks Act as well as voluntary and traditional rules, including Yamabaru Model Forestry.

The Yaeyama Islands' forest area accounts for 62% (36,716 ha) of the Islands' total area (59,198 ha) (Forest Management Section, Department of Agriculture, Forestry, and Fisheries, Okinawa Prefecture 2014), and about 73% (26,696 ha) of the forest area is distributed on Iriomote Island, containing the nominated property. Iriomote Island has a forest area to land area rate of approximately 92%, and is characterised by the largest proportion of national forests (94%) (Table 2-36). Logging for timber production is not implemented either in the nominated property or buffer zones on Iriomote Island.

Table 2-36: Forest area by owner of four regions containing the nominated property (ha: upper) and breakdown (% : lower in the parentheses)

	Area	Forest Area	Rate of Forest (%)	National Forest	Prefectural Forest	Municipal Forest	Privately-Owned Forest
Amami-Oshima Island	71,235	59,718	83.8	4,808 (8.1)	1,152 (1.9)	13,498 (22.6)	40,260 (67.4)
Tokunoshima Island	24,785	10,792	43.5	3,825 (35.4)	9 (0.1)	667 (6.2)	6,291 (58.3)
Northern part of Okinawa Island	34,023	30,789	90.5	10,946 (35.6)	3,885 (12.6)	9,465 (30.7)	6,494 (21.1)
Iriomote Island	28,961	26,696	92.2	24,970 (93.5)	1 (0.0)	689 (2.6)	1,036 (3.9)

Areas of the islands and regions were obtained from the Land Area by Island and the Land Area by Municipality sections of the 2015 Statistical Reports on the Land Area by Prefectures and Municipalities in Japan by the Geospatial Information Authority of Japan. The area of the northern part of Okinawa Island was obtained by aggregating the areas of the three Yambaru villages.
The forest land area by owner was calculated using forestry records for state-owned forests held by the Forestry Agency and the GIS and forestry records for prefectural, municipal, and privately-owned forests held by the Kagoshima and the Okinawa Prefectures.

Box 5. Highly resilient forest dominated by Castanopsis

The four regions containing the nominated property are high in biodiversity and essential as habitats to endemic species and rare species. On the other hand, on Amami-Oshima Island and in the north of Okinawa Island, local forest resources have been used for timber, fuel wood, etc, since old times, and a certain level of forestry operations are conducted around the nominated property. The reasons for the two islands having been successful in both conserving endemic/rare species and engaging in the forestry industry include the high regeneration ability of the forests dominated by Castanopsis, a tree species with a strong sprouting power (Hirata et al. 1979). For example, a study was conducted to examine the sprouting ability of Okinawa's Castanopsis forests. The following is a report about the recovery process of a forest located in a former logging site in the north of Okinawa Island (Osawa et al. 2003).

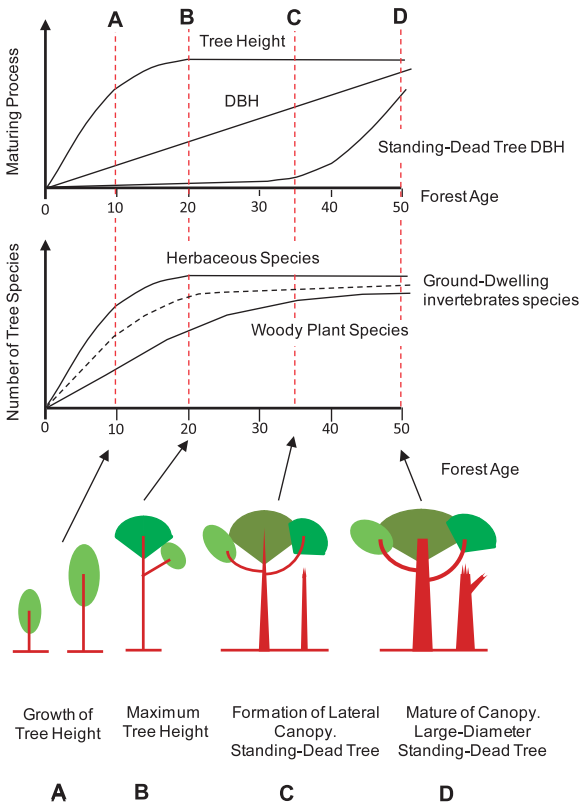


Figure 2-23: Regeneration process and structural characteristics of forests on northern part of Okinawa Island (Osawa et al. 2003, partly modified)

Immediately after logging, pioneer broadleaved trees are dominant. Castanopsis appear from the 10th year and their height and stem diameter (diameter at breast height; DBH) increase year after year, up to around the 20th year since the deforestation (A and B in Figure 2-23).

Around the 20th to 30th year since the deforestation, the accumulated number of species constituting the forest canopy reaches the upper limit at 80 to 85. The broadleaved trees are replaced by new dominant species, such as Castanopsis, *Schima wallichii* ssp. *liukiuensis*, Japanese snowbell (*Styrax japonica*), and *Distylium racemosum*. While the tree height almost reaches the upper limit of 15 m, DBH (diameter at breast height: ca. 25 cm at this stage) continues to increase. This is the stage when the growth of DBH outperforms that of tree height (C in Figure 2-23).

Around the 35th year after the deforestation, the structure of the forest layers consisting of canopy, subcanopy, and understory trees becomes clearer. Castanopsis and other canopy trees stretch their lateral branches further, while increasing the stem diameter (at this stage, DBH reaches around 30 cm at the maximum). As a forest tree community enters an adjustment phase, small-diameter trees are thinned out, and a rapidly increasing number of standing-dead trees begin to stand out (C and D in Figure 2-23). At this stage, a forest becomes able to meet habitat requirements of certain endemic/rare species such as Okinawa woodpeckers, which need, for nest building, large-diameter (DBH $\geq$ 20 cm) and rotten-centre trees. In addition, threatened epiphytic plants, such as *Dendrobium okinawens*, tend to grow on large-diameter trees, and it is thought that long-term stable forests are important for such trees (Abe et al., 2018).

After 50 or more years have passed since deforestation, a forest has become composed of large-diameter trees with DBH of around 65 cm at the maximum, and there may be some changes in their physical structure, such as hollows and shoots arising from thick lateral branches. A forest structure diversifies further, and some of large diameter trees having DBH of around 60 cm become snags (D in Figure 2-23). At this stage, a forest becomes able to meet habitat requirements of certain endemic/rare species such as Yanbaru long-armed scarab beetles, which need tree hollows that have a sufficient level of humic substances to feed their larvae.

Amami-Oshima Island's chinquapin forests always recover from logging and restore itself in a relatively short period of time. However, large-diameter trees need a longer span of time to recover, and approximately 80 years after a selective cutting and approximately 110 years after a complete cutting are required to return to a state similar to that of the original primary forest (Shimizu et al. 1988).

It should be noted that the rapid sprout regeneration and growth of underbrush help prevent sediment runoff and contribute to the smooth restoration of forest.

2.a.5.3. Fishery industry

1) Amami-Oshima Island and Tokunoshima Island

The Amami Island Group, which includes Amami-Oshima Island and Tokunoshima Island, is surrounded by coral reefs and a number of natural patch reefs in adjacent waters, forming generous fishing grounds. Types of fishery operated there include vessel-based fishery (hook-and-line fishing such as single-hook fishing, trawl fishing, longline fishing, and drop-line fishing), net fishery (lift net fishing, gill net fishing, etc.) and diving apparatus fishery. Production volume of the vessel-based fishery in the Amami Island Group in 2015 was 1,859 tons (Oshima Branch Office, Kagoshima Prefecture 2018). In addition, the mild climate and warm seawater temperature allow the breeding of aquaculture species such as fish, pearl oyster and Japanese tiger prawn (Oshima Branch Office, Kagoshima Prefecture 2018). However, the Amami Island Group's fishery industry is characterised by its small scale, with fishing boats weighing less than 10 tons accounting for 96% (1,678 boats) of all fishing fleet, and private operators accounting for 96% (618 operators) of all fishery businesses (Oshima Branch Office, Kagoshima Prefecture 2018).

The Amami Island Group—in particular, Amami-Oshima Island—has varied and irregular coastlines. Therefore, a number of fishing ports and harbours are situated in coves. As of 2017, Amami-Oshima Island and Tokunoshima Island have 23 and 4 fishing ports, respectively (Oshima Branch Office, Kagoshima Prefecture 2018), but none of them are located within the nominated property or buffer zone.

2) Northern part of Okinawa Island and Iriomote Island

The coastal areas of Okinawa Prefecture, including the nominated northern part of Okinawa Island and Iriomote Island, have expansive reef flats formed by highly developed coral reefs. The ocean floor topography along the areas is characterised by the narrow sea shelves, with the Ryukyu Trench being located on the east side of the reef flats and the Okinawa Trough being laid on the western side. Such characteristics of the ocean area have encouraged people to operate offshore fishery, including pole and line fishery targeting diadromous fish (e.g. tuna and bonito), fishery using floating fish rafts (Payaos), and drop-line squid fishery, as well as continental shelf and coral reef fishery, such as bottom angling and spearfishing using diving apparatus (Department of

Agriculture, Forestry and Fisheries 2014a, b; Okinawa Prefecture 2014; Okinawa General Bureau, Cabinet Office, Government of Japan 2014).

Okinawa Prefecture's fishery industry is characterised by its small scale, with fishing boats weighing less than 10 tons accounting for 95% (2,787 boats) of all fishing fleet, and private operators accounting for 99% (2,583 operators) of all fishery businesses. However, various measures have been implemented to promote the fishery industry and establish the basis for fishery production since FY1972, immediately after the return of Okinawa to Japan. At the same time, the "Resource-Controlling Fishery" and "Cultivation-Centric Fishery" projects have been launched to develop aquacultural basis for mozuku (*Nemacystus decipiens*), Japanese tiger prawn, sea grape, and *Monostroma nitidum* (Department of Agriculture, Forestry and FisheriesOkinawa Prefecture 2014a, b; Okinawa General Bureau, Cabinet Office, Government of Japan 2014). The production volume of Okinawa Prefecture's fishery industry in 2012 was 15,295 tons and 17,458 tons for marine fishery and marine aquaculture, respectively.

As of 2014, Okinawa Prefecture had 88 fishing ports, including 7 ports located in the northern part of Okinawa Island (the three villages of Kunigami Village, Ogimi Village, and Higashi Village) and one port located in Iriomote Island (Department of Agriculture, Forestry and Fisheries 2014, Okinawa Prefecture 2014c), but none of them are located within the nominated property or buffer zone.

Catch landing (Photo: MOEJ)

2.b. History and Development

2.b.1. History

The geological history of the nominated property is described in the preceding section 2.a.7.1. This section provides an overview of the history after the emergence of mankind.

The Ryukyu Chain was first populated by mankind in the Paleolithic, or 30,000 years ago, at the latest. Some ancient human bones of the Yamashita Cave Man, discovered in the Yamashita Cave located close to the Naha city center on Okinawa Island, were subjected to a dating process using specimens collected from the site. As a result, they were estimated to date back 32,000 to 37,000 years. An early human settlement estimated to be 30,000–35,000 years old was found in Sakitari-do, another cave located in the southern part of the Okinawa Island. The cave also contained the world's oldest fishhooks and other artifacts, illustrating that people who lived in the cave led a life well adapted to the insular and oceanic environment (Fujita et al. 2016). The bones of the Minatogawa People, unearthed in the southern part of the Okinawa Island, too, were dated through the radioactive carbon dating method and estimated to be 16,000 to 18,000 years old. Geologists say that the Minatogawa People are close to the Jomon people (about 16,500 to 2,300 years ago) in mainland Japan and the Neolithic people from southern China to northern Indochina. There was no earthenware excavated from the ruins, but the People seem to have been able to use fire (Hokama 1986; Takara 1993; Asato and Doi 1999; Hayaishi 2011).

After the Paleolithic Age, there is a long span of time for which no records exist. In the Ryukyu Chain, the Shell Midden Period apparently started some 6,000 years ago, under the influence of the Jomon culture. The Shell Midden people are considered to have had the ability of using earthenware and ground stones. They seem to have followed a lifestyle similar to that of the Paleolithic Age, sourcing their food from the nature, including seafood from coral reefs and plants and animals from the land (Hokama 1986; Takara 1993). At least by the middle of the Shell Midden Period (some 3,000 years ago), groups of settlements had been established at many locations of the Ryukyu Chain (Asato and Doi 1999; Hayaishi 2011).

Certain studies on animal fossils (Matsuoka 2000; Nakamura and Ota 2015) and analyses of the number of tree species constituting an evergreen broadleaved forest, island area, and forest area (Hattori 2014) suggest that, up to around this Period, evergreen broadleaved forests had been better developed than today in locations other than the nominated property, including the central and southern parts of Okinawa Island, Miyako Island, and other Central and South Ryukyu islands. They also suggest that, while these evergreen broadleaved forests provided habitats to species commonly shared with the nominated property (northern part of Okinawa Island and Amami-Oshima Island)—such as mountain-stream frogs, Okinawa woodpeckers, Okinawa rails, Amami jays, and Amami thrushes, increasingly dynamic human activities had caused a significant change in the vegetation and the fauna at such locations.

On Okinawa Island, influential families, who obtained ruling power through battles during the 12th to the 16th centuries and played a role as a local lord, built castles called *Gusuku* for residential and defense purposes, based on the self-defensive rural settlements established during the 10th to the 12th centuries. This period is referred to as the "*Gusuku* Period". Later, mega-sized *Gusukus* started to be built, and the Ryukyu Kingdom was established in 1429 (Government of Japan 1996). These *Gusukus* constitute the cultural World Heritage, "*Gusuku*

Sites and Related Properties of the Kingdom of Ryukyu." Incidentally, this cultural heritage does not have any overlap with the nominated property.

The Ryukyu Kingdom placed Amami-Oshima Island and Tokunoshima Island under its control by 1447 A.D., and Iriomote Island by 1500 A.D. However, in the 1600s, the Amami Island Group was separated from the Kingdom and belonged to the Satsuma Domain (current Kagoshima and Miyazaki Prefectures).

From 1944 to 1945, Okinawa Island became a World War II battlefield. After the war, the Amami Island Group and Okinawa Prefecture were placed under the administrative authority of the US military. It was in 1953 when the administrative rights were returned to the Amami Island Group and in 1972 to Okinawa Prefecture (Government of Japan 1996; Oshima Branch Office, Kagoshima Prefecture 2014). In 1953, when the US military had the administrative authority, the United States Civil Administration of the Ryukyu Islands promulgated the "Land Acquisition Procedure" and seized land in the main areas of the prefecture to construct military bases. As a result, as of 1972, the area of the US military installations located within the prefecture was as large as 28,660.8 ha (the aforementioned "area" includes the one jointly used / shared. The same applies hereinafter)., or approximately 12% of the prefecture's land area (Military Base Affairs Division, Executive Office of the Governor, Okinawa Prefecture 2018).

The US military bases in Okinawa Prefecture have reduced approximately 34% since the prefecture's return to Japan. As of March 2017, the US military bases within Okinawa Prefecture cover an area of 18,822 ha, which accounts for 8% of the prefecture's total area (Military Base Affairs Division, Executive Office of the Governor, Okinawa Prefecture 2018). Most recently, in northern part of Okinawa Island including the nominated property, the land of approximately 4,166 ha, including the joint use land, out of the land of approximately 7,824 ha in Northern Training Area (NTA) was returned from the US Government to the Government of Japan in December 2016 (hereinafter, referred to as the "returned land"). Later on, the returned land was handed from the Ministry of Defense to respective land owners in December 2017, after the Ministry conducted soil contamination surveys and waste treatment in accordance with relevant laws and ordinances to confirm that the returned land was free from soil contamination, water pollution, and so on. The area of approximately 2,793 ha of the returned land is incorporated in the nominated property. At present, the US military installations in Kunigami Village and Higashi Village, located in the northern part of Okinawa Island, occupy an area of 1,446 ha (7% of the village's land) and 2,267 ha (28% of the village's land), respectively (Figure 2-24).

After the return of the Amami Island Group to Japan, a series of projects for reconstruction, growth, promotion, and development were launched for the area under special measures acts and plans based thereon, in light of its historical background and the gap with the mainland arising from its geographical and natural constraints (Table 2-37). Also in Okinawa Prefecture, promotion, development and growth projects were undertaken in accordance with special measures acts and plans based thereon in light of its historical background, the gap with the mainland arising from its geographical and natural constraints, as well as its societal circumstances, including the concentration of the US military installations.

As a result of recent legal revisions, the responsibility to develop promotion and development plans was

transferred from the central government to the two prefectural governments, and relevant local municipalities developed plans on their own initiative with the participation of local residents (Okinawa Prefecture 2012; Kagoshima Prefecture 2014). These plans explicitly states their commitment to engaging in various measures designed to properly conserve and make the best use of the natural environment so that the value of the property as a natural World Heritage candidate will be preserved for the future. These plans have accomplished certain results in facilitating tourism promotion and exchange activities designed to achieve a shift to self-sustaining development while conserving the local natural environment and respecting traditional culture.

Table 2-37: History of Special Measures Acts in Amami Island Group and Okinawa Prefecture

	Amami Island Group (Kagoshima Pref.)		Okinawa Pref.	
	Amami-Oshima Island	Tokunoshima Island	Northern part of Okinawa Island	Iriomote Island
1953	Amami Island Group returned to Japan		—	
1954	Act on Special Measures concerning the Reconstruction of the Amami Island Group (The Act has been amended and extended about every five years.)		—	
1964	Act on Special Measures concerning the Promotion of the Amami Island Group (renamed)		—	
1971	—		Act on Special Measures concerning the Promotion and Development of Okinawa (The Act has been amended and extended about every five years.)	
1972	—		Okinawa Prefecture returned to Japan	
1974	Act on Special Measures concerning the Promotion and Development of the Amami Island Group (renamed)		—	
2002	—		Act on Special Measures for the Promotion of Okinawa (renamed)	

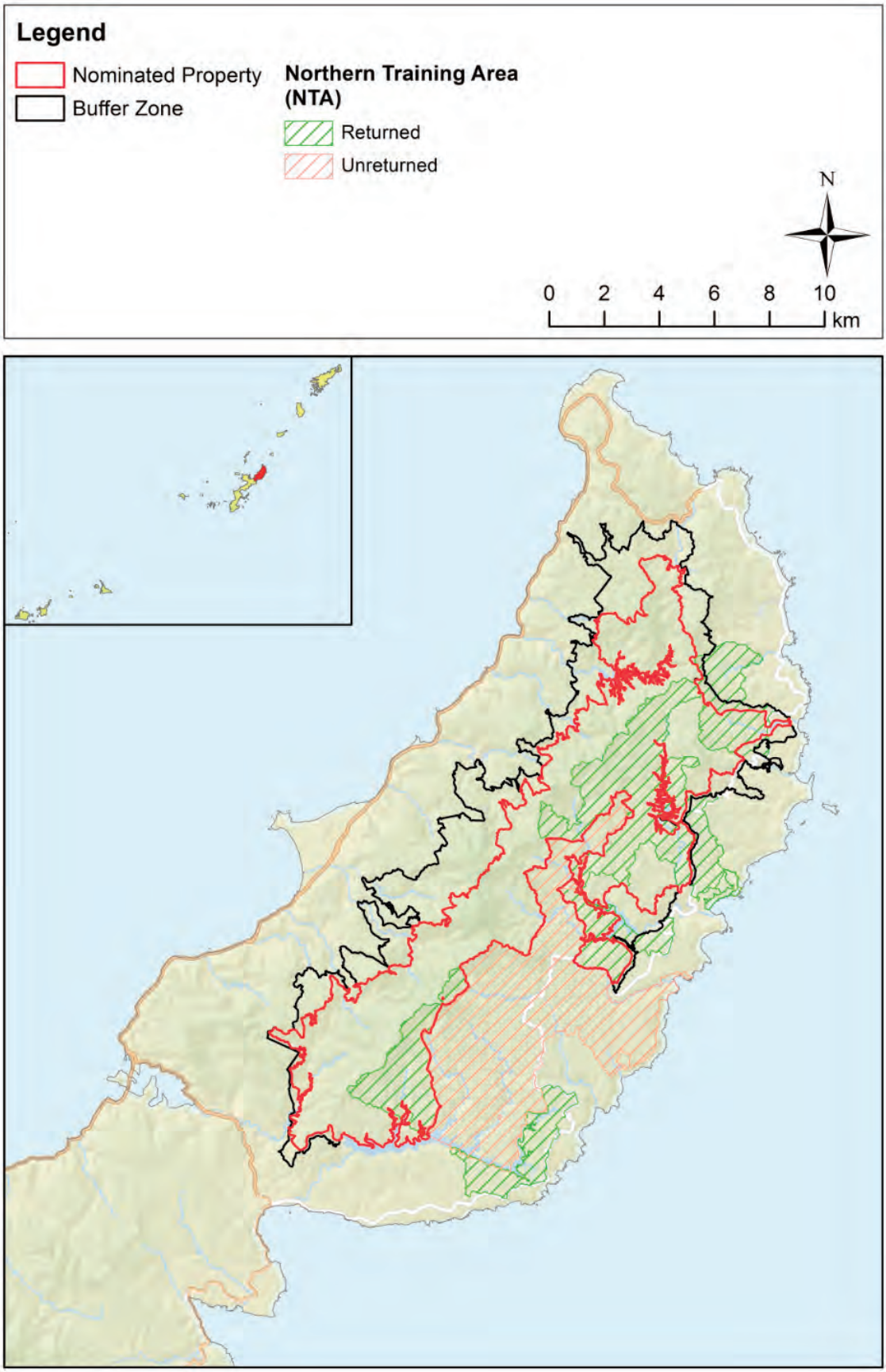


Figure 2-24: US Northern Training Area (NTA) and returned land

Box 6. Local residents' traditional view of nature and landscape

The forests of the nominated property include only small areas of pure primeval sub-tropical rainforests, and most of them have been exposed to a certain level of human interference since old times. Still, they provide nurseries and habitats for a number of highly-endemi/rare species of plants and animals. The factors making this possible are local residents' recognition about nature and landscape, which they have fostered, over a long period of time, by making use of natural resources including endemic plants and animals in their daily life, their way of interacting with nature based on the recognition, and their lifestyle and culture they have developed therefrom and handed over from generation to generation (Environment Agency 1999; Kagoshima Prefecture 2003; Kagoshima University 2013).

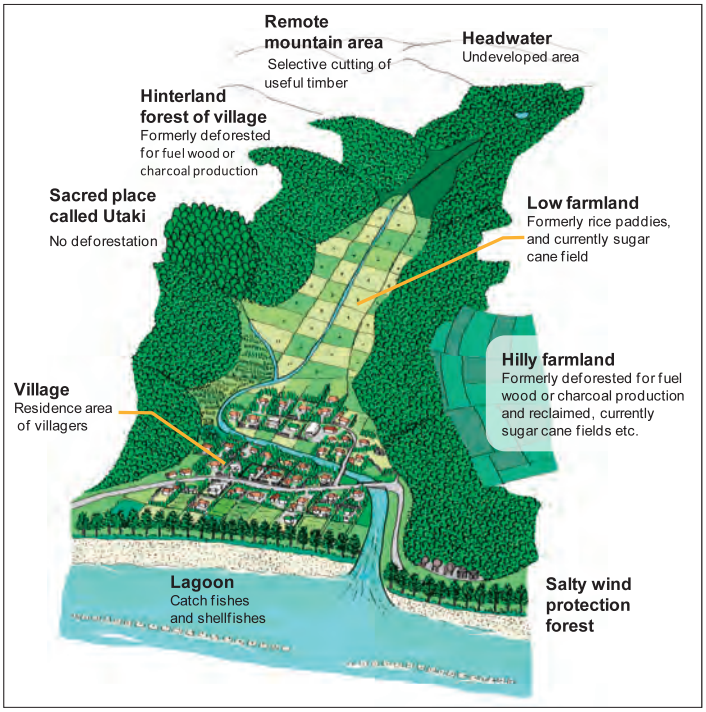


Figure 2-25: Schematic view of northern part of Okinawa Island's village and use of lands
Source: Nago City History Compilation Committee (1988)

Traditionally, people on the Central and South Ryukyus led their life in a close relationship with the surrounding nature. Their villages were unable to be separated from the sea and surrounding mountains in the sense that a village served as the basis of villagers' activities. They caught fish and shellfish in the sea in front of the village, washed things and caught Tanaga (a dialect of Tenaga-ebi, or freshwater prawn), cultivated land in the fields and mountains behind the village, and collected firewood and lumber therefrom as a way of living. As for people's everyday tools that are stored in museums in the respective islands, there are many different kinds of indigenous plants and seafoods such as fish and shellfish that are processed and manufactured. Among textiles and folkcraft goods that are designated as national and local traditional folkcraft goods, there are crafts that are made of natural materials in the respective islands (Nakama 2012).

People believed that, beyond the sea, there was a paradise where gods lived (called by different names depending on the region, such as *Neriya-Kanaya*, *Nirai Kanai*, *Ryugu*, etc.), and the gods brought fertility and disaster to the people. During the age of the Ryukyu Kingdom, the "*Noro*" system was established. A *Noro* (which means a priestess) was in charge of performing rituals, farming rites and annual events to welcome gods and send them back. Various types of events and performing arts that are presumed to have been created in that era remain as the village's tradition, although they have been simplified and affected by the phenomenon of depopulation associated with the ageing of the local population and the declining number of young people. These traditional events and arts constitute the culture that is deeply rooted in the natural environment and is still prevalent.

In addition, religious beliefs have also influenced the structure of villages. For example, in the northern part of Okinawa Island, it was believed that gods, after welcomed by a *Noro*, would descend to a mountain, and then come down to the village along the mountain's ridge line. With such a belief, people imagined a sacred space composed

of a *Kami-yama* (the mountain to which gods descend), *Kami-michi* (the road through which gods come to their village), and *Myah* (an open space located at the village centre to perform rituals) and formed a space (landscape) of their village as an integral part of the ocean in front of it and mountains behind it. A village faces the sea along the axis of a water system, and is separated from neighbouring villages by mountain ridges. Within the village, there are stone walls made of coral limestone and windbreak hedges made of Fukugi trees (*Garcinia subelliptica*), which have been maintained to protect houses from typhoons and tidewater damage (Figure 2-25). These traditional village landscapes are relatively well preserved in the northern part of Okinawa Island.

A village's lands have been used rationally for different purposes, divided into the cultivation area, the fuel wood area, the building materials are, and the undeveloped remote headwaters area, which were placed in a concentric circle centred on the village. Such land use is based on a space concept focused on the protection of headwater areas. People who were engaged in forestry work designated the "day of the god of mountains" to express their gratitude to mountain gods, and observed the custom of staying away from mountains on the day. Such taboos and rules were designed to control access to a sacred domain, and created myths about encounters with holy spirits (called by different names depending on the region, such as *Kenmun, Kijimunah, Bunagaya*, etc.) and gods of mountains, as well as the existence of divine spaces. These myths have been handed down and protected among villagers in a variety of forms.

In the Central and South Ryukyus, people recognize that all the surrounding mountains, forests, and the sea are part of their sphere of life and this natural environment plays an integral role in their lives, while they use natural environment for a long time based on such traditional lives and faiths.

"Sinugu" ceremony in Ada Village of the northern part of Okinawa Island.
One of the traditional events derived from local people's deep involvement in nature (see Box 6) (Photo: MOEJ)

2.b.2. History of major industries

2.b.2.1. Agriculture

1) Amami-Oshima Island and Tokunoshima Island

The municipalities of the Amami Island Group, including Amami-Oshima Island and Tokunoshima Island containing the nominated property, implemented land improvement projects during both the prewar and the postwar periods, mainly with the aim of improving paddy fields and promoting rice cultivation. As of 1953, when the Amami Island Group was returned to Japan, the arable land area of the Island Group as a whole was 16,376 ha, which was not enough to provide stable agricultural production. In order to improve the poor land conditions swiftly and ensure the stability of farm management, municipalities carried out the development of agricultural infrastructure through reconstruction and promotion projects from 1954 onward. The paddy field area was reduced from 4,252 ha in 1963 to 87 ha in 1998 for such factors as the special measure projects designed to convert paddies into dry fields, ageing of farmers, reversion of paddy fields to wild land due to lack of successors. On the contrary, dry fields cover 16,800 ha, accounting for 99.4% of the total cultivated land. Currently, the main crop of the Island Group is sugar cane. Cultivation of vegetables, flowers, and fruits is also carried out in addition to livestock raising (Oshima Branch Office, Kagoshima Prefecture 2014).

2) Okinawa Island and Iriomote Island

The arable land area across Okinawa Prefecture was 45,940 ha as of 1972, the year when the prefecture was returned to Japan. Arable land continued to decrease up until 1977 due to the influence of land conversion associated with the Okinawa Ocean Expo and the buying up of land by business sectors. However, from 1978 onward, the arable land area began to increase owing to government-subsidised farmland/grassland development projects and the buying back of farmland lost through the buying up, before reaching a post-return high of 47,100 ha in 1992. However, after that, the arable land area continued to decrease, affected by the increasingly severe agricultural environment surrounding Okinawa Prefecture, such as import liberalization of canned pineapples and pineapple juice, and increased abandonment of cultivated land by aged farmers. As a result, the arable land area diminished to 38,900 ha in 2012. By land type, paddy fields decreased by 65% (1,590 ha) from 2,440 ha in 1972 to 851 ha in 2012. Similarly, dry fields decreased by 12% (5,400ha) from 43,500 ha to 38,100 ha. What is to be noted here is that pasture land increased by 1,260% (5,500 ha), while fruit tree orchards decreased by 65% (3,800 ha) (Okinawa General Bureau, Cabinet Office, Government of Japan 2012).

Sugar cane field (Photo: MOEJ)

2.b.2.2. Forestry

In the Central and South Ryukyus, firewood has long been used in daily life, and for the production of salt, sugar, and dried bonito, etc. Also, timber, railroad ties, and charcoals for shipment have been produced from forests. In recent years, construction materials such as structural materials for buildings and laminated woods, as well as wood chips for mushroom production and livestock raising are the main forest products. Castanopsis (*Castanopsis sieboldii*), which characterizes the region's subtropical rainforest, has a great capacity for sprouting and regeneration, and enables to balance forestry with conservation of landscapes and biodiversity (see Box 5).

1) Amami-Oshima and Tokunoshima Islands

As the government took measures in line with its promotion plan to develop industry and social infrastructure in the Amami Island Group, following their reversion to Japan in 1953. Part of Amami-Oshima and Tokunoshima Islands was deforested to develop farmland and construct dams and roads. At the same time, forestry was developed primarily in private forests in Amami-Oshima Island. Wood chips have been produced since the 1960s, leveraging natural regeneration of evergreen broadleaved trees, which takes place on a 35- to 45-year cycle. The timber production, however, has decreased by 1/2 (about 0.1 million m^3) after peaking (about 0.2 million m^3) in the early 1970s, with no logging conducted on a large scale since the mid-1990s (Yoneda 2016).

Agriculture has long been an important industry in Tokunoshima Island, where forest resources are used in the daily life of local communities. With no industrial forestry, main forest products still constitute a major part of the island's forestry production. Timber production has dropped to almost 1/20 in recent years, from approximately 8,400 m^3 in the early 1970's (Shinohara 1975) to current 480 m^3. Moreover, forestry production today is mostly limited to main forest products. Therefore, most of the highland forests in the nominated property are maintained in good condition (Kyushu Regional Forest Office, Forestry Agency 2010).

2) Okinawa and Iriomote Island

The government took measures in line with its promotion plan to develop industry and social infrastructure in Okinawa Prefecture as well, following its reversion to Japan in 1972. As a result, part of Okinawa Island was also deforested to develop farmland and construct dams and roads. On the other hand, prefectural and municipal forests played a key role in developing forestry, with raising of seedling and afforestation done in parallel with logging and timber production. Due to the decline in timber demand and the change in economic situation, the logging area in recent years has decreased to about 1/70 of that in the postwar reconstruction period (decreased from a total of about 6,000 ha in 1959-1968 to a total of about 90 ha in 1999- 2008). The growing stock has increased to about three times that at the time of returning to Japan (increased from 40 m^3/ha in 1972 to 125 m^3/ha in 2008). In fact, the forests in the northern part of Okinawa Island have recovered from the devastation in the postwar reconstruction period and are in better condition than ever before (Forest and Greenery Division, Agriculture, Forestry and Fisheries Department, Okinawa Prefecture 2013).

Iriomote Island, where malaria was once rampant, although it is now declared malaria-free, had long been unsuitable for settlement, which inhibited its development. For the most part, forest resources are used in the daily life of local communities. With no industrial forestry, Iriomote Island remains largely intact with rich natural surroundings (Marusugi 1994, Kagoshima University 2013).

Box 7. *Somayama* system

In the 18th century, the Ryukyu Kingdom Government introduced the *Somayama* system through establishment of forest policy regulations regarding forest management and use. The government was also engaged in the protection, fostering, and recovery of forests in the northern part of Okinawa Island.

The *Somayama* system was intended to allow local residents to undertake the management of government-owned lands, and at the same time use the lands to a certain extent (Forest and Greenery Division, Department of Agriculture, Forestry and Fisheries, Okinawa Prefecture 2013). Furthermore, the government redrew boundaries between administrative districts to allocate forests and mountains to each district (Miwa 2011), established management rules and limitations as well as penalties for violations, developed hierarchical monitoring system, and implemented various systems including the "Mountain Game," in which villages competed with each other for forestry business performance (Nakama 1984). The government also provided a wide range of technical guidance concerning forest management. It has been confirmed that in the northern part of Okinawa Island, these systems had been maintained in a self-sustaining way almost up until the return of Okinawa Prefecture to Japan in 1972. It is believed that local communities had used and made necessary changes to these systems and practices to better manage their own resources (Miwa 2011).

Blossoms of *Castanopsis sieboldii* (Photo: MOEJ)

2. b. 3. Backgrounds concerning the designation of the protected area and World Heritage nomination

Since the nominated property possesses historical backgrounds of local communities and industries there, as stated earlier in 2.b.1 and 2.b.2., land ownership situations are complicated and there are many sites of the land that were used for agriculture and forestry. Therefore, since the designation of some of the protected areas, immediately after the postwar reversion of the Amami Island Group in 1953 as well as the reversion of Okinawa Prefecture in 1972, careful coordination has hitherto been conducted with local stakeholders for the expansion and designation of the protected areas.

In addition, with regard to the returned land of NTA in Northern part of Okinawa Island, the designation of the protected area has been strongly supported by Okinawa Prefecture and local villages, taking into account the importance of its natural environment. Therefore, the new designation and expansion of the protected area were conducted for those important areas.

Coordination processes with local stakeholders, concerning the designation and expansion of the National Park as a main protection measure for the nominated property, the designation and expansion of the Forest Ecosystem Reserve, its nomination to be inscribed on the World Heritage List, and the formulation of the Comprehensive Management Plan, are shown below. .

2. b. 3. 1. History of coordination processes with local residents and others concerning the designation and expansion of the National Park

Regarding Amami-Oshima Island, Tokunoshima Island (Amamigunto National Park), and Northern part pf Okinawa Island (Yambaru National Park), where new national parks were designated, MOEJ has considered their directions with experts since the late 1990s and 2000s, through a series of opinion exchanges at workshops and other occasions with related municipalities and local residents, concerning how to conserve local natural environments with a vision of the national park designation.

Since this area was selected as a candidate site for the World Heritage nomination at the experts' review meeting held by MOEJ and Forestry Agency in 2003, efforts have been made to explain to local people about the designation of national parks and nomination for World Heritage. The processes of designation of Amamigunto National Park and Yambaru National Park, as well as expansion of Iriomote-Ishigaki National Park are shown below (Figure 2-26).

Even after the designation and expansion of the national parks, MOEJ and relevant local governments have continuously organized explanatory sessions and symposiums to local residents and stakeholders. They have conducted dissemination and public awareness activities regarding the values as a World Heritage site, and reported on progress of the nomination, in addition to dissemination and public awareness regarding the regulatory details of national parks, and so on.

(1) Amamigunto National Park (newly designated in March 2017)
MOEJ established a review conference comprising experts and local concerned parties in 2010, to sort out ideas and thoughts regarding designation and management of Amamigunto National Park. Toward new designation of the national park, a total of 77 explanatory meetings to local residents and stakeholders have been held in Amami-Oshima Island, as well as 50 in total in Tokunoshima Island, since 2012, for the purpose of opinion exchanges with local residents and stakeholders. Following the public comments after the park plan was prepared, Amamigunto National Park was designated on March 7, 2017.

(2) Yambaru National Park (designated in September 2016, expanded in June 2018)
Review conferences comprising experts and local concerned parties and discussion sessions with local residents have been held in northern part of Okinawa Island since 2007, to sort out ideas and thoughts regarding designation and management of Yambaru National Park.

Since 2013, toward new designation of the national park, there were 58 relevant events organized, such as explanatory sessions regarding the designation of the national park in respective communities, explanation to concerned parties, lectures to the general public, and opinion exchanges with local residents and stakeholders in addition to the coordination with respective villages and land owners. Following the public comments after the park plan was prepared, Yambaru National Park was designated on September 15, 2016.

In addition, with regard to the returned land in northern part of Okinawa Island, MOEJ held explanatory sessions for local residents in respective villages, from 2016 to 2017, based on the research and analyses regarding the natural environment in the returned land of Northern Training Area (NTA). Similar to the time of designation, following collecting public comments after preparation of the part expansion plan, Yambaru National Park was expanded on a large scale and incorporated most parts of the returned land on June 29, 2018.

(3) Iriomote Ishigaki National Park (expanded in April 2016)
As for Iriomote Island that was designated as a national park in 1972, only some areas of the island, including the Urauchi River Basin in the central part of the island, were included in the park zone. Since 2013, toward expansion of the national park, there were 12 relevant events organized, such as explanatory sessions regarding designation of the national park in respective communities, explanation to concerned parties, lectures to the general public, and opinion exchanges with local residents and stakeholders, in addition to the coordination with stakeholders and land owners. Following the public comments after the park plan was prepared, the national park was expanded on a large scale to include almost the entire area of Iriomote Island on April 15, 2016.

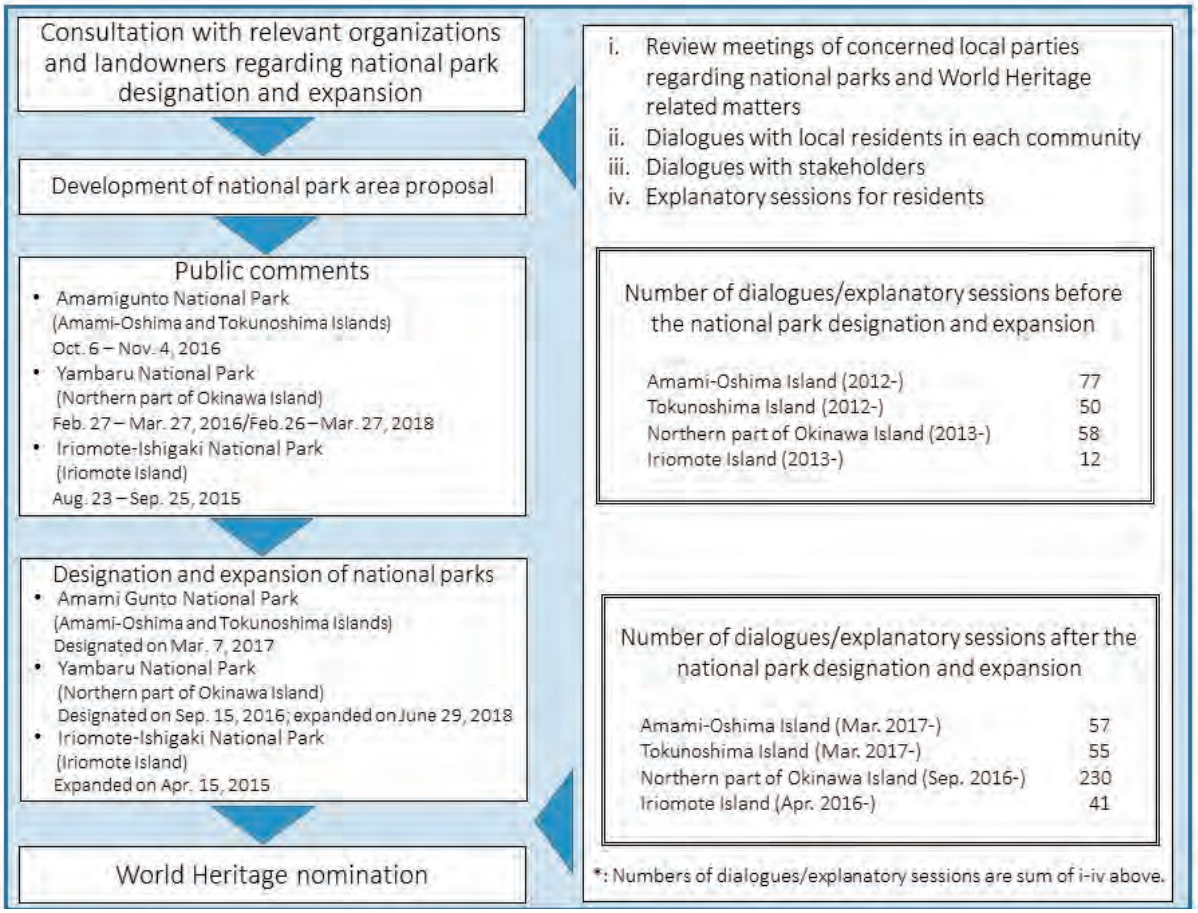


Figure 2-26: Consulation processes with local stakeholders for several years before and after the designation and expansion of the national parks

Daialogue with local residents in Higashi Village, northern part of Okinawa Island (December 4. 2017)

(Photo: MOEJ)

Box 8: The state of the natural environment in the returned land of Northern Training Area (NTA)

In December 2016, part of NTA (4,166 ha) was returned from the U.S. Government to the Government of Japan. As for the returned land, the Ministry of Defense investigated the history of land use, including the period before its confiscation by the U.S. Forces, and grasped probabilities of soil contamination, water pollution, etc. and then based on these, the Ministry conducted soil contamination surveys, waste treatment, and so on, in accordance with relevant laws and ordinances, mainly in helipad sites, forest roads, locations where helicopters crashed in the past, etc. As a result, the returned land was confirmed to be free from soil contamination and water pollution, and the land was returned to its owners, including the Forestry Agency, Okinawa Prefecture, Kunigami Village, and so on, in December 2017.

MOEJ conducted surveys and data collection on the natural environment from JFY 2016 to JFY 2017, for considering the incorporation of the returned land into the National Park. With regard to 3,690 ha, a part of the returned land, they were evaluated as integrated and consecutive to the natural environment in the existing Yambaru National Park. Thereafter, they were incorporated in the Yambaru National Park in June 2018 (Table 2-38 and Figure 2-27). The state of the natural environment is as follows.

- Subtropical broadleaved forests, dominated by Castanopsis and *Quercus miyagii*, are the main vegetation consecutively present from the backbone ranges of northern part of Okinawa Island. Most of these trees are aged 50 years or older. These large-diameter hollow trees offer habitats for small animals such as the Yanbaru long-armed scarab beetle (EN) and the Ryukyu long-haired rat (EN) that are globally threatened species. These old forest environments in good condition are stable habitats for diverse fauna and flora, including threatened species.
- In addition, cloud forests cover the high altitude land above 300 m, which is home to terrestrial and epiphytic plants. Mountain stream vegetations developed in unique shapes are distributed in mountain stream zones, adapting to environments where they are exposed to swift currents when the water rises.
- As for animals, all species (except Okinawa spiny rat*) that are attributable to OUV of Northern part of Okinawa Island are confirmed here, including the Okinawa rail (EN), Okinawa woodpecker (CR), Ryukyu long-haired rat (EN), Ryukyu black-breasted leaf turtle (EN), and all the globally threatened frogs. The existence of these species is supported stably by the good forest environments.

* Habitats of the Okinawa spiny rat are limited to a certain area in the northern part of Okinawa Island due to predation by mongooses in the past, etc. and so far its existence is not confirmed in the returned land. However, this area is close to the species limited habitat and it is expected that recent progresses of mongoose control may contribute to the expansion of its habitat to the neighbouring areas including the returned land.

Table 2-38 Expansion of Yambaru National Park (land area)

	National Park designation (September 2016)	After National Park expansion (June 2018)
Special Protection Zone	789 ha	3,009 ha (+2,220 ha)
Class I Special Zone	4,428 ha	5,001 ha (+573 ha)
Class II Special Zone	4,054 ha	4,413 ha (+359 ha)
Class III Special Zone	3,345 ha	3,857 ha (+512 ha)
Ordinary Zone	1,006 ha	1,031 ha (+25 ha)
Total terrestrial area	13,622 ha	17,311 ha (+3,689 ha) *1

*1 Out of the returned land, an area of 3,567 ha was incorporated into the National Park. However, the sum of the expanded land area is not 3,689 ha, due to the incorporated area other than the returned land.

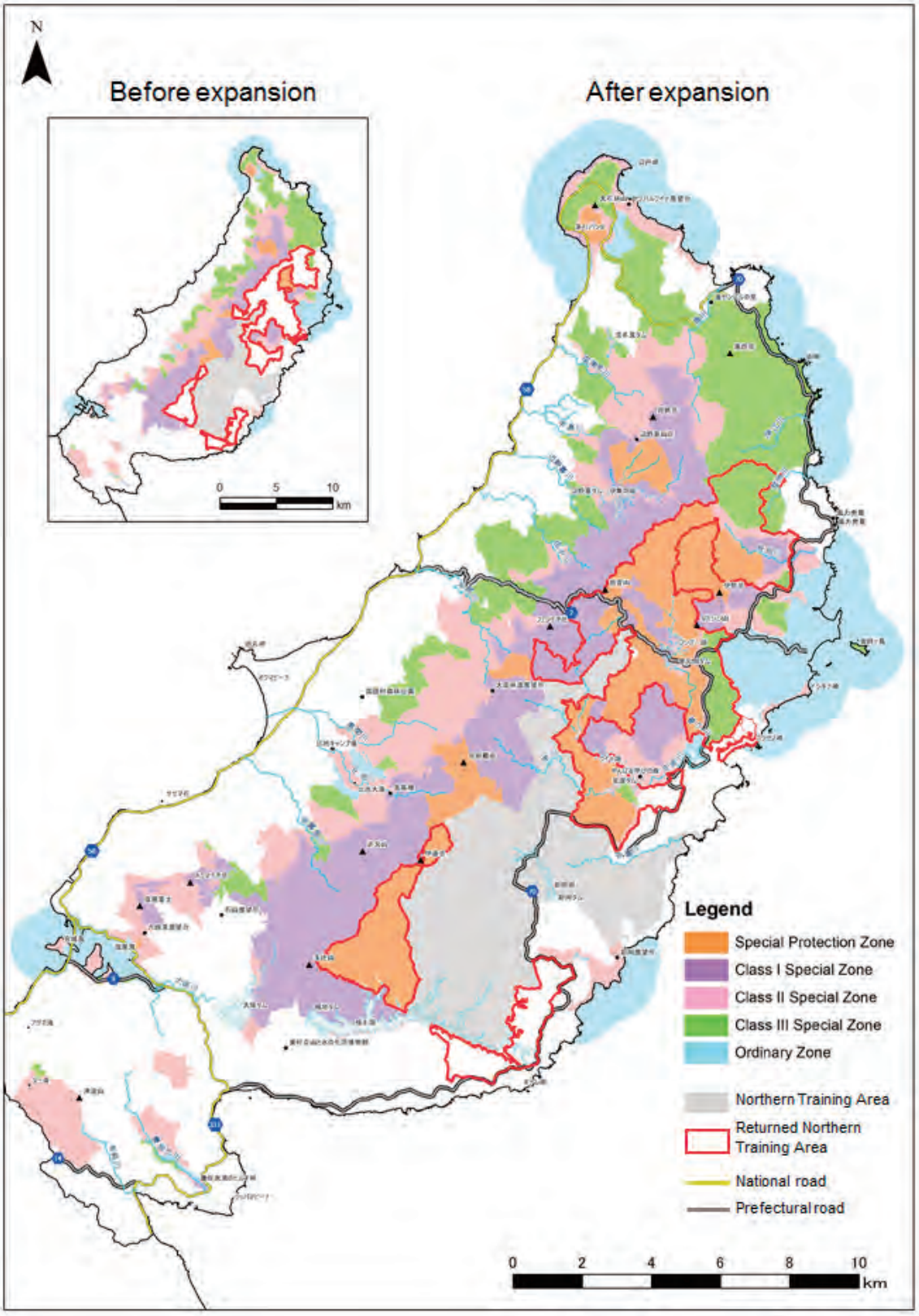


Figure 2-27: Expansion and zoning of Yambaru National Park

2. b. 3. 2. History of coordination with local stakeholders concerning the designation and expansion of the Forest Ecosystem Reserve

The Forestry Agency, which is in charge of national forests in the four regions containing the nominated property, has promoted the following designation and expansion of the Forest Ecosystem Reserve (Figure 2-28).

(1) Designation of the Amami Gunto Forest Ecosystem Reserve (2013)

The Kyushu Regional Forest Office of the Forestry Agency established a Committee for the Designation of the Amami Island Group Forest Ecosystem Reserve in 2008 and designated the Amami Gunto Forest Ecosystem Reserve in 2013, after consideration in the Committee over five times.

In addition, the Amami Gunto Forest Ecosystem Reserve Conservation Management Committee was established in 2014, comprising experts, stakeholders, and related local governments, and the Forest Ecosystem Reserve Conservation Management Plan was formulated in 2016, after consideration in the Committee over four times.

(2) Designation of the Yambaru Forest Ecosystem Reserve (2017)

Following the return of land of approximately 4,166 ha in northern part of Okinawa Island to the Government of Japan in December 2016, the Kyushu Regional Forest Office of the Forestry Agency newly designated the Yambaru Forest Ecosystem Reserve targeting many of the national forests in the returned land in December 2017, based on consideration in the Protection Forest Management Committee of the Kyushu Regional Forest Office, comprising experts and relevant local governments, over four times from May 2017.

In addition, the Protection Forest Management Committee of the Kyushu Regional Forest Office prepared the Yambaru Forest Ecosystem Reserve Conservation Management Plan (Draft) in December 2018, after consideration over twice from August 2018. Consideration shall be promoted further in the coming period, and the Yambaru Forest Ecosystem Reserve Conservation Management Plan will be formulated by March 2019.

(3) Expansion of the Iriomote Island Forest Ecosystem Reserve (2012 and 2016)

The Kyushu Regional Forest Office of the Forestry Agency established a Committee for the Designation of the Iriomote Island Forest Ecosystem Reserve that comprises experts, stakeholders, and relevant local governments, in 2009, and expanded the reserve in 2012, after consideration in the Committee over three times. Later on, in 2016, the reserve was further expanded after consideration in the Committee.

In addition, the Iriomote Forest Ecosystem Reserve Conservation Management Committee was established, comprising experts, stakeholders, and relevant local governments, in 2012. It formulated the Forest Ecosystem Reserve Conservation Management Plan in 2016, after consideration in the Committee over five times.

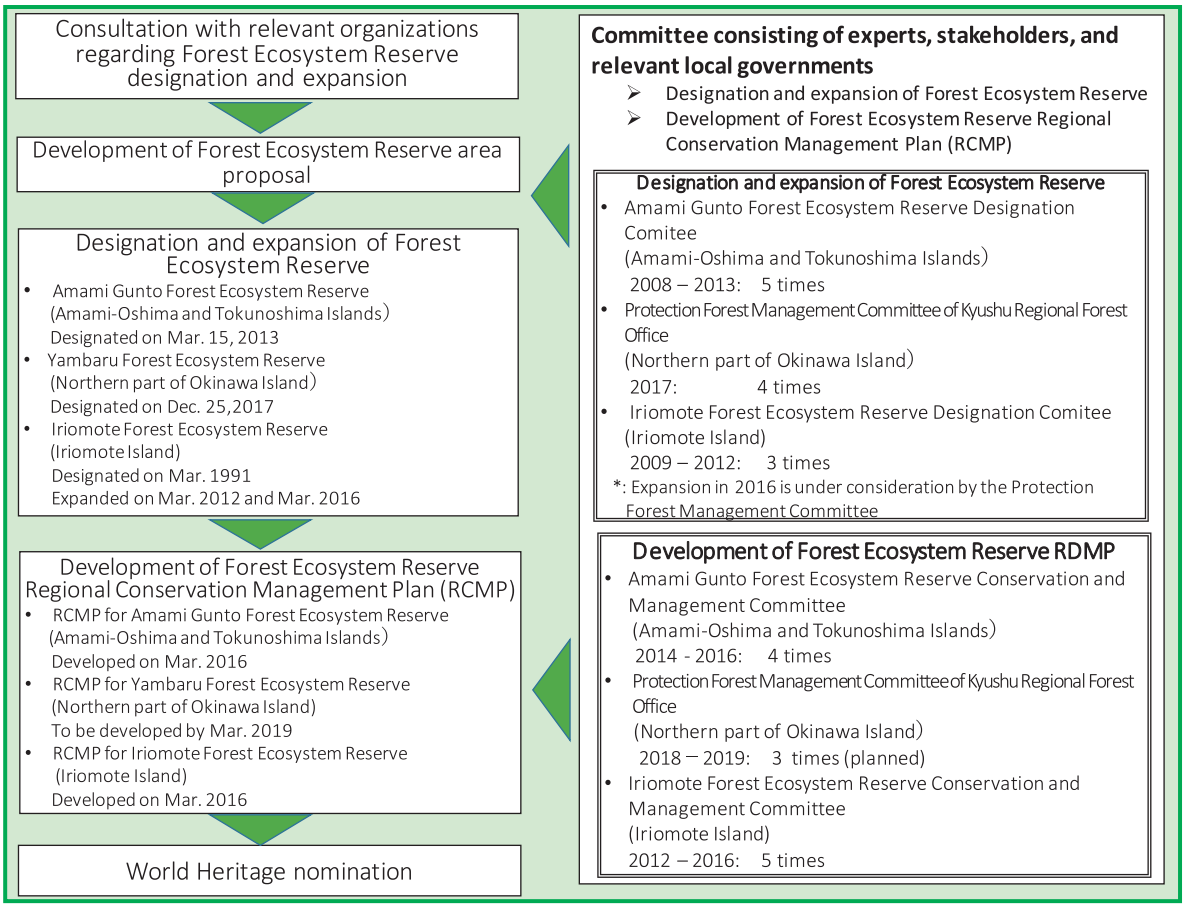


Figure 2-28: Coordination processes with local stakeholders for several years before and after the designation and expansion of the Forest Ecosystem Reserves

2. b. 3. 3. Coordination processes with local stakeholders concerning World Heritage nomination and formulation of the Comprehensive Management Plan

The Scientific Committee, comprising experts, was established by MOEJ, Forestry Agency, Kagoshima Prefecture, and Okinawa Prefecture in 2013 (see 5.e.2. Figure 5-4). The Committee organized eight sessions for extracting nominated property, proving its values, determining the area for nomination, and so on, through scientific examinations, and prepared the nomination documents. With regard to nomination details, MOEJ and relevant local governmetns have explained to and shared information with local residents through explanatory sessions (Figure 2-26), toward designation and expansion of the National Park and World Heritage nomination.

In addition, MOEJ, Forestry Agency, Kagoshima Prefecture, and Okinawa Prefecture established, in 2014, the Amami Working Group and Okinawa Working Group under the Scientific Committee, which were held once or twice a year as a platform for scientific examination and coordination regarding the management of the nominated property (Figure 5-4). With scientific advice from experts that are affiliated to respective working groups, after 2015, the Comprehensive Management Plan of the nominated property was considered in the sub-local meetings comprising local stakeholders in the four respective areas, which were held once or twice a year respectively. Ultimately, the Plan was approved (as stated in detail in 5.e.1 and 5.e.2) by the Regional Liaison Committee, a higher organization of the sub-local meetings and comprising relevant administrative organizations relating to all four regions containing the nominated property, which was held once or twice a year (Figure 5-4).

Box 9. History of Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island

In 2003, MOEJ and the Forestry Agency jointly established the Committee to Review Candidates of World Natural Heritage, and selected three areas, including this property, Shiretoko, and the Ogasawara Islands, as new candidates from Japan as World Natural Heritages. The Committee assessed that this property possessed diverse and highly endemic subtropical ecosystems and that it provides habitats for threatened species. However, it was indicated as a challenge that some parts of the important areas such as habitats, etc. for threatened species have not been sufficiently protected and secured.

Since 2003, MOEJ and the Forestry Agency have conducted detailed investigations and coordination with local communities, toward new designation or expansion of protected areas relating to this property. As a result, MOEJ expanded Iriomote Ishigaki National Park in April 2016, Yambaru National Park in September of the same year, and designated Amami Island Group National Park in March 2017. In addition, the Forestry Agency designated the Amami Island Group Forest Ecosystem Reserve in 2013 and expanded the Iriomote Forest Ecosystem Reserve in 2012 and 2016 (see 2.b.3. for details). During this period, the United States Government returned the land of approximately 4,166 ha from Northern Training Area (NTA) in the northern part of Okinawa Island to the Government of Japan.

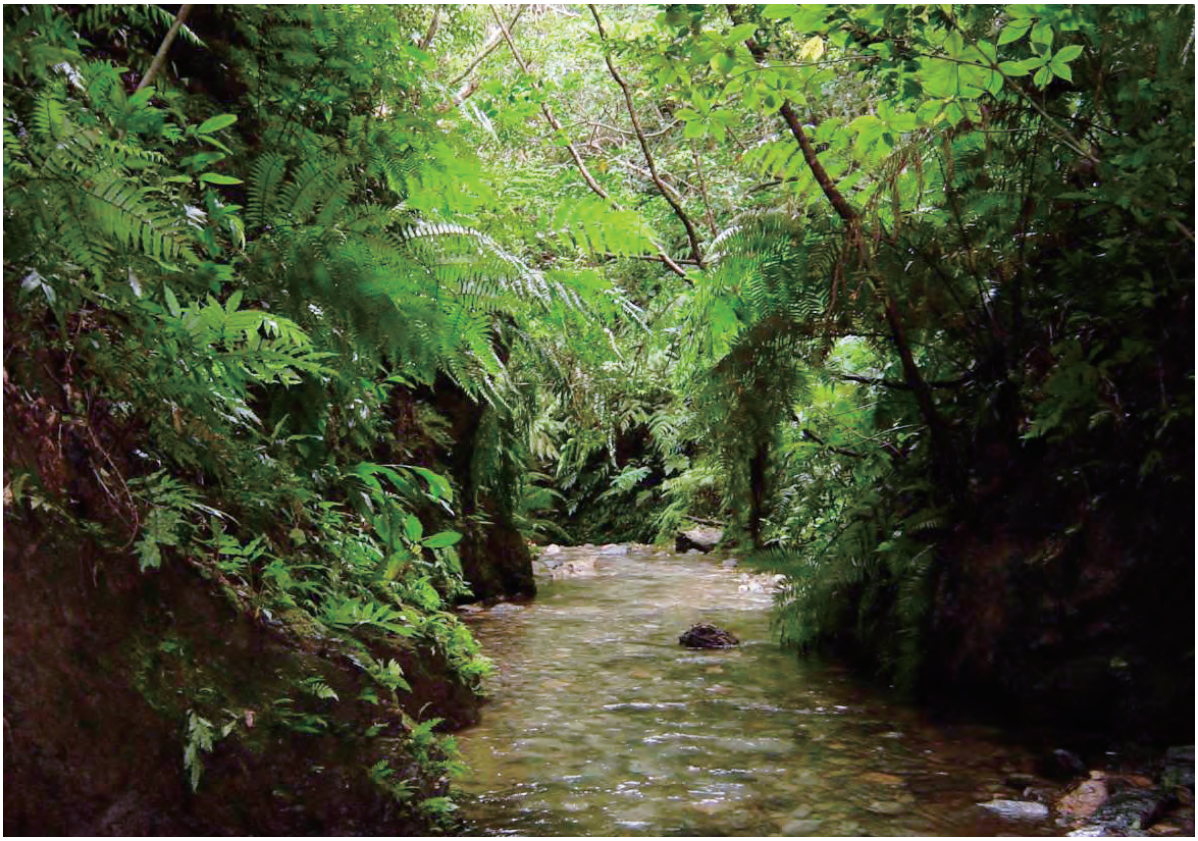
Since 2013, MOEJ, the Forestry Agency, Kagoshima Prefecture, and Okinawa Prefecture have established the Scientific Committee comprising experts, the Regional Liaison Committee comprising related administrative organizations in all of the four areas, sub-local meetings for respective areas comprising related administrative organizations and local organizations, for considering and preparing the nomination document and Comprehensive Management Plan (see 5.e.1 and 5.e.2 for details). MOEJ and related municipalities explained about contents in the nomination documents to local residents to share information (Figure 2-22).

Following these processes, the Government of Japan submitted the nomination letter of this property to the UNESCO World Heritage Center on February 1, 2017. Subsequently, after an investigation by the IUCN, which is an advisory organization of the World Heritage Committee, the Government of Japan was notified, in May 2018, with a technical assessment report by the IUCN that recommended postponement of listing this property in the World Heritage List. The Government of Japan withdrew its nomination of this property, following these assessment results. Thereafter, with regard to designating the returned land from NTA as a protected area, reviewing the boundary of the nominated property, etc., the Government of Japan independently invited Mr. Bastian Bertzky, Scientific Adviser of IUCN, for field visits and his advice, in order to respond to indications and recommendations in the IUCN technical report. The present nomination is a result of those preparations (see 2.b.3, Box 8, Annex 1).

Mountain torrent basins within the returned land in Northern Training Area (NTA)
(Photo: MOEJ)

3

Justification for Inscription



Mountain stream of the Okuma River, the northern part of Okinawa Island (Photo: MOEJ)

3. Justification for Inscription

3.1.a. Brief synthesis

The nominated property is a terrestrial serial site covering 42,698 ha comprised of five component parts in four regions, Amami-Oshima Island, Tokunoshima Island, and the Northern part of Okinawa Island in the Central Ryukyus, and Iriomote Island in the South Ryukyus. These four islands containing the nominated property are members of the Ryukyu Chain at the southern tip of the Japanese archipelago aligned in an arc shape along the eastern rim of the Eurasian Continent. The nominated property stretches about 750 km from northeast to southwest. Influenced by the Kuroshio Current and the subtropical high-pressure system that sits over the west part of north Pacific Ocean, it has a warm and humid subtropical climate and is covered mainly with evergreen broadleaved subtropical rainforests.

The nominated property is the best representative of the Central and South Ryukyus, which is one of the most biologically diverse areas in the Japanese archipelago of which the global importance in the conservation of biodiversity is recognized. The nominated property has large number of species in many taxonomic groups including many threatened species and the proportion of threatened species is high. As a whole, around 57% of the terrestrial vertebrates of the Biodiversity Hotspot of Japan, including 44% of species endemic to Japan as well as 36% of globally threatened vertebrates in Japan, are living in the four regions containing the nominated property.

In addition, the nominated property has many species endemic to the Central and South Ryukyus. For example, 75 species out of the 95 globally threatened species in the nominated property are endemic to the Central and South Ryukyus, and the rate of endemism is high in many taxonomic groups. Various examples of evolution of endemic species, especially many examples of relict and/or evolutionarily distinct species, are found in the nominated property.

These features of the biodiversity of the nominated property are all interrelated and derived from the geological history of the formation of the Central and South Ryukyus as continental islands. The terrestrial creatures of the Ryukyu Chain were separated from the relatives on the Eurasian Continent, and further divided by deep ocean and the Kuroshio Current to form the biota of the North, Central and South Ryukyus. The geological separation led to speciation and thus the biota of the Central and South Ryukyus became unique, and many examples of endemic species are found in non-flying terrestrial vertebrate groups, including terrestrial mammals, terrestrial reptiles and amphibians, and plants that were not able to cross the straits with ease. Also, the Central and South Ryukyus have differences in their patterns of speciation and endemism in the terrestrial biota because of differences in the distance from the continent and the timing of separation.

Thus, the nominated property is of overall high global irreplaceability for the protection of unique terrestrial species including many endemic and globally threatened species, reflecting its geological history as a continental island group with a long history of isolation, and contains the most important and significant natural habitats for *in-situ* conservation of the unique and rich biodiversity of the Central and South Ryukyus.

3.1.b. Criteria under which inscription is proposed

Criterion (x)

The nominated property is the best representative of the Central and South Ryukyus, which is one of the most biologically diverse areas in the Japanese archipelago of which the global importance in the conservation of biological diversity is recognized. The nominated property contains the most important and significant natural habitats for *in-situ* conservation of the unique and rich biodiversity of the Central and South Ryukyus. The nominated property is an area with high species richness in many taxonomic groups, including 95 globally threatened species, and the proportion of threatened species is high. Also, there are a large number and rate of endemic species, including many relict and/or evolutionarily distinct species, reflecting the geological history of the Central and South Ryukyus. The nominated property includes areas of overall high global irreplaceability for the protection of endemic and globally threatened species of Outstanding Universal Value.

The global significance for species conservation of the nominated property also has been internationally recognized, as shown in Table 3-1: the nominated property is situated within a Global 200 terrestrial priority ecoregion, the Nansei Shoto Archipelago Forests; and the Nansei Shoto Endemic Bird Areas. The nominated property includes three Important Bird Areas and Key Biodiversity Areas, and one Alliance for Zero Extinction site.

More details about the features of the nominated property are described below. The Japanese archipelago as a whole has been selected as one of the world's 36 terrestrial Biodiversity Hotspots by Conservation International. The four regions containing the nominated property, which together cover less than 0.5% of the Japan's land area, support a large proportion of the fauna and flora in Japan. For example, there are 1,819 vascular plants that account for 26% of the total vascular plant species in Japan, 21 terrestrial mammals (19%), 394 birds (62%), 36 terrestrial reptiles (50%), 21 amphibians (28%), and nearly 68% of inland water fish and 21% of insects (Table 3-2). As a whole, around 57% of the terrestrial vertebrates of Biodiversity Hotspot of Japan, including 44% of species endemic to Japan as well as 36% of globally threatened vertebrates in Japan, are living in the four regions containing the nominated property. The species richness in the nominated property results from a combination of factors including past climate changes, the diverse dispersal histories of species involving the Kuroshio Current and migratory birds, subtropical climate conditions, and the geographical location in a biogeographic transition zone, in addition to the history of formation of islands isolated from the continent. These effects are especially prominent in vascular plants and insects, and they show characteristic biotas with mixed elements of East Asia, Southeast Asia, and the Pacific Islands.

The fauna and flora of the nominated property includes 95 globally threatened species. These globally threatened species consist of 11 terrestrial mammals (52% of the native species in the nominated property), 12 birds (6%), 8 terrestrial reptiles (22%), 12 amphibians (57%), 6 inland water fish, 20 insects, and 26 vascular plants, including 14 Critically Endangered species (Table 2-8, Table 2-13, Table 2-16, Table 2-19, Table 2-22, Table2-25, Table 2-28). The Japanese Ministry of the Environment has identified more than 540 threatened species in the four regions containing the nominated property on their red list. As such, the number and rate of threatened species in respective taxonomic groups are large in the nominated property.

Table3-1: Priority areas for conservation on a global scale

Priority areas classification	Name of Priority areas	Selection rationale	Corresponding islands in the nominated property(○)				Sources
			Amami-Oshima Island	Tokuno-shima Island	Northern part of Okinawa Island	Iriomote Island	
Terrestrial hotspots	・Japan	・Selected as Japanese Archipelago. ・The Ryukyu Chain embraces many endemic species, including threatened species such as the Amami rabbit (*Pentalagus furnessi*), Okinawa spiny rat (*Tokudaia muenninki*), Amami tip-nosed frog (*Odorrana amamiensis*), and so on. The fauna and flora are different from the ones in the mainland Japan.	○	○	○	○	1)
Global 200: Priority Ecoregions for Global Conservation (Olson and Dinerstein, 2002)	・32 Nansei Shoto Archipelago Forests	・There are a very high number of endemic plant species and bird species. ・Iriomote Island is the sole habitat for the Iriomote cat (*Prionailurus bengalensis iriomotensis*), a globally rare and threatened species. ・It shows complicated patterns of endemism in the subtropical islands of East Asia. ・Key species: Iriomote cat, Amami rabbit, Okinawa rail (*Gallirallus okinawae*), and Okinawa woodpecker (*Sapheopipo noguchii*)	○	○	○	○	2)
EBA	・148 Nansei Shoto	・Habitat for restricted-range species: Okinawa rail, Okinawa woodpecker, Amami jay (*Garrulus lidthi*), Amami woodcock (*Scolopax mira*) and Amami thrush (*Zoothera dauma major*) etc.	○	○	○	○	3)
AZE site	・Yambaru, northern Okinawa forest	・Habitat for Okinawa spiny rat, Okinawa woodpecker, Okinawa rail, Namie's frog (*Limnonectes namiyei*), Okinawa Ishikawa's frog (*Odorrana ishikawae*) and Okinawa tip-nosed frog (*Odorrana narina*).	—	—	○	—	4)
IBA[*1]	・IBA JP158 Amami islands	・A1: Habitat for Amami woodcock, Amami thrush and Amami jay. ・A2: Habitat for Amami woodcock, Amami thrush and Amami jay etc.	○	○	—	—	5)
	・IBA JP159 Yambaru, northern Okinawa forest	・A1 and A2: Habitat for Okinawa rail, Amami woodcock, and Okinawa woodpecker.	—	—	○	—	
	・IBA JP166 Yaeyama islands	・A2: Habitat for Japanese woodpigeon (*Columba janthina*), Taiwan green-pigeon (*Treron formosae*). ・A4i: Habitat for grey-tailed tattler (*Heteroscelus brevipes*), ruddy turnstone (*Arenaria interpres*), roseate tern (*Sterna dougallii*), and black-naped tern (*S. sumatrana*)	—	—	—	○	
Key Biodiversity Areas (KBA)[*2]	・Amami Islands	・Habitat for eleven threatened species listed in the IUCN Red List, and eight restricted-range species. ・IBA JP158: Amami islands	○	○	—	—	6)
	・Yambaru	・AZE site: Yambaru, northern Okinawa forest ・Habitat for 20 threatened species listed in the IUCN Red List, and four restricted-range species. ・IBA JP159: Yambaru, northern Okinawa forest	—	—	○	—	
	・Yaeyama Islands	・Habitat for14 threatened species listed in the IUCN Red List, and five restricted-range species. ・IBA JP166: Yaeyama islands	—	—	—	○	

*1: A1: The site is known or thought regularly to hold significant numbers of a globally threatened species or species that need to be globally protected. A2: The site is known or thought to hold a significant number of restricted-range species. A4i: The site is known or thought to hold congregations of ≥1% of the biogeographic populations of waterbirds..

*2: For Japanese selections, vertebrates and insects are targeted. Among threatened species in the IUCN Red List and the MOEJ Red, habitats for Japanese endemic species are targeted as habitats with risks, and habitats for restricted-range species as targeted as irreplaceable. IBA and AZE are all incorporated in KBA in the Japanese selection.

Sources: 1) Critical Ecosystem Partnership Fund (2008), 2) Olson et al. (2000), Olson and Dinerstein (2002), 3) Birdlife International (2018a), 4) Website of the Alliance for Zero Extinction, 5) Birdlife International (2018b), 6) Birdlife International (2018c); Natori et al. (2012)

Table 3-2: Numbers of species inhabiting the four regions containing the nominated property and the rates of endemic and threatened species

Taxonomic group	Number of species in Japan	Number of species endemic to Japan	Rate of endemic species to total species in Japan	Number of threatened species in Japan (IUCN RL)*1	Number of threatened species in Japan (MOEJ RL)*2	Number of species inhabiting the nominated property (Rate to total species in Japan)	Number of species endemic to the nominated property (Rate to total endemic species in Japan)	Rate of endemic species to total species in the nominated property	Number of threatened species inhabiting the nominated property (IUCN RL) (Rate to total threatened species in Japan)	Number of threatened species inhabiting the nominated property (MOEJ RL) (Rate to total threatened species in Japan)	Sources
Vascular plants *3	Approx. 7,000	Approx. 2,800	Approx. 40%	47	1,786	1,819 (26%)	188 (7%)	10%	26 (55%)	361 (20%)	1)
Terrestrial mammals	108	42	39%	29	33	21 (19%)	13 (31%)	62%	11 (38%)	13 (39%)	2)
Birds *4	633	11	2%	49	97	394 (62%)	4 (36%)	1%	12 (24%)	36 (37%)	3)
Terrestrial reptiles	72	47	65%	19	37	36 (50%)	23 (49%)	64%	8 (42%)	13 (35%)	4)
Amphibians	74	65	88%	20	29	21 (28%)	18 (28%)	86%	12 (60%)	10 (34%)	4)
Inland water fishes*6	Approx. 400	-	-	19	169	267 (68%)	13 -	5%	6 (32%)	69 (41%)	5)
Vertebrates*5	Approx. 1,287	165	13%	136	365	739 (57%)	71 (44%)	10%	49 (36%)	137 (38%)	–
Insects*6	Approx. 30,000	-	-	36	363	6,153 (21%)	1,607 -	26%	20 (56%)	37 (10%)	6)
Inland decapod crustaceans*6	73	38	52%	2	21	47 (64%)	15 (39%)	32%	0 (0%)	5 (24%)	7)

Sources: 1) Ministry of the Environment (2014a); 2) Abe (2008) and Odachi et al. (2015, 2016); 3) Takagi (2007) and Ornithological Society of Japan (2012); 4) Herpetological Society of Japan (2017); 5) Ministry of the Environment (2014b); 6) Biodiversity Center of Japan, Ministry of the Environment (2010); 7) Hayashi (2011)

The numbers of species for the nominated property are based on the Annex 3-2: Species lists.

*1: The numbers of species for the IUCN Red List are based on ver 2018-1. Summary Statistics Table 5. For terrestrial mammals, terrestrial reptiles, and fishes, marine species were excluded. Assessments for the IUCN Red List are, in principle, conducted at a species level. However, the Iriomote cat and the Steller sea lion, which are subspecies of mammals, as well as the Ryukyu ayu-fish, Japanese rosy bitterling, and *Oncorhynchus masou ishikawae* which are subspecies of inland water fishes, are counted as species as they have been assessed at a subspecies level and there are no other threatened subspecies belonging to the same species in Japan. Likewise, each subspecies of insects is counted as one species because insects are assessed only at the level of subspecies, not at the level of species.

*2: The numbers of species for the MOE Red List include subspecies (vascular plants also include varieties).

*3: The numbers of plant species include subspecies, varieties, and hybrids (excluding those listed on the IUCN Red List).

*4: The numbers of threatened species of birds inhabiting the nominated property do not include those recorded as vagrants.

*5: For vertebrates, the number of species endemic to Japan, the rate of endemic species to total species in Japan, and the rate of species endemic to the nominated property to total endemic species in Japan do not include inland water fishes.

*6: The figures of these taxonomic groups are the data for the four islands including the whole Okinawa Island.

The species listed on the IUCN Red List of Threatened Species (2018-1) include followings: terrestrial mammals including the Iriomote cat (*Prionailurus bengalensis iriomotensis*) (CR), Okinawa spiny rat (*Tokudaia muenninki*) (CR), Yanbaru whiskered bat (*Myotis yanbarensis*) (CR), Amami rabbit (*Pentalagus furnessi*) (EN), Amami spiny rat (*Tokudaia osimensis*) (EN), Tokunoshima spiny rat (*Tokudaia tokunoshimensis*) (EN), and Ryukyu long-haired rat (*Diplothrix legata*) (EN); birds including the Okinawa woodpecker (*Sapheopipo noguchii*) (CR) and Okinawa rail (*Gallirallus okinawae*) (EN); reptiles including the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*) (EN), Asian brown pond turtle (*Mauremys mutica*) (EN), yellow-margined box turtle (*Cuora flavomarginata*) (EN), banded ground gecko (*Goniurosaurus splendens*) (EN), and Sakishima grass lizard (*Takydromus dorsalis*) (EN); amphibians including Anderson's crocodile newt (*Echinotriton andersoni*) (EN), Amami Ishikawa's frog (*Odorrana splendida*) (EN), Okinawa Ishikawa's frog (*Odorrana ishikawae*) (EN), greater tip-nosed frog (*Odorrana supranarina*) (EN), and Utsunomiya's tip-nosed frog (*Odorrana utsunomiyaorum*) (EN); inland water fish including the Ryukyu ayu-fish (*Plecoglossus altivelis ryukyuensis*) (EN); insects including the Yanbaru long-armed scarab beetle (*Cheirotonus jambar*) (EN) and a species of damselfly (*Rhipidolestes okinawanus*) (EN); vascular plants including wild gingers (*Asarum* species, CR: 4 species, EN: 5 species, VU: 2 species), *Arisaema* species (CR: 1 species, EN: 1 species), Amami violet (*Viola amamiana*) (CR), *Oxygyne shinzatoi* (CR), *Carex collifera* (CR); and others (Table 2-10, Table 2-14, Table 2-17, Table 2-20, Table 2-23, Table2-26, Table 2-29).

Seventy-five (79%) of the 95 globally threatened species in the nominated property are endemic to the Central and/or South Ryukyus. There are abundant examples of diverse speciation and endemic species from invertebrates to mammals and plants in the nominated property, and thus the number of endemic species are large in respective taxonomic groups, and the levels of endemism are also high (Table 3-2). For example, 188 species out of 1,819 species of vascular plants are endemic, as well as 1,607 out of 6,153 insect species are endemic to the Central and/or South Ryukyus. Especially, there are quite high rates of endemic species among terrestrial mammals (62%), terrestrial reptiles (64%), amphibians (86%), and fresh water crab species of Potamonidae (100%).

One of the unique features of the nominated property is that not only the large number of species endemic to the Central and/or South Ryukyus are seen, but also abundant cases of relict and new endemic species are found, reflecting its formation process as continental islands (Table 2-32).

Relict endemic species are the descendants of ancient species that have survived only in isolated area, while their conspecifics and related species and lineages that used to inhabit the neighboring areas have been driven extinct by various reasons including predation and fierce competition. Relict endemic species generally have large genetic differences with their related species and lineages that inhabit other areas and are characteristically distributed in discontinuous areas. Many of them can be seen in the Central Ryukyus and representative examples of relict endemic species in the nominated property include monospecific Amami rabbit that occurs only on Amami-Oshima and Tokunoshima Islands (see Box 2); Amami jay (*Garrulus lidthi*) on Amami-Oshima Island; Ryukyu black-breasted leaf turtle and Namie's frog (*Limnonectes namiyei*) in the Northern part of Okinawa Island; and Ryukyu long-haired rat and Anderson's crocodile newt distributed on three islands of the Central Ryukyus containing the nominated property. There are also plant relict endemic species such as *Arisaema heterocephalum* (Araceae), *Viola amamiana* (Violaceae) and *Polystichum obae* (Dryopteridaceae).

The Central Ryukyus also offer examples of relict endemic species that have further speciated into different species or subspecies now endemic to individual islands (i.e. new endemic species). One example is the spiny rats which separated into three species that are endemic to Amami-Oshima Island, Tokunoshima Island and Okinawa Island, respectively (see Box 3). Another example is the species group of Ryukyu ground gecko which separated into different endemic species and subspecies in each of Tokunoshima Island, Okinawa Island (both of which contain the nominated property) and other surrounding islands.

On the other hand, in the South Ryukyus, a number of new endemic species are observed that evolved by the separation from the Central Ryukyus by Kerama Strait. The typical examples include the group of Habu vipers (Habu viper *Protobothrops flavoviridis* in the Central Ryukyus and Sakishima habu viper *P. elegans* in South Ryukyus) and the group of grass lizards (green grass lizard *Takydromus smaragdinus* in the Central Ryukyus and Sakishima grass lizard *T. dorsalis* in South Ryukyus) (Table 2-32). Further, after the South Ryukyus were separated from the continent, they were temporarily connected with and then separated from Taiwan, and during that period, some terrestrial species moved into Taiwan from the South Ryukyus. Also, there are some species that are considered to have moved into the South Ryukyus crossing the sea from the continent in the Pleistocene glacial period when the sea level declined. From these events, there are various new endemic species and subspecies in the South Ryukyus, resulting from the speciation between the South Ryukyus and Taiwan or the Continent. The former species are represented by the Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*), Yaeyama pond turtle (*Mauremys mutica kami*), and Kishinoue's giant skink (*Plestiodon kishinouyei*), while the latter species include the Iriomote cat (*Prionailurus bengalensis iriomotensis*) and Ryukyu wild boar (*Sus scrofa riukiuanus*) (Table 2-32). Many of these species live on Iriomote Island, one of the component parts of this nomination.

Speciation between populations that inhabit different islands and development of endemism is still ongoing to this date. As a result of genetic differentiation caused by isolation into different geographic populations through the geological formation of the islands, various examples of speciation into species/subspecies endemic to each individual island across the Central and South Ryukyus can be seen. Typical examples include the group of tip-nosed frogs, that have separated into four different species in the Central and South Ryukyus (see Box 4), wild gingers (species of *Asarum*) that have speciated into 14 species on the four islands containing the nominated property, and inland water crabs of Potamonidae that have speciated into 10 species on the four islands containing the nominated property.

Among these endemic species in the nominated property, there are as many as 20 species identified as Evolutionarily Distinct and Globally Endangered (EDGE) species by the Zoological Society of London, i.e. they have no or few close relatives in their evolutionary lineage and also are globally threatened. The 20 EDGE species consist of 6 terrestrial mammals i.e. the Amami rabbit, Ryukyu long-haired rat, Amami spiny rat, Tokunoshima spiny rat, Okinawa spiny rat, and Ryukyu bent-winged bat (*Miniopterus fuscus*); 3 bird species i.e. the Okinawa rail, Amami woodcock (*Scolopax mira*), and Amami jay; 6 terrestrial reptiles i.e. the Ryukyu black-breasted leaf turtle, Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*), banded ground gecko, Sakishima grass lizard, Kishinoue's giant skink, and Barbour's blue-tailed skink (*Plestiodon barbouri*); and 5 amphibian species i.e. the Okinawa Ishikawa's frog, Namie's frog, Otton frog (*Babina subaspera*), Yaeyama harpist frog

(*Nidirana okinavana*), and Anderson's crocodile newt. Of these, the Okinawa spiny rat (54th), Ryukyu black-breasted leaf turtle (47th), and Kuroiwa's ground gecko (74th) are ranked in the Top 100 EDGE species indicating the highest priority for conservation in each taxonomic group (Zoological Society of London, https://www.edgeofexistence.org/species/).

The species richness, large number and high rate of threatened species and endemic species, and diverse examples of speciation and unique evolution, are all interrelated and have resulted from the geological history of the Central and South Ryukyus that formed as continental islands as described below. The Ryukyu Chain was part of the Eurasian Continent at its eastern rim until the middle Miocene (Neogene, approx. 15 Ma) and thus the terrestrial biota of this area was common with that of the neighboring parts of the continent. Later, the Ryukyu Chain was separated from the continent by the development of Okinawa Trough, and formed an archipelago of small islands. The creatures of the Ryukyu Chain were divided into the North, Central and South Ryukyus by three deep straits and the Kuroshio Current, and they received further the effect of sea-level changes during the glacial period. During these processes, the terrestrial creatures became isolated, were fragmented in their distribution and went through the unique processes of evolution. The isolation history of terrestrial biota is longer in the Central and South Ryukyus than that of the North Ryukyus and Taiwan that were connected to the mainland Japan and the continent, respectively, at the time of declined sea level during the Pleistocene glacial period. For this reason, in the Central and South Ryukyus, such examples of endemic species are clearly shown in non-flying terrestrial vertebrate groups, including terrestrial mammals, terrestrial reptiles and amphibians, and plants that were not able to cross the straits with ease. Thus, the speciation increased the number of endemic species and number of species, together with other factors mentioned before. Many species are now classified as threatened because of their limited habitat and limited size of population that make them vulnerable to threats like predation by invasive alien species.

The so-called "irreplaceability scores" of the nominated property, which show its importance for the conservation of endemic and/or threatened species are comparable or higher than those of several existing World Heritage properties (see 3.2.4.3. Table 3-16). Thus, the nominated property is a globally unique and important habitat for many endemic species and threatened species, which is irreplaceable for *in-situ* conservation of biodiversity.

3.1.c. Statement of Integrity

As described below, the nominated property includes all the elements necessary to express its Outstanding Universal Value as a serial nomination, is of adequate size to ensure the complete representation of its biodiversity values, and does not suffer from adverse effects of development or neglect. As such, it fulfils the conditions of integrity for inscription on the World Heritage List, as described in Paragraphs 87–95 of the Operational Guidelines.

3.1.c.1. Integrity of the nominated property

The key attributes expressing the Outstanding Universal Value of this property are many endemic species and threatened species. In the four regions containing the nominated property, around 90% of endemic species and globally threatened species of the Central and South Ryukyus are present for the taxonomic groups of vascular plants, terrestrial mammals, birds, reptiles, amphibians, inland water fish, insects, and inland water decapod

crustaceans. They also support approximately 90% of native species of the region among the same taxa (Table 3-4 and Figure 3-3). Furthermore, these regions include the most important areas with a concentration of 20% of Japanese threatened species of plants (listed on MOEJ Red List 2018).

The four regions containing the nominated property consist of mountains and hills with relatively high altitudes, meaning that rivers and streams are well developed. In these regions, the intact and contiguous subtropical rainforests with old trees exist in relatively large clusters securing particularly stable habitats. Some parts of these rainforests have been affected by human activities in the past, but have recovered to an almost natural state, thanks to the vigorous sprouting capacity of the dominant species, *Castanopsis sieboldii*. They are now providing important habitats for species.

The five component parts of the nominated property form core areas that contain the most important actual and potential distributional areas of endemic species and threatened species that are key attributes expressing the Outstanding Universal Value of this property. The nominated property possess substantial size of the intact subtropical rainforests and all of other main habitats that are required for sustaining these species, such as cloud forests around top of the mountains, mountains and hills with intricate mazes of small ridges, valley and rivers, and lower wetlands around river mouths. Each component has different characteristic endemic and/or threatened species, and if any of the five components were to be missed, it would be impossible to understand the whole picture of the unique characteristics of the biota of the Central and South Ryukyus.

As for the Tokunoshima Island, the nominated property consists of two component parts, (a) and (b), that cover the northern and southern mountains respectively. Between two component parts, there are some differences in vegetation and distribution of threatened plant species, for example, only component part (a) includes the mountain with cloud forests. However, both of them are important habitats for many endemic and/or globally threatened species. Recent research revealed that Amami rabbits have interacted between the two mountain areas while keeping unique genetic characteristics in each area (Ando et al. 2018), and it is considered important to protect both mountain areas for the conservation of the species.

3.1.c.2. Controlling threats to integrity of the property

Key threats to the plants and animals, which are major attributes of the nominated property, include: the impacts of invasive alien species such as small Indian mongoose and cats; wildlife roadkills; and the illegal collection of wild rare and threatened species. For the impacts from these threats, the risks to the nominated property are prevented or mitigated by the following measures implemented through collaboration among related administrative organs, private organizations and local communities (see 4.a.2):

- Small Indian mongoose control projects on Amami-Oshima Island and in the Northern part of Okinawa Island;
- Measures to prevent traffic accidents involving wildlife on the four islands containing the nominated property;
- Ordinances on the Proper Keeping and Management of Pet Cats and measures to control feral cats in habitats of rare species (in forests) on the four islands containing the nominated property;

- Designation of protected species based on laws and ordinances, and monitoring/patrols to control illegal harvesting on the four islands containing the nominated property.

In recent years, tourism industry, such as eco-tours utilizing natural resources of each islands, has developed, and ecotourism guidelines for sustainable tourism use have been established in Amami-Oshima Island, Tokunoshima Island and the Northern part of Okinawa Island, and similar guidelines are under preparation on Iriomote Island.

3.1.d. Statement of Authenticity

Not applicable because this nomination does not claim cultural values.

3.1.e. Protection and management requirements

The nominated property is appropriately managed based on relevant Acts and regulations with adequate resources. The nominated property is designated as Special Protection Zones or Class I Special Zones of Amamigunto National Park, Yambaru National Park, and Iriomote-Ishigaki National Park (IUCN Management Category: II); and/or the Preservation Zones of Amamigunto Forest Ecosystem Reserve, Yambaru Forest Ecosystem Reserve and Iriomote Forest Ecosystem Reserve (IUCN Management Category: Ib). The nominated property also includes small areas of the Class II Special Zone of National Park and/or the Conservation and Utilization Zone of Forest Ecosystem Reserve, however, these areas are planned to be upgraded to the Class I Special Zone by the end of JFY2019 (March 2020) after the necessary procedures based on relevant laws and regulations, and the landowners and stakeholders have already agreed to treat these lands in a similar manner as the Class I Special Zone. In addition, the nominated property is designated as National Wildlife Protection Area and Natural Monument Protection Area (Table 3-3) (See Chapter 5 for details). The nominated property is thereby protected by the highest-ranked strict protection measures in the Japanese protected area system, and is ensured of appropriate long-term protection. Moreover, most parts of the five component parts are public lands owned and managed by a public body (national or local government). Although Amamigunto National Park currently includes some private lands, the process of gradual transition to public ownership according to a plan is ongoing.

The four regions containing the nominated property are all small island areas, and people have settled there and engaged in mainly agriculture and forestry from a long time ago. They are inhabited by more than 100,000 people. Some of the endemic and threatened species of the nominated property, such as Iriomote cat, Amami jay, Okinawa rail and Okinawa woodpecker, appear not only in the nominated areas, which are the main habitats for them, but also in the surrounding secondary forests and farmlands. The places for residents' lives and industrial activities are close to the habitats for endemic species and threatened species. To enable the coexistence of protection of the property and the people's livelihoods, buffer zones were set up mainly in the Class II Special Zone of the National Park and/or the Conservation and Utilization Zone of the Forest Ecosystem Reserve, adjacent to the nominated property. In the buffer zones, industrial activities are carried out in sustainable way so as to avoid direct impact on the nominated property (see Chapter 5).

In addition to the establishment of buffer zones, a broader range of conservation and management measures are needed to counter threats to the nominated property mentioned above, i.e. invasive alien species such as

mongooses and cats, wild animal roadkill, and illegal capture and collection of rare species, as well as potential impact on the nominated property from tourism. Therefore, Surrounding Conservation Areas are designated under the Comprehensive Management Plan. Surrounding Conservation Area is an area where the management agencies and private organizations or relevant stakeholders are coordinated to conduct relevant initiatives, such as conservation and management through legal or customary means, including the designation of Class III Special Zone of the National Park, sustainable use, dissemination and awareness raising regarding the conservation of World Heritage sites, in order to eliminate and reduce any threats and negative impacts on the property. In the Comprehensive Management Plan, the whole islands excluding the nominated property and the buffer zones are designated as Surrounding Conservation Areas for Amami-Oshima Island (including satellite islands), Tokunoshima Island, and Iriomote Island. As for the Northern part of Okinawa Island, the administrative districts of three Yambaru villages are designated as Surrounding Conservation Area. In the parts of the nominated property that are not surrounded by buffer zones, neighboring Surrounding Conservation Areas contribute, like the buffer zones, to the maintenance of the Outstanding Universal Value into the future and conservation management of the property.

Considering the whole region, in which the nominated property is located, as a target area of the Comprehensive Management Plan, three different management categories were set up to facilitate the organic management of the nominated property in partnership with many stakeholders (refer to the Chapter 5 and Annex 2 for details).

Also, some endemic species and/or threatened species living in the nominated property, such as the Amami rabbit, Okinawa rail and Iriomote cat, have been designated and legally protected as National Endangered Species and/or National Natural Monuments. Control projects of mongooses and cats and other projects have been conducted as parts of the protection and recovery program of National Endangered Species as well as the programs against invasive alien species for conservation of rare species, and monitoring are conducted as part of these programs.

The nominated property is a serial property covered by multiple legal protection schemes. The administrative organs responsible for each scheme i.e. the Ministry of the Environment, the Forestry Agency, the Agency for Cultural Affairs, Kagoshima and Okinawa Prefectures, and 12 municipalities, have established the Regional Liaison Committee to facilitate and coordinate their works in the management of multilayered protected areas and protection of designated species. They manage the nominated property in a consistent manner based on the Comprehensive Management Plan. In addition, four sub-local meetings including local stakeholders as members have been set up under the Regional Liaison Committee to effectively carry out conservation and management of the nominated property through collaboration and cooperation with the local communities. Also, the Scientific Committee and its local Working Groups comprised of academic experts have been established to provide scientific advice to the conservation management by management authorities, and promote adaptive conservation management in light of scientific knowledge and insight (see 5.e.2., Figure 5-4).

Table 3-3: Protected areas relating to the nominated property

	Designation for protection
Amami-Oshima Island	Amamigunto National Park Mt. Yuwandake National Wildlife Protection Area Amamigunto Forest Ecosystem Reserve Kamiya and Mt. Yuwandake Natural Monument Protection Area
Tokunoshima Island	Amamigunto National Park Amamigunto Forest Ecosystem Reserve
Northern part of Okinawa Island	Yambaru National Park Yambaru Forest Ecosystem Reserve Yambaru (Ada area) National Wildlife Protection Area Yambaru (Aha area) National Wildlife Protection Area Mt. Yonahadake Natural Monument Protection Area
Iriomote Island	Iriomote-Ishigaki National Park Iriomote National Wildlife Protection Area Iriomote Forest Ecosystem Reserve Nakama River Natural Monument Protection Area Natural Monument: Ubundul *Satakentia liukiuensis* community

Sakishima grass lizard (*Takydromus dorsalis*) (Photo: JWRC)

3.2. Comparative Analysis

As mentioned under 2.1.a. and 3.1., the country of Japan as a whole is recognized as one of the world's 36 terrestrial biodiversity hotspots, and the four regions containing the nominated property in the Central and South Ryukyus are one of the most biologically diverse areas in Japan. They have prominently high species diversity as well as high integrity securing a good amount of stable habitats. More than half of the terrestrial vertebrates of the whole biodiversity hotspot is represented on the four regions containing the nominated property, including many of the country's endemic vertebrates and globally threatened vertebrates. The level of endemism is also very high in many taxonomic groups (Table 3-2).

The nominated areas support about 90% of the many endemic and threatened species found in the Central and South Ryukyus, and include their most important habitats. This includes a number of species of global conservation concern, including 14 Critically Endangered species listed on IUCN Red List, a number of relict endemic species that represent ancient lineages, as well as 20 Evolutionarily Distinct and Globally Endangered (EDGE) species. The survival of these species depends on the remaining large, intact forest areas that are protected in the nominated property.

The nominated property lies within a Global 200 terrestrial priority ecoregion, the Nansei Shoto Archipelago Forests, and also belongs to the Nansei Shoto Endemic Bird Area. The nominated property includes Important Bird Areas and Key Biodiversity Areas, and Alliance for Zero Extinction site, all identified for their global significance for species conservation (Table 3-1).

3.2.1. Approach to comparative analysis

The comparative analysis has been conducted at three scales:

a) Sub-regional analysis: Comparing the four regions containing the nominated property with other islands in the Central and South Ryukyus to justify the site selection within the island chain;
b) National analysis: Comparing the nominated property with the existing natural World Heritage properties in Japan;
c) Regional and global analyses: Comparing the nominated property with neighbouring islands and island groups in East and Southeast Asia as well as with other subtropical islands that have already been inscribed on the World Heritage List under criterion (x).

The comparative analysis will demonstrate the outstanding value of the nominated property by making use of indicators across different taxonomic groups such as plants, mammals, birds, reptiles and amphibians. The indicators include the total number of species; the number of endemic, threatened and so-called Evolutionarily Distinct and Globally Endangered (EDGE) species; rates of endemism as well as so-called irreplaceability scores that represent the importance of a protected area for species conservation.

Locations of comparative sites are shown in Figure 3-1.

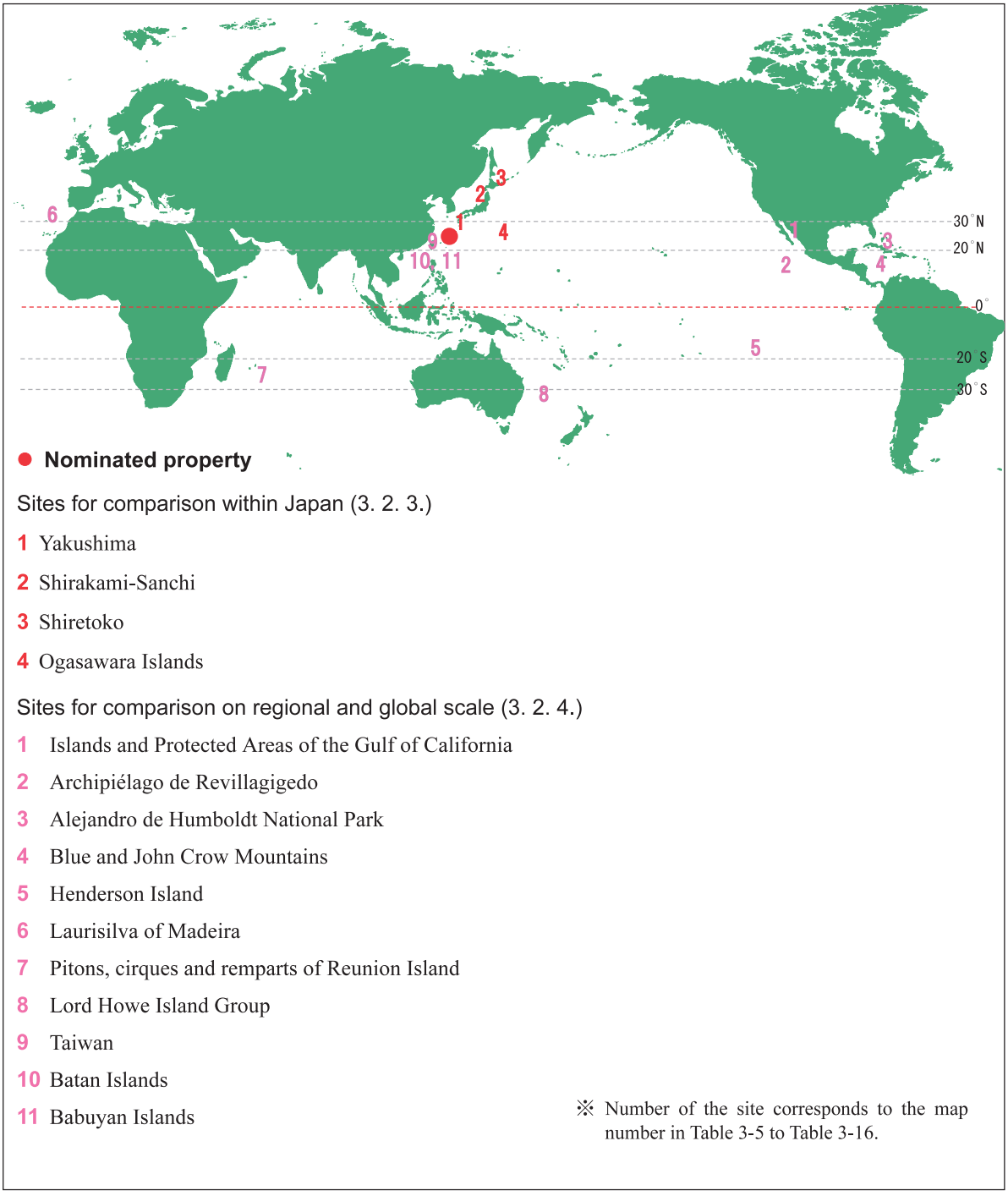


Figure 3-1: Distribution of comparative properties covered in the comparative analysis

3.2.2. Comparison within the Ryukyu Chain

The Ryukyu Chain was selected in 2003 as one of the new natural candidate sites for nomination to the World Heritage List, along with Shiretoko and the Ogasawara Islands, by the "Review Committee on Candidate Natural Sites for nomination to the World Heritage List" (see Box 9). The Committee was comprised of academic experts, and was jointly established by the Ministry of the Environment and the Forestry Agency.

1) Comparison of the North Ryukyus and the Central and South Ryukyus

The early stages of the preparation process for the nomination included a discussion of the differences between the North Ryukyus represented by Yakushima and the Central and South Ryukyus in the Ryukyu Chain. It is considered that, by the late Miocene (approximately 12 to 5 Ma), the biota of the North Ryukyus had already been separated from that of the Central Ryukyus by the Tokara Strait which is over 1,000 m deep (Okamoto 2017). On the other hand, the strait between mainland Kyushu and islands in the North Ryukyus is only around 100 m deep, and it is thought that islands in the North Ryukyus became connected with Kyushu during the last glacial period which occurred about 20 thousand years ago, when the sea surface declined by 120 to 140 m (Kaizuka and Naruse 1977; Tsukada 1983). Therefore, the biota of the North Ryukyus has a strong relation with Kyushu and other parts of mainland Japan, and represents a subset of the biota of Kyushu.

The terrestrial biota of the Central and South Ryukyus clearly differs from that of the North Ryukyus divided by the Tokara Strait. From a biogeographic perspective, the Watase Line, which coincides with the Tokara Strait, has been proposed as a boundary between the Palearctic and Indomalayan realms for the distribution of mammals, reptiles, and amphibians (Tokuda 1969). There are some publications reporting that the flora is also different on both sides of Tokara strait, though not so clear as the terrestrial fauna (Nakamura et al. 2009; Suzuki and Miyamoto 2018).

Therefore it is considered that the biota of the Central and South Ryukyus are biogeographically different from that of the North Ryukyus, and it was decided to focus on the Central and South Ryukyus in this nomination.

2) Comparison among the Central and South Ryukyus

The selection process of the nominated property from the Central and South Ryukyus through examinations at the Scientific Committee in 2013 was as follows.

The Central and South Ryukyus include the Amami Island Group, Okinawa Island Group, and Sakishima Island Group. In identifying islands to be included in the nomination, analytical indicators were defined in light of two conditions, i.e. a) the World Heritage criteria and b) the condition of integrity, as stipulated in the "Operational Guidelines for the Implementation of the World Heritage Convention". Then comparative scientific analyses for respective islands were conducted as follows and four islands having potential Outstanding Universal Value as a natural World Heritage property were identified.

a) Indicators in light of criterion (x)

The following five indicators were selected in light of criterion (x), since the nominated property is a critical habitat for many endemic species that are globally unique and also many globally threatened species, with the

background of isolation and speciation of terrestrial fauna and flora in the continental island reflecting its geological history.

(1) Number of endemic species (and subspecies) in terrestrial vertebrates *1

(2) Number of relict endemic species (and subspecies) in terrestrial vertebrates *1

(3) Number of new endemic species (and subspecies) in terrestrial vertebrates *1

(4) Number of threatened terrestrial vertebrate species (listed as CR, EN or VU on IUCN Red List)

(5) Number of threatened vascular plant species (listed as CR, EN or VU on the MOEJ Red List *2)

*1 Targets of indicators relating to endemic species were limited to terrestrial vertebrates for the following reasons;
- they need larger and diverse environment, and many of them are symbolic species in the ecosystem which reflect the geohistory of the Ryukyu Chain,
- in those taxa, certain evolutionary biological studies are in progress and they serve as a foundation to prove the Outstanding Universal Value.

*2 : For the Japanese vascular plant species, the number of species assessed in IUCN Red List is small, so we used the MOEJ Red List which covers almost all the species in Japan.

b) Indicators in light of integrity

Because endemic and threatened species with Outstanding Universal Value from science and conservation view point mainly inhabit in terrestrial subtropical rainforests, sufficient forest space need to be secured for the long-term survival of important species. So, the following three indicators were selected in light of integrity.

(6) Area of forests

(7) Ratio of forest area to the island

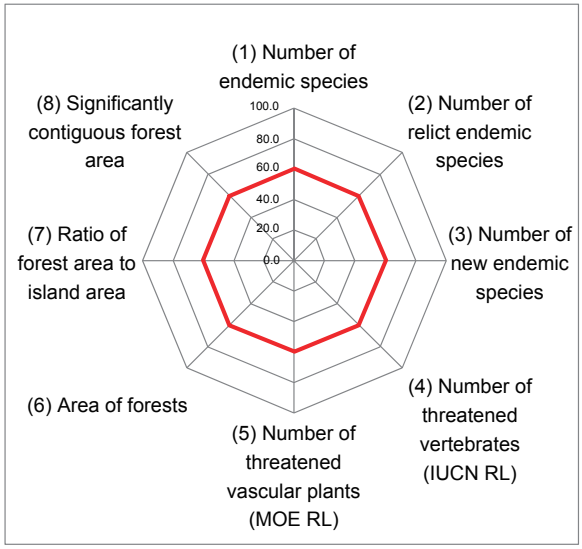
(8) Significantly contiguous forest area (Ratio of contiguous forests by connectivity analysis)

The results of comparative analysis within the Central and South Ryukyus based on the above eight indicators are shown as radar charts (Figure 3-2), in which each indicator is expressed as percentages of the maximum value. The total scores of each of the four islands/regions, i.e. Amami-Oshima Island, Tokunoshima Island, the Northern part of Okinawa Island, and Iriomote Island, are clearly higher than that for other islands, both in relation to the criterion and integrity. Therefore, it was concluded to nominate these four islands/regions as components of the natural World Heritage serial site.

As for the Ishigaki Island, the total numbers of endemic species and threatened species are close to that of nearby Iriomote Island (Figure 3-3), but the forest area and ratio of forest area to the island are small, and the connectivity of the forest is low. Consequently, it was considered that the island did not meet the conditions of integrity, and the island was not selected. Actually, most of the lowland on Ishigaki Island is developed and changed into urban area or agricultural land, and not much forest area left. Most of the species on Ishigaki Island are living in more stable conditions on neighboring Iriomote Island.

The four regions containing the nominated property encompass the largest and most important natural habitats among the islands of the Ryukyu Chain, and they support around 90% of the native species, endemic species and threatened species in the Central and South Ryukyus (Table 3-4, Figure 3-3).

Based on the above results of scientific analysis, the nominated property which demonstrates Outstanding Universal Value (OUV) for inscription on the World Heritage List is to be limited only to these four islands.



Comparison among islands in the Ryukyu Chain, using the following indicators.
Radar chart is expressed as a relative value when the maximum value in each evaluation indicator is 100.

- Terrestrial vertebrates, including subspecies
  - (1) Number of endemic species
  - (2) Number of relict endemic species
  - (3) Number of new endemic species
  - (4) Number of threatened species (IUCN Red List)
- Vascular plants, including subspecies and varieties
  - (5) Number of threatened species (MOEJ Red List)*1
- State of the forest
  - (6) Area of forests
  - (7) Ratio of forest area to island area
  - (8) Significantly contiguous forest area*2

*1: Since vascular plants in Japan have not been evaluated with enough species in the IUCN Red List, we used the MOEJ Red List which evaluated almost all species.
*2: The proportion of forests with cohesiveness degree of 60% or more to the island area by focal analysis of vegetation maps.

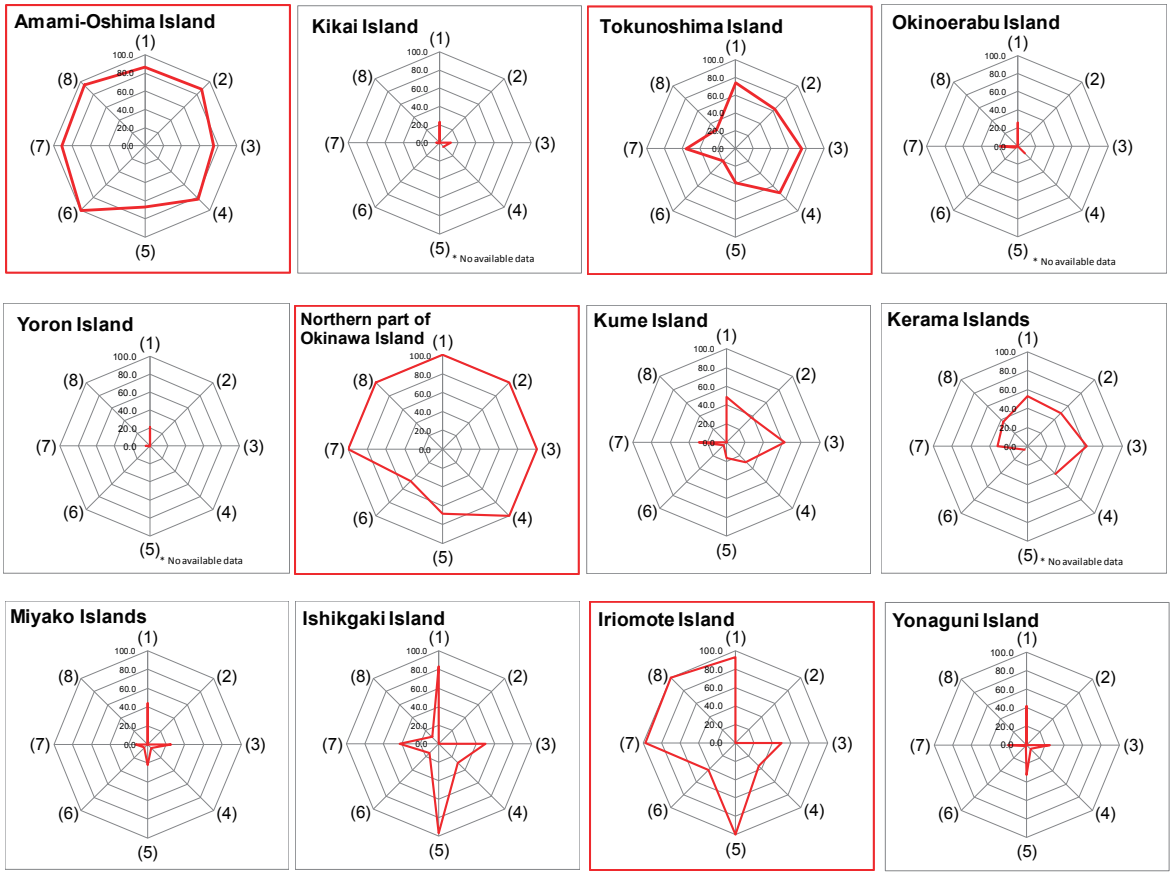


Figure 3-2: Selection of nominated islands from scientific viewpoint

Table3-4: Number and rate of native, endemic, and threatened species of the four regions containing the nominated property in the Central and South Ryukyus

	Number of native species			Number of endemic species			Number of threatened species (IUCN RL)*2		
	Central & South Ryukyus	Four regions	Proportion of four regions (%)	Central & South Ryukyus	Four regions	Proportion of four regions (%)	Central & South Ryukyus	Four regions	Proportion of four regions (%)
Terrestrial mammals	23	21	91	14	13	93	11	11	100
Birds	469	394	84	4	4	100	12	12	100
Terrestrial reptiles	46	36	78	29	23	79	13	8	62
Amphibians	22	21	95	18	18	100	12	12	100
Inland water fishes*3	268	267	99.6	13	13	100	6	6	100
Insects*3	6,785	6,153	91	1.849	1,607	87	20	20	100
Inland water decapod crustaceans*3	61	47	76	27	15	56	2	0	0
Vascular plants *1	2,064	1,819	88	207	188	90	27	24	89
Total	9,738	8,758	90	2,161	1,881	87	103	93	90

*1 : For vascular plants, subspecies, varieties, and hybrids are included.
*2 : For terrestrial mammals, inland water fishes and insects, the assessments of subspecies level are included.
*3 : The figures of these taxonomic groups are the data for the four islands including the whole Okinawa Island.

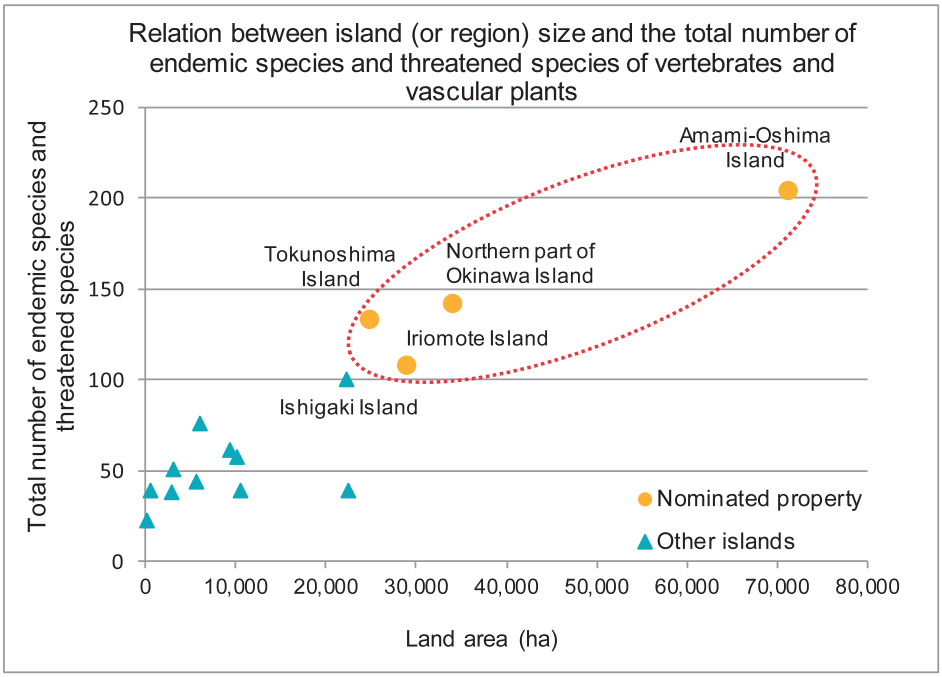


Figure 3-3: Comparison of area and the total number of endemic species and threatened species among islands/ regions in the Central and South Ryukyus

*The symbols mark the total number of endemic species and threatened species (on IUCN Red List) of vertebrates and vascular plants. Figures for the Northern part of Okinawa Island are based on the data for three Yambaru villages.
*Total number of endemic and threatened species are as of the selection of four regions.

3.2.3. Comparison within Japan

In this section, the nominated property is compared with the exiting natural World Heritage properties in Japan. As shown in Figure 3-1, there are 4 natural sites inscribed on the World Heritage List in Japan, and Shiretoko is the only site inscribed on the basis of the criterion (x) under which this nomination is proposed. Shiretoko is located at the edge of the northeast of Japan and quite different from the nominated property in terms of climate, ecosystems, and biota. Other in-country natural World Heritage properties that are considered similar to the nominated property are the following two island areas.

1) Yakushima

Yakushima is inscribed on the World Heritage List under criteria (vii) and (ix). Yakushima Island represents the North Ryukyus of the Ryukyu Chain, but as mentioned above, the biota of Yakushima has a strong relation with Kyushu and other parts of mainland Japan, and the terrestrial biota of the nominated property clearly differs from that of Yakushima. Also, the rate of endemism in Yakushima is lower than in the Central Ryukyus.

The Outstanding Universal Value of Yakushima includes the distinct vertical distribution pattern in the vegetation and biotic communities of the island, from the subtropical zone along the coast to the subarctic zone on the mountain tops, and in the stunning natural scenery dominated by huge Yakusugi (Japanese cedar, *Cryptomeria japonica*) with large diameters which are several thousand years old. These ecological processes and natural phenomena are quite different from the values of the nominated property which features rich biodiversity with many endemic and endangered species.

2) Ogasawara Islands

The Ogasawara Islands are inscribed on the World Heritage List under criterion (ix). Similar to the nominated property, these are subtropical islands with endemic biota and unique ecosystems, but are relatively dry. In addition, as a characteristic of oceanic islands, they have biased taxonomic composition and there is only one mammal species (a flying fox) and no amphibian species, and the total number of vertebrate species is not large. As such, the nominated property is different from the Ogasawara Islands in terms of climate conditions, ecosystems, and biotas.

The Outstanding Universal Value of the Ogasawara Islands lies in the important on-going process of biological evolution in oceanic islands, especially speciation processes of land snails and plants by adaptive radiation. On the other hand, in the nominated property, there are a number of good examples of vicariance and speciation as well as formation of endemic fauna and flora (relict and new endemic species) reflecting the different geological history of continental islands compared to oceanic islands. The species richness of the nominated property is higher, because the Central and South Ryukyus are continental islands and have humid climate conditions.

3) Comparison of the number of species with existing natural World Heritage properties in Japan

The nominated property is an area with large number of species, endemic species and threatened species in Japan (see Table 3-2). Comparing the number of species with the existing four natural World Heritage properties, the nominated property has the second largest number of plant species after Yakushima, and second largest

number terrestrial mammals after Shiretoko, and the largest number of species of all the other taxonomic groups, demonstrating its rich biological diversity (Table 3-5).

Table 3-5: Comparison of the number of species inhabiting natural World Heritage properties in Japan

Map number	Name of property	Area (ha)	Criteria	Vascular plants	Terrestrial mammals	Birds	Reptiles	Amphibians	Inland water fish	Insects
●	Nominated property	42,698	[(x)]	1,819	21	394	36	21	267	6,153
1	Yakushima	10,747	(vii), (ix)	> 1,900	16	150	15	8	–	1,900
2	Shirakami-Sanchi	16,971	(ix)	> 500	14	84	7	9	–	> 2,000
3	Shiretoko	71,100	(ix), (x)	817	35	264	7	3	42	2,500
4	Ogasawara Islands	7,939	(ix)	441	1	195	2	0	40	1,380

*Information on existing heritage properties is based on relevant nomination documents.

3.2.4. Regional and global comparisons

3.2.4.1. Selection of the sites to compare

For the regional comparison in East and Southeast Asia, three islands/island groups to the south of the nominated area were selected, i.e. Taiwan, Batan Islands, and Babuyan Islands (Figure 3-1). Batenes protected landscapes and seascapes in Batan Islands is listed on the tentative list of Philippines as cultural property.

Taiwan was formed by an upheaval on the continental shelf after the Luzon Arc collided with the continental plate, and it is thought that parts above sea-level were formed around 6 to 2 million years ago (Teng 1990; Liu et al. 2000; Sibuet and Hsu 2004, etc.). So, the formation of Taiwan was in a different process and period of time from the Ryukyu Chain. However, it is considered that, from phylogenetic analyses of non-flying terrestrial animals and geological research, there was a subsequent certain period of time when it was connected with the South Ryukyus until 1.8 million years ago when it was disconnected due to changes in the flow of the Kuroshio Current (Iryu et al. 2006), and that during this period, some fauna and flora moved from the South Ryukyus into Taiwan (Shen 1994; Shih et al. 2009; Shih and Ng 2011; Okamoto 2017, etc.). After it was disconnected from the South Ryukyus, Taiwan was connected to the continent during the glacial period of the Pleistocene Era, resulting in the current biotas that are similar to the ones on the continent.

The Batan Islands and Babuyan Islands are oceanic islands belonging to the Luzon Arc, comprising islands formed during the Tertiary (>3.5 million years ago) and islands formed during the Quaternary (<2.8 million years ago) (Yang et al. 1996; Tseng et al. 2018).

For the global comparative analysis, eight subtropical island properties with outstanding terrestrial biodiversity were selected from the existing natural and mixed World Heritage properties as follows. Out of 52 island properties of natural or mixed World Heritage, there are 25 properties that are inscribed under criterion (x) for

their terrestrial biodiversity. Among these 25 properties, eight properties are identified as being located in the zone between 20 and 30 degrees latitude, roughly corresponding to the subtropical region in which the nominated property is located. These include: Islands and Protected Areas of the Gulf of California (Mexico); Archipiélago de Revillagigedo (Mexico); Alejandro de Humboldt National Park (Cuba); Blue and John Crow Mountains (Jamaica); Laurisilva of Madeira (Portugal); Pitons, cirques and remparts of Reunion Island (France); Henderson Island (United Kingdom of Great Britain and Northern Ireland); and Lord Howe Island Group (Australia) (Figure 3-1).

3.2.4.2. Comparison of the number of species

For the eleven sites (three neighboring islands and eight existing island World Heritage properties) selected above and the nominated property, the respective area, island type, and number of resident species are shown in Table 3-6. The number of resident species of each island represents the number of terrestrial native species (to the best possible extent) based on the available literature. However, comparison could not be made for some areas and taxonomic groups because detailed information was not available. It should be noted that the area or number of species for the three neighboring islands are figures for the whole islands/island groups, and thus not directly comparable to the figures for the nominated property or other existing World Heritage properties that are protected areas on islands.

From this table, the nominated property, being a continental island, is confirmed to have more species in all taxonomic groups, compared to the oceanic islands included in the comparison. Therefore, further comparative analyses were conducted with the four continental islands in terms of vascular plants, terrestrial mammals, birds, terrestrial reptiles, and amphibians of which information on the number of species as well as the number and rate of endemic species are available. In addition, among these taxonomic groups, with the exception of vascular plants, EDGE species, that are uniquely evolved globally threatened species, were identified, and numbers and ranks of EDGE species were compared. The results are shown in Table 3-7 to Table 3-15.

Okinawa Ishikawa's frog (*Odorrana ishikawae*) (Photo: MOEJ)

Table 3-6: Comparison of number of species among nominated property, existing World Heritage properties and neighboring island areas[*1]

Map number	Name of property	Land area[*2] (ha)	Criteria[*3]	Latitude	Island type[*4]	Vascular plants	Terrestrial mammals	Birds[*5]	Terrestrial reptiles	Amphibians	Source
●	Nominated property	42,698	[(x)]	N24°-28°	C	1,819[*6]	21	394	36	21	1)
2	Archipiélago de Revillagigedo	16,900	(vii), (ix), (x)	N19°	O	202	–	109	4	0	1)
5	Henderson Island	3,700	(vii), (x)	S24°	O	71	0	23	4	–	2)
6	Laurisilva of Madeira	15,000	(ix), (x)	N32°	O	150	2	43	1	–	2)
7	Pitons, cirques and remparts of Reunion Island	105,838	(vii), (x)	S21°	O	840	5	78	6	–	2)
8	Lord Howe Island Group	1,540	(vii), (x)	S31°	O	241	1	168	2	–	2), 3)
10	Batan Islands	23,347	–	N20°	O	–	10	60	16	1	4), 5), 6)
11	Babuyan Islands	58,200	–	N19°	O	–	13	126	44	4	4), 5), 7)
1	Islands and Protected Areas of the Gulf of California	382,841	(vii), (ix), (x)	N27°	C, O	695	45	154	115	≥ 4	1), 2)
3	Alejandro de Humboldt National Park	68,572	(ix), (x)	N20°	C	1,447	10	95	45	21	2)
4	Blue and John Crow Mountains	26,252	(x)	N18°	C	1,620	10	101	20	13	1), 2)
9	Taiwan	3,598,000	–	N23°	C	4,077	78	534	89	37	8), 9), 10), 11)

*1:The number of species represents the number of terrestrial native species (to the best possible extent). "–" indicates that data on the number of resident species was not available.
*2:"Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire islands for Taiwan, Batan and Babuyan Islands.
*3:Only the criteria for natural values are indicated for mixed World Heritage sites.
*4:C: Continental island, O: Oceanic island.
*5:Number of identified species (including vagrants).
*6:Includes subspecies, variant species and crossbred species.

1) Annexes of respective nomination documents, 2) UNEP-WCMC 2016, 3) Australian Government 2007, 4) Heaney et al. 2010, 5) Oliveros et al. 2011, 6) Gonzalez et al. 2008, 7) Brooke et al. 2004, 8) Peng and Yang 2008, 9) Lin 2008, 10) Yan 2008, 11) Lue et al. 2008.,

1) Vascular plants

Table 3-7 shows the number of species, endemic species, and rate of endemic species of vascular plants on the four regions on continental islands located in neighborhood or in the similar latitude as the nominated property for comparison. The nominated property has 1,819 vascular plant species of which 188 are endemic (endemism rate of 10%). When comparing the nominated property with the three existing World Heritage properties, the nominated property has the largest number of vascular plant species. As for the rate of endemic species, Alejandro de Humboldt National Park of Cuba stands out at 63%, as it is known to be one of the area with the highest endemism rate of vascular plants in the world. The rate of endemic vascular plant species of the nominated property is lower compared to Blue and John Crow Mountains and Taiwan at 20% and 26% respectively. This is because the flora of the nominated property is diverse in origin reflecting the geological history, past climate changes, and geographical arrangement of the islands and the Kuroshio Current as mentioned in Chapter 2.a.2.1. However, when compared to the Islands and Protected Areas of the Gulf of California, where species have become established through both continental and oceanic island processes as with the nominated property, it has a higher number of species, number of endemic species, and endemism rate (2.5 times higher for the number of species and endemism rate, and more than 6 times higher for number of endemic species). Taiwan has large number of species and endemic species, but this is because the land area and altitudinal range are remarkably larger than the other sites compared.

Table 3-7: Comparison of vascular plant species diversity among nominated property and other four continental island areas [*1]

Map number	Name of Property	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Vascular plant species	Endemic species	Endemism rate	Source
	Nominated property (total of four regions)	42,698	0 – 694	[(x)]	1,819[*5]	188[*5]	10%	1)
	Amami-Oshima Island	11,640	0 – 694	–	1,307[*5]	125[*5]	10%	1)
•	Tokunoshima Island	2,515	60 – 645	–	957[*5]	80[*5]	8%	1)
	Northern part of Okinawa Island	7,721	100 – 503	–	1,048[*5]	72[*5]	7%	1)
	Iriomote Island	20,822	0 – 470	–	1,165[*5]	59[*5]	5%	1)
1	Islands and Protected Areas of the Gulf of California	382,841	0 – 990	(vii), (ix), (x)	695	28[*5]	4%	1), 2)
3	Alejandro de Humboldt National Park	68,572	220 – 1,168	(ix), (x)	1,447	905	63%	2)
4	Blue and John Crow Mountains	26,252	850 – 2,250	(iii), (vi), (x)	1,620	316	20%	1), 2)
9	Taiwan	3,598,000	0 – 3,952	–	4,077	1,067	26%	3)

*1:The number of resident species represents the number of terrestrial native species to the best possible extent.
*2:"Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3:The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4:Only the criteria for natural values are indicated for mixed World Heritage sites.
*5:Includes subspecies, variant species and hybrid species.
1) Respective nomination documents and their appendices, 2) UNEP-WCMC 2016, 3) Peng and Yang 2008.

2) Terrestrial mammals

Table 3-8 shows the number of species, endemic species, and rate of endemic species of terrestrial mammals on the four continental islands located in neighborhood or in the similar latitude as the nominated property for comparison. The nominated property has 21 terrestrial mammal species of which 13 are endemic (endemism rate of 62%). Further, the nominated property has many endemic subspecies reflecting the ongoing speciation among islands, and endemism rates in subspecies level is 82% and is very high. Taiwan and the Islands and Protected Areas of the Gulf of California have a large number of terrestrial mammal species as their land areas are first and second largest among the sites compared, but have a low rate of endemic species at 27% and 7% respectively. This is thought to be because many mammal species migrated from the continent to these islands via land bridges during the last glacial period when the sea level declined. Both Alejandro de Humboldt National Park and Blue and John Crow Mountains have 10 mammal species and an endemism rate of 30%. The nominated property has about twice as much terrestrial mammal species and endemism rate compared to these two existing World Heritage properties.

Table 3-8: Comparison of terrestrial mammal diversity among nominated property and four continental island areas [*1]

Map number	Name of property	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Terrestrial mammal species	Endemic species	Endemism rate	Source
	Nominated property (total of four regions)	42,698	0 – 694	[(x)]	21 (22)	13 (18)	62% (82%)	1)
	Amami-Oshima Island	11,640	60– 694	–	13	8 (10)	62% (77%)	1)
●	Tokunoshima Island	2,515	100 – 645	–	12	8 (10)	67% (83%)	1)
	Northern part of Okinawa Island	7,721	0 – 503	–	11	7 (9)	64% (82%)	1)
	Iriomote Island	20,822	0 – 470	–	7	3 (6)	43% (86%)	1)
1	Islands and Protected Areas of the Gulf of California	382,841	0 – 990	(vii), (ix), (x)	45	8	18%	1), 2)
3	Alejandro de Humboldt National Park	68,572	220 – 1,168	(ix), (x)	10	3[*5]	30%	2)
4	Blue and John Crow Mountains	26,252	850 – 2,250	(iii), (vi), (x)	10	3	30%	1), 2)
9	Taiwan	3,598,000	0 – 3,952	–	78	21	27%	3)

*1:The number of resident species represents the number of terrestrial native species to the best possible extent. Figures in parentheses indicate the number/rate of species including endemic subspecies.
*2:"Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3:The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4:Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5:The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species.
1) Respective nomination documents and their appendices, 2) UNEP-WCMC 2016, 3) Lin et al. 2008.

With regard to EDGE species of terrestrial mammals in respective areas, Table 3-9 shows the numbers of species, their names, EDGE scores, and EDGE ranks. The nominated property has the largest six EDGE species, while other areas have less than half of that. Each area includes one species that is ranked within the top 100 of the EDGE ranking of mammals. For other species that are ranked lower than that, EDGE species in the nominated property area all included within the top 300. So, it can be said that there are more species with higher importance for the conservation in the nominated property than other areas.

Table 3-9: Comparison of EDGE species of terrestrial mammals in the nominated property and four continental island areas

Map number	Name of property	Number of EDGE species	Name of the species	EDGE score	EDGE rank
●	Nominated property	6	Okinawa spiny rat (*Tokudaia muenninki*)	5.320180347	54
			Amami rabbit (*Pentalagus furnessi*)	5.089100208	107
			Tokunoshima spiny rat (*Tokudaia tokunoshimensis*)	4.627033167	198
			Amami spiny rat (*Tokudaia osimensis*)	4.595826943	207
			Ryukyu long-haired rat (*Diplothrix legata*)	4.429169781	260
			Ryukyu bent-winged bat (*Miniopterus fuscus*)	4.337875781	292
1	Island and Protected Areas of the Gulf of California	3	San Jose Brush Rabbit (*Sylvilagus mansuetus*)	5.210119141	78
			Tres Marias Cottontail (*Sylvilagus graysoni*)	4.253506889	340
			Pygmy Spotted Skunk (*Spilogale pygmaea*)	3.910494171	412
3	Alejandro de Humboldt National Park	2	Cuban Solenodon (*Atopogale cubana*)	6.215143138	6
			Black-tailed Hutia (*Mysateles melanurus*)	3.684374163	478
4	Blue and John Crow Mountains	2	Jamaican Greater Funnel-eared Bat (*Natalus jamaicensis*)	5.527554746	38
			Brown's Hutia (*Geocapromys brownie*)	3.713134046	469
9	Taiwan	1	Chinese Pangolin (*Manis pentadactyla*)	5.849285841	17

- From the EDGE species list (Zoological Society of London 2018), terrestrial mammals were extracted, excluding marine mammals.
- The distribution of terrestrial mammals in comparative target areas was judged by overlaying the distribution map of the IUCN Red List with the boundary of respective World Heritage sites (the island as a whole for Taiwan). The distribution of possibly extinct population was excluded.

3) Birds

Table 3-10 shows the numbers of recorded species, resident species, endemic species and rate of endemic species of birds on the four continental islands located in neighborhood or in the similar latitude as the nominated property for comparison. In the nominated property, 394 bird species have been identified, of which 49 are resident bird species and four are endemic species (endemism rate of 8%). Endemism rate on species level is not high but the number of endemic subspecies is large reflecting the ongoing speciation among islands, and endemism rate on subspecies level is as high as 48%. Taiwan has a large number of both recorded and endemic species because the land area and altitudinal range are remarkably larger than the other sites compared. Regarding the rate of endemic species, however, the nominated property and Taiwan are roughly the same level at 8% and 9% respectively. This is probably because the both sites have a high rate of migratory birds and vagrants in the bird fauna, given that they are both located on the bird migratory pathways and typhoon routes.

The other three sites compared have a rather high rate of endemic species with Blue and John Crow Mountains at the highest at 56% (32 species), followed by Islands and Protected Areas of the Gulf of California at 25% (12 species) and Alejandro de Humboldt National Park at 21% (20 species). The number of recorded species, however, is as low as between about one fourth (95 species) to half (181 species) of that of the nominated property (394 species) whereas the number of resident species is roughly at the same level. Thus, it can be concluded that the proportion of migratory birds in the bird fauna is relatively low in these existing World Heritage properties, meaning that the bird fauna of these sites is different from that of the nominated property in terms of the life history (migratory or not) of the birds.

Table 3-10: Comparison of bird species diversity among nominated property and four continental island areas [*1]

Map number	Name of property	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Recorded bird species	Resident species	Endemic species	Endemism rate[*5]	Source
	Nominated property (total of four regions)	42,698	0 – 694	[(x)]	394 (437)	49 (63)	4 (30)	8% (48%)	1)
	Amami-Oshima Island	11,640	0 – 694	–	315 (338)	42	2 (12)	5% (29%)	1)
●	Tokunoshima Island	2,515	60 – 645	–	196 (203)	38 (36)[*7]	1 (7)	3% (19%)	1)
	Northern part of Okinawa Island	7,721	100 – 503	–	195 (207)	38 (40)	3 (12)	8% (30%)	1)
	Iriomote Island	20,822	0 – 470	–	312 (333)	44 (46)	0 (17)	0% (37%)	1)
1	Islands and Protected Areas of the Gulf of California	382,841	0 – 990	(vii), (ix), (x)	181	48	12	25%	1), 2)
3	Alejandro de Humboldt National Park	68,572	220 – 1,168	(ix), (x)	95	–	20[*6]	21%	2)
4	Blue and John Crow Mountains	26,252	850 – 2,250	(x)[*4]	100	57	32	56%	1), 2)
9	Taiwan	3,598,000	0 – 3,952	–	534	156	14	9%	3)

*1:The number of resident species represents the number of terrestrial native species to the best possible extent. Figures in parentheses indicate the number/rate of species including endemic subspecies.

*2:"Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3:The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4:Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5:The rate of endemic species was calculated against resident birds that stay in the area all year long.
*6:The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species.
*7: Information on the distribution of species and subspecies by island is not necessarily consistent because the preciseness of the information varies depending on the literature (e.g., species level versus subspecies level, inconsistent migratory status between species and subspecies levels).
1) Respective nomination documents and their appendices, 2) UNEP-WCMC 2016, 3) Yan et al. 2008.

With regard to EDGE species of resident birds that stay all year round and breed in respective areas, Table 3-11 shows the numbers of species, their names, EDGE scores, and EDGE ranks. There are three EDGE species in the nominated property, which is the second largest after the four species in Alejandro de Humboldt National Park. There are no resident birds that are specified as EDGE species in other areas. It can be said that the number of EDGE species in the nominated property compares favorably with the ones in other existing World Heritage properties.

Table3-11: Comparison of EDGE species of resident birds in the nominated property and four continental island areas

Map number	Name of property	Number of EDGE species	Name of the species	EDGE score	EDGE rank
●	Nominated property	3	Okinawa rail (*Gallirallus okinawae*)*	4.074521375	346
			Amami woodcock (*Scolopax mira*)	3.821402826	421
			Amami jay (*Garrulus lidthi)*	3.555435566	506
3	Alejandro de Humboldt National Park	4	Cuban Kite (*Chondrohierax wilsonii*)	5.263073883	42
			Blue-headed Quail-dove (*Starnoenas cyanocephala*)	4.255623919	254
			Gundlach's Hawk (*Accipiter gundlachi*)	4.249363322	255
			Grey-headed Quail-dove (*Geotrygon caniceps*)	3.673216833	461
1	Island and Protected Areas of the Gulf of California	0	–	–	–
4	Blue and John Crow Mountains	0	–	–	–
9	Taiwan	0	–	–	–

- From the EDGE Species List (Zoological Society of London 2018), resident birds that live and breed throughout the year, i.e. the species categorized as native resident and native breeding in the Data Zone of BirdLife International, were extracted.
- The distribution of birds in comparative target areas was judged by overlaying the distribution map of the BirdLife International with the boundary of respective World Heritage sites (the island as a whole for Taiwan). The distribution of possibly extinct population was excluded.

*: Following the Ornithological Society of Japan (2012), *Gallirallus okinawae* is used here. However, note that the IUCN Red List uses *Hypotaenidia okinawae* (del Hoyo et al. 2014).

4) Terrestrial reptiles

Table 3-12 shows the number of recorded species, endemic species, and rate of endemic species of terrestrial reptiles of the four continental islands located in neighborhood or in the similar latitude as the nominated property for comparison. The nominated property has 36 terrestrial reptiles of which 23 are endemic (endemism rate of 64%). Taiwan and the Islands and Protected Areas of the Gulf of California have the first and second largest land area among the sites compared and have large numbers of reptile species accordingly. However, their rate of endemic species is low (89 species, 24% and 115 species, 42% respectively). This is thought to be because many reptile species migrated from the continent to these islands via land bridges during the last glacial period when the sea level declined.

Alejandro de Humboldt National Park and Blue and John Crow Mountains in the Caribbean Region have roughly the same level of reptile species as the nominated property (36 species) at 45 and 20 species respectively, but their rates of endemic species are higher than that of the nominated property (64%) at 90% and 83%, reflecting the length of history since isolation of the islands that date back to Paleogene. However, one of the characteristics of the nominated property is that it clearly represents ongoing speciation processes taking place on the islands, demonstrated by the high endemism rate of 87% (as high as the endemism rate of the Caribbean sites), when endemic subspecies are included in the count.

Table 3-12: Comparison of terrestrial reptile diversity among nominated property and four continental island areas [*1]

Map number	Name of property	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Terrestrial reptile species	Endemic species	Endemism rate	Source
	Nominated property (total of four regions)	42,698	0 – 694	[(x)]	36 (38)[*5]	23 (33)[*5]	64% (87%)[*5]	1)
	Amami-Oshima Island	11,640	0 – 694	–	16	10 (11)	63% (69%)	1)
●	Tokunoshima Island	2,515	60 – 645	–	17	11 (12)	65% (71%)	1)
	Northern part of Okinawa Island	7,721	100 – 503	–	18	13 (14)	72% (78%)	1)
	Iriomote Island	20,822	0 – 470	–	19	8 (16)	42% (84%)	1)
1	Islands and Protected Areas of the Gulf of California	382,841	0 – 990	(vii), (ix), (x)	115	48	42%	1), 2)
3	Alejandro de Humboldt National Park	68,572	220 – 1,168	(ix), (x)	45	37[*6]	83%	2)
4	Blue and John Crow Mountains	26,252	850 – 2,250	(x)[*4]	20	18	90%	1), 2)
9	Taiwan	3,598,000	0 – 3,952	–	89	21	24%	3)

*1:The number of resident species represents the number of terrestrial native species to the best possible extent.
*2:"Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.
*3:The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4:Only the criteria for natural values are indicated for Mixed Cultural and Natural Heritage sites.
*5:Figures in parentheses indicate the number/rate of species including endemic subspecies.
*6:The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species.
1) Appendices of respective nomination documents, 2) UNEP-WCMC 2016, 3) Lue et al. 2008.

With regard to EDGE species of terrestrial reptiles in respective areas, Table 3-13 shows the numbers of species, their names, EDGE scores, and EDGE ranks. There are six EDGE species in the nominated property, which is the largest, followed by four species in the Islands and Protected Areas of the Gulf of California, one species in Blue and John Crow Mountains and Taiwan, respectively, and no EDGE species in Alejandro de Humboldt National Park. In addition, the nominated property includes two species that are ranked in the top 100 in the EDGE ranking of reptiles, while those species are not distributed in other areas. In this regard, it can be said that the nominated property possesses more species with higher importance for conservation than other areas.

Table3-13: Comparison of EDGE species of terrestrial reptiles in the nominated property and four continental island areas

Map number	Name of property	Number of EDGE species	Name of the species	EDGE score	EDGE rank
●	Nominated property	6	Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)	5.734166698	47
			Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*)	5.579293508	74
			Banded ground gecko (*Goniurosaurus splendens)*	5.198545329	172
			Sakishima Grass Lizard (*Takydromus dorsalis*)	4.829429609	295
			Kishinoue's Giant Skink (*Plestiodon kishinouyei*)	3.951321715	547
			Barbour's blue-tailed Skink (*Plestiodon barbouri*)	3.89749805	564
1	Island and Protected Areas of the Gulf of California	4	a lizard species (*Uta tumidarostra*)	3.993416874	529
			a lizard species (*Uta encantadae*)	3.975667873	531
			a lizard species (*Uta lowei*)	3.966735253	537
			a lizard species (*Uta palmeri*)	3.939774162	556
4	Blue and John Crow Mountains	1	Jamaican Tailspot Sphaero (*Sphaerodactylus dacnicolor*)	4.935627238	236
9	Taiwan	1	Chinese Softshell Turtle (*Pelodiscus sinensis*)	5.29006438	152
3	Alejandro de Humboldt National Park	0	–	–	–

- From the EDGE species list (Zoological Society of London 2018), terrestrial reptiles were extracted, excluding marine reptiles.
- The distribution of terrestrial reptiles in comparative target areas was judged by overlaying the distribution map of the IUCN Red List with the boundary of respective World Heritage sites (the island as a whole for Taiwan). The distribution of possibly extinct population was excluded.

5) Amphibians

Table 3-14 shows the number of recorded species, endemic species, and rate of endemic species of amphibians of the four continental islands located in neighborhood or in the similar latitude as the nominated property for comparison. The nominated property has 21 amphibian species of which 18 are endemic (endemism rate of 86%). Taiwan has by far the largest land area among the sites compared and a large number of amphibians accordingly, but it has a low rate of endemic species (89 species, 24%). This is thought to be the same reason as reptiles.

Alejandro de Humboldt National Park and Blue and John Crow Mountains in the Caribbean Region have roughly the same level of amphibian species as the nominated property (21 species) at 21 and 13 species respectively, but their rates of endemic species are higher than the nominated property (86%) at 96% and 92%, reflecting the length of history since isolation of the islands. When looking at the endemism rate of individual regions containing the nominated property, the endemism rates for Amami-Oshima Island and the Northern part of Okinawa Island are approximately 90%, almost as high as the Caribbean sites. This reflects the fact that the nominated property is a serial property comprised of two distinct parts: the Central Ryukyus with a long history of isolation from the continent and rest of Japan and high endemism (86-91%); and the South Ryukyus with low endemism (63%) that have a relatively recent history of separation with subspecies and related species distributed in the continent and Taiwan.

Information on the reliable specific number of amphibian species and endemic amphibian species could not be obtained for the Islands and Protected Areas of the Gulf of California, and it is assumed that amphibians are few in this site because it belongs to dry desert climate.

Table 3-14: Comparison of amphibian diversity among nominated property and four continental island areas [*1]

Map number	Name of property	Land area (ha) [*2]	Altitude (m)[*3]	Criteria[*4]	Amphibian species	Endemic species	Endemism rate	Source
	Nominated property (total of four regions)	42,698	0 – 694	[(x)]	21	18	86%	1)
	Amami-Oshima Island	11,640	0 – 694	–	10	9	90%	1)
●	Tokunoshima Island	2,515	60 – 645	–	7	6	86%	1)
	Northern part of Okinawa Island	7,721	100 – 503	–	11	10	91%	1)
	Iriomote Island	20,822	0 – 470	–	8	5	63%	1)
1	Islands and Protected Areas of the Gulf of California	382,841	0 – 990	(vii), (ix), (x)	≥ 4	–	–	1), 2)
3	Alejandro de Humboldt National Park	68,572	220 – 1,168	(ix), (x)	21	20[*5]	96%	2)
4	Blue and John Crow Mountains	26,252	850 – 2,250	(x)[*4]	13	12	92%	1), 2)
9	Taiwan	3,598,000	0 – 3,952	–	89	21	24%	3)

*1:The number of resident species represents the number of terrestrial native species to the best possible extent.
*2:"Land area" represents land area of the specified site for nominated property and existing World Heritage properties, and land area of the entire island for Taiwan.

*3:The lowest-highest altitudes for nominated property and existing World Heritage properties, and coastal line-highest altitude for Taiwan.
*4:Only the criteria for natural values are indicated for mixed World Heritage sites.
*5:The original literature only gave the rate of endemic species. The number of endemic species was calculated from the number of resident species and the rate of endemic species.
1) Respective nomination documents and their appendices, 2) UNEP-WCMC 2016, 3) Lue et al. 2008.

With regard to EDGE species of amphibians in respective areas, Table 3-15 shows the numbers of species, their names, EDGE scores, and EDGE ranks. There are five EDGE species in the nominated property, which is the largest, followed by four species in Alejandro de Humboldt National Park, three species in Taiwan, and no species in the Islands and Protected Areas of the Gulf of California and the Blue and John Crow Mountains. It can be said that the number of EDGE species in the nominated property compares favorably with the ones in other existing inscribed areas.

Table 3-15: Comparison of EDGE species of amphibians in the nominated property and four continental island areas

Map number	Name of property	Number of EDGE species	Name of the species	EDGE score	EDGE rank
●	Nominated propeerty	5	Okinawa Ishikawa's frog *1 (*Odorrana ishikawae*)	5.212495014	425
			Namie's frog (*Limnonectes namiyei*)	5.140770954	463
			Otton frog (*Babina subaspera*)	5.082476558	499
			Yaeyama harpist frog*1 (*Babina okinavana*)	5.010717966	550
			Anderson's crocodile newt (*Echinotriton andersoni*)	4.974405587	592
3	Alejandro de Humboldt National Park	4	a frog species (*Eleutherodactylus tetajulia*)	5.726878831	185
			a frog species (*Eleutherodactylus principalis*)	5.088230761	496
			a frog species (*Eleutherodactylus toa*)	5.053466986	514
			a frog species (*Eleutherodactylus ronaldi*)	4.379896971	873
9	Taiwan	3	a frog species (*Micryletta steinegeri*)	5.57159893	269
			a frog species (*Rana sauteri*)	5.08033054	500
			Yaeyama harpist frog *2 (*Babina okinavana*)	5.010717966	550
1	Island and Protected Areas of the Gulf of California	0	–	–	–
4	Blue and John Crow Mountains	0	–	–	–

- From the EDGE species list (Zoological Society of London 2018), amphibians were extracted.
- The distribution of amphibians in comparative target areas was judged by overlaying the distribution map of the IUCN Red List with the boundary of respective World Heritage sites (the island as a whole for Taiwan). The distribution of possibly extinct population was excluded.

*1: Since there were significant errors in the distribution maps of the IUCN Red List with regard to the Okinawa Ishikawa's frog (*Odorrana ishikawae*) and Yaeyama harpist frog (*Babiana okinavana*), corrections were made to make a judgment on its distribution.
*2: On IUCN Red List, the scientific name of the Yaeyama harpist frog is given as *Babina okinavana* and it is stated that the species also inhabits in Taiwan. However, it is treated as *Nidirana okinavana* that belongs to a separate genus by the Herpetological Society of Japan (2017).

3.2.4.3. Comparison in terms of the irreplaceability for biodiversity

A thematic study report by the IUCN and UNEP-WCMC, "Terrestrial Biodiversity and the World Heritage List: Identifying broad gaps and potential candidate sites for inclusion in the natural World Heritage network" (Bertzky et al. 2013) noted "irreplaceability" as an indicator concept to show degrees of importance of certain places and areas and conducted numerical analyses. This is an indicator concept based on the calculation on what proportion target areas account for in the habitat of a certain species of terrestrial fauna, and is a sum of the calculated score of each species across the area. Following this method, irreplaceability scores for the nominated property were calculated (see Box 10) to make comparisons with existing scores for protected areas in the eleven sites in Table 3-6, and the results are shown in Table 3-16. However, it was not possible to make a comparison with the Babuyan Islands in the Philippines since there was no information available.

Irreplaceability scores for the nominated property were 6.78 for all species of all taxonomic groups and 5.46 for threatened species.

This score is based on the calculation for the terrestrial mammals, birds and amphibian species. Since terrestrial mammals and amphibians are not able to cross sea areas with ease, many of them are not distributed on oceanic islands as native species. Therefore, it was expected that scores for oceanic islands would become lower. As expected, in the comparative target areas for this analysis, irreplaceability scores for protected areas on all six oceanic islands consisting of five existing World Heritage properties and one on the neighboring islands, were confirmed to be lower than the ones in the nominated property.

Among the continental islands, irreplaceability scores for the nominated property did not reach the ones for the Islands and Protected Areas of the Gulf of California in Mexico (13.17 for all species, 12.04 for threatened species), but they were at the same level of the Blue and John Crow Mountains in Jamaica (6.84 for all species, 5.80 for threatened species), and higher than the scores for Alejandro de Humboldt National Park in Cuba (3.92 for all species, 3.85 for threatened species). For Taiwan, a continental island in the neighborhood of the nominated property, irreplaceability scores for eight protected areas were available, but all scores were lower than 1.0 for respective protected areas, as shown in Table 3-16.

When comparing the score according to taxonomic groups, scores for mammals in the nominated property (2.91 for all species and 2.88 for threatened species) are the second highest after the Islands and Protected Areas of the Gulf of California, where the number of terrestrial mammals is high, as shown in Table 3-8. In terms of scores for amphibians (2.49 for all species and 2.41 for threatened species), the nominated property is the third after the Blue and John Crow Mountains as well as Alejandro de Humboldt National Park, where rates of endemic species are high, as shown in Table 3-14. Although scores for birds in the nominated property are rather low (1.38 for all species and 0.17 for threatened species), these scores for all species are similar to the ones in the Blue and John Crow Mountains that have the highest scores among continental islands in this comparison. This is thought to reflect avifauna in the nominated property where there are a few resident species and more migratory and passage visitor birds.

Table 3-16: Comparison of irreplaceability score among nominated property, selected existing World Heritage properties and neighboring island areas

Map number	Island type[*1]	Name of property	Land area[*2] (ha)	Multi-taxa		Terrestrial mammals		Birds		Amphibians	
				Overall species	Threatened species	Overall species	Threatened species	Overall species	Threatened species	Overall species	Threatened species
●	C	Nominated property	42,698	6.78	5.46	2.91	2.88	1.38	0.17	2.49	2.41
1	C, O	Islands and Protected Areas of the Gulf of California	382,841	13.17	12.04	13.08	12.04	0.07	0.01	0.01	0
3	C	Alejandro de Humboldt National Park	68,572	3.92	3.85	0.11	0.10	0.08	0.03	3.73	3.71
4	C	Blue and John Crow Mountains	26,252	6.84	5.80	0.13	0.12	1.52	1.25	5.19	4.43
9	C	Chatienshan Nature Preserve	7,974	0.08	0.01	0.01	0	0.02	0	0.05	0.01
		Hua-Tung Coast Landscape Area	138,368	0.11	0.03	0.03	0	0.04	0	0.04	0.01
		Kenting National Park	32,927	0.17	0.14	0.01	0	0.01	0.01	0.14	0.13
		Shei-Pa National Park	76,959	0.32	0.01	0.08	0	0.17	0	0.06	0
		Taitung Hungyeh Village Taiwan Cycas Nature Preserve	317	0.04	0.02	0.01	0	0.01	0	0.02	0.02
		Taroko National Park	98,040	0.64	0.11	0.21	0	0.25	0	0.19	0.11
		Tawushan Nature Preserve	47,848	0.34	0.09	0.06	0	0.17	0.02	0.11	0.07
		Yushan National Park	103,121	0.82	0.08	0.42	0	0.26	0.01	0.15	0.07
5	O	Henderson Island	3,700	4.00	4.00	0	0	4.00	4.00	0	0
2	O	Archipiélago de Revillagigedo	16,900	4.00	3.00	0	0	4.00	3.00	0	0
7	O	Pitons, cirques and remparts of Reunion Island	105,838	2.61	0.77	0.12	0.12	2.5	0.65	0	0
8	O	Lord Howe Island Group	1,540	1.00	1.00	0	0	1	1	0	0
6	O	Laurisilva of Madeira	15,000	0.12	<0.01	0.01	0.01	0.11	0	0	0
10	O	Batanes Protected Landscape and Seascape	23,347	0.01	0	0	0	0.01	0	0	0

*1:C: Continental island, O: Oceanic island.
*2:"Land area" represents land area of the specified protected areas.

Box 10. Outline of the methods of species irreplaceability analysis

- The irreplaceability scores were calculated following the methods by Bertzky et al. (2013) and Le Saout et al. (2013). Briefly, the percentage of a species' range overlapping with the nominated property was calculated using GIS. Then, the percentages were substituted in the equation of Bertzky et al. (2013) to calculate scores for respective species. Evaluation was made with the total sums of those scores.
- Target species were terrestrial mammals, birds, and amphibian species for which sufficient number of species have been globally evaluated in the IUCN Red List and relevant species for which range map was available were used for the calculation. Among them, two types of scores were calculated, i.e. (1) the score based on all species of evaluation target and (2) the score based only on globally threatened species.
- Relevant information on range maps of target species was used as below.
  - Mammals and amphibians: Digital Distribution Maps on The IUCN Red List of Threatened Species. Version 6.1 (IUCN 2018)
  - Birds: Bird species distribution maps of the world. Version 7.0. (BirdLife International and Handbook of the Birds of the World 2017). Bird species were excluded when they were regarded as wide-area species (range>220,084 km^2) according to GIS data.
  - Since there were some erroneous inclusion of wrong islands in the information on the distribution maps of the IUCN Red List with regard to the Okinawa Ishikawa's frog and Yaeyama harpist frog, corrections were made for the calculation.
- In principle, irreplaceability scores for comparative sites were based on quotations from Bertzky et al. (2013) and Le Saout et al. (2013). As for scores for the sites that were not included in these literatures as well as scores for areas other than existing World Heritage properties, scores for relevant protected areas were quoted from Analysis of Protected Area Irreplaceability (http://irreplaceability.cefe.cnrs.fr/index.htm).
- The following points should be kept in mind when interpreting the irreplaceability score:
  - This analysis excludes the species not on the IUCN Red List, the species of which range map is not available, and the taxonomic groups that have not yet been fully assessed globally (e.g. plants, reptiles, fish, invertebrates);
  - The score for a species is expressed from 0 (the range of the species is not included in the target protected area) to 1 (the whole range of the species is included in the target protected area);
  - The score for the protected area is calculated as a sum of the score of each species, which means a protected area with large number of species or a protected area covering large area have potential of high score;
  - The calculation is based on the range area only and not considering the density of the species.

3.2.5. Synthesis of global comparative analysis

The World Heritage property of Islands and Protected Areas of the Gulf of California is inscribed under criteria (vii), (ix), and (x). It includes 244 islands and coastal areas as well as diverse marine area capturing a broad spectrum of landscapes and conservation values. As a background, the site is an exceptional example where "land bridge islands" and "oceanic islands" can be observed simultaneously. The terrestrial community on "land bridge islands" was established when they were connected to the neighboring North American Continent due to sea-level decline during the Pleistocene glacial period, while that on "oceanic islands" was established by the movement of biota via the sea and sky. The property belongs to desert climate and its natural environment and ecosystems are different from the ones in the nominated property where moist rainforests exist.

While the main value of Islands and Protected Areas of the Gulf of California lays in marine biodiversity, this comparative analysis uses only the data of terrestrial species, and this property also has characteristic terrestrial biodiversity. It has a large number of endemic and threatened terrestrial mammal species and subspecies (Table 3-8). Probably this is because many speciation occurred on numerous islands of various origin, as mentioned above, distributed in wide range. The land area of this property is nearly 10 times as large as the nominated property (Table 3-6). As a result, this property has high irreplaceability scores for terrestrial mammals (13.08 for all species and 12.04 for threatened species), and the highest score for total of three taxonomic groups (13.17 for all species and 12.04 for threatened species) among five sites compared (Table 3-16). Actually, the score of this site is ranked as 28th highest for all species and fourth for threatened species in the protected areas of the world (according to the Analysis of Protected Area Irreplaceability).

Islands and Protected Areas of the Gulf of California also have largest total number of species and number of endemic species in terrestrial reptiles in our comparison (Table 3-12). The property supports EDGE species of three mammals and four reptiles (Table 3-9, Table 3-13), and San Jose scrub rabbit is included top 100 mammal EDGE species, but the numbers of EDGE species are all smaller than the nominated property. Also, because of dry environment, the diversity of vascular plants and amphibians are relatively low.

The World Heritage property of Blue and John Crow Mountains is a mixed site inscribed under natural criterion (x). Natural features of the property include its high diversity of plant species as one of two Centers of Plant Diversity in Jamaica, where flowering plants, liverwort and moss, and others are quite diverse and endemic to Jamaica, together with a large number of endemic species of fauna. It is a part of one of the 78 most irreplaceable protected areas for the conservation (Bertzky et al. 2013).

The land area of Blue and John Crow Mountains site is around 60% of the one in the nominated property (Table 3-6), meaning it is smaller, but it is situated in the middle of a large island. This property features high rate of endemism in birds (56%), reptiles (90%) and amphibians (92%) (Table 3-10, Table 3-12, Table 3-14), resulted in high irreplaceability score (6.84 for all species and 5.80 for threatened species) (Table 3-16) ranked as 60th highest for all species and 29th for threatened species in the protected areas of the world. Although the endemism rate of species are slightly lower in the nominated property, the irreplaceability score calculated for the nominated property (6.78 for all species and 5.46 for threatened species) is about the same range as this property.

Blue and John Crow Mountains are home to two mammal and one reptile EDGE species, and Jamaican greater funnel-eared bat is included in top 100 mammal EDGE species (Table 3-9, Table 3-13).

The World Heritage property of Alejandro de Humboldt National Park is inscribed under criteria (ix) and (x). The property features that it shows ongoing processes of local speciation and development of ecological communities both on land and in the freshwater, resulted from a history being a Pleistocene Refuge as well as its size, altitudinal range and complexity and diversity of land forms and soil types, including rocks and soils toxic to plants. There is high degree of endemism across numerous taxonomic groups. This property is one of the most important sites in the Western Hemisphere for its endemic flora and one of the most biologically diverse tropical island sites on Earth.

The land area of Alejandro de Humboldt National Park is around 1.6 times as large as the nominated property (Table 3-6) and is a small part of a huge island. The rate of endemic plant species is more than 60%, which is the highest among five areas included in this comparative analysis (Table 3-7). It also features high rate of endemism in amphibians (96%). However, the irreplaceability score of this property (3.92 for all species and 3.85 for threatened species) is lower than that of the nominated property. This property supports 2 mammals, 4 birds and 4 amphibian EDGE species, and Cuban solenodon and Cuban kite are included in the top 100 EDGE species of mammals and birds respectively (Table 3-9, Table 3-11).

The area of Taiwan is nearly 100 times as large as the nominated property, and there are numerous species in all taxonomic groups living there (Table 3-6). In particular, there are many vascular plant species with a high rate of endemic species at 26% (Table 3-7). However, endemism rates in other taxonomic groups are relatively low (Table 3-8, Table 3-10, Table 3-12, Table 3-14), and consequently, the available data of irreplaceability scores for the protected areas on the island is low (0.82 for all species and 0.14 for threatened species at maximum levels) (Table 3-16). There are one mammal, one reptile and three amphibian EDGE species on the island, and Chinese pangolin is ranked within the top 100 of mammal EDGE species (Table 3-9, Table 3-13, Table 3-15).

The nominated property has high number of species and endemic species in general, especially the number of recorded species of vascular plant, birds and amphibians are second largest among five sites compared (Table 3-7, Table 3-10, Table 3-14). The property also features high rate of endemism in all taxonomic groups except for birds, especially the rate for terrestrial mammals (62%) is much higher than other four sites compared (Table 3-8). The irreplaceability score calculated for the sites (6.78 for all species and 5.46 for threatened species) is about the same level of Blue and John Crow Mountains, and higher than the Alejandro de Humboldt National Park, the existing properties on the World Heritage List (Table 3-16).

Furthermore, the unique feature of the property in this comparative analysis is large number of EDGE (Evolutionarily Distinct and Globally Endangered) species. The nominated property has total of 20 EDGE species consisting of 6 mammal, 3 avian, 6 reptile, and 5 amphibian species, among which Okinawa spiny rat, Ryukyu black-breasted leaf turtle and Kuroiwa's ground gecko are included in the top100 EDGE species of respective taxonomic groups (Table 3-9, Table 3-11, Table 3-13, Table 3-15). These numbers are much larger than other sites compared. This is showing that the nominated property has gone through unique evolutionary

processes resulting from a long history of discontinuation from the Continent and isolation from neighboring terrestrial areas, and that the critical importance of protection of nominated property for the conservation of biological diversity.

Conclusions

In conclusion, the Central and South Ryukyus are invaluable concentration of unique biota that cannot be found anywhere else on earth, and the nominated property contains the most important natural habitats for *in-situ* conservation of the unique and rich biodiversity of the Central and South Ryukyus. The nominated property supports high level of species richness and endemism in many taxonomic groups. The area also supports a large number and ratio of threatened species, including several Critically Endangered species, as shown in Chapter 2, and a large number and rate of endemic species, including many relict and/or evolutionarily distinct species of Outstanding Universal Value. The nominated property includes areas of overall high global irreplaceability for the protection of endemic and globally threatened species.

Kishinoue's giant skink (*Plestiodon kishinouyei*) (Photo: MOEJ)

3.3. Proposed Statement of Outstanding Universal Value

a) Brief synthesis

The nominated property is a terrestrial serial site covering 42,698 ha comprised of five component parts in four regions, Amami-Oshima Island, Tokunoshima Island, and the Northern part of Okinawa Island in the Central Ryukyus, and Iriomote Island in the South Ryukyus. The islands of the Central and South Ryukyus are members of the Ryukyu Chain at the southern tip of the Japanese archipelago. Influenced by the Kuroshio Current and the subtropical high-pressure system, the nominated property has a warm and humid subtropical climate and is covered mainly with evergreen broadleaved subtropical rainforests.

The nominated property is the best representative of the Central and South Ryukyus that contain the richest biota in Japan, one of the world's biodiversity hotspots. The nominated property has a large number of species in many taxonomic groups. The property also supports many threatened species and species endemic to the Central and South Ryukyus, and the proportions of those species are high. Further, various examples of evolution of endemic species, especially many examples of relict and/or evolutionarily distinct species, are found in the nominated property.

These features of the biodiversity of the nominated property are all interrelated and derived from the geological history of the Central and South Ryukyus as continental islands. Reflecting its long history of separation and isolation, the terrestrial creatures went through various evolutionary processes and formed unique biota, as observed in many examples of endemic species in non-flying terrestrial vertebrate groups and plants. Also, the Central and South Ryukyus have differences in their patterns of speciation and endemism.

Thus, the nominated property is of overall high global irreplaceability for the protection of unique terrestrial species including many endemic and globally threatened species, and contains the most important and significant natural habitats for *in-situ* conservation of the unique and rich biodiversity of the Central and South Ryukyus.

b) Criteria under which inscription is proposed

Criterion (x)

The four regions containing the nominated property, which together cover less than 0.5% of Japan's land area, support a large proportion of the fauna and flora in Japan. For example, there are 1,819 vascular plants, 21 terrestrial mammals, 394 birds, 36 terrestrial reptiles and 21 amphibians. As a whole, around 57% of the terrestrial vertebrates of the Biodiversity Hotspot of Japan, including 44% of species endemic to Japan as well as 36% of globally threatened vertebrates in Japan, are living in the four regions containing the nominated property. The number and proportion of threatened species are also large in the nominated property, including 95 globally threatened species.

Among those species listed on IUCN Red List of Threatened Species, the Amami rabbit (*Pentalagus furnessi*) lives on Amami-Oshima and Tokunoshima Islands and is the only species in its genus, with no close relatives anywhere in the world. Okinawa rail (*Gallirallus okinawae*), which lives in the Northern part of Okinawa Island, is one of the non-flying rails that are known to be vulnerable to extinction. Spiny rats form an endemic genus consisting of three species (*Tokudaiada osimensis*, *T. tokunoshimensis*, *T. muenninki*) endemic to each of the

three regions of the nominated property in the Central Ryukyus. Iriomote cat (*Prionailurus bengalensis iriomotensis*) only inhabits Iriomote Island, "the world's smallest island where wildcats live".

Also, there are abundant examples of diverse speciation and endemic species in the nominated property. For example, 188 species of vascular plants and 1,607 insect species are endemic. Especially, rates of endemism among terrestrial mammals (62%), terrestrial reptiles (64%), amphibians (86%), and inland water crabs (100%) are high. Among these endemic species in the nominated property, there are as many as 20 species identified as Evolutionarily Distinct and Globally Endangered (EDGE) species, including the Okinawa spiny rat (*Tokudaida muenninki*), Ryukyu black-breasted leaf turtle (*Geoemyda japonica*), and Kuroiwa's ground gecko (*Goniurosaurus splendens*) that are ranked in the Top 100 EDGE species.

The species richness, large number and high proportion of threatened species and endemic species, and diverse examples of speciation and unique evolution, are all interrelated and have resulted from the geological history of the Central and South Ryukyus that formed as continental islands. The Ryukyu Chain was part of the Eurasian Continent until the middle Miocene, but it became separated and formed an archipelago of small islands through the development of the Okinawa Trough and three deep straits. The terrestrial creatures there became isolated on small islands and went through the unique processes of evolution. For this reason, in the Central and South Ryukyus, many examples of endemic species are clearly shown in non-flying terrestrial vertebrate groups and plants that were not able to cross the straits with ease.

c) Statement of integrity

The nominated property includes all the elements necessary to express its Outstanding Universal Value as a serial nomination, is of adequate size to ensure the complete representation of its biodiversity values, and does not suffer from adverse effects of development or neglect.

The four regions containing the nominated property consist of mountains and hills and have the intact and contiguous subtropical rainforests with old trees that secure particularly stable habitats for approximately 90% of native species, endemic species and globally threatened species of the Central and South Ryukyus.

The five component parts of the nominated property have substantial size of the intact subtropical forests and other habitats, and form core areas that contain the most important actual and potential distributional areas of endemic species and threatened species that are key attributes expressing the Outstanding Universal Value of this property. Each component has different characteristic endemic and/or threatened species, and the nominated property as a whole represents the unique characteristics of the biota of the Central and South Ryukyus.

The nominated property is under the strictest protection in Japanese system. Key threats to the biota include the impact of invasive alien species such as small Indian mongoose and cats, wildlife roadkills and the illegal collection of wild rare and threatened species. For these threats, the risks to the nominated property are prevented or mitigated by various measures implemented through collaboration among related administrative organs, private organizations and local communities. In recent years, the tourism industry has developed, and measures towards sustainable tourism use have been started on each island.

d) Statement of authenticity

Not applicable because this nomination does not claim cultural values.

e) Protection and management requirements

The nominated property is designated as Special Protection Zones or Class I Special Zones of national parks managed by the Ministry of the Environment and/or Preservation Zones of Forest Ecosystem Reserves managed by the Forestry Agency. In addition, the nominated property is designated as National Wildlife Protection Area and Natural Monument Protection Area. The nominated property is thereby protected by the highest-ranked strict protection measures in the Japanese protected area system, and is ensured of adequate management resources and appropriate long-term protection.

The four islands containing the nominated property are inhabited by people, and the places for residents' lives and industrial activities are close to the habitats for endemic species and threatened species. To enable the coexistence of protection of the property and the people's livelihoods, buffer zones were set up mainly in the Class II Special Zone of the national park and/or the Conservation and Utilization Zone of the Forest Ecosystem Reserve, adjacent to the nominated property. In addition, Surrounding Conservation Areas encompassing the nominated property and the buffer zones are designated under the Comprehensive Management Plan to implement conservation through legal or customary means as well as a broader range of conservation and management measures required to counter threats to the nominated property such as invasive alien species and illegal collection of rare and threatened species. Looking at the whole region in which the nominated property is located and setting up three different management categories facilitates the organic management of the nominated property in partnership with many stakeholders.

Some of the endemic species and/or threatened species living in the nominated property, such as the Amami rabbit, three species of spiny rats, Okinawa rail and Iriomote cat, have been designated and legally protected as National Endangered Species and/or National Natural Monuments.

The responsible administrative organs, i.e. the Ministry of the Environment, the Forestry Agency, the Agency for Cultural Affairs, Kagoshima and Okinawa Prefectures, and 12 municipalities, have established the Regional Liaison Committee to facilitate and coordinate their works in the management of multilayered protected areas and the protection of designated species. They manage the nominated property in a consistent manner based on the Comprehensive Management Plan which covers conservation management measures not only in the nominated property but also in the buffer zones and Surrounding Conservation Areas.

Under the Regional Liaison Committee, four sub-local meetings including local stakeholders as members have been set up, and regional Action Plans were formulated to effectively carry out conservation and management of the nominated property through collaboration and cooperation with the local stakeholders. Also, the Scientific Committee and Local Working Groups comprised of academic experts have been established to provide scientific advice to the conservation and management by administrative organs, and promote adaptive conservation and management in light of scientific knowledge and insight.

4

State of Conservation and Factors Affecting the Property

4. a. Present State of Conservation

4. b. Factors Affecting the Property

View from the Funaura Bay, Iriomote Island (Photo: MOEJ)

4. State of Conservation and Factors Affecting the Property

4.a. Present State of Conservation

Among the endemic species and threatened species that indicate the value of the nominated property, this chapter describes the current conservation status of the targeted monitoring species shown in Chapter 6. Subtropical rainforests in the nominated property provide habitats for many endemic species and threatened species including these indicator species. Forests within the nominated property that were previously cut and trimmed have currently been restored to almost primeval conditions due to their high regenerating ability. There are no agricultural lands or residents within the nominated property. Forests in the nominated property are strictly secured as protected areas and have been maintained in a good condition as a whole.

4.a.1. Present conservation state of species subject to monitoring

1) Amami rabbit (*Pentalagus furnessi*)

The Amami rabbit is an endemic species of monospecific genus that is found only on Amami-Oshima Island and Tokunoshima Island. This rabbit makes burrows mainly on slopes in primary forests and uses adjacent areas along streams and secondary forests, etc., where many herbaceous plants and other food items can be found, as feeding ground. It also eats Castanopsis acorns from autumn to winter (Sugimura 1990; MOEJ 2014; Yamada 2017).

(Photo: MOEJ)

The distribution range of the Amami rabbit is estimated to be about 37,000 ha on Amami-Oshima Island and about 6,700 ha on Tokunoshima Island. On Amami-Oshima Island, the distribution range has been diminished and partially fragmented in comparison to that in 1970s, while the range consists of two areas in north and south on Tokunoshima Island (MOEJ 2014; Ohnishi et al. 2017; Ando et al. 2018). On Tokunoshima Island, it has been revealed that the two populations separated in south and north have unique genetic traits respectively (Ando et al. 2018). On Amami-Oshima Island, observed are genetic differences between distant areas within a population but also the occurrence of gene flow among the areas at a low level (Ohnishi at al. 2017). It is thought that these observations indicate a low dispersal ability of the rabbit.

It is estimated that the population of the rabbit on Amami-Oshima Island was ranged from 2,500 to 6,100 in 1993 to 1994 but dropped to 2,000 to 4,800 in 2002 to 2003, while on Tokunoshima Island, the population ranged from 120 to 300 in 1998 but dropped to 100 to 200 in 2003 to 2004 (Sugimura and Yamada 2004; MOEJ 2014). Their population on Amami-Oshima Island is now on track to recover due to positive results from mongoose control

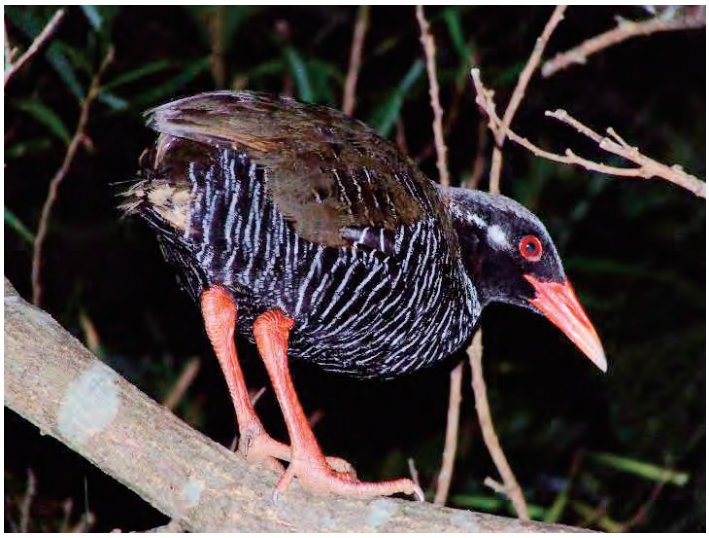
measures that started in 2000 (Watari et al. 2013). On Tokunoshima Island there have been indications of population decline in some areas but the range expansion in other areas in recent years. The Amami rabbit is listed as EN in the IUCN Red List (2018) and MOEJ Red List (2018). The important factors threatening this species are thought to be development activities in its forest habitats and the predation by mongooses, an invasive alien species, recently coupled with growing problems of predation by cats (*Felis catus*) and dogs (*Canis familiaris*), and an increasing number of traffic accidents.

MOE, Forestry Agency, and Ministry of Education, Culture, Sports, Science and Technology (MEXT) developed a plan for a protection and recovery program in 2004 under which a variety of efforts have been underway. These include to monitor the distribution range and population density, to gather ecological data (including those on breeding activities), to take prevention measures of traffic accidents, and to implement mongoose control on Amami-Oshima Island. On Tokunoshima Island, effective measures will be considered such as expanding distribution areas by securing continuity of the habitat.

Regarding domestic cats that have affected native species including the Amami rabbit, relevant municipalities in Amami-Oshima Island and Tokunoshima Island introduced the Ordinance Concerning Appropriate Keeping and Management of Pet Cats, in 2011 and 2014 respectively, to prevent cats becoming feral. In addition, MOEJ and relevant municipalities in Amami-Oshima Island formulated the Feral Cat Management Plan for Ecosystem Conservation in Amami-Oshima Island in 2018, and the measures required have been taken. On Tokunoshima Island, MOEJ has been capturing feral cats to eliminate from the wild, in cooperation with three relevant municipalities.

2) Okinawa rail (*Gallirallus okinawae*)

The Okinawa rail is a flightless rail that was described as a new species in 1981 (Yamashina and Mano 1981), and a species endemic to the northern part of Okinawa Island (Ornithological Society of Japan 2012). They live year-round as resident birds on the forest floor of evergreen broadleaved forests or surrounding grasslands.



(Photo: MOEJ)

In 1985, the area of Okinawa rail distribution was approximately 320 km^2 and their population was estimated to be 1,500 to 2,100, but both the distribution range and estimated population fell thereafter until 2005. It was estimated that over the course of 20 years, their inhabitable range dropped by about 34% and their population dropped by about 40% (580 to 930 birds) (MOEJ 2014). Starting in 2011, a trend of recovery has been observed in the distribution range and estimated population of Okinawa rail, which is attributable to positive results from mongoose control and other measures. The estimated population in

subsequent years has been hovering around 1,500.

The species is listed as EN on the IUCN Red List (2018) and as CR on the MOEJ Red List (2018). While the main threat to this species is believed to be predation by mongooses, cats, dogs and other such animals, a certain number of traffic accidents in recent years is also confirmed.

MOEJ and the Okinawa Prefecture jointly embarked on an effort to deal with mongooses in 2000, and cats in 2002. MOEJ, Forestry Agency, MEXT, Ministry of Land, Infrastructure, Transport and Tourism (MLIT) developed a plan for a protection and recovery program in 2004 under which they have been conducting studies and research, conservation activities, the rehabilitation of injured and sick animals, measures against factors causing injured and sick animals, captive breeding, and other actions in cooperation with municipal governments and NPOs.

3) Iriomote cat (*Prionailurus bengalensis iriomotensis*)

The Iriomote cat, a subspecies of the leopard cat (*Prionailurus bengalensis*), endemic to Iriomote Island, is adapted to the small-size of Iriomote Island, where there are no small mammals native to the island. These cats typically feed on native flying foxes and alien black rats (*Rattus rattus*) as well as birds, reptiles, amphibians, insects, crustaceans in different combinations according to the season. Approximately 80 species have been confirmed as being their prey (Nakanishi and Izawa 2015).

(Photo: MOEJ)

The Iriomote cat prefers environments with hydrological systems, such as forest peripheries, lowland areas, riversides, and wetlands, and also mangrove forests, vicinity of agricultural land and seashore (Okinawa Prefecture 2006; MOEJ 2014). It was considered that the cats inhabited mainly in lowland areas on the coastal side, and the population was estimated to be around 100; however, recent studies have reported that there is a resident and breeding population also in the mountainous inland area (Izawa et al. 2003; Nakanishi and Izawa 2014), with implications suggesting a similar level of population density as in the lowland areas.

While the IUCN Red List (2018) categorizes the leopard cat as LC, its subspecies−the Iriomote cat−is listed as CR, and the MOEJ Red List (2018) also lists it under CR. The threatening factors include traffic accidents, disappearance or modifications of favorable habitats, and transmission of diseases from domestic cats and competition with them.

MOEJ, Forestry Agency and other relevant agencies developed a plan for a protection and recovery program in

1995, under which they have been implementing in cooperation with researchers, scientific studies, conservation activities, the rehabilitation of injured and sick Iriomote cats, and other actions. In addition, Taketomi Town formulated the Ordinance on Keeping of Cats in 2001, which obligates residents who have pet cats to microchip them, limit the number of cats kept by owners, observe due procedures regarding the quarantine when they bring cats into Iriomote Island, etc.

4.a.2. Major current threats and countermeasures

The major current threats are the predation and competition caused by alien species, traffic accidents, and illegal capture and collection.

4.a.2.1. Invasion of alien species

A large number of endemic species occurs in the Central Ryukyus and the South Ryukyus, both being isolated island groups. In particular, the Central Ryukyus is characterized by an ecosystem that lacks predatory mammals and consequently are very vulnerable to highly predacious alien species. This section provides a summary of the steps taken to deal with mongooses and cats, both of which have been found to have a strong impact on native species, including endemic species, and are currently subject to control.

1) Small Indian mongoose (*Herpestes auropunctatus*)

The small Indian mongoose is native to the region extending from West Asia to Southeast Asia, and prescribed as a Designated Invasive Alien Species under Act on the Prevention of Adverse Ecological Impacts Caused by Designated Invasive Alien Species (Invasive Alien Species Act). With the aim of eliminating habu vipers (*Protobothrops flavoviridis*) and rats, the mongooses were released on Okinawa Island and Amami-Oshima Island, where there were no native carnivorous mammals, without sufficient impact studies being conducted. As a result, on both islands, the expected effect could not be obtained, but they preyed on endemic species and rare species, which have seriously impacted the native ecosystems that lack high-level predators.

Mongoose Busters setting a trap (Photo: JWRC)

Efforts to capture the mongooses began around 2000 in an attempt to eliminate them, and since the enactment of the Invasive Alien Species Act in 2005, their capture has been performed strategically and systematically pursuant to a control plan. Respective islands have introduced the formation of teams comprising around 40 staff members, called Mongoose Busters, together with mongoose search dogs, and implement planned capturing, monitoring, and relevant activities for public awareness.

MOEJ has implemented capturing programs in the entire area of Amami-Oshima Island, by setting traps at

approximately 34,000 sites in order to completely eliminate mongooses. Since 2007, collaboration with a private company that owns approximately 70% of the private land within the nominated property has been promoted. Concretely, MOEJ has established a consensus with the private company as to mongoose capturing and monitoring activities within their properties, and those activities have been implemented.

In the northern part of Okinawa Island, Okinawa Prefecture built fences for the purpose of preventing invasion by mongooses to the north from the central and south parts where mongooses are densely populated. In addition, MOEJ and Okinawa Prefecture have promoted, in cooperation with the US Forces, since 2007, mongoose control programs within Northern Training Area (NTA) adjacent to the nominated property in Northern part of Okinawa Island, at the same level as outside NTA. Concretely, traps have been set at around 30,000 sites in the entire area of the northern part of Okinawa Island, including NTA, and Mongoose Busters regularly conduct capturing and monitoring. Mongoose control programs have been conducted as tasks for the US Marines in Okinawa in some areas within NTA, which plays an important part in complete elimination of mongooses from the northern part of Okinawa Island.

As the project outcomes and progress are scientifically assessed by a review committee on a regular basis, the control project is implemented adaptively with improvements being made to both plans and methods. As a result of the project to date, a remarkable population decrease of mongooses and considerable shrinkage of their distribution areas have been achieved. This is now producing positive effects, as the monitoring survey of native species, which is carried out simultaneously, confirmed expansion of distribution areas of the Amami rabbit and Okinawa rail in the nominated property (Table 4-1). The control project is steadily progressing towards complete elimination of mongooses from a wide range by physical trapping method. It is a pioneering effort even from an international perspective. In the northern part of Okinawa Island, monitoring to prevent re-invasion of mongooses in south of central area will be implemented after complete elimination, and immediate measures will be taken in case re-invasion is confirmed.

Table 4-1: Developments of the mongoose control project on Amami-Oshima Island and Okinawa Island*

Event	Amami-Oshima Island	Okinawa Island
Introduction	Introduced from Okinawa Island in 1979; 30 mongooses released in the northwestern part.	Introduced from Bangladesh in 1910; 17 mongooses released in the southern part of Okinawa Island.
Study started	Impact study started in 1989 by an NPO. Distribution spread eastwards and westwards from the spot where they were introduced.	Basic study started in 1985 by University of the Ryukyus. Mongooses reached the northern part of Okinawa Island at the beginning of the 1990s; distribution spread further north.
Elimination started	Capture by municipal governments started in 1993. Capture by the prefecture started in 1996. Study by the Environment Agency and the prefecture started in 1996.	Capture by the prefecture started in 2000.
Elimination project fully underway	Elimination project by the Environment Agency started in 2000. Estimated number of mongooses: approximately 10,000.	Capture project by MOEJ started in 2001.

Event	Amami-Oshima Island	Okinawa Island
Control plan	Developed in 2005. Phase 2 control plan: Started in 2013 aiming to achieve complete elimination from Amami-Oshima Island by JFY2022. Estimated number as of 2017: 50 or less	Developed in 2005. Phase 3 control plan: Started in 2017 aiming to achieve eradication from the northern part of Okinawa Island and to prevent re-invasion by JFY2026.
Control project	Amami Mongoose Busters formed in 2005. Search dogs introduced in 2007. Started coordination with a private company that owns most of the private land in the nominated property as of 2007.	Erection of first northward migration prevention fences completed in 2006. Started capturing within Northern Training Area in cooperation with the U.S. Forces in 2007 Yambaru Mongoose Busters formed in 2008.
	Population growth of Amami rabbits, Amami spiny rats (*Tokudaia osimensis*), Ryukyu long-haired rats (*Diplothrix legata*) and endemic frogs reported from 2003 to 2011 (Fukasawa et al. 2013; Watari et al. 2013). Estimated number of mongooses in 2012: less than 300.	Search dogs introduced in 2009. Number of captures dropped in and after 2010; Okinawa rail distribution expanded. Erection of second northward migration prevention fences completed in 2013. Erection of third northward migration prevention fences completed in 2017.

*: Compiled with reference to the brochures below.
http://kyushu.env.go.jp/naha/files/mongoose_amami_E.pdf
http://kyushu.env.go.jp/naha/files/mongoose_yambaru_E.pdf

2) Cats (*Felis catus*)

Captured feral cat (Photo: MOEJ)

Domestic cats have been spotted in mountainous areas away from human dwellings on Amami-Oshima Island, Tokunoshima Island, and the northern part of Okinawa Island, where there are no native carnivorous mammals. As a result of feces analyses and automatic-camera studies, it has been confirmed that rare endemic species, including the Amami rabbit, Ryukyu long-haired rat, three species of spiny rats, and Okinawa rail, are preyed on by the domestic cats. There are also concerns about influence of infection of communicable diseases on rare species. On Iriomote Island, there are concerns over such issues as the competition with and the transmission of diseases to Iriomote cats. For those reasons, each island has actions underway, in cooperation with relevant organizations, which include capturing feral cats in the habitat range of rare species and promoting the appropriate keeping of pet cats as a step to deal with their source origin (making obligatory by an ordinance to register pet cats; recommending neutering them and keeping them indoors; and prohibiting abandonment) (Table 4-2).

On Amami-Oshima Island, relevant municipalities introduced the Ordinances on the Proper Keeping and Management of Pet Cats in 2011, and MOEJ conducted capturing cats in habitats of rare species as a model project from 2009 to 2013, and estimated the cat population in 2014. Although the removal from the wild had been suspended since 2014 till recently due to the difficulties in dealing with individuals captured, in order to

undertake urgent measures for endangered species, MOEJ, Kagoshima Prefecture, and local municipalities coordinated to consider how to deal with the issues, and formulated in March 2018 the "Feral Cat Management Plan for Ecosystems Conservation on Amami-Oshima Island" that stipulates details of such as period of time, purposes, policies, implementing structures, etc. (see Annex 5-32). Based on this Management Plan, MOEJ launched capturing in July 2018. Captured cats are temporarily accommodated by the Amami-Oshima Island Cat Management Council comprising five municipalities of Amami-Oshima Island. The Council has exerted its efforts in transferring captured cats to those who wish to adopt them. As for cats that find no one to adopt them, they are euthanized in the least painful manner.

Meanwhile, the Plan aims at preventing potential and apparent impacts caused by feral cats and conserving the Island's unique native ecosystems. As a concrete measure to achieve this, relevant municipalities in Amami-Oshima Island amended the above-mentioned ordinances in 2017, to deal with cats that have an impact on indigenous ecosystems, in addition to capturing cats to eliminate from the habitats of rare species. For example, cat owners are obligated to register and microchip their pet cats, to sterilize free-ranging cats, and to obtain permission when they have five or more cats. Any owner who violates these obligations shall be punished. Further, appropriate keeping of pet cats shall be promoted.

On Tokunoshima Island, related three municipalities enacted the Ordinance Concerning Appropriate Keeping and Management of Pet Cats in 2014. In addition, since MOEJ conducted a model project in 2014 to estimate feral cat population in the habitats of rare species, capturing feral cats has also been continued. In Northern part of Okinawa Island, Ada Ward of Kunigami Village established the Regulation Concerning Keeping of Cats in 2002, and the three villages enacted the Ordinance Concerning Welfare and Management of Cats in 2004.

On Iriomote Island, for the purpose of prevention of disease infections from domestic cats to the Iriomote cat and of competition between them, volunteers on the island, veterinary associations, and NPOs started spaying and neutering, vaccination, and measures for appropriate keeping of pet cats. They also promoted capturing of cats, transfer them outside the island, and looking for new owners to adopt them. Taketomi Town enacted the Ordinance on Keeping of Pet Cats in 2001, which obligates residents who have pet cats to microchip them, limit the number of cats kept by the owners, observe due procedures regarding the quarantine when people newly bring cats into Iriomote Island. As a result, the number of stray cats on the island has decreased and impacts on the Iriomote cat have not been observed. The risk of infection of communicable diseases and competition between them is now reduced. Currently, most of the rates for spaying and neutering, microchipping, vaccination, virus check of pet cats are maintained to be more than 95%.

Table 4-2: Countermeasures against cats in four regions containing the nominated property

Region	Promotion of appropriate keeping	Implementation status of cat capture and estimated number of individuals in rare species habitats (in forests)
Amami-Oshima Island	Ordinance Concerning Appropriate Keeping and Management of Pet Cats (five municipalities, 2011, amended 2017)	Experimental implementation from 2009 to 2013 - Estimated number of cats: 600 to 1,200 (2014) Full-scale implementation since 2018 onwards
	Feral Cat Management Plan for Ecosystem Conservation on Amami-Oshima Island (MOEJ, Kagoshima Prefecture, five municipalities from JFY2018 to JFY2027)	
Tokunoshima Island	Ordinance Concerning Welfare and Management of Cats (three municipalities, 2014)	Implementation since 2014 - Estimated number of cats: 150 to 200 (2014)
Northern part of Okinawa Island	Regulation Concerning Keeping of Cats (Ada Ward, Kunigami Village, 2002) Ordinance Concerning Welfare and Management of Cats (three villages, 2004)	Implementation since 2001
Iriomote Island	Taketomi Town Ordinance on Keeping of Cats (Taketomi Town, 2001, amended 2008)	Currently feral cats are not confirmed in rare species habitats (in forests)

Outreach booklet on feral cat issue in Amami region “The islands in harmonious coexistence between people, wildlife and cats” (in Japanese)
Publisher: Kagoshima Environmental Studies Group of Kagoshima University

4.a.2.2. Traffic accidents, etc.

Impacts brought by road development may include environmental changes to the land form, etc., traffic accidents involving animals, fragmentation of habitats, etc., water contamination resulting from soil run-off at the time of construction, and alien species and illegal collectors gaining easier access. Table 4-3 shows the road development status in the four regions containing the nominated property.

Table 4-3: Road development status in four regions containing the nominated property

	National roads (km)*1 (Number of routes)	Prefectural roads (km) (Number of routes)	Municipal roads (km)	Public road density*2 (m/ha)	Forest roads*3 (km)	Forest road density*4 (m/ha)	Sources
Amami-Oshima Island*5	73.0 (1)	286.3 (14)	1,093.1	18	364.5	4 (5)	1)
Tokunoshima Island	–	98.6 (6)	918.8	41	35.6	1 (3)	1)
Northern part of Okinawa Island	60.6 (2)	75.8 (22)	212.0	10	155.5	5 (6)	2), 3), 4)
Iriomote Island	–	54.2 (1)	43.9	3	–	–	5)

*1: Of a road segment for which public notice of commencing services has been given pursuant to the provisions of the Road Act, the actual length counted as its total length minus any length that overlaps with another route, is not available for service yet or is ferry-serviced.
*2: Road density is the density relative to the area of the island (the area of three Yambaru villages for Northern part of Okinawa Island).
*3: "Forest roads" applicable herein are only those pursuant to the forest road standards of the Forestry Agency and do not include any skid roads or skid trails. A figure that represents the total of prefecture-operated and municipality-operated forest roads.
*4: Forest road density is the density relative to the area of the island (the area of three Yambaru villages for Northern part of Okinawa Island) or the density relative to the area of the forest (in brackets).
*5: This includes Kakeroma Island, Ukejima Island, and Yoro Island.
Sources: 1) Oshima Branch Office, Kagoshima Prefecture (2015); 2) Civil Engineering and Construction Unit, Okinawa Prefecture (2014); 3) Okinawa General Bureau, Cabinet Office (2009); 4) Local Regions and Remote Islands Promotion Division, Okinawa Prefecture (2014) and; 5) Yaeyama Office, General Affairs Department, Okinawa Prefecture (2013)

Traffic accidents have occurred in and around the nominated property involving endemic species and rare species, such as the Amami rabbit, Ryukyu long-haired rat, Okinawa rail, Iriomote cat, and crested serpent eagle (*Spilornis cheela perplexus*), along with such small animals as Okinawa rail chicks, Anderson's crocodile newt (*Echinotriton andersoni*), the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*), and the Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*) falling into roadside ditches. To address these circumstances, a series of actions has been taken in the four regions containing the nominated property in collaboration with related organizations.

With respect to impacts arising from the road structure, related sections of the national and prefectural governments have formulated guidelines for public works with consideration given to the natural environment and developed written instructions, etc. that specifically set out actions in terms of planning, design, and construction work (North National Road Office, Okinawa General Bureau 2008; Yaeyama Regional Public Works Office, Civil Engineering and Construction Unit, Okinawa Prefecture 2009). Pursuant to those instructions, etc., they are working to make improvements to the road structure, including installing underpasses for animal crossings and ditches that are sloped in a way that small animals may crawl out.

The following gives an overview of the status of traffic accidents involving major rare species, along with countermeasures.

1) Amami rabbit

On Amami-Oshima Island and Tokunoshima Island, the Amami Island Group Rare Wildlife Protection Program Council, formed by 16 relevant organizations, including MOEJ, Forestry Agency, local governments, and the Amami Nature Experience Promotion Council, formed by 14 organizations, have been running campaigns since 2009 that target islanders, tourists, etc. of both islands for the prevention of traffic accidents involving Amami rabbits and other wildlife. Various actions have been taken, including installation of signboards intended to prevent accidents at locations where traffic accidents occur frequently (Figure 4-1). MOEJ and local concerned parties are collaborating in rescue and rehabilitation of injured and sick animals.

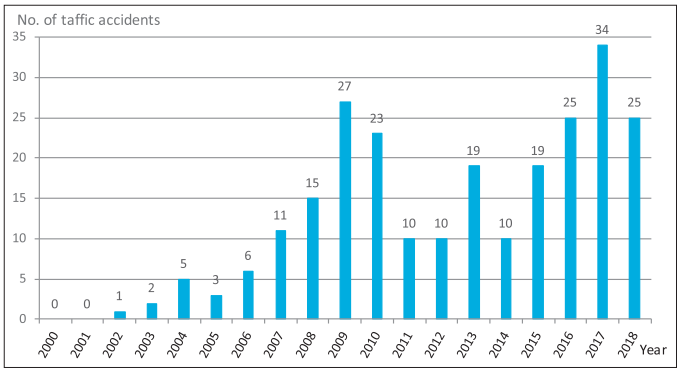


Figure 4-1: Shifts in total number of traffic accidents involving Amami rabbits on Amami-Oshima and Tokunoshima Islands (since January 2000 as of September 30, 2018) (Based on data of MOEJ)

Traffic accident prevention campaign (Photo: MOEJ)

2) Okinawa rail

While the Okinawa rail population has increased thanks to positive results from actions dealing with alien species, a certain number of traffic accidents involving this bird is also occurring every year (Figure 4-2).

In the northern part of Okinawa Island, the Liaison Meeting on Yambaru Region Roadkill Prevention, formed by 25 relevant organizations, including MOEJ, Forestry Agency and local governments, engages in the collection and analysis of accident information, placing of warning signs along routes with frequent accidents, and improvement of the road structure, such as creating fences and underpasses to prevent Okinawa rails from entering the road (Nakamatsu and Kinjo 2014). It also takes actions in buffer zones and the living domain of residents, such as traffic accident prevention campaigns targeting islanders, tourists and others. There are also rescue and veterinary care operations for animals involved in an accident that are managed in collaboration among MOEJ, the Conservation & Animal Welfare Trust, and Yanbaru Animal Clinic (a private veterinarian clinic).

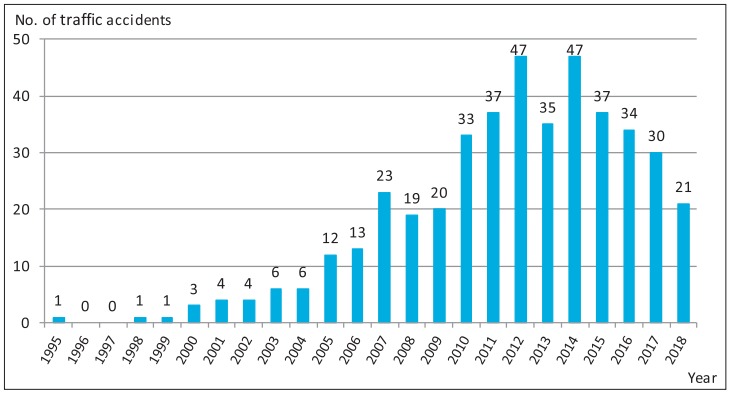


Figure 4-2: Shifts in number of traffic accidents involving Okinawa rails (since 1995 as of September 30, 2018)
(Based on data of MOEJ)

Warning sign along routes
(Photo: MOEJ)

3) Iriomote cat

As Iriomote cats have a broad home range, stretching from forests in mountain foothill areas to lowland areas adjacent to agricultural land, etc. to the living domain of residents and coastal areas, there are roads running in their home range. Figure 4-3 shows the number of traffic accidents involving Iriomote cats.

On Iriomote Island, the Liaison Meeting on Prevention of Traffic Accident Occurrences Involving Iriomote Cats, formed by 23 relevant organizations, including MOEJ, Forestry Agency and local governments, works to share information and maintain collaboration so that actions implemented by the respective relevant organizations and others in connection with nature conservation, road administration, road use, etc. can be carried out effectively. It also takes various actions that include placing road signs intended to prevent traffic accidents involving Iriomote cats, making useful changes to the road structure by adding underpasses, anti-vibration pavement, etc. to arterial roads, installation of fences to keep the Iriomote cat out of roads, and running traffic accident

prevention campaigns targeting tourists, residents and others. MOEJ and private organizations are also operating programs for accommodating, rehabilitating back to the wild, and monitoring injured and sick animals.

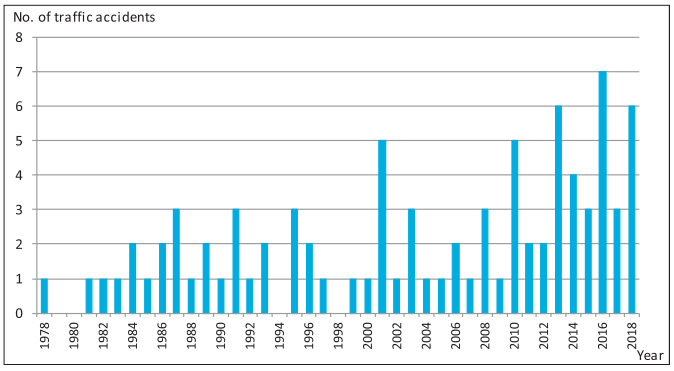


Figure 4-3: Shifts in number of traffic accidents involving Iriomote cats by year (since 1978 as of September 30, 2018)
(Based on data of MOEJ)

Example of improvement of road structure (adding an underpass) (Photo: JWRC)

4.a.2.3. Illegal capture and collection

As the Central Ryukyus and the South Ryukyus have many rare endemic species that are found only in those regions, both regions are the target destinations for amateurs and other interested parties to collect plants and animals (to keep or grow, or to collect specimens). This has a serious impact on rare endemic species, and releases and escapes of such species to other areas also pose a threat to local biodiversity. Another factor contributing to the escalating collection activities is the development of a road network that has reached forest areas, thus providing easier access to spots where endemic species and rare species live or grow. The national, prefectural and municipal governments, relevant local organizations, local NPOs, and others are working in collaboration to address this issue (Table 4-4).

On Amami-Oshima Island, administrative organs installed gates at some entrances of main forest roads for the purpose of protecting rare species and managing entries of tourism use. In addition, five municipalities and MOEJ have been conducting nighttime patrolling for preventing illegal collections. Since December 2018, they have strengthened patrolling on Saturdays and Sundays in major forest roads. Similarly on Tokunoshima Island, the administrative organs installed gates at entrances of main forest roads, in addition to nighttime patrolling by the MOEJ. In the Yama Kubiri Line, the major forest road on Tokunoshima Island, traffic regulations of general vehicles, pre-registration of certified guides, nighttime traffic regulations, etc. shall be implemented after the summer of 2019, according to the Ordinance Concerning Forest Road Management in Tokunoshima Town. In Northern part of Okinawa Island, Kunigami Village has been conducting traffic regulations during the nighttime, after sunset to dawn, targeting 11 village forest roads. According to the rules, in case of entering these roads during the nighttime for animal watching, etc., prior applications shall be submitted and approved by the village mayor. This shall exclude entries and traffic of residents in their daily lives. MOEJ has been conducting forest road patrols in collaboration with local forestry cooperatives, for the purpose of understanding the state of forest road utilization, such as passing conditions of people and vehicles, and calling for preventing illegal collection, in addition to the dissemination of various laws and ordinances regarding the prevention of illegal collection. In

October 2018, the local police, MOEJ, Okinawa Prefecture, Kunigami Village, and Kunigami Village Forestry Cooperatives jointly implemented patrolling for the purpose of arresting poachers, which established a coordination system with police officers. Furthermore, in addition to the current forest road patrolling (i.e. "route patrolling"), it is planned to add animal trails and strip roads for the patrolling (i.e. "area patrolling"), and to strengthen the control system by almost doubling the scope and number of patrols against illegal capture and collection. Patrols shall be conducted in coordination with the police and relevant organizations in the coming period, in addition to strengthening preventive measures against illegal capture and collection as well as promoting relevant coordination for regulations of main prefectural forest roads. On Iriomote Island, in addition to patrolling of the national park by MOEJ staff, Taketomi Town is promoting considerations towards the establishment of a surveillance system against illegal collection based on the ordinance described below.

Table 4-4: Measures against illegal capture and collection

Region	Actors	Actions
Amami-Oshima Island Tokunoshima Island	Amami Island Group Rare Species Protection Measure Council MOEJ Forestry Agency Kagoshima Prefecture Five municipalities Related local organizations Local NPOs, etc.	Placing spotters, installing surveillance cameras, installing gates at the entrance to the forest roads, forest road entrance regulation, joint patrol, campaigns against illegal collection, making awareness-raising guidebooks, distribution of leaflets to raise awareness
Northern part of Okinawa Island	Local residents, local forestry businesses, MOEJ	Forest road patrol, distribution of awareness-raising leaflet, information collection and sharing among local stakeholders
	Yanbaru Long-Armed Scarab Beetle etc. Poaching Prevention Council MOEJ Forestry Agency Okinawa Prefecture Three Yambaru villages Nago City Police Related local organizations, etc.	Forest road patrol, making awareness-raising posters
	Kunigami Village	Forest road entry regulation at nighttime
Iriomote Island	Forestry Agency	Collecting information on the distribution of rare plants, mainly arboreal plants, installing gates (Otomi trail)
	Taketomi Town	Rare species protection, alien species control by amending Nature Protection Ordinance

In addition to the statutory protection of the species by the national government discussed in Chapter 5, there are municipal systems in place in the Amami Island Group. The Ordinance to Protect Endangered Wild Fauna and Flora which was established by Kagoshima Prefecture, five municipalities of Amami-Oshima Island, and three towns of Tokunoshima Island, respectively, designates particularly important species as "endangered species of wild fauna and flora" and prohibits the capture and collection thereof. In order to raise public awareness on protection of rare wild fauna and flora, flyers have been distributed to call for the prevention of illegal capture and collection in arterial roads, commercial facilities, airports, etc. in Amami-Oshima Island and Tokunoshima

Island. Similarly, local companies, such as rental car companies and hotels, have been requested to cooperate in disseminating to users through distributing those flyers. On Iriomote Island, Taketomi Town in its Nature Protection Ordinance, has designated especially important species as Special Endangered Species of Wild Fauna and Flora, and prohibits their capturing and collection. Meanwhile, Okinawa Prefecture has been preparing to formulate the Ordinance Concerning Protection of Rare Wild Fauna and Flora (tentative name) (Table 4-5).

With regard to illegal transportation of rare fauna and flora at ports and airports, in addition to abovementioned efforts regarding the prevention of poaching within the habitats as well as dissemination and strengthening of regulations in accordance with laws and ordinances, relevant agencies, and related organizations shall consider and undertake effective measures in coordination among themselves.

Table 4-5: Number of designated endangered species in the nominated property under the ordinances to protect endangered wild fauna and flora

Local governments	Number of species
Kagoshima Prefecture	22
Five municipalities on Amami-Oshima Island	57
Three towns on Tokunoshima Island	31
Taketomi Town	43

4.b. Factors Affecting the Property

This section describes the factors having potential impacts on the nominated property.

4.b.(i) Development pressures

The nominated property is appropriately protected as Special Protection Zone or Class I Special Zone within national park where any development activities are regulated. The following describes the possible impacts resulting from development activities in and around the nominated property.

1) River and dam construction

As a feature of an island region where the river size is small and rainwater therefore flows out into the ocean in a relatively short time, it is extremely important to secure water for the people living there. In particular, the Central Ryukyus and the South Ryukyus, though being pluvial regions, are relatively affected by frequent droughts. For that reason, coupled with the growing demand for water due to human activities (agriculture, touristic activities, etc.), dam construction has been implemented.

While dams on Amami-Oshima Island, Tokunoshima Island, and Okinawa Island have previously impacted the habitats of animals and plants, development plans administered by the national and prefectural governments have been completed, and there is no construction plan for the future in the nominated property.

Although there is no large dam on Iriomote Island, where water is taken from five water sources (rivers) within the island by building weirs, the island is often exposed to drought and a new water source development project may be planned in order to address the tight water supply. In such a case, it will be necessary to pay attention in terms of planning (site selection and size) and construction methods, etc. so as to eliminate any possible impact inside the nominated property and on the animals and plants that live or grow there.

2) Alien species

The following invasive alien species including domestic origin have been observed in the four regions containing the nominated property and their surrounding islands, as well as the central and southern parts of Okinawa Island. While impact of such species on the nominated property remains unclear, any future impact and further invasion is a concern, which points to the need to monitor and take action to prevent the invasion and spread of alien species.

Species that have been observed in the four regions containing the nominated property, for which there are concerns over future impacts despite not currently having a major effect

• Feral goat (*Capra hircus*)

Goats as livestock have been kept domestically and otherwise as an important source of protein on islands of the Ryukyu Chain, but some have become feral. On Amami-Oshima Island and its surrounding islands, feral goats live mainly in cliff areas along the coast. In some places outside of the nominated property, such as sharply inclined slopes and headlands exposed to the open sea, they have had vegetation destroyed and soil runoff occurred as a result of their feeding damage. Four municipalities containing the nominated property in Amami-Oshima Island implement programs to prevent damages by goats, while all of the municipalities (five municipalities) have established ordinances to prohibit the pasturage of goats.

• Dog (*Canis familiaris*)

Dogs are found in the habitats of rare species on Amami-Oshima Island, Tokunoshima Island and the northern part of Okinawa Island. Their predation on small and mid-sized endemic mammals and bird have been confirmed, and there are growing concerns about their impacts. Dogs that are not registered by owners or tagged according to the prescribed measures must be removed from the wild, based on the Rabies Prevention Act. Local governments are duly implementing captures and other countermeasures against these dogs.

• Black rat (*Rattus rattus*)

In the northern part of Okinawa Island, black rats have been frequently spotted in the habitat of Okinawa spiny rats, an endemic species. It is needed to consider the possibility of their overlapping habitats and active hours that may impact the Okinawa spiny rats (Yamada and Kawachi 2009; Kawachi et al. 2010; Kudaka and Kudaka 2017).

• White-lipped treefrog (*Polypedates leucomystax*)

Native to Southeast Asia. The white-lipped treefrog is prescribed as a Designated Invasive Alien Species under the Invasive Alien Species Act (see 5.c.6). This species has invaded into Yoron Island, the Okinawa Island Group, the Miyako Islands, and Ishigaki Island, and became widespread; it has also been spotted in the northern

part of Okinawa Island. It was also found on Ishigaki Island in 2007 and, for the first time ever, its invasion into Iriomote Island was confirmed in August 2015 (MOEJ 2015). There are concerns over competition with Owston's green treefrog (*Rhacophorus owstoni*), an endemic species with a similar life pattern. MOEJ has been examining ways to control white-lipped treefrogs and making awareness-raising efforts so as to prevent their spread, and has engaged in various actions on Iriomote Island, including monitoring studies, captures, and removal of egg masses. Due to these efforts, the population of this species is decreasing.

• Lanceleaf tickseed (*Coreopsis lanceolata*)

Native to North America. This species is prescribed as a Designated Invasive Alien Species under the Invasive Alien Species Act. The species had been used for road slope greening purposes or for gardening and spread all over Japan. It is established on Amami-Oshima Island and Tokunoshima Island, and there are records confirming its existence on Okinawa Island as well. However, it has not spotted on the Yaeyama Islands. Given the concerns over its competition with endemic species, in areas where their distribution has been confirmed, relevant activities for control as well as for raising public awareness have been continuously conducted by the prefectures, local residents, MOEJ, municipalities, in addition to elementary and junior high schools, local guides, etc.

• Bay Biscayne creeping-oxeye (*Sphagneticola trilobata*)

Native to South America. The species became rampant after being used for road slope greening purposes, and has been spotted in the four regions containing the nominated property. There are concerns over its effect of suppressing endemic plants, competition and hybridization with endemic plants, and allelopathic effects inhibiting growth of other plants. Particularly in the case of Iriomote Island, its impacts on communities of *Acrostichum aureum* that is believed to be an endemic new species (Yokota's personal correspondence 2014) is concerned. In areas where their distribution has been confirmed, relevant activities for control as well as for raising public awareness have been continuously conducted by the prefectures, local residents, MOEJ, municipalities, in addition to elementary and junior high schools, local guides, etc.

• Mile-a-minute (*Mikania micrantha*)

Native to South and North America. This species is prescribed as a Desingnated Invasive Alien Species under the Invasive Alien Species Act. This species has been spotted in the part of Okinawa Island and on Amami-Oshima and Iriomote Islands (MOEJ 2017). There are concerns over its effect of suppressing endemic plants, as well as competition with endemic plants, and its possible wider distribution in the future (Yokota's personal correspondence 2014). In areas where their distribution has been confirmed, relevant activities for control as well as for raising public awareness have been continuously conducted by the prefectures, local residents, MOEJ, municipalities, in addition to CSR activities conducted by business sectors, local guides, etc.

Removal of alien plants by participation of school children (Photo: MOEJ)

Species that have encroached into islands surrounding the four regions containing the nominated property, for which there are concerns over possible future impacts

• Japanese weasel (*Mustela itatsi*)

Domestic alien species. This species was introduced for the purpose of rat control and has become established on relatively small islands in the Ryukyu Chain. There are concerns that if this weasel becomes established in the nominated property, it may prey on endemic small mammals, birds, amphibians, reptiles, insects, and other small animals.

• Indian peafowl (*Pavo cristatus*)

Native to South Asia. This species became established on Ishigaki Island and its adjacent islands. There are concerns that if this bird becomes established on Iriomote Island, it may prey on endemic amphibians, reptiles, insects, and other small animals. MOEJ engages in various activities that include studying the status and impacts of this species on the ecosystem, and testing capture methods. Since JFY2006, MOEJ has also been implementing a control project on Aragusuku Island, located about 6 km south-east of Iriomote Island. In order to prevent its invasion into Iriomote Island, Taketomi Town has been conducting basic studies since 2014 to identify its range and egg-laying sites, as well as implementing a removal project since 2015.

• Green anole (*Anolis carolinensis*)

Native to North America. This species is prescribed as a Designated Invasive Alien Species under the Invasive Alien Species Act. It has been confirmed in the southern part of Okinawa Island and on Zamami Island of the Kerama Islands. There are concerns that if this lizard becomes established in Northern part of Okinawa Island, it may prey on endemic insects and compete with indigenous lizards. In addition to a control project in the areas in which it became established, MOEJ and Okinawa Prefecture have been investigating the distribution of this species and engage in awareness-raising activities to prevent the spread thereof.

• Green iguana (*Iguana iguana*)

Native to Latin America. This species became established in northern part of Ishigaki Island. There are concerns that if this lizard becomes established on Iriomote Island, it may prey on indigenous insects. MOEJ tracks the status of this species, engages in trial control, and is examining effective capture methods.

• Taiwan beauty snake (*Elaphe taeniura friesi*)

A Taiwanese-origin distinct subspecies of the Sakishima beauty snake (*E. t. schmackeri*) that is distributed on the Yaeyama Islands. Taiwan beauty snake is prescribed as a Designated Invasive Alien Species under the Invasive Alien Species Act. This snake has become established in the central part of Okinawa Island. There are concerns if it becomes established in Northern part of Okinawa Island, it may prey on endemic small mammals, birds, amphibians and reptiles, and compete with indigenous snakes. Since this snake is hardly caught by traps for habu vipers, Okinawa Prefecture and MOEJ have attempted to understand their distribution status through purchasing individual snakes and to develop better traps by analyzing their behavior.

• Taiwan habu viper (*Protobothrops mucrosquamatus*)

Distributed in Taiwan, southern and eastern China, and northern Vietnam. The species is prescribed as a

Designated Invasive Alien Species under the Invasive Alien Species Act. It is established in the central Okinawa Island (Onna Village and Nago City). There are concerns that if this snake becomes established in Northern part of Okinawa Island, they may prey on endemic small mammals, amphibians, reptiles, and birds, and compete with the indigenous snakes.

• Cane toad (*Rhinella marina*)

Native to Latin America. This species is prescribed as a Designated Invasive Alien Species under the Invasive Alien Species Act. The toad is found in almost all parts of Ishigaki Island. On Iriomote Island, unintentionally introduced cane toads have been found, but the species is not established. There are concerns that if this toad becomes established, it may prey on endemic insects and small animals, compete with indigenous amphibians and reptiles, and its venom might affect crested serpent eagles and Iriomote cats, both of which are higher-level predators on the island. MOEJ developed the Cane Toad (*Rhinella marina*) Control Plan for the Yaeyama Region of Okinawa Prefecture in an attempt to reduce the density of this species on Ishigaki Island, and monitors its potential invasion into other islands, including Iriomote Island.

On the islands including the nominated property, there are airports and ports, together with many movements of passengers and cargo. Accordingly, it is difficult to uniformly strengthen quarantine targeting all alien species. For example, the number of tourists who visited Okinawa Prefecture was around 8.77 million in JFY2016. Therefore, with basic policies to strengthen the control system of invasion status, to implement early prevention and eradication, and to raise public awareness, it is thought that intensive measures should be focused on species with special needs. The following measures have been conducted, based on the Comprehensive Management Plan.

(a) Monitoring of Invasion Status and Early Control

Stakeholders have exerted their efforts in the immediate grasping of information on alien species' invasion, through daily field patrolling and information sharing with related organizations, etc. Relevant agencies have organized regular liaison meetings since JFY2015, to promote information sharing. In addition, since JFY2017, the four regions containing the nominated property have set their respective survey lines and started survey projects regarding invasion status of species that are listed in the list of invasive alien species threatening biodiversity, human health and/or economy development in Japan.

As for invasive alien species that are already confirmed to have invaded and become established, highly necessary and urgent control projects shall be promoted, taking into account relevant aspects, such as possible risks caused by their impact on relict endemic species, new endemic species, threatened species, and important habitats for these species, development of control techniques, and so on. These control projects shall be systematically implemented by administrative organs in an integrated manner, in coordination with local residents and related organizations. In addition to the list of invasive alien species threatening biodiversity, human health and/or economy development in Japan, Kagoshima Prefecture shall prioritize and select alien species to strategically implement their control, especially for designated species based on the ordinance that is currently under consideration concerning measures against alien plants. In Okinawa Prefecture, similar measures shall be undertaken, especially for alien species that were selected as target alien species to be controlled in the alien

species list of Okinawa Prefecture based on Okinawa Prefecture's Guidelines for Countermeasures against Alien Species.

Consideration of Ordinances Concerning Measures against Alien Species in Kagoshima Prefecture

For the purpose of preventing damages that alien species may cause on ecosystems, relevant ordinances shall be established concerning the designation of alien species that may cause damages, and appropriate treatment of the designated alien species, such as prohibition of their release, obligation to keep them in a proper cage, etc. In addition, regarding any construction by a given contractor of public projects in Kagoshima Prefecture, it shall be evaluated, after 2019, in its construction performance assessment, as one of the activities that the contractor contributes to the local community, when it undertakes measures against alien species.

Early control of alien plants in Northern part of Okinawa Island

After mile-a-minute (*Mikania micrantha*), a Designated Invasive Alien Species, was confirmed in JFY2016 in the Surrounding Conservation Area (Figure 1-9), which is an area targeted by the Management Plan, in Northern part of Okinawa Island, MOEJ and Okinawa Prefecture immediately undertook actions to control the plant. Currently, the coordination has been proceeding with local residents and CSR activities of companies.

Preventive measures against alien frogs/toads on Iriomote Island

Since access to Iriomote Island is limited to ferry boat routes from Ishigaki Port, it is relatively easy to undertake preventive measures against invasions. Intensive measures for preventing invasion and establishment in the island have been implemented, especially for species that may cause damages. As concrete efforts that have hitherto been undertaken, the following measures have been implemented in Iriomote Island and Ishigaki Island that could be an invading route to Iriomote Island, based on advice from experts, since there is a concern that alien frogs/toads such as the cane toad (*Rhinella marina*) and white-lipped treefrog (*Polypedates leucomystax*), which have invaded in the past, may re-invade.

- By implementing activities for the control and inspection of alien frogs/toads especially in material yards of Ishigaki Port, from which ferry boats leave for Iriomote Island, their dispersal through slipping into construction materials is prevented. Unintentional invasion of alien species from Ishigaki Island to Iriomote Island has been prevented, by alarming related industrial sectors and their operators who handle materials with high risks of involving frogs/toads, etc. and requesting their cooperation.
- On Iriomote Island, a control and eradication system has been established through setting monitoring points in a high density, which enables to conduct continuous monitoring and to grasp any invasion at an early stage.

By this measure that has been undertaken, it has currently been successful in terms of preventing new establishment of cane toads and white-lipped treefrogs. In addition, efforts for raising public awareness have been exerted, through distributing flyers at regular circulating ferry boats from Ishigaki Island and entrance ports for Iriomote Island, such as Ohara Port and Uehara Port.

Border control against alien ants in Okinawa Prefecture

As to the red imported fire ant (*Solenopsis invicta*), a Designated Invasive Alien Species, its establishment has

not been confirmed in Japan, including the nominated property. However, it has settled in Taiwan, which is geographically close to Okinawa Prefecture, and the risk of its invasion is high. Accordingly, concerned parties including port managers and research institutes, have been in coordination to initiate countermeasures against this ant, as part of the project against alien species in Okinawa Prefecture since JFY2016.

In this project, monitoring activities such as trapping, the time-unit sampling method, etc. have been conducted, together with conducting surveys on the red imported fire ant in Taiwan that is an advanced country on this matter, for establishing technologies and systems of inspection and control of alien ants including the red imported fire ant. As a result of monitoring activities by traps installed in 26 sites within Okinawa Prefecture, including main ports, the invasion of any invasive alien ants, such as red imported fire ants and the Argentine ant (*Linepithema humile*), has not been confirmed. Further consideration shall be carried out to establish technologies and systems for surveillance and monitoring.

Meanwhile, Okinawa Prefecture has enacted the Ordinance Concerning Invasion Prevention of Alien Species Regarding Filling Materials in Reclamation of Public Water Areas, for the purpose of preventing any invasion of alien species such as alien ants that are mixed into the earth and sand transported from outside the prefecture through the implementation of projects for reclamation of public water areas (see Annex 4-13). This Ordinance prohibits implementers of projects for the reclamation of public water areas from transporting into the Prefecture any filling materials to/with which Designated Invasive Alien Species are attached or mixed, and obligates to notify due surveys to confirm whether or not any Designated Invasive Alien Species are attached or mixed to/with filling materials, in addition to their control measures to be undertaken when any mixture of alien species is discovered. In the process of examining notification documents submitted by the implementer, according to the Ordinance, Okinawa Prefecture is able to conduct inspections, in case of any concern about a mixture of invasive alien species, based on advice from experts. In addition, when any Designated Invasive Alien Species are identified to have been mixed with filling materials, the prefecture is able to recommend due measures for their control to be undertaken, or the cancellation of the transportation or use of those filling materials.

(b) Raising Public Awareness, etc.

It is important to deepen the understanding of the public and concerned parties and raise their awareness, for preventing unintentional invasion and dispersion of invasive alien species including domestic origins. Therefore, activities for public awareness have been conducted, by distributing leaflets on alien species in respective islands, flyers for respective invasive alien species, such as the mile-a-minute, Bay Biscayne creeping-oxeye, and red imported fire ant. Learning materials for children were also prepared and distributed on the white-lipped treefrog and green anoles. In addition, the preparation of guidebooks on invasive alien species has been proceeded, for introducing species listed in the List of Invasive Alien Species Threatening Biodiversity, Human Health and/or Economy Development in Japan, as well as indigenous similar species that are observed in the Amami Island Group and in Okinawa Prefecture.

Especially, Okinawa Island is a place with many human and cargo movements. For preventing dispersal of invasive alien species, MOEJ, together with staff of the municipalities, since JFY2016, have conducted inspections on invasive alien species and provided relevant instructions for managers of main tourist facilities,

tourist sites, parks, and other facilities in the central and south areas of Okinawa Island that are located over the lines of tourists, movements toward Northern part of Okinawa Island**.**

3) Genetic disruption

As there are many endemic species in the nominated property, the introduction of any related species or any group with different genetic traits even if belonging to the same species from mainland or another island in the Central Ryukyus and the South Ryukyus might cause genetic disruption as a result of hybridization.

Ryukyu wild boar (*Sus scrofa riukiuanus*) (Photo: MOEJ)

For example, there are cases of genetic disruption on Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island that occurred as a result of hybridization between the Ryukyu wild boar (*Sus scrofa riukiuanus*), a subspecies endemic to the region, and livestock pigs and wild boars from the mainland (*Sus scrofa leucomystax*). For example, the production of wild boar and domestic pig hybrids was conducted by crossbreeding western livestock pigs with the Ryukyu wild boar under a rough management, during the period from 1970s to 1980s, on Uchipanari and Sotopanari Islands, uninhabited islands affiliated to Iriomote Island and located off its western coast (Kurosawa et al. 2013; Mizoguchi 2013). It is pointed out that their descendants have gone wild (Takahashi and Tisdell 1992), and genetic analyses also suggested that possibility (Tsuboi et al. 2011; Mizoguchi 2013; Murakami et al. 2014). Genetic analyses suggested possibilities in hybridization of the Ryukyu wild boar (*Sus scrofa riukiuanus*) with wild boar (*S. s. leucomystax*) from the Japanese mainland on Tokunoshima Island, and with local livestock pigs and wild boars from the Japanese mainland in the northern part of Okinawa Island, respectively (Hayashi et al. 2013; Takano et al. 2013; Mizoguchi 2013).

The Yaeyama yellow-margined box turtle (*Cuora flavomarginata evelynae*) and the Yaeyama pond turtle (*Mauremys mutica kami*), both of which are distributed naturally on the Yaeyama Islands, had been brought into Okinawa Island and the surrounding islands. Consequently, a hybrid of the Ryukyu black-breasted leaf turtle (*Geoemyda japonica*), a species endemic to the northern part of Okinawa Island, with the yellow-margined box turtle has been found (Otani, 1995), and another hybrid with the Yaeyama pond turtle has been found (Ota and Hamaguchi 2003), indicating that genetic disruption may have occurred relative to the population of the Ryukyu black-breasted leaf turtle. Whenever a hybrid or an alien species is found, control procedures are implemented.

4.b. (ii) Environmental pressures

1) Climate change

It is predicted that effects of climate change on the nominated property include warming temperatures, rainfall shortages, increased typhoons, and torrential rains (Kyushu Regional Environmental Office, MOEJ 2012; Fukuoka Regional Headquarters, JMA 2015; Japan Meteorological Agency 2015; Okinawa Regional Headquarters, JMA 2015).

• Warming temperatures

Warming temperatures might cause a reduction or northward shift of the species and their habitats for which the nominated property is the southernmost distribution range, or a new competition as a result of animals of a southern origin making inroads (alien species, etc.), with particularly significant impacts likely to be brought to endemic species and species having a limited distribution range.

• Changes in trends of rainfall shortages and droughts, etc.

If the occurrence of rainfall shortages and droughts were to become more frequent as a result of climate change, it would likely become a factor that would pose a direct threat to such animals as endemic amphibians that inhabit inland waters and endemic rheophytes that have adapted to the mountain stream zone.

• Typhoons and torrential rains

As has been discussed in 2.a, the Central Ryukyus and the South Ryukyus constitute one of the zones most vulnerable to tropical cyclones (typhoons) that are among the most powerful even on a global scale; these areas are hit by typhoons very frequently every year, with an annual average over the past approximately 60 years amounting to 7.6 times (with a maximum of 15 times and a minimum of three). Wildlife in this region have adapted themselves to those frequent strikes of typhoons and torrential rains over a long period of time, but potential increases in the frequency of powerful typhoons, torrential rains, and other consequences thereof are predictable, as future climate change might cause a greater disruption to forests, mountain stream zones, and other environments.

Meteorological data accumulation and analysis will be a critical matter for the purpose of predicting future changes to insular ecosystems caused by climate change that could occur. The Japan Meteorological Agency (JMA) has been constantly engaged in highly accurate observations over a long period of time in cooperation with the World Meteorological Organization (WMO) and other national and international organizations to monitor climate change by means of data accumulation and analysis. The work of analysis and prediction using such data is performed by organizations and researchers from a wide variety of fields, including disaster prevention, agricultural, forestry and fisheries, and ecological system conservation (Ministry of Education, Culture, Sports, Science and Technology, JMA, MOEJ 2013; Climate Change Impact Evaluation Subcommittee, Global Environment Committee of the Central Environment Council 2015).

2) Acid rain

MOEJ is constantly engaged in the wide-area, long-term monitoring of acid rain in cooperation with national and international organizations, including mainly the Acid Deposition Monitoring Network in East Asia

(EANET), with an observation point for the Central Ryukyus and the South Ryukyus, which contains the nominated property, built at Cape Hedo in Northern part of Okinawa Island. While no impact from acid deposition, such as arboreal degradation or soil acidification, has been recognized so far, it is feared that an impact originating in East Asian countries, where air pollutant emissions are rising sharply as a result of rapid economic growth, might become evident in the future (MOEJ 2014). It is known that acid rain affects epiphytic lichens and some orchid species (Frei et al. 1984; Taoda 1996). In the nominated property, particular attention should be paid to the influence on the endemic epiphytes in the cloud belts.

4.b. (iii) Natural disasters and risk preparedness

• Earthquakes and Tsunamis

Since the Great East Japan Earthquake in 2011, there is a renewed awareness in Japan of the importance of learning from the history of past earthquakes and tsunamis. The following record exists regarding the earthquakes and resultant tsunamis that have caused relatively serious damage in the vicinity of the nominated property (Table 4-6).

Table 4-6: Earthquakes and tsunamis that caused relatively serious damage in the vicinity of the nominated property

Year	Epicenter	Earthquake scale	Seismic intensity	Tsunami runup height	Notes
1771	Sea near Ishigaki Island	M 7.4 (estimate)	4 (estimate)	Approximately 30 m	Commonly known as the "Great Meiwa Tsunami." Casualties reached approximately 12,000.
1911	Sea near Kikai Island	M 8.0	6	Approximately 5 m	
1960	Off the Chilean coast	M 9.5	–	4.4 m	
1995	Sea near Amami -Oshima Island	M 6.9	5	2.7 m	12- to 24-cm tsunami observed in various locations between Kyushu and Izu Oshima Island.

Sources: Websites of the Naze Weather Station, Okinawa Regional Office, JMA, and Ishigaki Local Meteorological Observatory.

Although according to Goto et al. (2013), boulders brought by tidal waves during a typhoon can be found throughout the Central Ryukyus and the South Ryukyus, tsunami rocks (boulders found on coral reefs or in coastal areas) are only found in the Sakishima Island Group of the South Ryukyus, which suggests that there are no signs indicating that Amami-Oshima Island and the Okinawa Island Group have seen any mega-tsunami large enough to push up a tsunami rock the size of at least 1 m in diameter onto the shore in the past 2,300 years. In the meantime, massive tsunamis have repeatedly hit the Sakishima Island Group, with implications of the recurrence period being 150 to 400 years (Araoka et al. 2013).

To address natural disasters, including earthquakes, tsunamis, typhoons and torrential rains (see 4.b.(ii)),

Kagoshima Prefecture and Okinawa Prefecture have developed disaster prevention plans, respectively, for disaster prevention purposes in an attempt to stay prepared for responding to emergency situations once a disaster strikes (Kagoshima Prefecture Disaster Prevention Council 2015; Okinawa Prefecture Disaster Prevention Council 2015).

Acorns of *Castanopsis sieboldii* (Photo: MOEJ)

4.b. (iv) Responsible visitation at World Heritage sites

Amami-Oshima Island, Tokunoshima Island, and Okinawa Island have regular flight and ferry services from the mainland, and also have a road network in place, including highways on Okinawa Island, for traveling from the airport or seaport. In the case of Iriomote Island, there are regular flight services from the mainland as well as from Okinawa Island to Ishigaki Island, an island located in its vicinity, from where regular ferry service to Iriomote Island is operated; therefore, any of the islands provides easy access to visit the nominated property.

Factors that might have a negative impact on the nominated property include a sharp increase in visitors, the concentration of visitors in some locations, and traffic accidents involving wildlife as a result of car traffic (see 4.a.2.2).

1) Tourism statistics from the past several years

Table 4-7 shows statistics on the status of visits to the nominated property. There is a substantial difference between the Amami Island Group, which contains Amami-Oshima Island and Tokunoshima Island, and Okinawa Prefecture, which contains Northern part of Okinawa Island and Iriomote Island, in terms of circumstances associated with tourism. The number of inbound visitors and travelers in 2017, including local residents and business travelers, was approximately 830,000 for the island group as a whole, about 470,000 for Amami-Oshima Island, and about 130,000 for Tokunoshima Island (Oshima Branch Office, Kagoshima Prefecture 2018a, b).

Meanwhile, tourism is positioned as a key industry in Okinawa Prefecture, with the number of inbound tourist visitors to the prefecture in 2017 marking an all-time high of approximately 9.4 million (Okinawa Prefecture Tourism Policy Division 2018). There is no accurate statistical data on how many of those tourists visited the northern part of Okinawa Island (three Yambaru villages); it is estimated that approximately 7% of inbound tourists to Okinawa Prefecture (around 670,000) visited the three Yambaru villages, on average of the past five years (Department of Culture, Tourism and Sports, Okinawa Prefecture 2017). The number of tourists who visited Iriomote Island in 2017 totaled about 320,000 (Commerce and Tourism Department, Taketomi Town 2018).

Yambaru Wildlife Conservation Center and its exhibitions (Photo: JWRC)

Table 4-7: Changes in number of visitors* in four regions containing the nominated property in the past five years

	2013	2014	2015	2016	2017	Source
Amami-Oshima Island	370,360	393,654	422,527	431,740	473,704	1)
Tokunoshima Island	126,345	124,275	129,806	127,846	129,358	1)
Okinawa Island	6,413,700	7,058,300	7,763,000	8,613,100	9,396,200	2)
Iriomote Island	346,401	379,727	387,952	329,917	315,294	3)

Sources: 1) Oshima Branch Office, Kagoshima Prefecture (2018a, b); 2) Okinawa Prefecture (2018), Tourism Policy Division, Okinawa Prefecture (2018); 3) Policy Promotion Department, Taketomi Town (2018).

* The number of visitors means: in source 1), the number of inbound visitors (sum total of the number of people who entered any island of the Amami Island Group from outside of the island group and the number of people who travelled within the island group); in source 2), the number of inbound visitors to Okinawa Prefecture from outside of the prefecture and; in source 3), the number of inbound visitors to Iriomote Island from outside of the island.

2) Major site use

The main tourism form has been visiting sightseeing sites and facilities, in the Amami Island Group and Okinawa Prefecture. However, ecotourism and other forms of tourism characterized by hands-on experience and extended stays that take advantage of their resources, such as abundant nature and indigenous culture, have been promoted in recent years.

2)-1. Amami-Oshima and Tokunoshima Islands

Major categories of inbound visitors to the Amami Island Group are local residents and business travelers, and the percentage of tourists is believed not to be substantial (Development Bank of Japan 2014).

• Amami-Oshima Island

In addition to group sightseeing tours using a large bus, individual tourists renting a car are increasing, reflecting the recent introduction of low-cost air flights. Many tourists enjoy visiting natural scenic sites and visitor facilities while others enjoy marine activities such as bathing and snorkeling. The main guided tours include canoeing through mangrove forests and wildlife observations at night. The major visitor destinations and number of visitors to Amami-Oshima Island are shown in Figure 4-4.

• Tokunoshima Island

In regard to the form of tourism on Tokunoshima Island, there are a number of individual tourists renting a car to visit natural scenic places, while others enjoy marine activities such as bathing and snorkeling. In recent years, guided ecotours in forest areas and development of wildlife observation facilities are being promoted. The major visitor destinations and number of visitors on Tokunoshima Island are shown in Figure 4-4.

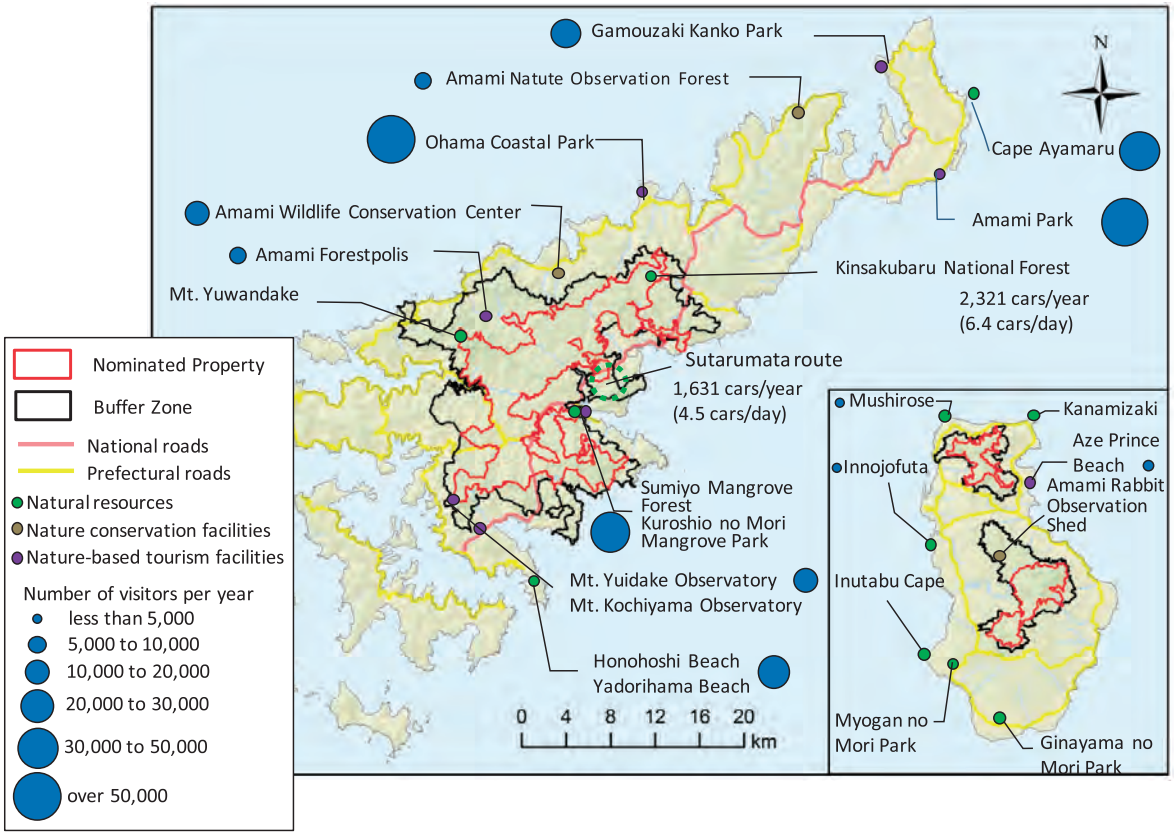


Figure 4-4: Major visitor destinations and number of visitors to Amami-Oshima Island and Tokunoshima Island
Source: Kagoshima Prefecture (2016), Master Plan of the Amami Island Group Sustainable Tourism,
Article on regional edition of Mainichi Shimbun of February 22, 2017
*: Regarding Kinsakubaru National Forest and the Sutarumata Forest Road, the number is estimated based on the number of passing vehicles. Symbols are absent for the locations where data are not available.

2)-2. Northern part of Okinawa Island and Iriomote Island

Known as a tourism-oriented prefecture, Okinawa Prefecture has seen more than a tenfold growth in about 40 years since its reversion to Japan in 1972, in terms of the number of inbound visitors to the prefecture as well as its tourism revenues. Over the course of those years, the forms of tourism within Okinawa Prefecture have been constantly changing along with the progress shown in Table 4-8. In the late 1990s, an effort was begun to offer ecotourism and other forms of tourism characterized by hands-on experience and extended stays that take advantage of Okinawa's abundant nature and indigenous culture, driven by private businesses, local public agencies and others, through measures such as properly positioning ecotourism in the Act on Special Measures for Okinawa Promotion, development of a master plan by Okinawa Prefecture, and the formation of a promotional organization.

Table 4-8: Changes in tourism and progress of ecotourism promotion in Okinawa Prefecture

Year	Events - Actions
1972	Reversion to Japan. Number of inbound visitors to Okinawa Prefecture reaching 560,000, tourism revenues reaching 32.4 billion yen.
1975	Okinawa International Ocean Expo held. Main forms of tourism: multi-stop sightseeing group tours to visit historical sites and battle sites in Naha City and the south-central part of Okinawa Island
1987	Act on Development of Comprehensive Resort Areas enacted. A large number of resort hotels built, particularly in the south-central part of Okinawa Island, leading to dramatic increases in the number of inbound visitors.
1990 -	Number of tourists rapidly increased as a result of airfare deregulation and travel product price reduction. Multi-stop sightseeing tourism in and around Naha City ↓ Tourists spread out to the northern part of Okinawa Island and to isolated islands; repeat visitors increased. Multi-purpose, independent style of tourism taking root.
2002	Act on Special Measures for the Promotion and Development of Okinawa revised. Revised to create provisions on the promotion of environmentally-friendly hands-on nature activities (ecotourism) and on a program for the accreditation of conservation and utilization agreements.
2004	Master Plan "Okinawa Prefecture Eco-Tourism Promotion Plan" developed.
2006	NPO Eco-Tourism Promoting Council Okinawa established.
2017	Number of inbound visitors: 9.4 million; tourism revenues: 694.8 billion yen

Canoe tour on the Nakama River, Iriomote Island (Photo: MOEJ)

• Northern part of Okinawa Island

Multi-stop sightseeing trips represent the major form of tourism in the northern part of Okinawa Island whereby tourists staying in the south-central part of Okinawa Island take day trips by car to visit tourist sites and establishments, such as Cape Hedo, Daiseki-rinzain, and Hiji-otaki Falls; other patterns include staying in resort establishments in Kunigami Village (approximately 140,000 people per year) and ecotouring that offers hands-on experience in nature, such as canoeing through mangrove forests, local life and culture. Figure 4-5 shows the major visitor destinations and number of visitors in the northern part of Okinawa Island.

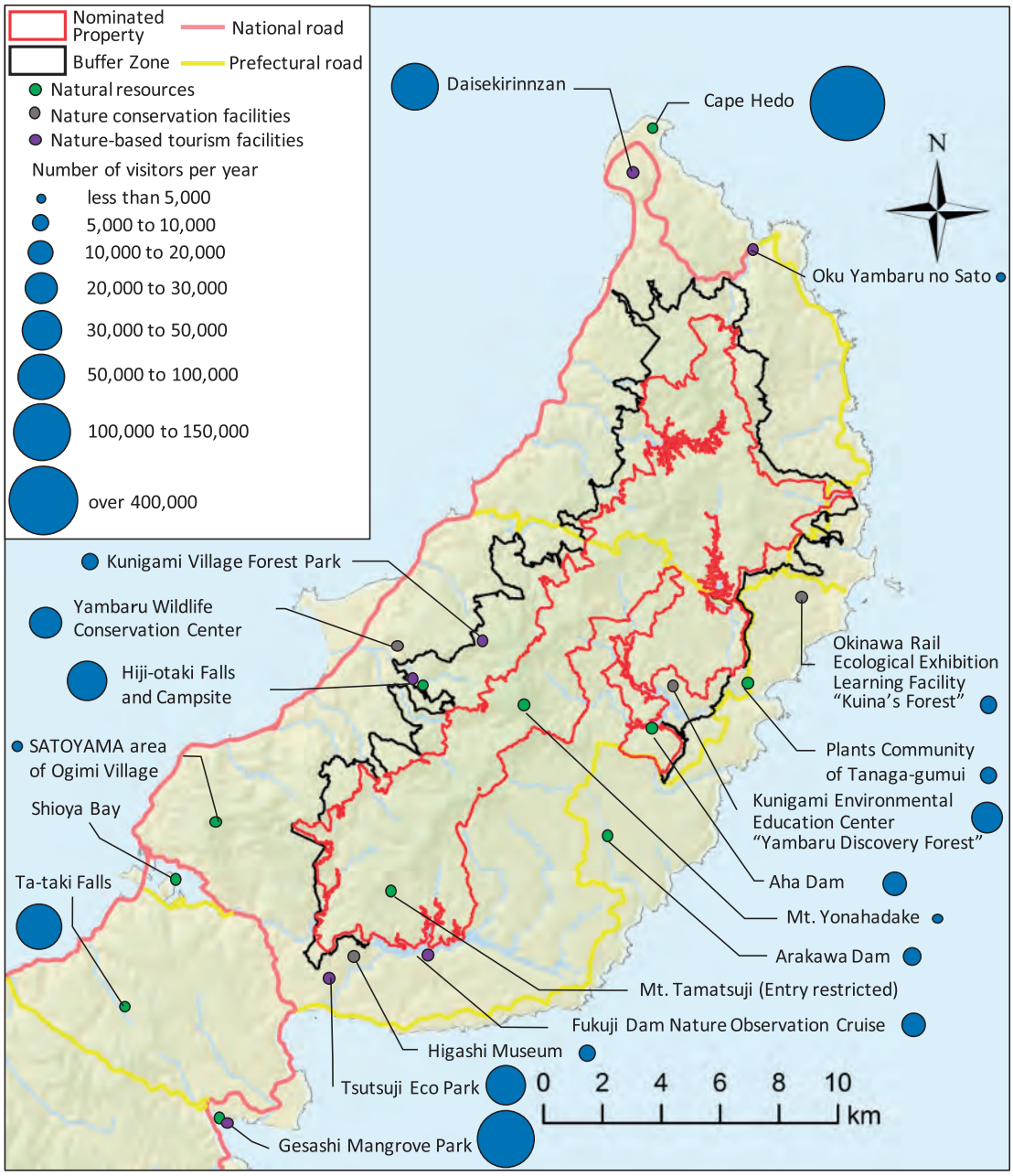


Figure 4-5: Major visitor destinations and number of visitors in the northern part of Okinawa Island

Source: Prepared based on the Survey on the state and future prediction of use and conservation of the natural environment toward inscription of Amami and Ryukyu on the World Heritage List (Okinawa Prefecture 2014). Those sites, where their annual users remained less than 1,000, together with used locations and facilities that were considered to have less relations with nature, were excluded.

* Symbols are absent for the locations where data are not available.

• Iriomote Island

The features of tourism on Iriomote Island include that around 80% of the tourists start and end their sightseeing trips at Ohara Port in the east district. There are many group tourists in wintertime and their main sightseeing style is a circular tour starting from a one-day trip to Iriomote Island with an accommodation at Ishigaki Island, to take a tour to the Nakama River or Yubu Island in the east district, and then move on to another island (Okinawa Development Finance Corporation 2014; Department of Environmental Affairs, Okinawa Prefecture et al. 2018). Another feature is the growing number of ecotour participants since the mid-1990s, though the percentage to total tourists is small: around 50,000 people per year (Department of Environmental Affairs, Okinawa Prefecture, et al. 2018). In recent years, there have been an increasing number of foreign tourists, along with cruise ships that have become larger and increases in their calling times at neighboring Ishigaki Island. Figure 4-6 shows the major visitor destinations and number of visitors on Iriomote Island.

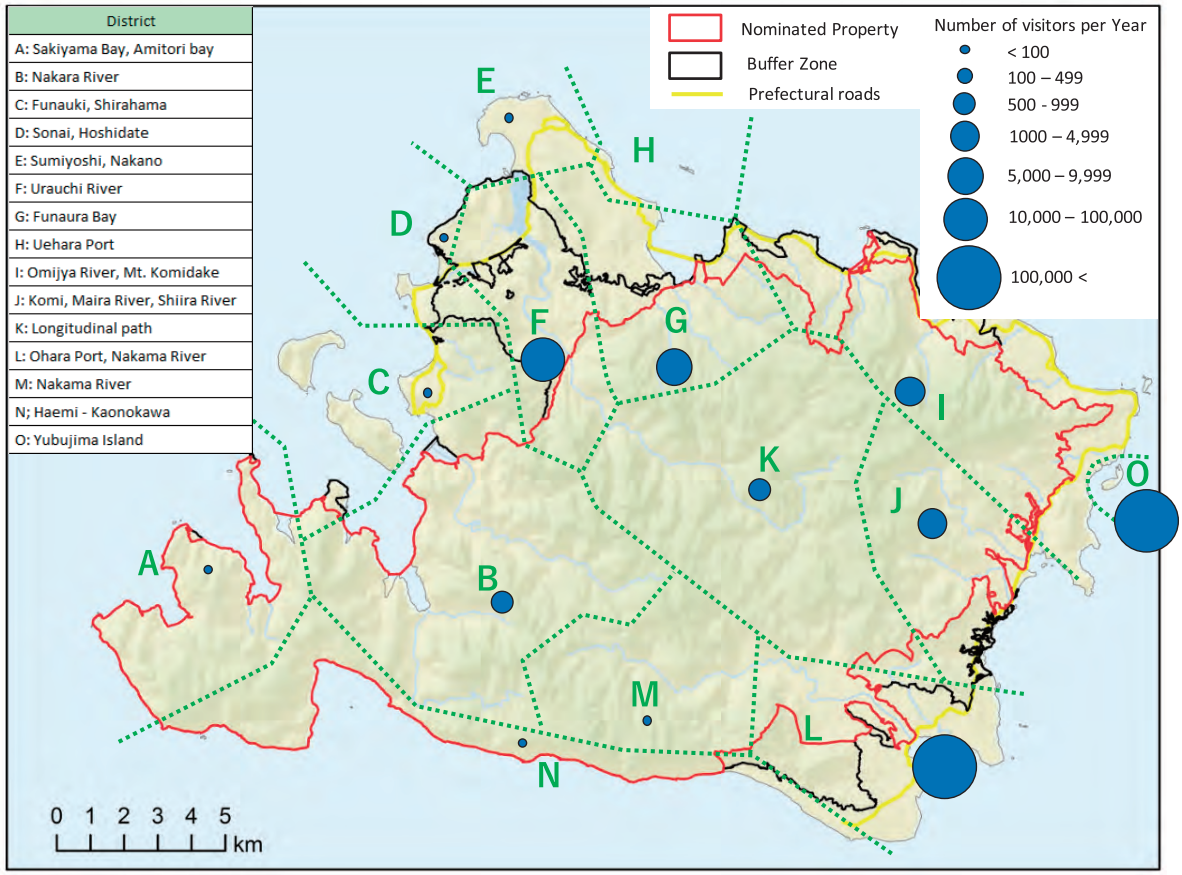


Figure 4-6: Major visitor destinations and number of visitors in Iriomote Island

Source: Report of surveys and consideration regarding the conservation and use of the natural environment on Iriomote Island, JFY2016 (Naha Nature Conservation Office, MOEJ 2016),

3) Promotion of appropriate sustainable use

Possible increases in tourism use to the nominated property due to their higher profile as a result of being inscribed on the World Heritage List, and steps to keep them at an appropriate level, are considered one of the critical issues for the purposes of maintaining their natural values and ensuring sustainable use (Kagoshima Prefecture 2015; Okinawa Prefecture 2015). Therefore, the Comprehensive Management Plan, in its section of Realization of Appropriate Tourism Management, defines a tourism management plan such as ecotourism and situates as its goal the realization of appropriate tourism management, in coordination, cooperation, and role allocation among administrative organs, tourism operators, local concerned parties, etc. In addition, it stipulates the basic policy regarding accepting tourism use according to respective zones in the nominated property, buffer zones, and Surrounding Conservation Areas (see Annex 2-1). The existing and ongoing actions to ensure sustainable tourism use in the nominated property are described below.

3)-1 Amami-Oshima and Tokunoshima Islands

Kagoshima Prefecture formulated the Master Plan of the Amami Island Group Sustainable Tourism, in March 2016, as a guideline for planned tourism management that is shared by the national government, the prefecture, and municipalities, for promoting sustainable tourism in the Amami Island Group, including Amami-Oshima Island and Tokunoshima Island. The purpose of this Master Plan includes three points, namely: systematic guidance for tourism use according to the nature of respective tourist spots, spillover effects of inscription on the World Heritage List to the whole of the Island Group, and realization of high quality tourism and improvement of user satisfaction.

The concept of the Master Plan is as follows. In order to avoid negative impacts by the expected increase in the number of tourists, systematic flows of tourists can be created by proper guidance to tourist spots, according to accommodating capacities, conditions of the natural environment, etc. (see Annex 5-40 for further details). Currently, relevant measures have been conducted, based on the Master Plan, to disperse tourists, through rehabilitation of the Amami Nature Observation Forest, establishment of a long trail in the Amami Island Group, consideration of rules for the users of forest roads in Kinsakubaru Forest on Amami-Oshima Island, the Yama-Kubiri Line forest road on Tokunoshima Island, and so on.

Especially in forest roads of Kinsakubaru Forest on Amami-Oshima Island, which is included in the nominated property and is a main tourist site, the Forestry Agency as an administrative organ has installed gates to limit the traffic of vehicles at the entrance, for the purpose of controlling entries of tourism use. In addition, MOEJ, the Forestry Agency, Kagoshima Prefecture, and Amami City have established the Liaison Meeting on Appropriate Use for Amami-Oshima Island comprising relevant organizations, and agreed on commencing tentative operation of voluntary rules including the obligation of accompanied guides, limiting the number of tourists, etc. In the Yama-Kubiri Line, which is a forest road run by Tokunoshima Town, nighttime animal watch tours are being conducted. For the purpose of protecting rare fauna and flora and controlling entries of tourism use, MOEJ, Forestry Agency, Kagoshima Prefecture, and Tokunoshima Town have established the Liaison Meeting on Appropriate Use for Tokunoshima Island comprising relevant organizations, and agreed on user rules including the obligation of accompanied guides, limiting the number of tourists, etc. In March 2018, Tokunoshima Town enacted the Ordinance Concerning Forest Road management in Tokunoshima Town, which

will serve as the legal grounds for limiting the use of forest roads (see Annex 4-11 for further details).

In addition, based on characteristics of the natural environment and culture of the Amami Island Group, the Master Plan aims at placing tourism use of high quality in small number of participants, such as ecotourism, at the center of tourism in the Amami Island Group. As Amami-Oshima Island and Tokunoshima Island are in their initial period of ecotourism development, the Overall Concept for Promoting Ecotourism of Amami Island Group, in accordance with the Ecotourism Promotion Act, was agreed in 2017, and the certification system of ecotour guides has been launched. Municipalities, tourism stakeholders, guides, and so on have undertaken relevant initiatives for realizing sustainable use, through formulating voluntary rules, conducting surveys on resources, preparing programs, considering human resources development, etc. Figure 4-7 shows timelines that are defined in the Master Plan. A summary of main initiatives shall be referred to in Annex 5-40.

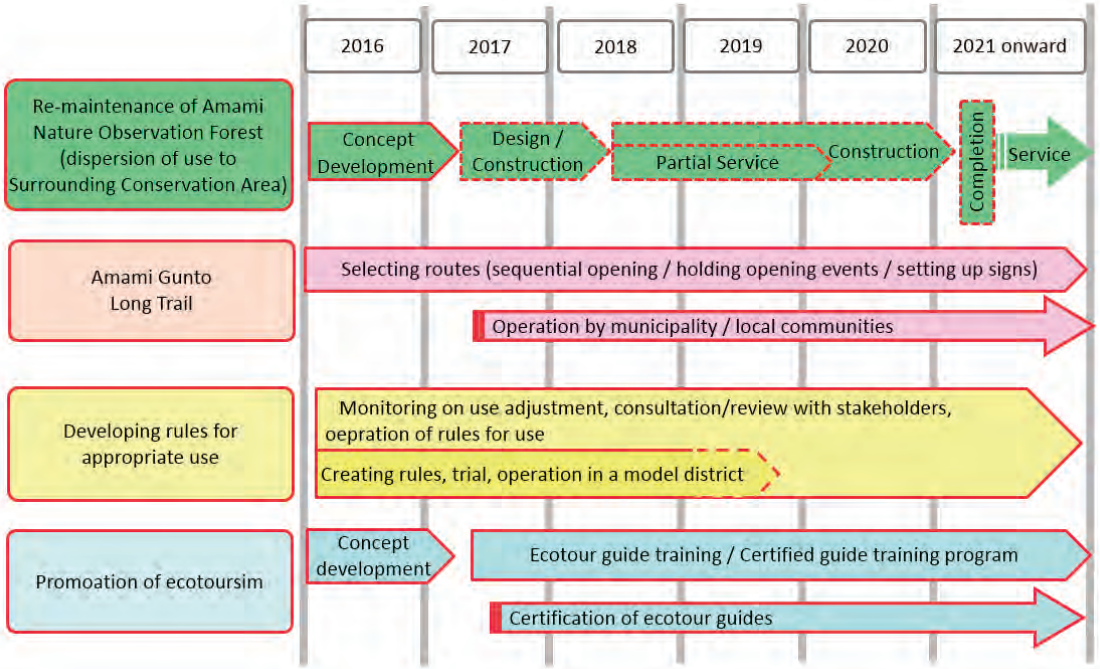


Figure 4-7: Timelines for the major measures in the Master Plan of the Amami Island Group Sustainable Tourism

3)-2 Northern part of Okinawa Island and Iriomote Island

Okinawa Prefecture established the Biodiversity Strategy of Okinawa in March 2013, as a basic plan for biodiversity conservation, in which coexistence with nature and wise use of blessings from nature have been positioned as the basic policy. As its measures, Okinawa Prefecture has stated to prevent the degradation of the natural environment due to overuse of natural resources and work towards sustainable use of the natural environment (see Annex 5-43 for further details).

In addition, the Fifth Okinawa Prefecture Basic Plan for Tourism Promotion, revised in March 2017, stipulates

the promotion of appropriate and decent use of terrestrial resources, such as forests, rivers, and mountains, based on a deeper understanding of their importance and vulnerabilities, with a vision of their inscription on the World Heritage List (see Annex 5-46 for further details).

On the foundation of the basic understanding stipulated in these related upper plans, the preparation of the master plan on tourism management in Northern part of Okinawa Island and Iriomote Island is currently being proceeded. Use concentration and dispersion shall be guided through its operation, and systematic use of mass tours and ecotours shall be encouraged.

• Northern part of Okinawa Island

With regard to appropriate use and tourism management in Northern part of Okinawa Island, the Overall Concept for Yambaru Forests Tourism Promotion was developed in 2018, aiming at appropriate use and tourism use of forests in the Yambaru area. The Overall Concept has extracted main fields to use as natural tourism resources. Out of these areas, as for areas requiring strict management, including parts within the nominated property (core area), it has designated a "Protected Field" that shall not be utilized, and a "Limited Field" for which appropriate responses shall be taken for the conservation of the natural environment. In addition, it suggested a mechanism that only certified guides satisfying a certain criteria were allowed to guide tourists.

Concretely, it stipulates the establishment of two types of guides, namely, "Registered Guides" with a requirement of attendance in guide study sessions jointly organized by three villages, and "Certified Guides", who are higher level guides autonomously trained by respective villages (proposed name: Yambaru Forest Guide). As such, various types of field use are defined according to guide categories. This guide certification and registration system will be initiated in 2019 and preparation toward actual operation of the Overall Concept has been ongoing. Figure 4-8 shows a time flow of formulation of the Overall Concept (see Annex 5-47 for further details).

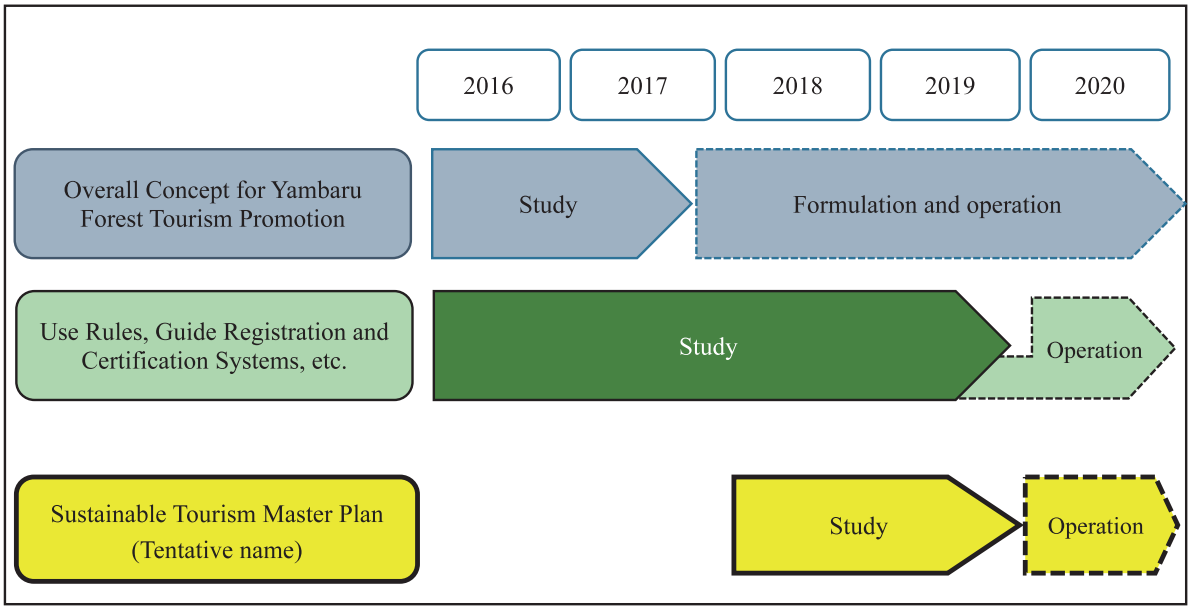


Figure 4-8: Timelines for the development of Overall Concept for Yambaru Forest Tourism Promotion and guide system

• Iriomote Island

In Taketomi Town where Iriomote Island is located, the Tourism Promotion Plan in Taketomi Town (March 2018) articulates that the Iriomote Island Ecotourism Guideline shall be formulated, and in the future, be positioned within a legal system based on the Ecotourism Promotion Act, for the purpose of promoting appropriate use and tourism management in the entire area of Iriomote Island, with a vision of its inscription on the World Heritage List.

The Iriomote Island Ecotourism Guideline aims at establishing a system for appropriate use and ecotourism promotion on Iriomote Island. Since JFY2017, both Okinawa Prefecture and Taketomi Town have been the joint secretariat to proceed with the preparation of its formulation by march 2020. Concretely, it is planned to compile relevant points, such as purposes and policies of ecotourism promotion, targeted fields to use, making user rules for respective fields, methods to control use, guide system, monitoring methods, etc. Currently, six working groups have been set for respective areas in Iriomote Island, including five land areas and one sea area. With the participation of guide operators, discussions are conducted as to use status of the fields, challenges of existing rules, etc., in addition to multiple opinion exchanges sessions on necessary rules including possibilities to establish legal systems (see Annex 5-50 for further details).

In Taketomi Town, enactment of the Ordinance Concerning Tourism Guides in Taketomi Town (tentative name) is being prepared as an ordinance applied to the town as a whole, including Iriomote Island. It aims at controlling disordered use of natural resources, by obligating the notification of guide operators and their business contents. This will serve as the foundation when the Ecotourism Guideline is formulated and implemented in Iriomote Island, and it has been positioned as a first step towards the guide registration and certification system. Currently, concrete contents of the Ordinance are under consideration. Its enactment is planned to be in September 2019,

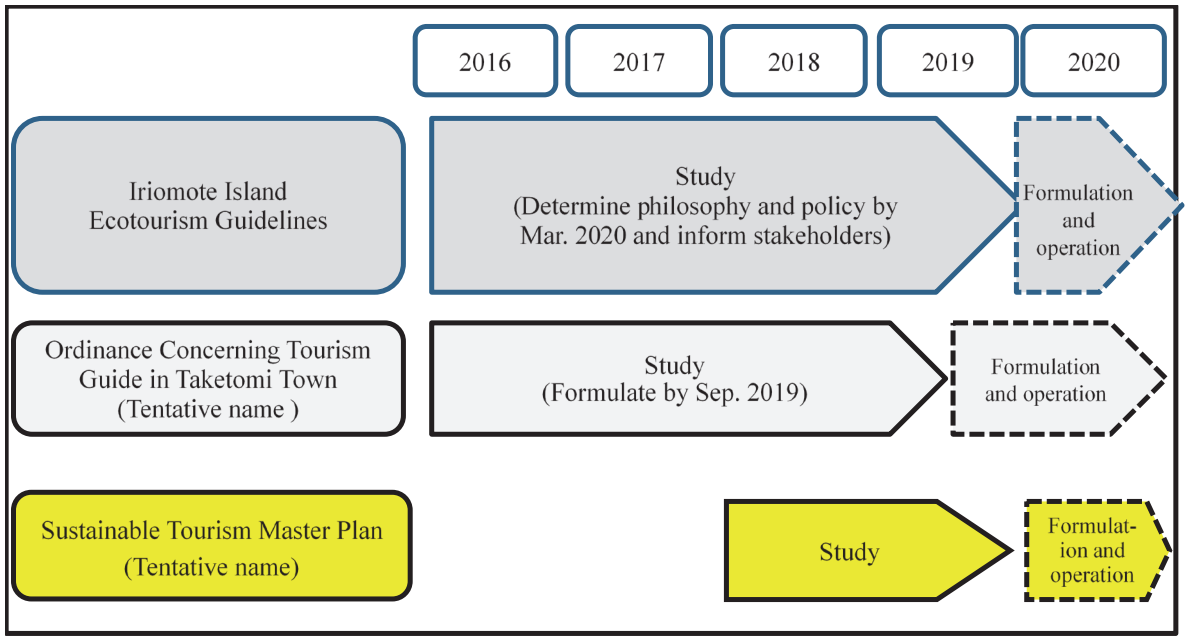


Figure 4-9: Timelines for the development of Iriomote Island Ecotourism Guideline and Ordinance Concerning Tourism Guides in Taketomi Town

followed by the start of its operation from JFY2019, at the earliest. Figure 4-9 shows a time flow of guideline formulation and establishment of the ordinance.

4.b. (v) Number of inhabitants within the property and buffer zone

Table 4-9 shows the number of residents within the property and buffer zones. There are no residents within the property boundaries. There are 83 households with 154 residents within the buffer zones.

Table 4-9: Residents within the nominated property and buffer zones (as of November 2018)

	Nominated property		Buffer zones	
	Number of residents	Number of households	Number of residents	Number of households
Amami-Oshima Island	0	0	149	80
Tokunoshima Island	0	0	5	3
Northen part of Okinawa Island	0	0	0	0
Iriomote Island	0	0	0	0
Total	0	0	154	83

Evergreen broadleaved forest, Northern part of Okinawa Island (Photo: MOEJ)

5

Protection and Management of the Property

5.a. Ownership

5.b. Protective Designation

5.c. Means of Implementing Protective Measures

5.d. Existing Plans Related to Municipality and Region in Which the Nominated Property is Located

5.e. Property Management Plan or Other Management System

5.f. Sources and Levels of Finance

5.g. Sources of Expertise and Training in Conservation and Management Techniques

5.h. Visitor Facilities and Infrastructure

5.i. Policies and Programmes Related to the Presentation and Promotion of the Property

5.j. Staffing Levels and Expertise

Amami rabbit (*Pentalagus furnessi*), Amami-Oshima Island

5. Protection and Management of the Property

5.a. Ownership

Table 5-1 shows the percentages of land ownership in each component part in the nominated property.

Table 5-1: Land ownership of four regions containing the nominated property (as of January 2019)

	Area of the nominated property by island (with area of the buffer zone in the lower cell)	National land	Prefectural land, municipal land	Private land, etc. (including land with unknown ownership)
Amami-Oshima Island	11,640ha	30% (3,473 ha)	37% (4,281ha)	33% (3,885ha)
	14,505ha	5% (728ha)	31% (4,436ha)	64% (9,341ha)
Tokunoshima Island	2,515ha	96% (2,403ha)	0.4% (10ha)	4% (102ha)
	2,812ha	28% (777ha)	9% (252ha)	63% (1,783ha)
Northern part of Okinawa Island	7,721ha	47% (3,613ha)	49% (3,810ha)	4% (298ha)
	3,398ha	30% (1,008ha)	49% (1,681ha)	21% (708ha)
Iriomote Island	20,822ha	96% (19,895ha)	0.1% (23ha)	4% (904ha)
	3,594ha	80% (2,876ha)	6% (204ha)	14% (514ha)
Total	42,698ha	69% (29,384ha)	19% (8,124ha)	12% (5,189ha)
	24,309ha	22% (5,390ha)	27% (6,573ha)	51% (12,346ha)

(Some total figures do not match the sum totals due to the rounding off of fractions.)

The percentage of national land is 69% for the nominated property and 22% for the buffer zones. All types of public land put together account for 88% of the nominated property and 49% of the buffer zones. With regard to other private properties, protection measures, including the designation of national parks, and nomination to be inscribed on the World Heritage List have been understood by the land owners, through conducting explanatory sessions and providing explanations to them individually.

Especially in the component part on Amami-Oshima Island, there are many private properties, accounting for around 47% of the total land in 2016. As to properties owned by a private company that possessed around 70% of these private properties, MOEJ and Kagoshima Prefecture have promoted converting them to public land since 2016, for strictly securing the protection of the nominated property's values. Approximately 60% of the target land is planned to be purchased by the end of JFY2018. MOEJ is exerting its efforts in continuously purchasing private properties in the coming period. The contact information of the main landowners—MOEJ, the Forestry Agency, Kagoshima Prefecture, Okinawa Prefecture, and local municipalities—is shown in Chapter 8.

5.b. Protective Designation

The nominated property is strictly protected and development activities are prohibited in principle, pursuant to domestic laws and systems with designations that include: Special Protection Zone and Class I Special Zone of national park; Preservation Zone of Forest Ecosystem Reserve; National Wildlife Protection Area and; Natural Monument. Meanwhile, though Class II Special Zones of national park and Conservation and Utilization Zones of Forest Ecosystem Reserve are partially included, it has been agreed among land owners and stakeholders that due procedures shall be promoted in accordance with relevant laws to upgrade them to Class I Special Zones by the end of JFY2019, and that these areas shall be treated in the similar manner as the Class I Special Zone before the completion of the procedures.

In addition, as for buffer zones, necessary regulations for use and development have been implemented, through combining various zonal classifications in national parks and voluntary rules, for conserving the values of the nominated property and promoting coexistence with local industries and livelihoods. Concrete zonal classifications are as shown in 5.c.1 Table 5-3-1. They are mainly designated as Class II Special Zones of national park and/or Conservation and Utilization Zone of Forest Ecosystem Reserve. It partly includes Special Protection Zones or Class I Special Zones of national park that are not connected to the nominated property, and national forest, public land, or Class III Special Zones of national park that are adjacent to the nominated property, where it is agreed to conduct forest management considering biodiversity. In addition, it also includes Ordinary Zones of national park that are surrounded by the nominated property, where conservation activities, such as measures against alien species, shall be intensively conducted.

These designations contribute to protection of endemic species and threatened species, as well as their habitats, which are the main attributes for the OUV of this property, and guarantee long-term preservation of its value. Tables 5-2-1 to 5-2-4 show detailed information on protected areas, such as names of the protected areas, designated years, legal foundation, and so on (see Annexes 3 and 4 for further details).

Figures 5-1-1 to 5-1-18 show maps depicting the boundaries of each protected area.

Kanpiree waterfalls, Iriomote Island (Photo: MOEJ)

Table 5-2-1: Designation details for protected areas in the nominated property (Amami-Oshima Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Amamigunto National Park (March 7, 2017) Total National Park / Area in Amami-Oshima Island Total terrestrial area: 42,181 ha / 34,330 ha Special Protection Zone: 5,248 ha / 3,806 ha Special Zone: 35,363 ha / 29,896 ha*1 Ordinary Zone: 1,570 ha /628 ha Total marine area: 33,082 ha*2 Marine Special Zone: 1,124 ha*2 Ordinary Zone: 31,958 ha*2	Natural Parks Act (June 1, 1957)	Outstanding natural scenic areas representing the sceneries of the State as designated by the Minister of the Environment for the purpose of serving to health, recreation and culture of the people as well as contributing to conservation of biological diversity, through protection of the excellent natural scenic areas and promoted utilization.
Amamigunto Forest Ecosystem Reserve (March 15, 2013) Total Forest Ecosytem Reserve / Area in Amami-Oshima Island Total area: 4,820 ha / 2,045 ha Preservation Zone: 2,253 ha / 731 ha Conservation and Utilization Zone: 2,567 ha / 1,314 ha	Act on the Administration and Management of National Forests (June 23, 1951) National Forests Administration and Management Bylaw (January 21, 1999)	Areas to protect and manage natural forests in virgin condition in order to maintain a natural environment of the forest ecosystem, protect plants and animals, preserve genetic resources, develop forest operation and management technique, and promote scientific research etc.
Mt. Yuwandake National Wildlife Protection Area (November 1, 1965) Total area: 320 ha (amended October 28, 2005) Special Protection Zone: 103 ha	Wildlife Protection, Control and Hunting Management Act (July 12, 2002)	Areas designated to protect and recover wildlife through prohibiting capture of wildlife, securing stable maintenance, conserving and managing diverse wildlife habitats and thereby securing local biodiversity conservation.
Natural Monument Kamiya/Yuwandake (November 8, 1968)	Law for the Protection of Cultural Properties (May 30, 1950)	Animals, plants, and geological features and minerals of significant scientific value to Japan that is designated by the Minister of Education, Culture, Sports, Science and Technology.

*1 : Areas of Special Protection Zone includes Class II Special Zone in Kakeroma, Ukejima, and Yoro Islands.
*2 : Marine areas are public water surfaces owned by the State and are not clarified for each island. Therefore the figures show the area of the entire Amamigunto National Park.

Evergreen broadleaved forest, Amami-Oshima Island (Photo: MOEJ)

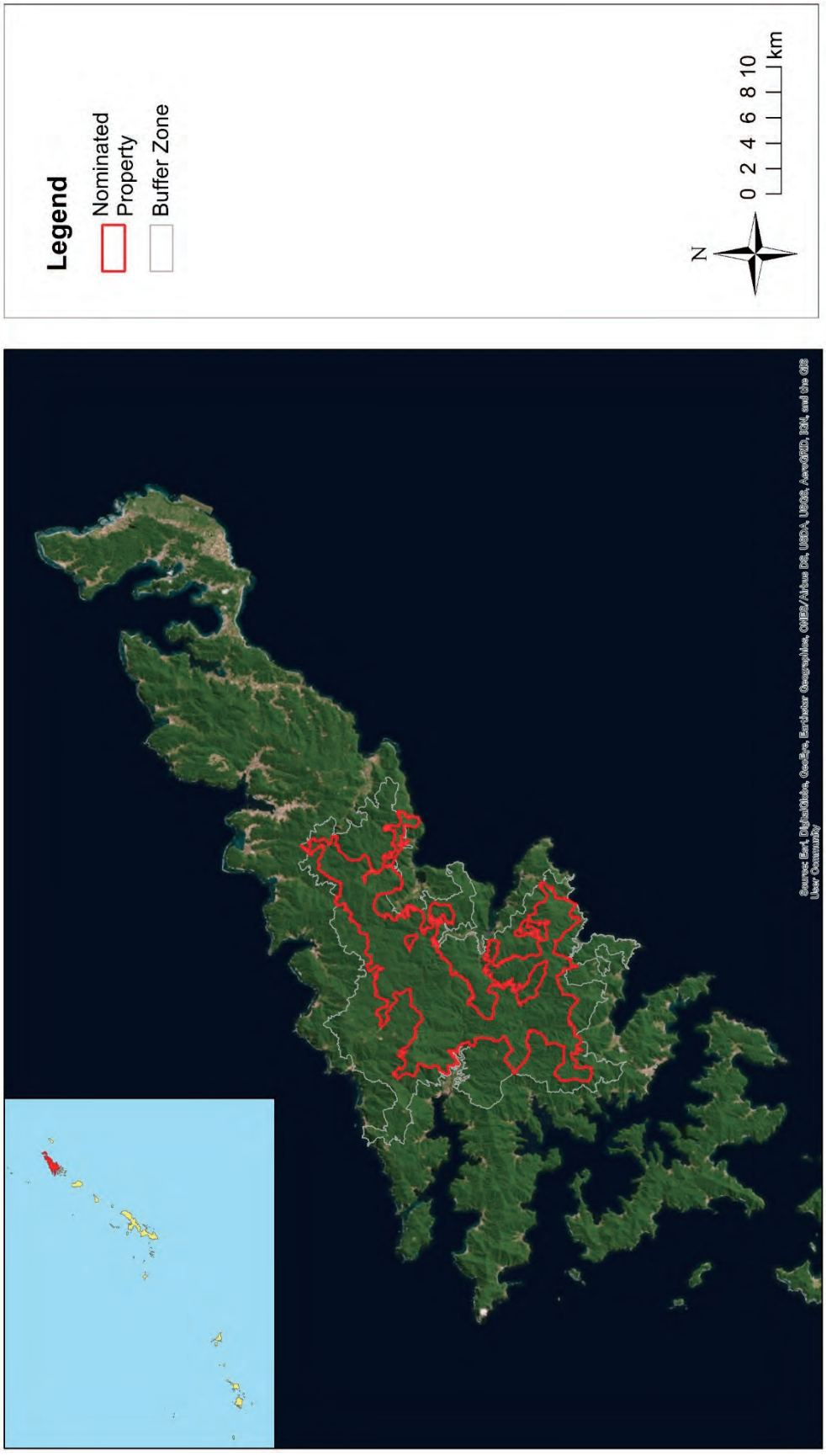


Figure 5-1-1: Boundary of the nominated property (Amami-Oshima Island, Satellite image)

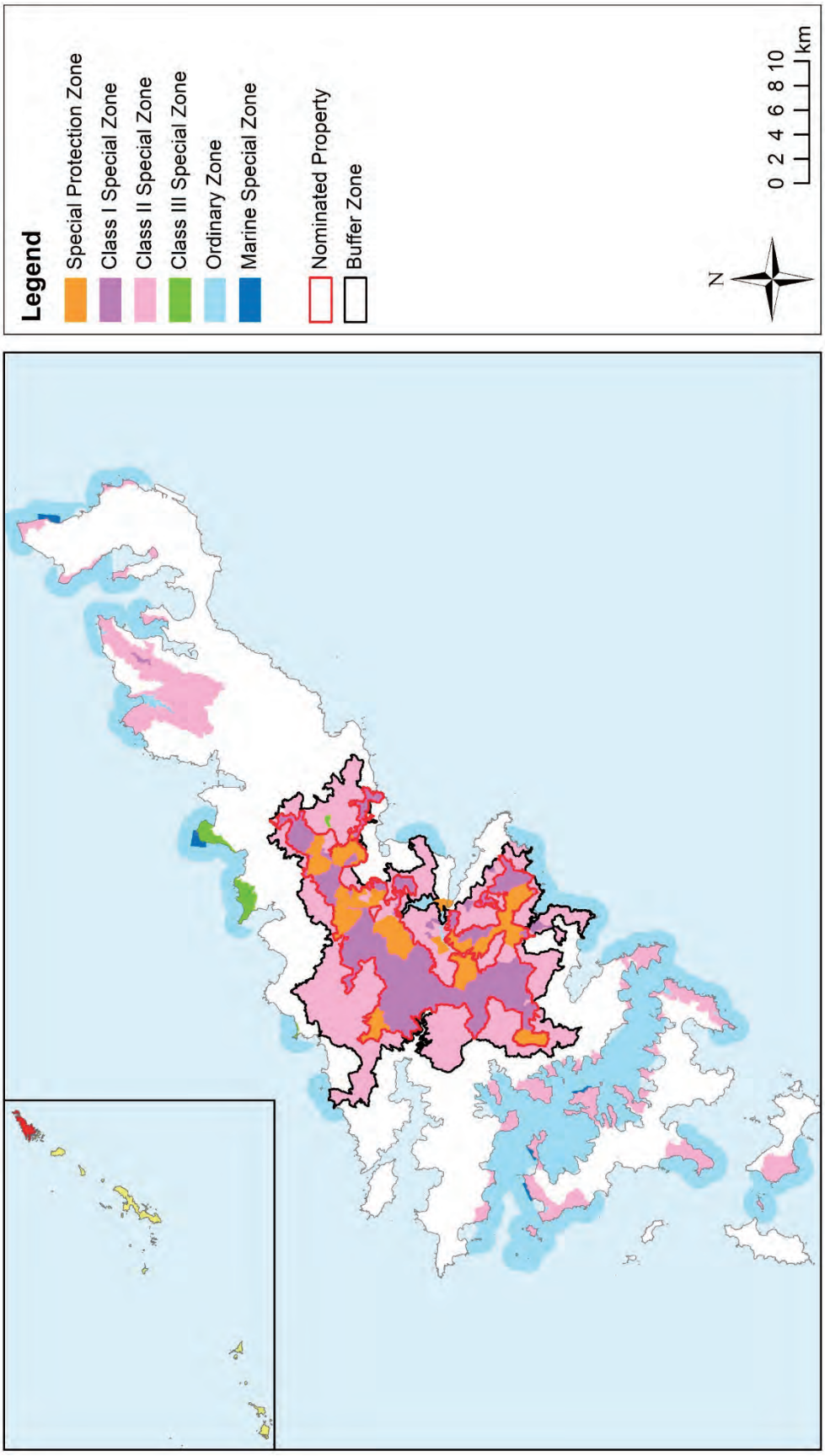


Figure 5-1-2: Amamigunto National Park (Amami-Oshima Island)

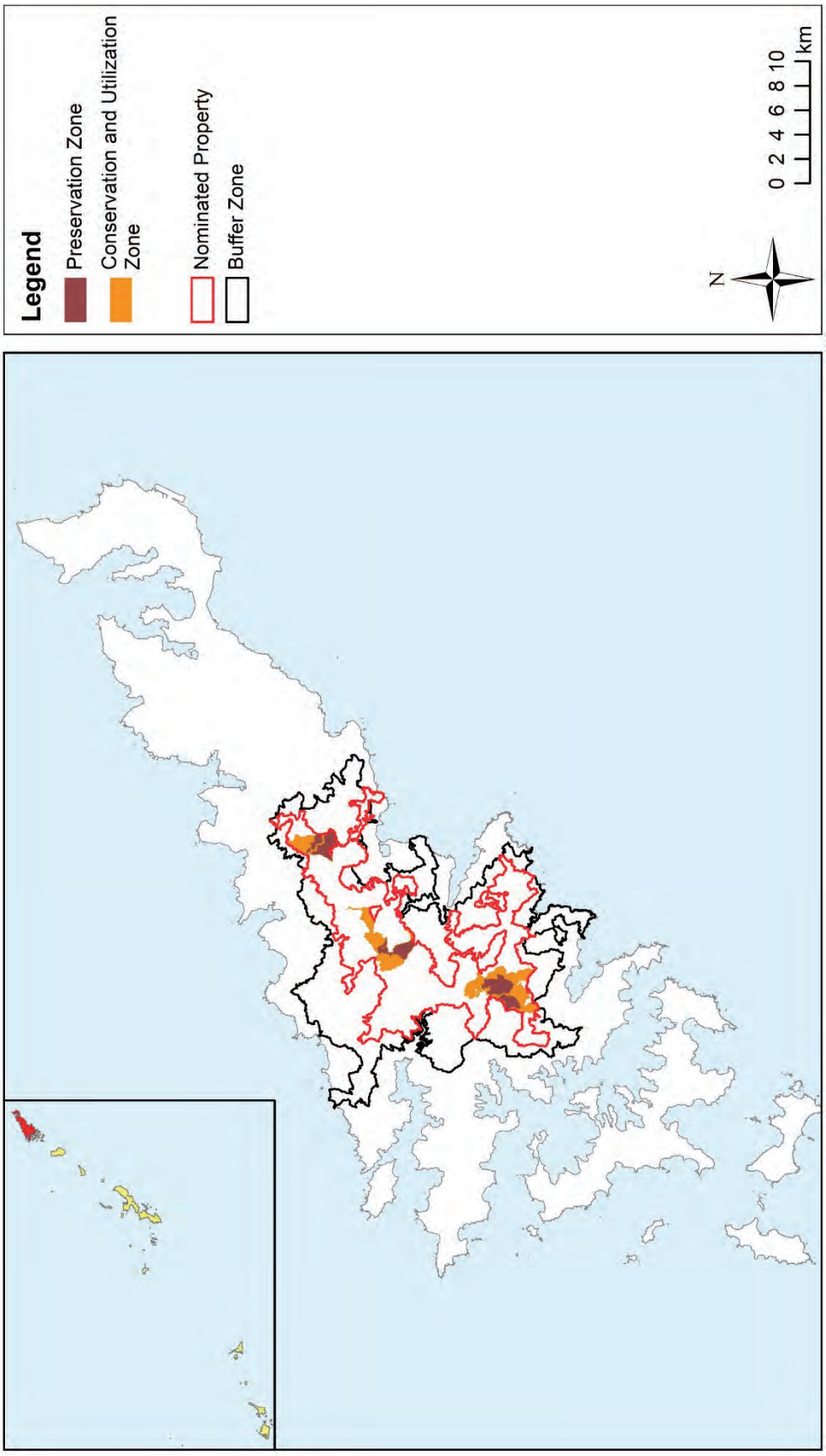


Figure 5-1-3: Amamigunto Forest Ecosystem Reserve (Amami-Oshima Island)

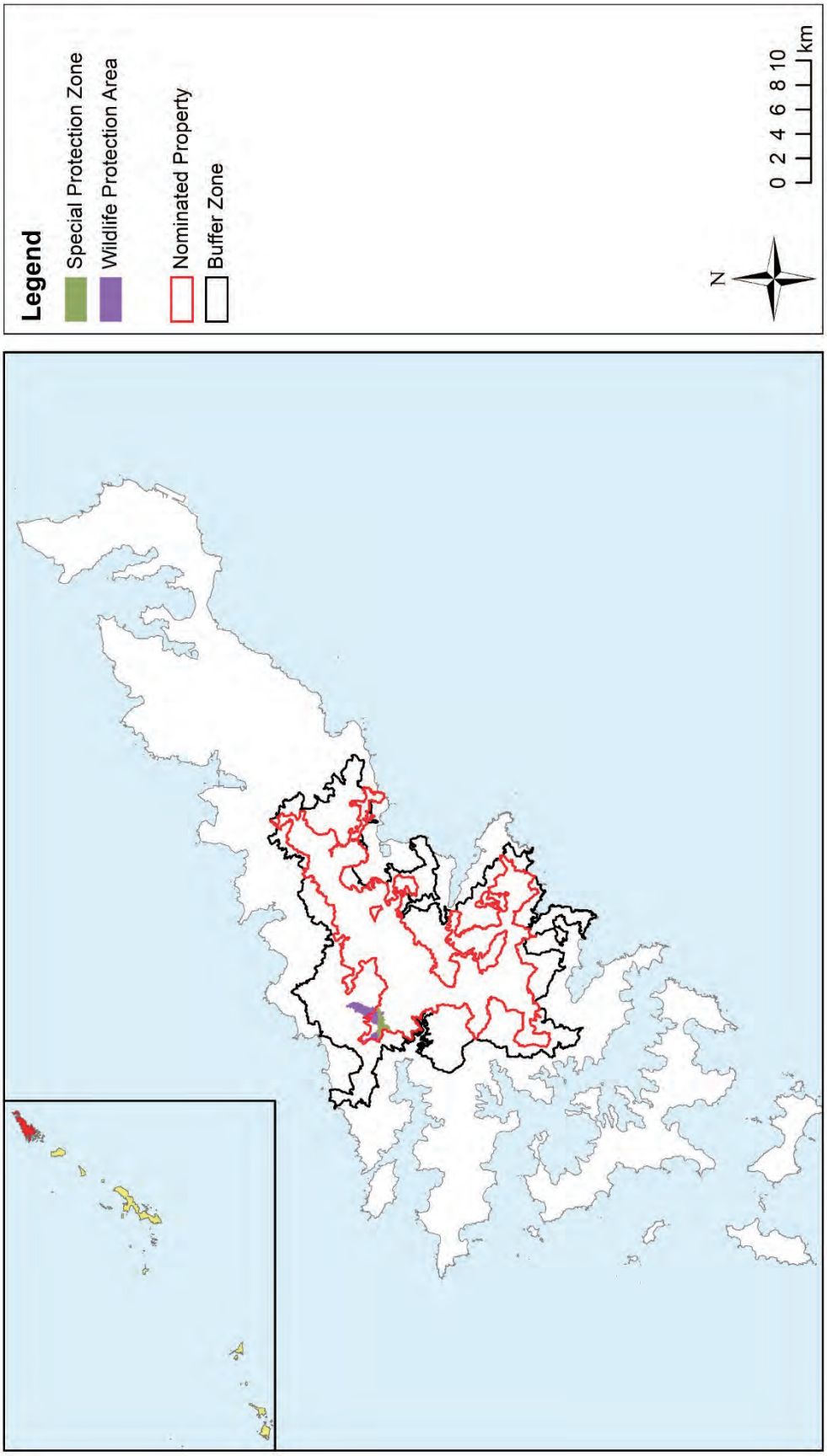


Figure 5-1-4: Mt. Yuwandake National Wildlife Protection Area (Amami-Oshima Island)

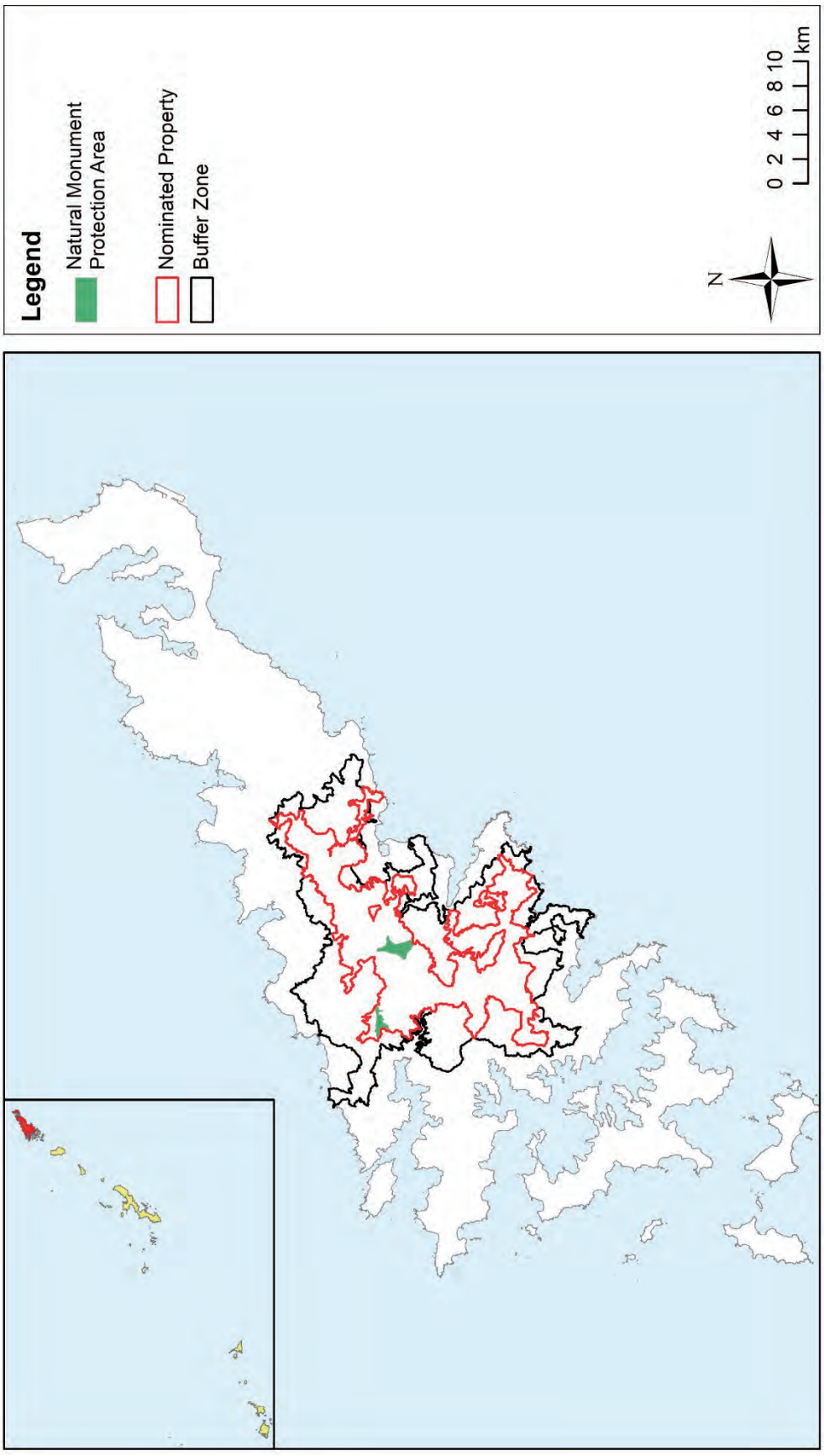


Figure 5-1-5: Natural Monument, Kamiya-Yuwandake (Amami-Oshima Island)

Table 5-2-2: Designation details for protected areas in the nominated property (Tokunoshima Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Amamigunto National Park (March 7, 2017) Total National Park /Area in Tokunoshima Island Total terrestrial area: 42,181 ha / 6,122 ha Special Protection Zone: 5,248 ha / 1,442 ha Special Zone: 35,363 ha / 4,362 ha Ordinary Zone: 1,570 ha / 318h a Total marine area: 33,082 ha* Marine Special Zone: 1,124 ha* Ordinary Zone: 31958 ha*	Natural Parks Act (June 1, 1957)	See Table 5-2-1
Amamigunto Forest Ecosystem Reserve (March 15, 2013) Total Forest Ecosytem Reserve / Area in Tokunoshima Island Total area: 4,820 ha / 2,775ha Preservation Zone: 2,253 ha / 1,521ha Conservation and Utilization Zone: 2,567 ha / 1,254 ha	Act on the Administration and Management of National Forests (June 23, 1951) National Forests Administration and Management Bylaw (January 21, 1999)	See Table 5-2-1

* : Marine areas are public water surfaces owned by the State and are not clarified for each island. Therefore the figures show the whole marine area of Amamigunto National Park.

Mt. Inokawadake, Tokunoshima Island (Photo: JWRC)

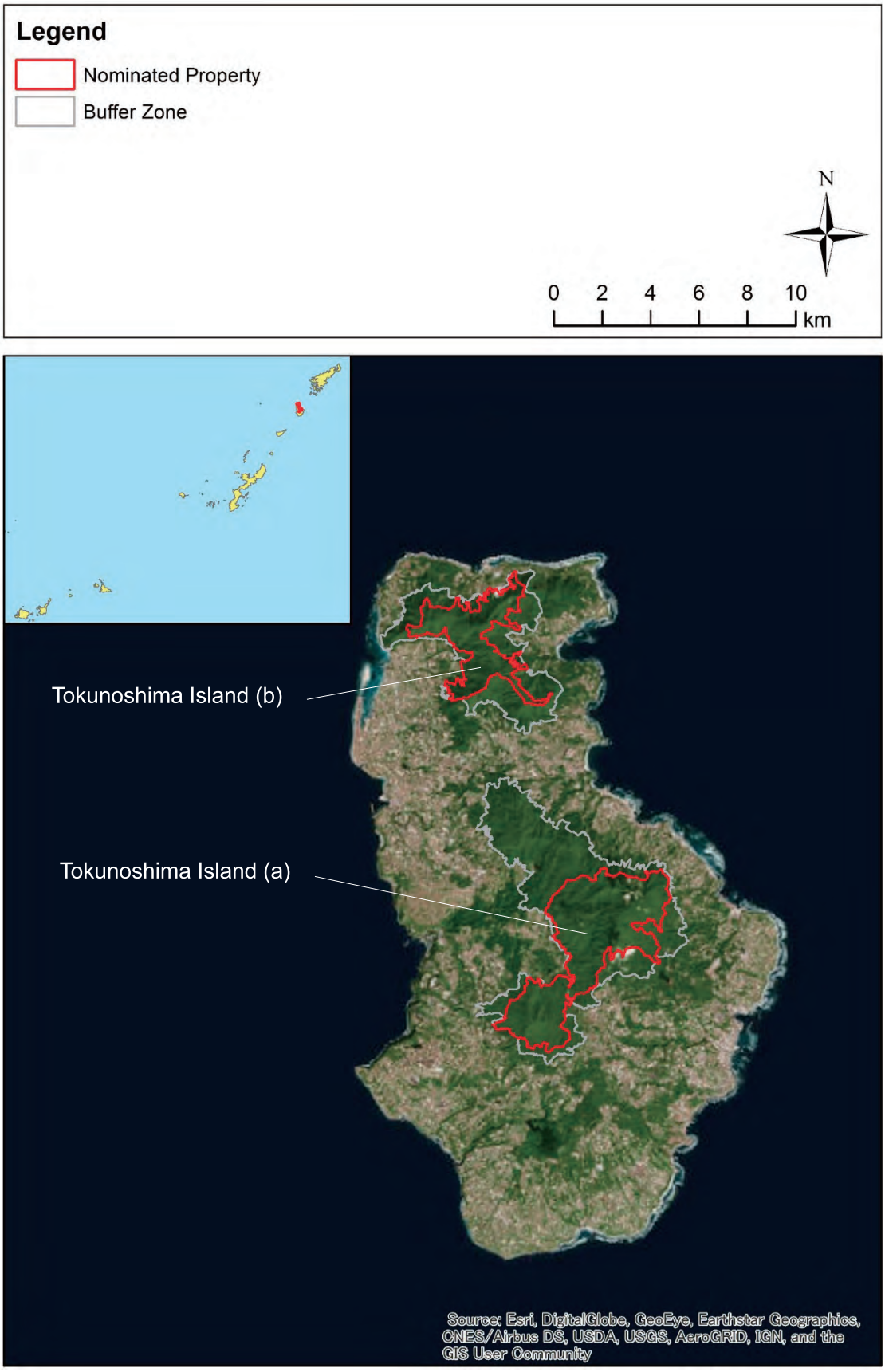


Figure 5-1-6: Boundary of the nominated property (Tokunoshima Island, Satellite image)

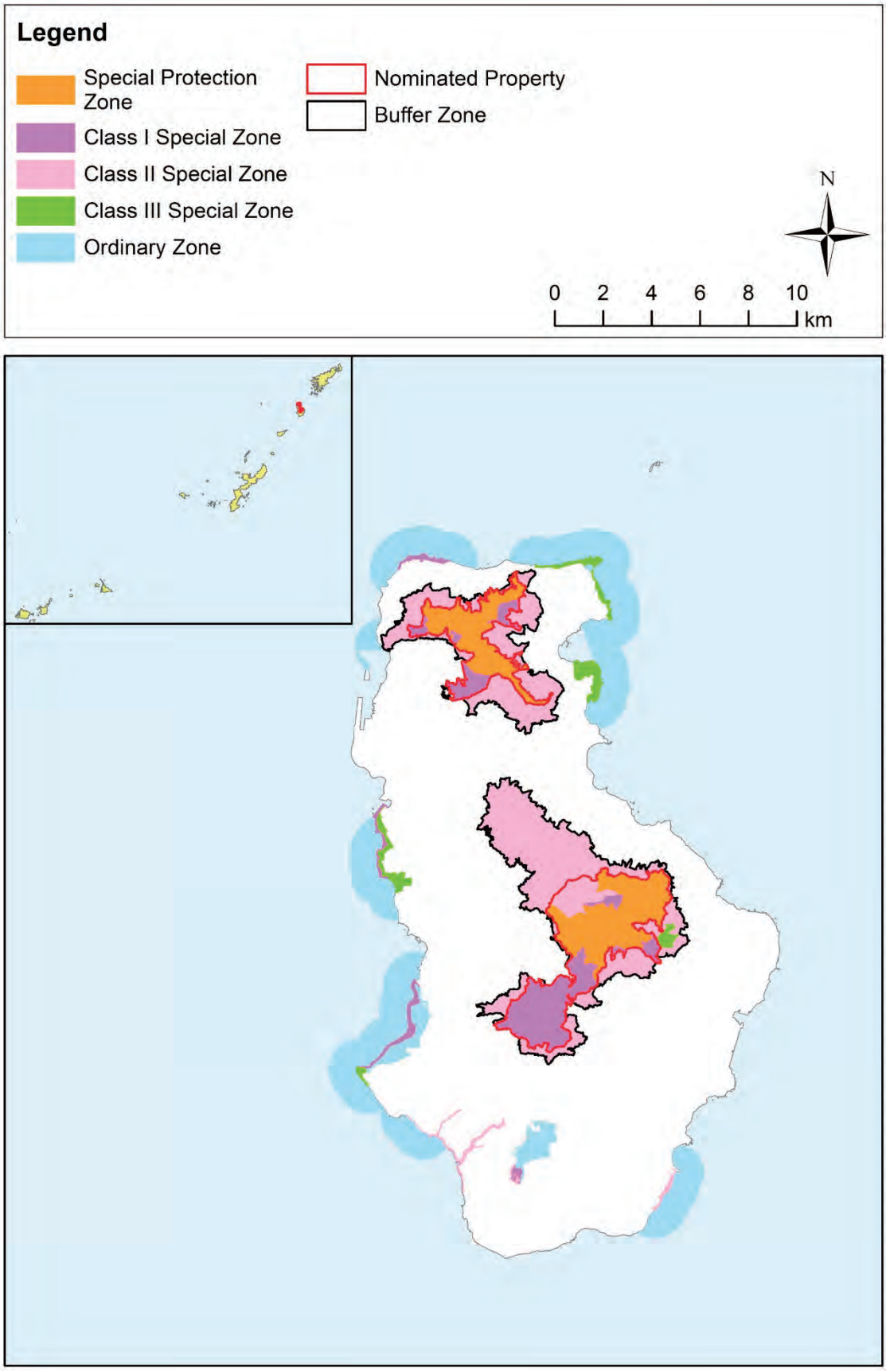


Figure 5-1-7: Amamigunto National Park (Tokunoshima Island)

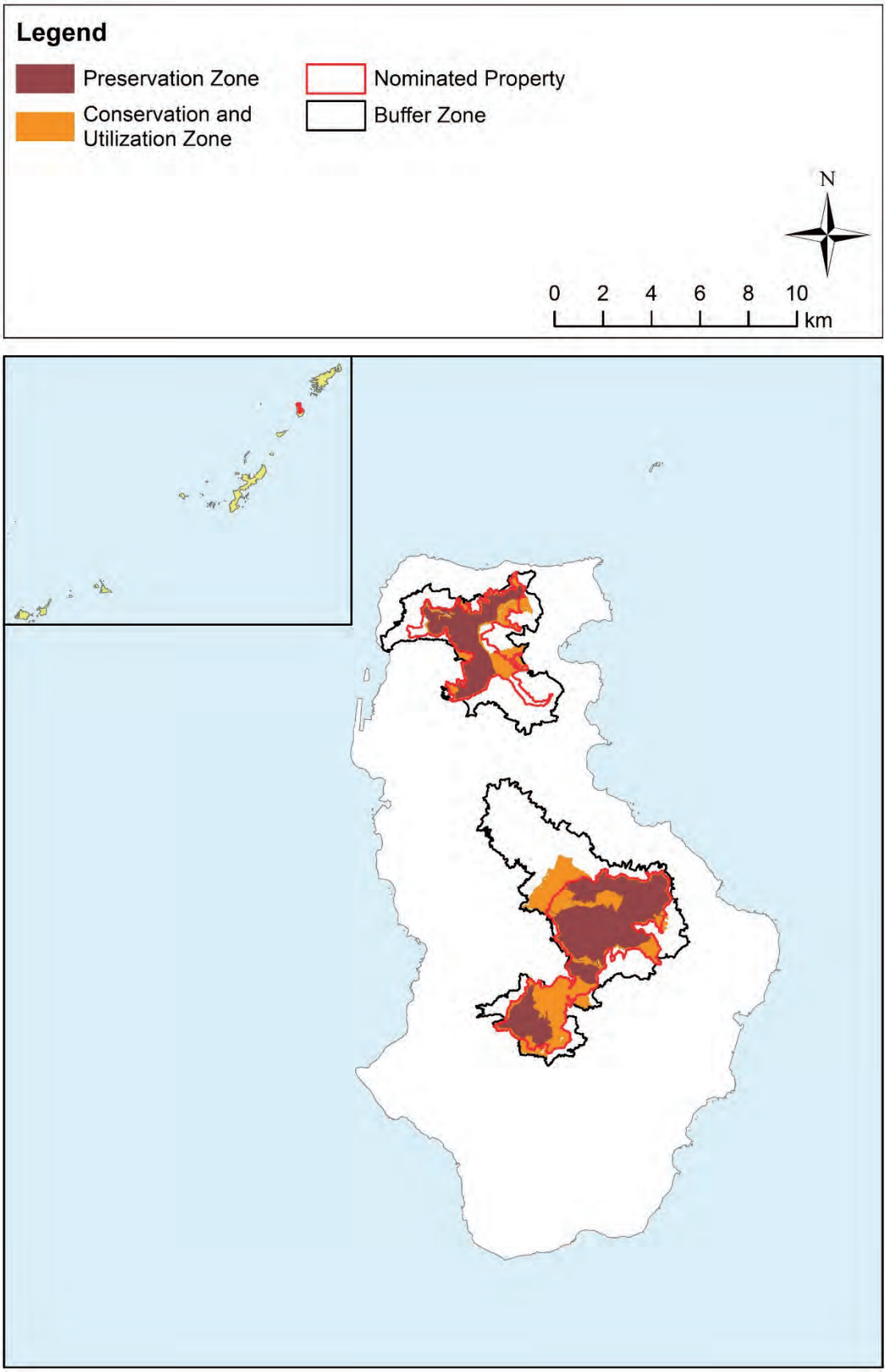
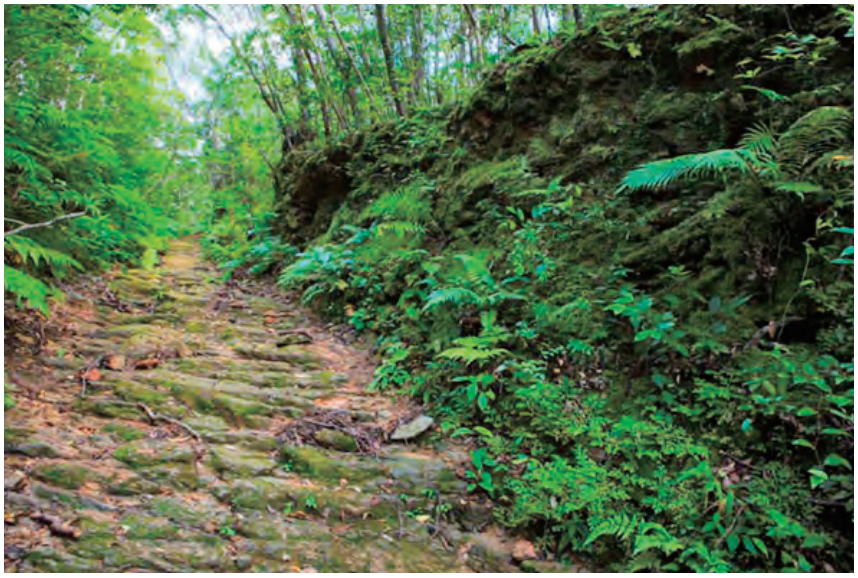


Figure 5-1-8: Amamigunto Forest Ecosystem Reserve (Tokunoshima Island)

Table 5-2-3: Designation details for protected areas in the nominated property (Northern part of Okinawa Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Yambaru National Park (September 15, 2016) Total terrestrial area: 17,311 ha (amended June 29, 2018) Special Protection Zone: 3,009 ha Special Zone: 13,271 ha Ordinary Zone: 1,031 ha Total marine area: 3,670 ha Ordinary Zone: 3,670 ha	Natural Parks Act (June 1, 1957)	See Table 5-2-1
Yambaru Forest Ecosystem Reserve (December 25, 2017) Total area: 3,007 ha Preservation Zone: 2,769 ha Conservation and Utilization Zone: 238 ha	Act on the Administration and Management of National Forests (June 23, 1951) National Forests Administration and Management Bylaw (January 21, 1999)	See Table 5-2-1
Yambaru (Ada area) National Wildlife Protection Area (November 1, 2009) Total area: 1,279 ha Special Protection Zone: 220 ha	Wildlife Protection, Control and Hunting Management Act (July 12, 2002)	See Table 5-2-1
Yambaru (Aha area) National Wildlife Protection Area (November 1, 2009) Total area: 465 ha	Same as above	See Table 5-2-1
Natural Monument Mt. Yonahadake Natural Monument Protection Area (May 15, 1972)	Law for the Protection of Cultural Properties (May 30, 1950)	See Table 5-2-1



Mt. Yonahadake Trail, Yambaru National Park (Photo: MOEJ)

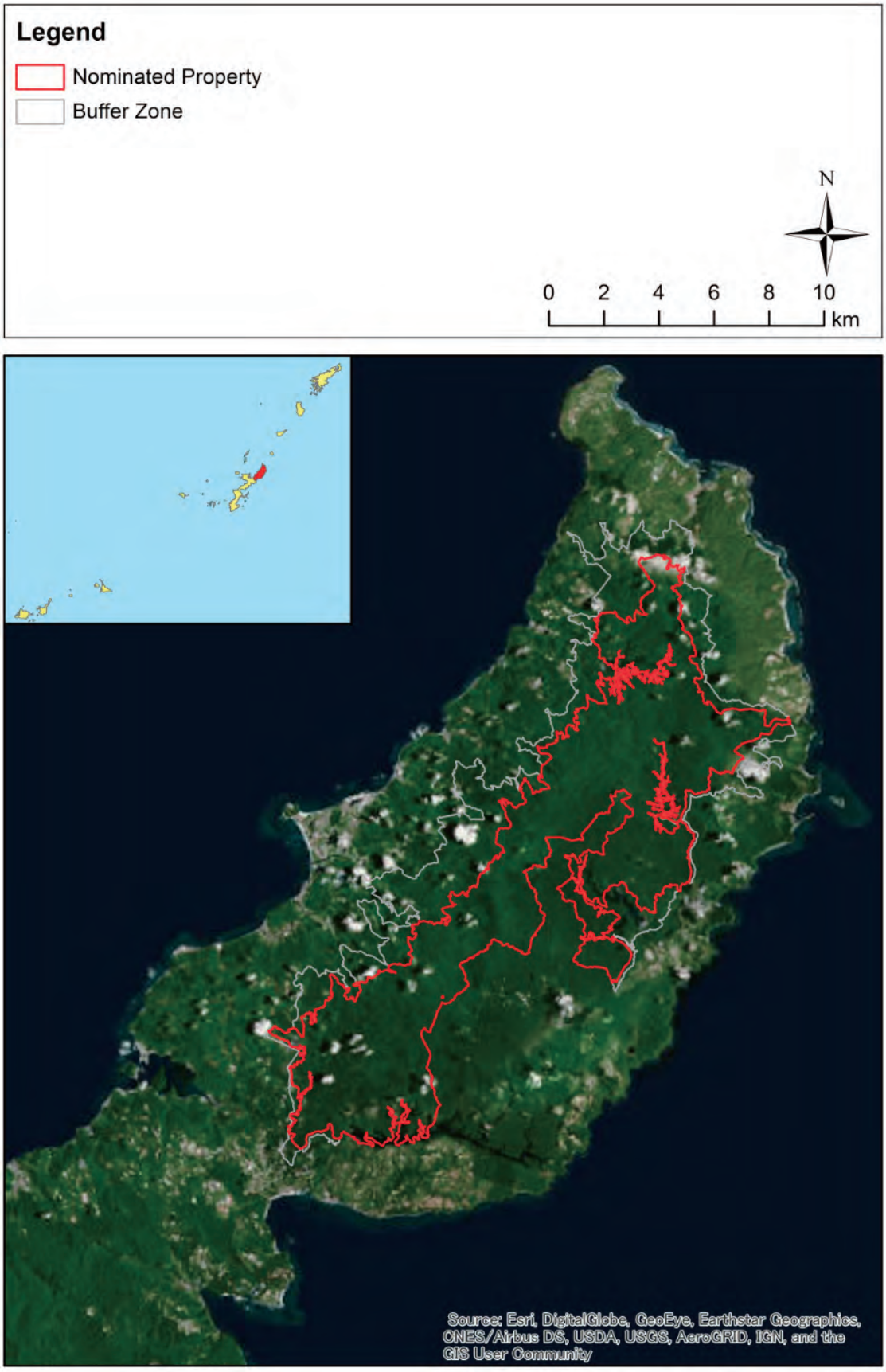


Figure 5-1-9: Boundary of the nominated property (Northern part of Okinawa Island, Satellite image)

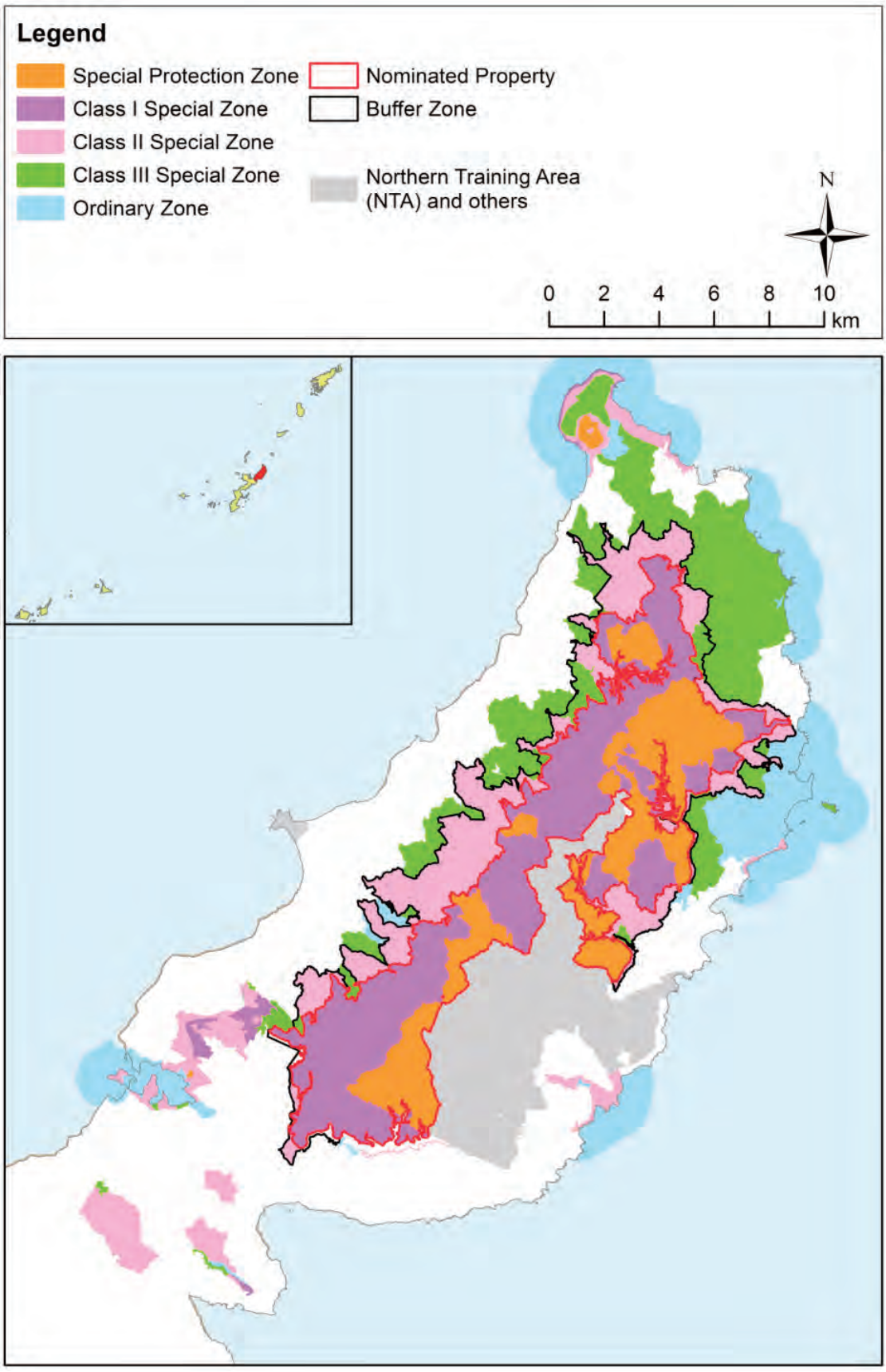


Figure 5-1-10: Yambaru National Park (Northern part of Okinawa Island)

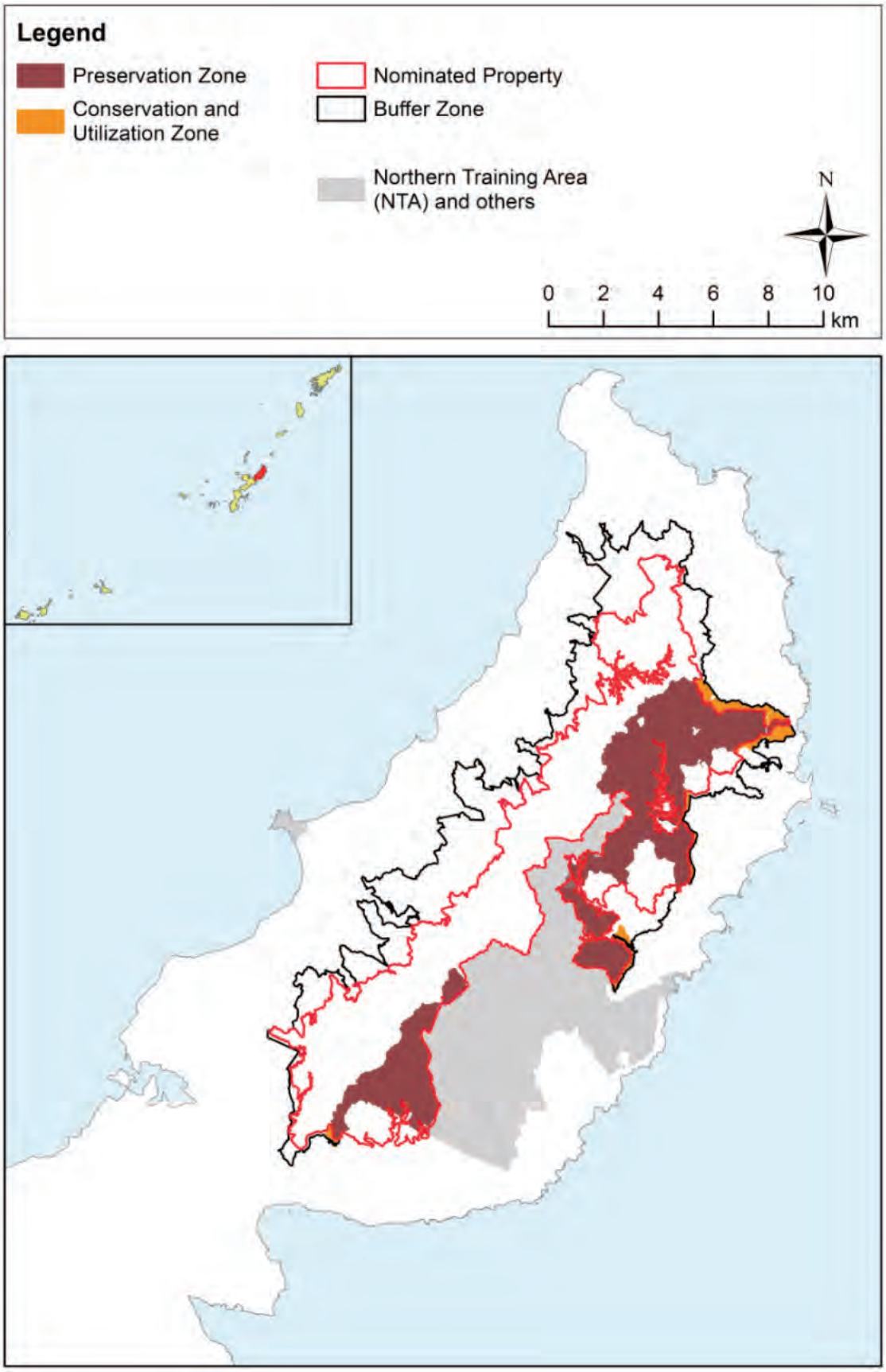


Figure 5-1-11: Yambaru Forest Ecosystem Reserve (Northern part of Okinawa Island)

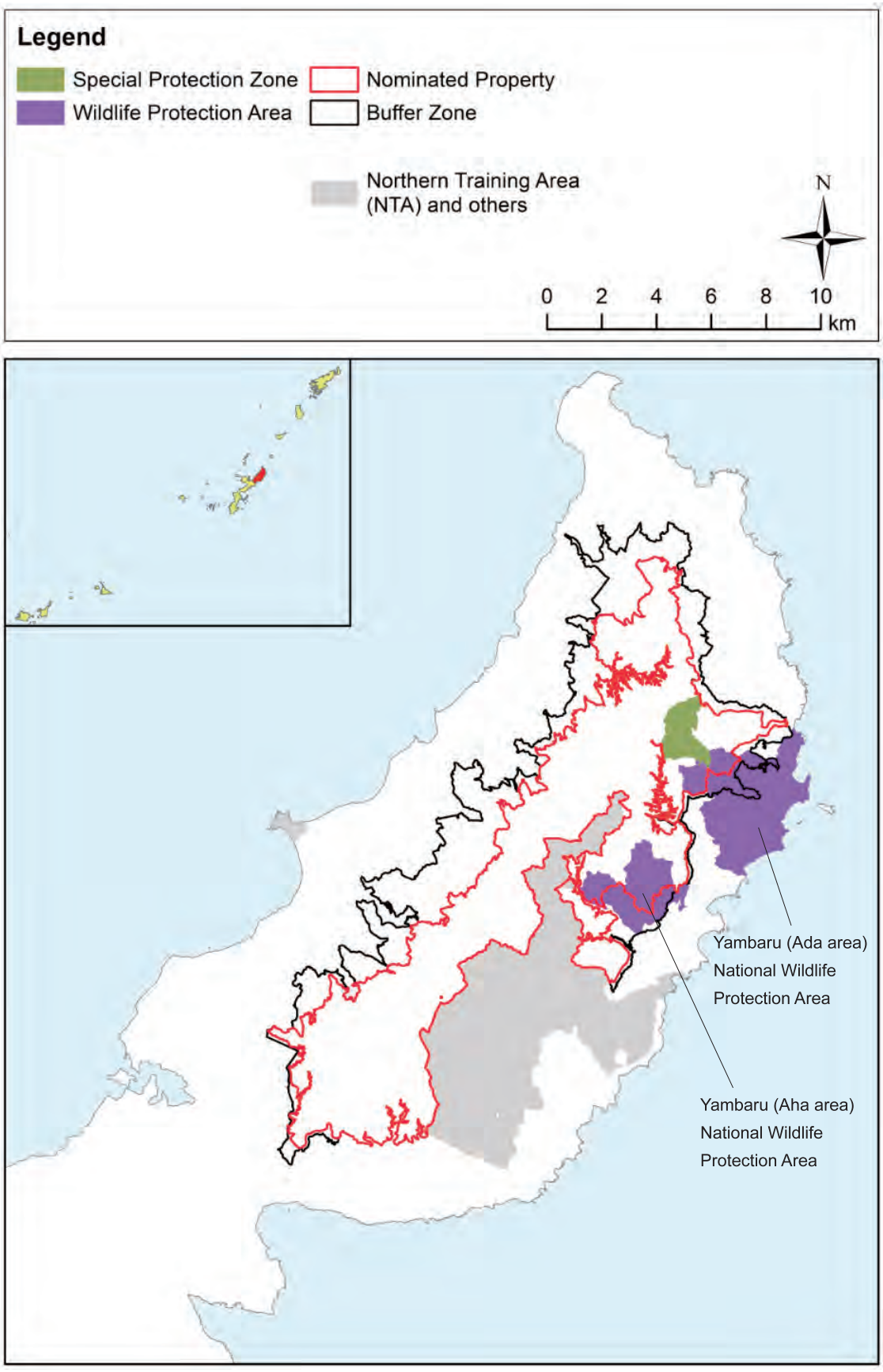


Figure 5-1-12: Yambaru (Ada area) and Yambaru (Aha area) National Wildlife Protection Area (Northern part of Okinawa Island)

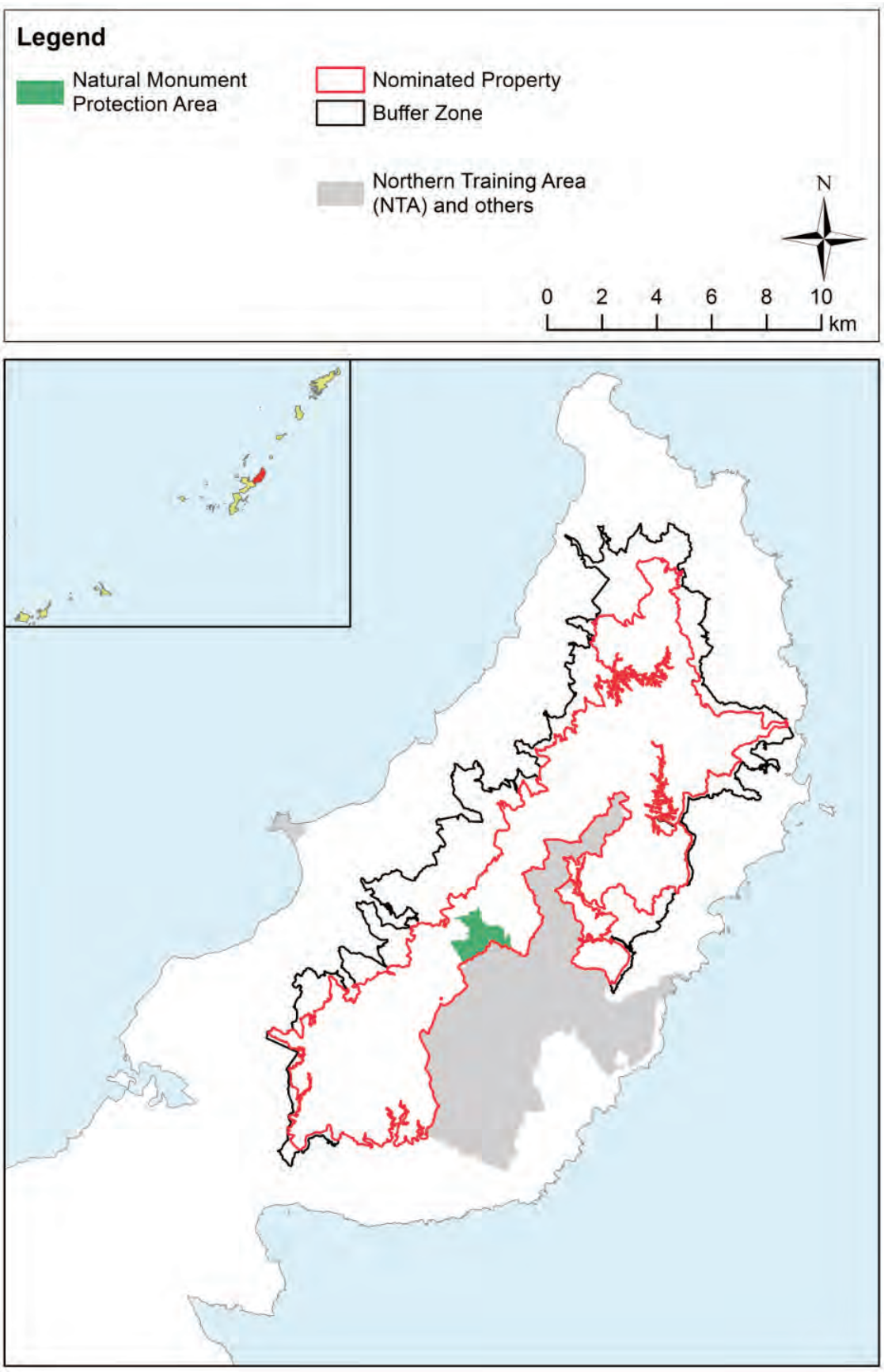


Figure 5-1-13: Mt. Yonahadake Natural Monument Protection Area (Northern part of Okinawa Island)

Table 5-2-4: Designation details for protected areas in the nominated property (Iriomote Island)

Name of protected area (Date of designation)	Legal foundation (Date of promulgation)	Objectives of system
Iriomote-Ishigaki National Park (May 15, 1972) Total National Park /Area in Iriomote Island Total terrestrial area: 40,653 ha / 29,446 ha (amended April 15, 2016) Special Protection Zone: 5,181 ha / 4,624 ha Special Zone: 28,814 ha / 22,226 ha Ordinary Zone: 6,658 ha / 2,596 ha Total marine area: 81,497 ha (amended April 15, 2016)* Marine Special Zone:15,923 ha Ordinary Zone: 65,574 ha	Natural Parks Act (June 1, 1957)	See Table 5-2-1
Iriomote Forest Ecosystem Reserve (March 28, 1991) Total area: 22,366 ha (expanded March 5, 2012 and March 2, 2016) Preservation Zone: 9,999 ha Conservation and Utilization Zone: 12,367 ha	Act on the Administration and Management of National Forests (June 23, 1951) National Forests Administration and Management Bylaw (January 21, 1999)	See Table 5-2-1
Iriomote National Wildlife Protection Area (March 1, 1992) Total area: 10,218 ha (amended October 24, 2011) Special Protection Zone: 9,999 ha	Wildlife Protection, Control and Hunting Managemnent Act (July 12, 2002)	See Table 5-2-1
Natural Monument Nakama River Natural Monument Protection Area (May 15, 1972) Ubundul *Satakentia liukiuensis* communities (May 15, 1972)	Law for the Protection of Cultural Properties (May 30, 1950)	See Table 5-2-1

* : Marine areas are public water surfaces owned by the State and are not clarified for each island. Therefore the figures show the entire marine area of Iriomote-Ishigaki National Park.

Mariyudo Waterfalls,
Iriomote-Ishigaki National Park
(Photo: MOEJ)

Figure 5-1-14: Boundary of the nominated property (Iriomote Island, Satellite image)

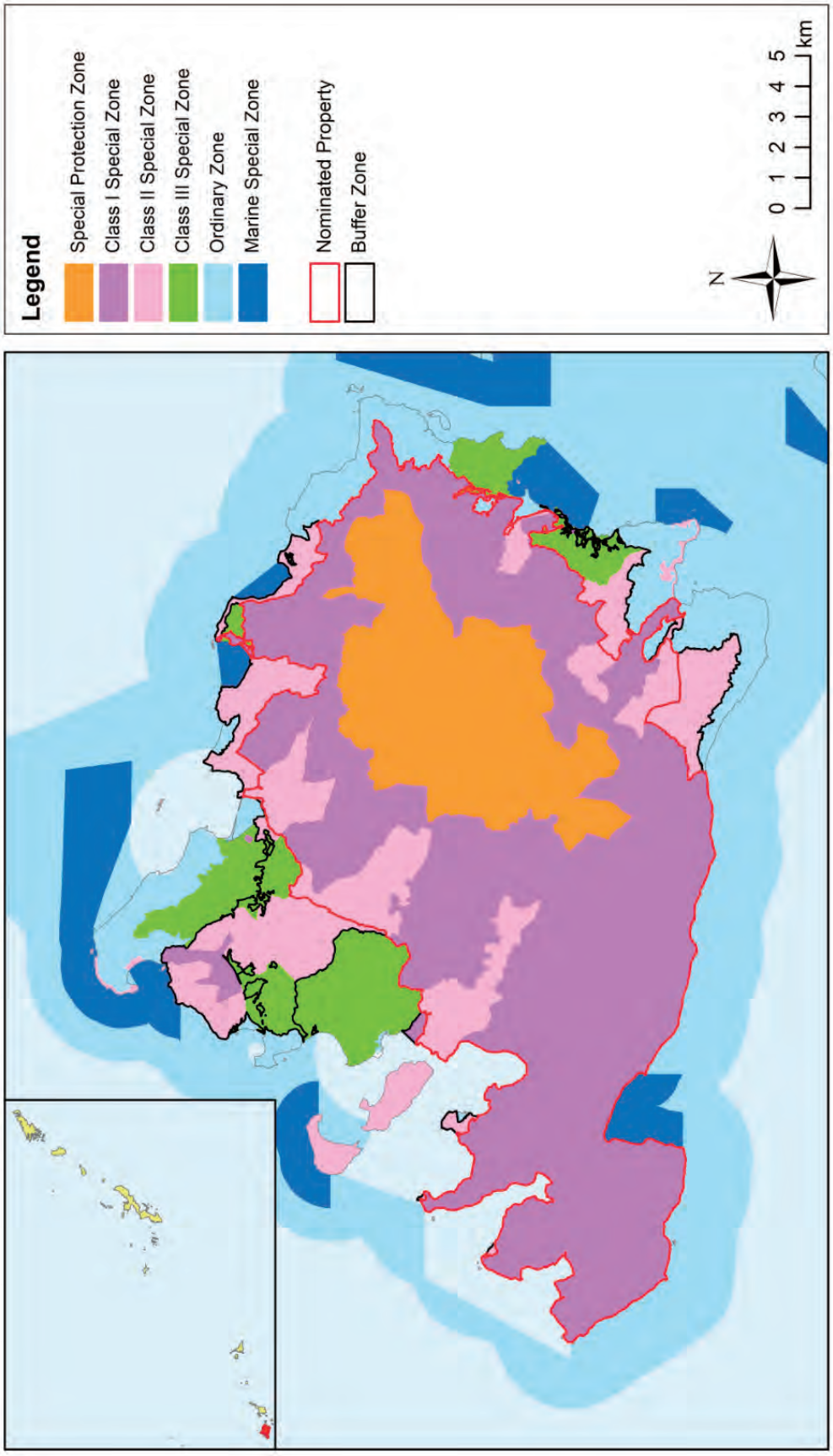


Figure 5-1-15: Iriomote-Ishigaki National Park (Iriomote Island)

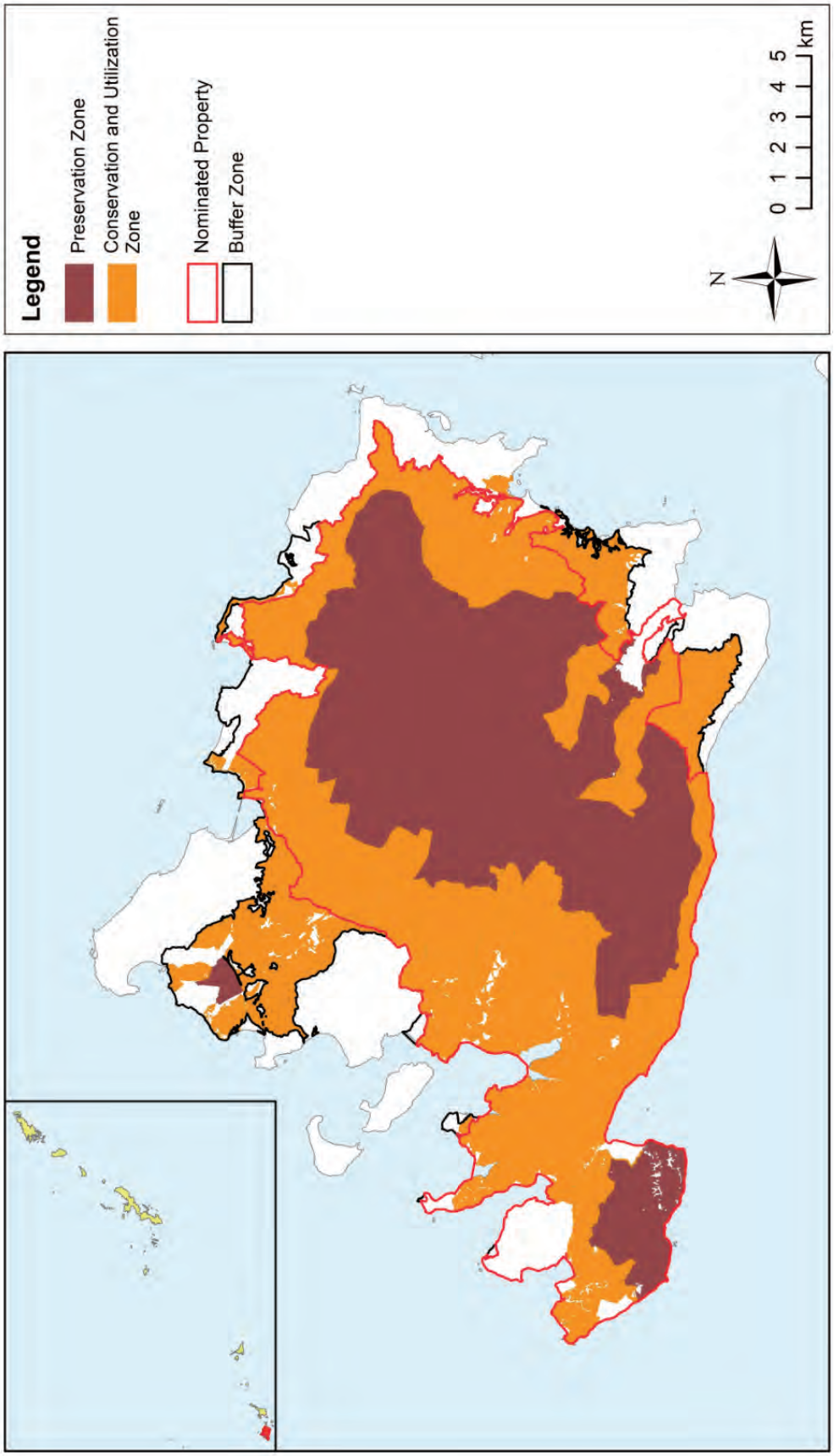


Figure 5-1-16: Iriomote Forest Ecosystem Reserve (Iriomote Island)

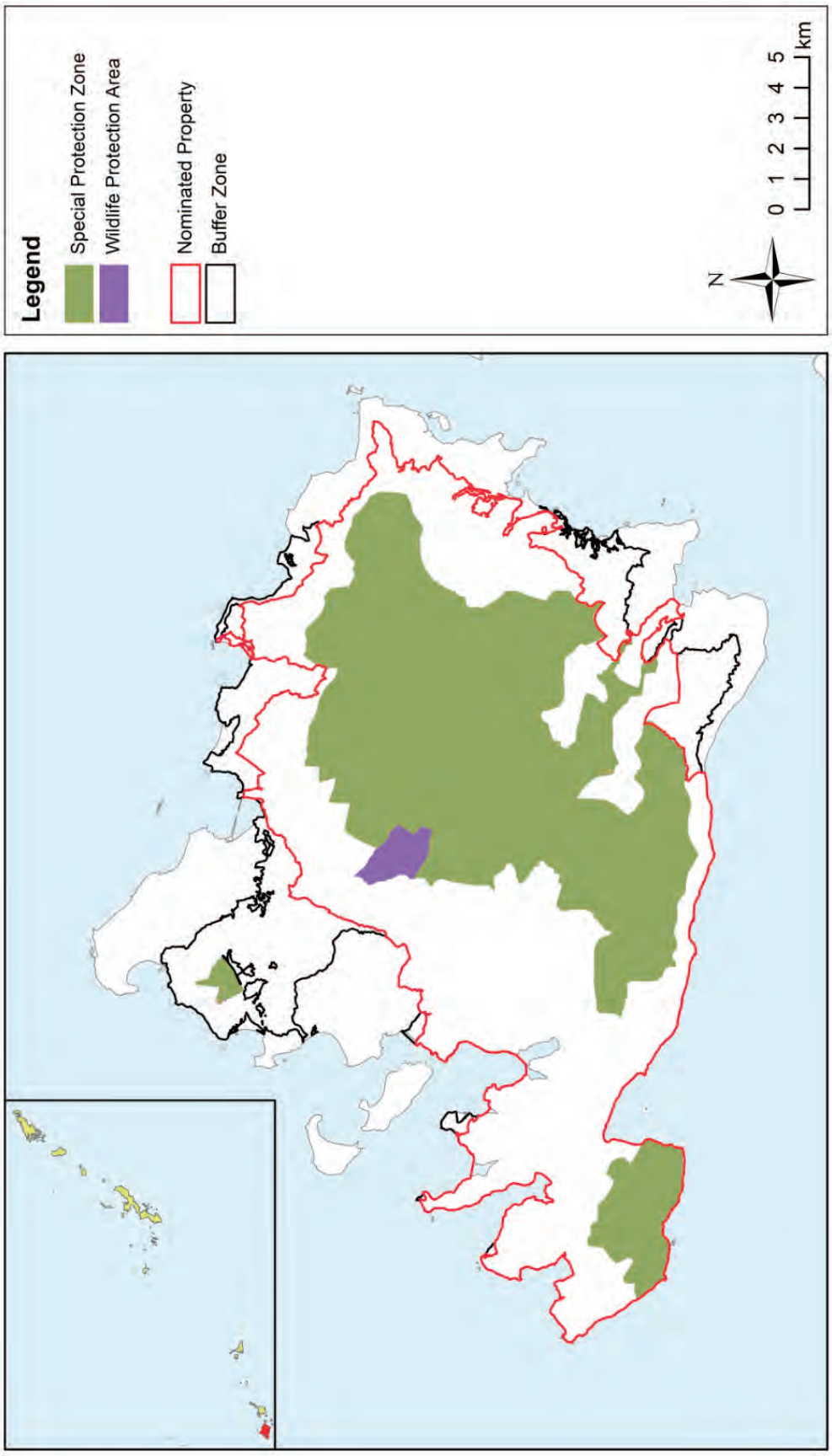


Figure 5-1-17: Iriomote National Wildlife Protection Area (Iriomote Island)

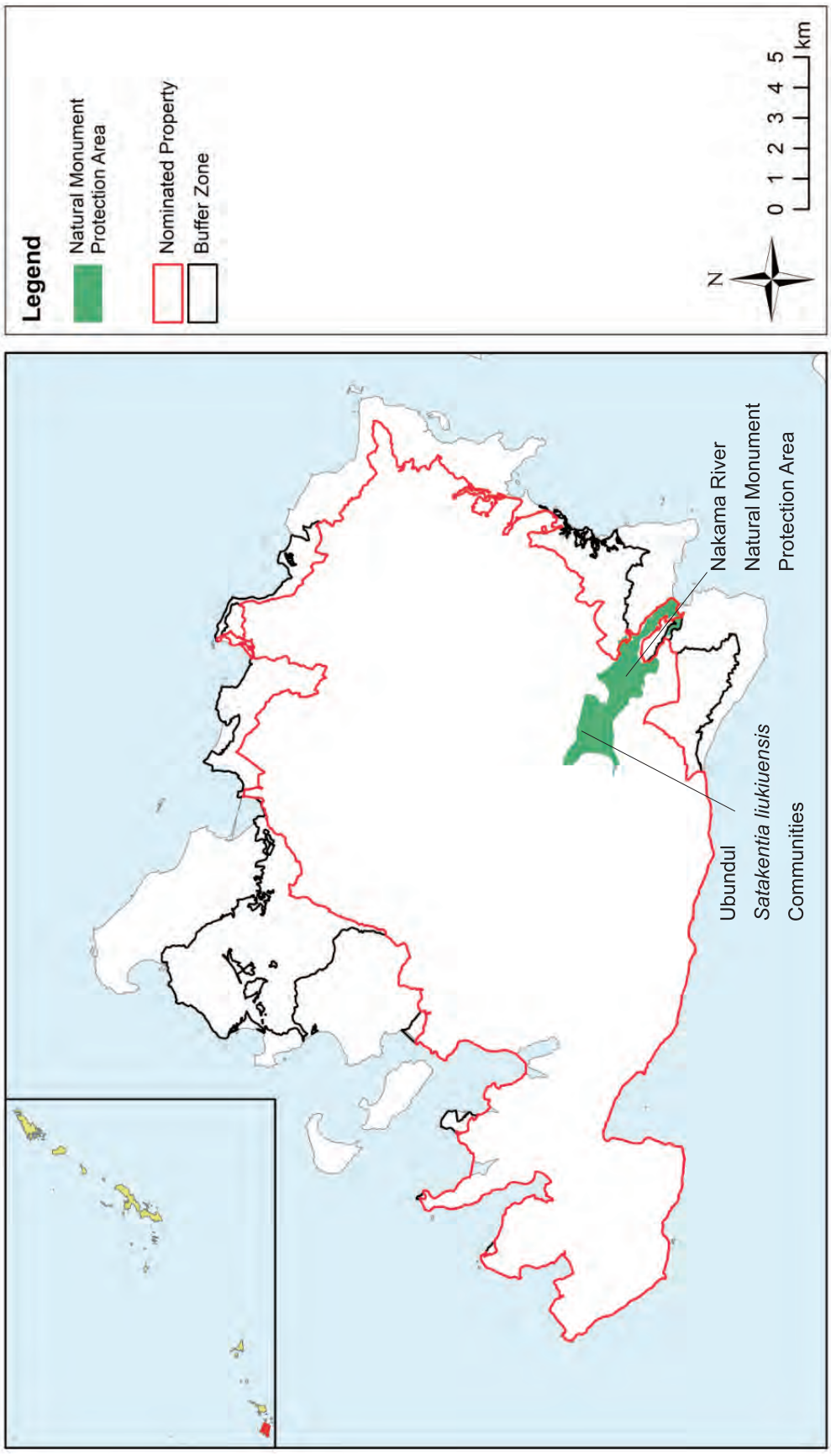


Figure 5-1-18: Natural Monument (Iriomote Island)

5.c. Means of Implementing Protective Measures

The nominated property is designated as protected areas listed in Tables 5-2-1 to 5-2-4, pursuant to domestic laws. Many of these protected areas overlap and complement one another, thereby enhancing their function of protecting the nominated property as the habitats of endemic species and rare species.

Some of these are designated and protected as National Endangered Species under the Act on Conservation of Endangered Species of Wild Fauna and Flora, or as Natural Monument under the Law for the Protection of Cultural Properties. Overviews of the respective protection measures are given below.

5.c.1. Amamigunto National Park, Yambaru National Park, and Iriomote-Ishigaki National Park

A national park is an area designated and managed by MOEJ under the National Parks Act to protect the excellent natural scenic areas and promote utilization for the purpose of contributing to citizens' health, recreation and culture, and conserve biodiversity.

National parks are divided into different categories and regulated according to those categories based on a Park Plan: Special Zone, an area where superb natural state must be maintained; Special Protection Zone, an area that conserves pristine state of nature, which must be protected in a particularly strict manner; and Ordinary Zone, an area where sceneries should be protected in an integrated manner along with aforementioned zones (Table 5-3-1).

Pursuant to the National Parks Act, a new national park was designated in Amami-Oshima Island and Tokunoshima Island in 2017, and one in the northern part of Okinawa Island in 2016—Amamigunto National Park and Yambaru National Park, respectively. Following the return of the land covering approximately 4,166 ha out of NTA to the Government of Japan in December 2016, the land of approximately 3,689 ha including the returned land was incorporated into the national park in June 2018. On the basis of assessment results of the IUCN technical assessment report, this area has been included in the nominated property (see Box 9 for further details). In addition, almost entire area of Iriomote Island was designated as a national park in 2016 due to a major expansion of Iriomote-Ishigaki National Park (Iriomote Island had part of its territory designated as Iriomote National Park in 1972).

Table 5-3-1: Regulations applicable within the respective zones

Acts in a Special Zone that require permission from the Minister of the Environment	Acts in a Special Protection Zone that require permission from the Minister of the Environment	Acts in an Ordinary Zone that require notification to the Minister of the Environment
1. Constructing, reconstructing or extending structures 2. Felling trees or bamboos 3. Mining minerals or extracting soil and stones 4. Causing increase or decrease of the water-level or quantity of water of rivers and lakes, etc. 5. Discharging sewage or waste water into a designated lakes, and wetlands 6. Setting or otherwise showing advertisements, etc 7. Accumulating or storing in the open air soil and stones or designated materials 8. Reclaiming the surface of water or reclaiming by drainage 9. Changing the feature of land 10. Collecting or damaging designated plants 11. Capturing or killing or wounding designated animals 12. Altering the colors of roofs, wall surface, etc. 13. Entering into designated wetlands, etc. 14. Using vehicles , horses or power -driven vessels, etc in designated areas	In addition to 1 through to 6, 8, 9, 12 and 13 on the left: 1. Damaging trees or bamboos 2. Planting or sowing seeds of plants 3. Pasturing livestock 4. Accumulating or storing things in the open air 5. Setting fire or making fire 6. Collecting or damaging plants, or collecting fallen leaves or branches 7. Capturing, killing or wounding animals, or collecting or damaging their eggs 8. Using vehicles, horses or power-driven vessels, or landing an airplanes, other than roads or plazas 9. Releasing animals	1. Constructing, reconstructing or extending major structures 2. Causing increase or decrease of the water-levels or quanty of rivers and lakes, etc. within a Special Zone 3. Setting or otherwise showing advertisements, etc 4. Reclaiming the surface of water or reclaiming by drainage 5. Mining minerals or extracting soil and stones 6. Changing the feature of land 7. Changing the feature of seabed

*1: Special Zones are classified into three categories with each subject to a different degree of restrictions. In Class I Special Zones, the existing landscape must be protected as much as possible, for instance, with the felling of trees and bamboos permitted only in the case of single-tree selection cutting. Class II Special Zones are defined as areas where efforts must be made to achieve good balance with agriculture, forestry, and fisheries, with the felling of trees and bamboos permitted so far as the relevant statutory criteria, such as a limit on the total clear-cut area, are satisfied. As for Class III Special Zones, there are no restrictions on the felling of trees and bamboos.

*2: Even if an application is filed for permission for conducting any the above-listed acts in a Special Protection Zone, approval is given only when such an act is deemed necessary for academic research or other forms of public interest.

In the Special Protection Zone that is designated as the nominated property, or the Class I Special Zone where similar protection measures have been undertaken, various actions that have an impact on the maintenance of evergreen broadleaved forests, which are an important habitats for wildlife characterizing nature in the area, are prohibited in principle, and strict protection measures are undertaken.

In buffer zones, necessary regulations for use and development have been conducted, through combining regulations and voluntary rules such as the policy for promoting the Yambaru Model Forestry, on the basis of Class II Special Zones of national park and other zonal classifications. Tables 5-3-2 to 3 show the state of these combinations, zonal classifications of national park, and their relations with relevant regulations for use and development in buffer zones.

In addition, pedestrian walkways and visitor centers have been enhanced on the basis of facility use plans for each national park to conserve the natural environment and promote its appropriate use.

Table 5-3-2: Various management categories in buffer zones

	National Park Class II Special Zone*1	National Park Class III Special Zone			National Park Ordinary Zone	Other*2
		Public land subject to Yambaru Model Forestry/prefectural forest subject to SGEC-FM certification	National forest	Other		
Amami-Oshima Island	97.2	-	-	0.2	0.6	2.1
TokunoshimaIsland	98.4	-	1.4	0.1	-	0.1
Northern part of Okinawa Island	90.0	7.5	0.8	-	-	1.7
Iriomote Island	74.5	-	20.3	-	0.0	5.2

*1: The figures includes Conservation and Utilization Zones of Forest Ecosystem Reserves.
*2: National forests and public land with no legal regulations, and/or Special Protection Zone and Class I Special Zones of national parks which are not connected to the nominated property.

Table 5-3-3: Regulations of development activities in relation to national park zones

(Representative examples of regulations*1)	National Park Class II Special Zone	National Park Class III Special Zone		National Park Ordinary Zone
		Public land subject to Yambaru Model Forestry/ prefectural forest subject to SGEC-FM certification	National forest/public land/other	
Construction of structures (building, road, dam etc.)	Regulated	Regulated	Regulated	In-advance notification is required for large-scale construction

(Representative examples of regulations[*1])		National Park Class II Special Zone	National Park Class III Special Zone		National Park Ordinary Zone
			Public land subject to Yambaru Model Forestry/ prefectural forest subject to SGEC-FM certification	National forest/public land/other	
Felling trees or bamboos	Selective cutting	Regulated	There is no legal regulation, but in-advance application is required.	There is no legal regulation, but in-advance application is required.	No regulation
	Clear cutting	Regulated	There is no legal regulation, but in-advance application is required. Based on Yambaru Model Forestry Guidelines, voluntary rules have been established, such as minimizing area of logging when clear cutting.	There is no legal regulation, but in-advance application is needed. It is agreed among stakeholders to implement biodiversity-conscious forest management.	In-advance notification is required for large-scale cutting.
Mining or extracting soil and stones by open pit (quarry etc.)		Regulated (It shall not be approved to obtain new mining rights)	Regulated (activities in habitats of rare species shall not be approved) *As it is a public land, commercial quarrying shall not be conducted.	Regulated (activities in habitats of rare species shall not be approved) *As it is a national forest/public land commercial quarrying shall not be conducted.	In-advance notification is required for large-scale cutting
Reclamation of the land Changing the land feature		Regulated	Regulated	Regulated	In-advance notification is required for large-scale cutting
Collecting plants and capturing animals * Collection and capture of rare species are regulated based on other laws.		No regulation[*2]	No regulation	No regulation	No regulation

*1: Additional regulations are set for each zone other than the regulations shown in this table (see Table 5-3-1 for further details).
*2: As for Yambaru National Park, additional regulations are being prepared on collection of rare plant species based on the Natural Park Act (notification is required under the Act).
*3: Although Yamabaru Model Forestry Guidelines are voluntary rules, they are described and underpinned in the Forestry Plan of the Northern Part of Okinawa Island based on the Forest Act.

5.c.2. Amamigunto, Yambaru, and Iriomote Forest Ecosystem Reserves

The purposes of a Forest Ecosystem Reserve are to contribute to the preservation of the natural environment composed by forest ecosystems, protection of wildlife and genetic resources, development of forest operation and administration techniques as well as academic research, etc. by administering primeval natural forests that represent Japan's climate zones and forest zones. A Forest Ecosystem Reserve is an area designated and administered by the Forestry Agency under a Regional Administration and Management Plan prescribed in the

Act on the Administration and Management of National Forests.

Under this system, Iriomote Island had the Iriomote Forestry Ecosystem Reserve designated in 1991 and expanded its boundaries in 2012 and 2016; consequently, most of Iriomote Island has been designated as a Forest Ecosystem Reserve. For Amami-Oshima Island and Tokunoshima Island, the Amamigunto Forest Ecosystem Reserve was designated in 2013, primarily in the mountainous regions of both islands. In the northern part of Okinawa Island, in December 2017, Yambaru Forest Ecosystem Reserve was designated after part of NTA of 4,166 ha was returned to the Government of Japan in December 2016.

A Preservation Zone within a Forest Ecosystem Reserve is a zone mainly consists of pristine natural forests including endemic and rare species habitats. A general rule applied to a Preservation Zone is to have natural transitions take care of it with no human intervention, so as not to affect the forest ecosystems.

A Conservation and Utilization Zone is a zone which has area large enough to serve as a buffer keeping Preservation Zone free from direct influence from the external environment. As a general rule, a Conservation and Utilization Zone which is consisted mainly of the same type of natural forest as those in Presercation Zone must be treated in a way equivalent to a Preservation Zone (Table 5-4).

Within the Forest Ecosystem Reserve, based on scientific grounds, acts are taken if deemed necessary to conserve and rehabilitate its endemic biodiversity and forest ecosystem. In addition, scientific researches, nature observation and education, utilization of genetic resources, and other acts of public interests are implemented if deemed necessary.

Table 5-4: Main policies concerning the Forest Ecosystem Reserve

Preservation Zone	In principle, this zone is left to natural transition, without human interference.
Conservation and Utilization Zone	Natural forests are dealt with in the same manner as those in the Preservation Zone. Artificial forests may undergo operations of multi-storied forests to transform into natural forests.

5.c.3. National Wildlife Protection Area

A National Wildlife Protection Area is an area designated by the Minister of the Environment pursuant to the Wildlife Protection, Control and Hunting Management Act. Its purpose is to conserve the area for protection of wildlife if deemed necessary from the viewpoint of international or national wildlife protection. In Japan, based on this act, capture of wildlife requires permission from the Minister of the Environment or other. Hunting of game species in hunting period does not require permission for capture but needs other procedures such as obtaining a hunting license and completing registration. However, hunting is prohibited within the boundaries of a Wildlife Protection Area (Table 5-5). In addition a zone that poses a particular need for the protection of wildlife or its habitat is designated as a Special Protection Zone, an area where certain development activities are regulated.

Mt. Yuwandake National Wildlife Protection Area

Mt. Yuwandake National Wildlife Protection Area is a forested area dominated by such broadleaved evergreen trees as Castanopsis (*Castanopsis sieboldii*), *Quercus miyagii*, *Machilus thunbergii* and *Distylium racemosum*, and gained this designation in 1965 as it serves as habitats for the Amami rabbit (*Pentalagus furnessi*), Amami woodcock (*Scolopax mira*), Amami thrush (*Zoothera dauma major*), white-backed woodpecker (*Dendrocopos leucotos owstoni*), Ryukyu robin (*Luscinia komadori komadori*), and other rare wildlife species. The entire area is included in either the nominated property or the buffer zone.

Yambaru (Ada area) National Wildlife Protection Area

Containing the vast expanse of an evergreen broadleaved forest, most notably Castanopsis, the area was designated as a National Wildlife Protection Area in 2009 as it provides habitats for the Okinawa woodpecker (*Sapheopipo noguchii*), Okinawa rail (*Gallirallus okinawae*), subspecies of Ryukyu robin (*Luscinia komadori namiyei*), Ryukyu long-haired rat (*Diplothrix legata*), and other rare wildlife species. It is included in either the nominated property or the buffer zone, except for the vicinity of settlements and other such areas.

Yambaru (Aha area) National Wildlife Protection Area

Containing the vast expanse of an evergreen broadleaved forest, most notably Castanopsis, the area gained its designation in 2009 as it provides habitats for the Okinawa woodpecker, Okinawa rail, subspecies of Ryukyu robin (*Luscinia komadori namiyei*), and other rare wildlife species. Most of its land area is included in either the nominated property or the buffer zone.

Iriomote National Wildlife Protection Area

Containing the vast expanse of a pristine evergreen broadleaved forest, most notably Castanopsis and *Quercus miyagii*, the area gained its designation in 1992 as it provides habitats for the Iriomote cat (*Prionailurus bengalensis iriomotensis*), crested serpent eagle (*Spilornis cheela perplexus*), emerald dove (*Chalcophaps indica yamashinai*), and other rare wildlife species. The entire area is included in either the nominated property or the buffer zone.

Table 5-5: Description of regulations applicable to the respective areas

Acts prohibited in Wildlife Protection Area	Acts in Special Protection Zone that require permission from the Minister of the Environment
Hunting of wildlife	1. Constructing a new building or other structure, or remodeling or adding to an existing building or structure 2. Undertaking landfill or reclaiming a water surface 3. Felling trees or bamboos 4. Any act specified by a Cabinet Order that might affect the protection of wildlife within the boundaries of a zone designated within a Special Protection Zone

5.c.4. National Endangered Species

A National Endangered Species means threatened wildlife species that live or grow in Japan, and is designated by Cabinet Order pursuant to the Act on Conservation of Endangered Species of Wild Fauna and Flora.

Among the animals and plants that live or grow in the nominated property, the designation of National Endangered Species has been given to six mammals, including the Iriomote cat, Amami rabbit, Ryukyu long-haired rat, Okinawa spiny rat (*Tokudaia muenninki*), Amami spiny rat (*T. osimensis*) and Tokunoshima spiny rat (*T. tokunoshimensis*); 13 birds, including the Amami woodcock, Okinawa rail, white-backed woodpecker and Okinawa woodpecker; two reptiles, including Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*) and the banded ground gecko (*G. splendens*); six amphibians, including Holst's frog (*Babina holsti*), the Otton frog (*B. subaspera*), Namie's frog (*Limnonectes namiyei*), Okinawa Ishikawa's frog (*Odorrana ishikawae*), Amami Ishikawa's frog (*O. splendida*) and Anderson's crocodile newt (*Echinotriton andersoni*); three insects, including a stag beetle (*Neolucanus okinawanus*) and Yanbaru long-armed scarab beetle (*Cheirotonus jambar*); one inland water decapod crustacean; and 32 plants, including *Polystichum obae* and *Dendrobium okinawense*. It is prohibited to capture, kill, injure, wound, collect, damage, transfer or perform any similar act on these National Endangered Species.

Of those National Endangered Species, plans for the protection and recovery program have been established for seven species, including the Amami rabbit, Okinawa rail, and Iriomote cat based on the Act. The plan aims to promote the species reproduction and maintain their habitats. A variety of work is underway, such as clarifying and monitoring their current status, maintaining and improving their habitats, and engaging in captive breeding, for the purpose of their stable survival under natural state (see Annex 5-17 to 5-23).

5.c.5. Natural Monuments

A Natural Monument means an animal (including its habitat, breeding, and migrating site), a plant (including its native growing sites) or a geological feature or mineral (including the area where peculiar natural phenomena are recognizable) that is designated by the Minister of Education, Culture, Sports, Science and Technology, pursuant to the Law for the on Protection of Cultural Properties for the purpose of preserving the important monuments that have significant scientific value to Japan. Those that are particulary important among them are designated as Special Natural Monumnet.

The animals designated as Special Natural Monumnets in the nominated property include the Amami rabbit, Iriomote cat, Okinawa woodpecker and crested serpent eagle. The designated Natural Monuments are: two mammals, i.e. Ryukyu long-haired rat and spiny rat; seven birds, i.e. Okinawa rail, white-backed woodpecker and Amami jay (*Garrulus lidthi*); three reptiles, i.e. yellow-margined box turtle (*Cuora flavomarginata*), Ryukyu black-breasted leaf turtle (*Geoemyda japonica*) and Kishinoue's giant skink (*Plestiodon kishinouyei*); one insect, i.e. Yanbaru long-armed scarab beetle; and one group of inland water decapod crustaceans, i.e. terrestrial helmet crabs (seven species belonging to the same genus *Coenobita*). In the plants category, one site is designated as Natural Monuments, i.e. the Ubundul *Satakentia liukiuensis* communities. In addition, three sites are designated as Natural Monument Protection Areas: Kamiya-Yuwandake, the Nakama River Natural Monument Protection Area, and Mt. Yonahadake Natural Monument Protection Area. In addition, a Natural Monument Protection Area is a certain area with rich natural monuments that should be protected. According to that classification, three areas, namely Kamiya and Mt. Yuwandake, Nakama River Natural Monument Protection Area, and Mt. Yonahadake Natural Monument Protection Area, have been designated as natural monuments.

In principle, any changes to be made to the current state of a Natural Monument or actions affecting the preservation of a Natural Monument require permission from the Commissioner for Cultural Affairs.

5.c.6. Programs concerning alien species countermeasures

The Act on the Prevention of Adverse Ecological Impacts Caused by Designated Invasive Alien Species specifies Designated Invasive Alien Species of which introduction from abroad would or may affect or damage ecosystems, human life and body, agriculture, forestry, and fisheries, etc. in Japan. The Act aims at preventing the invasion and dispersion of Designated Invasive Alien Species, through relevant measures that the government and others undertake to control them, by regulating their raising, growing, storing, carrying, import, and other treatment. As measures undertaken in the nominated property, the control program of the small Indian mongoose (*Herpestes auropunctatus*), which has already settled on Amami-Oshima Island and Northern part of Okinawa Island, has been implemented. Measures are also taken, in the early stage of invasion, to control the cane toad and white-lipped treefrog on Iriomote Island, and the mile-a-minute on Amami-Oshima Island, Northern part of Okinawa Island, and Iriomote Island.

In addition, the List of Invasive Alien Species Threatening Biodiversity, Human Health and/or Economy Development in Japan has compiled all alien species including not only those of external origin but also domestic origin, which affect or may affect ecosystems, human life and body, agriculture, forestry, and fisheries. Warning notices have been sent out widely to prevent the invasion and dispersion of invasive alien species.

The Action Plan to Prevent Damages and Risks caused by Alien Species in Japan was formulated in 2015 by MOEJ, the Ministry of Agriculture, Forestry, and Fisheries, and the Ministry of Land, Infrastructure, and Transportation. It outlines principles of actions for diverse parties such as the national government, local governments, private organizations, business sectors, researchers, citizens, and so on, to engage in measures against alien species, as well as concepts to effectively and efficiently undertake measures against alien species. In terms of responses to new invasive alien species, it places an importance on several responses, including the strengthening of the system for information collection to discover new invasions at an earlier stage before they become established, the implementation of monitoring activities, and immediate actions that shall be taken to eradicate alien species when they are confirmed to have invaded at the earliest stage. Relevant measures shall be undertaken, based on these principles and policies.

For the purpose of preventing damages that alien species may cause to ecosystems, Kagoshima Prefecture shall formulate relevant ordinances concerning the designation of harmful alien species, as well as appropriate treatment of designated alien species, including their raising by around March, 2019.

5.c.7. The cooperation with the United States Government (USG) for conservation of natural environment at Northern Training Area (NTA)

With regard to natural environment at the US Forces NTA which neighbors to the nominated property at Northern part of Okinawa Island, the proper conservation and management is conducted under structure of strict mutual alliance through the Environmental Subcommittee (ESC) under Japan-US Joint Committee composed of the Government of Japan (GOJ) and the USG (Figure 5-2). Both the GOJ and the USG will continue this scheme.

Marine Corps Base Camp Smedley D. Butler (Camp Butler), the collective administrative organization of the U.S. Marines stationed in Okinawa and others, for the smooth operation of their installations and others, formulated Integrated Natural Resources and Cultural Resources Management Plan (INRCRMP) as the main information source and guidance of effective maintenance and conservation of natural resources and cultural resources which are incorporated in the INRCRMP's installations. NTA is appropriately managed in accordance with the INRCRMP (Annex 5-52).

Especially with the effort related to the World Heritage nomination, the Ministry of the Environment of Japan (MOEJ) has provided various information to the U.S. Forces Japan (USFJ) as appropriate. As the formal statement made by both the GOJ and the USG (Annex 5-53) states, the GOJ and the USG shared a common view on the importance of paying special attention to the conservation of the nominated site by taking necessary measures such as promoting invasive alien species control projects in the wide range of the northern part of Okinawa Island, including NTA, to protect Outstanding Universal Value (OUV) of the nominated property and, accordingly, both the GOJ and the USG will continue to work together in bilateral forums including the ESC for the necessary conservation programmes such as capturing mongoose and feral cats for the benefit of native species, especially those that are threatened and endangered. The above-mentioned contents are regarded in Comprehensive Management Plan.

Reviewing past concrete programs, the MOE and the Okinawa Prefectural Government (OPG) have conducted mongoose control project since 2007 for over a decade at NTA at the same level as outside of NTA. Furthermore, at a part of NTA, U.S. Marine Corps have conducted mongoose control project as their activity. These cooperation are noted in the INRCRMP.

The information related to the results of conservation and management at the northern part of Okinawa Island including NTA, the distribution of endangered species including Okinawa rail (*Gallirallus okinawae*) is recovering, and after a part of NTA was returned in 2016, natural environmental survey and others were conducted in the returned land of NTA in 2016 and 2017 which lead that there are many large-diameter woods and forest formed by high-age trees and favorable natural resources are conserved in which endemic and endangered species including Yanbaru long-armed scarab beetle (*Cheirotonus jambar*) and Ryukyu long-furred rat (*Diplothrix legata*) and others can inhabit and grow stably.

Both the GOJ and the USG will share the information about World Heritage nomination as well as post evaluation, registration and monitoring and other information and exchange the opinions for the proper concervation and management of the nominated property.

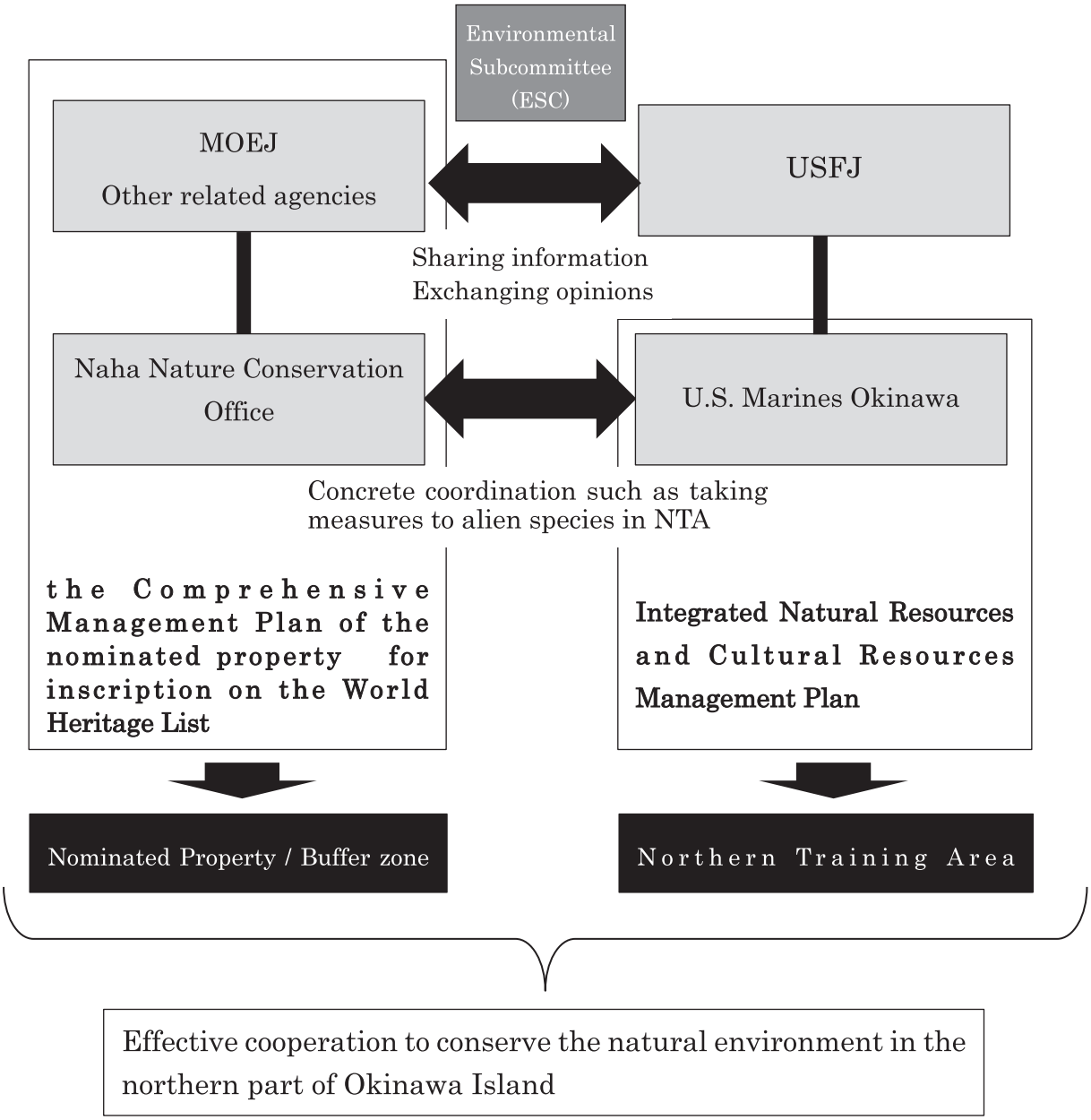


Figure 5-2: Cooperation between the United States Government and Government of Japan at Northern Training Area (NTA)

5.d. Existing Plans Related to Municipality and Regions in Which the Nominated Property is Located

Tables 5-6-1 to 5-6-4 list the plans concerning the conservation and use of the nominated property and the buffer zones, including National Park Plans, which provide protective regulations and visitor facility plans, and Regional Administration and Management Plans, which prescribe policies for the management of Forest Ecosystem Reserves and other national forests.

Table 5-6-1: Plans concerning the nominated property and the buffer zones (Amami-Oshima Island)

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Amamigunto National Park Plan	Article 7 of the National Parks Act	MOEJ	To serve as basic guidelines for appropriate operation of a National Park by clarifying policies to maintain the scenic beauty and landscapes, and to promote suitable use as a park.	The plan presents the regulation and utilization plan required for appropriately protecting the unique ecosystem, fauna and flora, landscapes, etc. that Amamigunto National Park contains, and actively promoting park utilization based on such protective actions.
Regional Administration and Management Plan (Amami-Oshima Island Forest Planning Zone)	Article 6, paragraph 1 of the Act on the Administration and Management of National Forests	Forestry Agency	A five-year plan that provides basic matters regarding the administration and management of national forest in the Amami-Oshima Island Forest Planning Zone, in light of the National Forest Management Basic Plan. National forest administration and management should be performed appropriately pursuant to this plan.	Basic matters regading the maintenance and conservation of national forest including Forest Ecosystem Reserve; matters regarding supplies of forest products; and matters regarding utilization of the national forest are described.
Amamigunto Forest Ecosystem Reserve Conservation Management Plan		Forestry Agency	A plan that clarifies how national forest conservation management should be designed in consideration of the features of the Amami Island Group, with the aim of handing down the unique nature of the Amami Island Group to posterity without letting it further deteriorate, and also gradually restoring it to a pristine state, in the Amamigunto Forest Ecosystem Reserve.	- Systematic promotion of countermeasures against alien species in order to protect the endemic ecosystem of the Amami Island Group. - Coordination of use and protection for the purpose of mitigating impacts on the endemic ecosystem as a result of its use.

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Mt. Yuwandake National Wildlife Protection Area Designation Plan; Mt. Yuwandake National Wildlife Protection Area Yuwandake Special Protection Zone Designation Plan	Article 28 and 29 of the Wildlife Protection, Control and Hunting Management Act	MOEJ	To protect wildlife found significant from both international and national viewpoints, and their habitats	The plan states the zone being designated, its area, the wildlife living there, guidelines on protection, etc.
Plan for Protection and Recovery Program (Amami woodcock, Amami thrush, Amami rabbit)	Article 45 of the Act on Conservation of Endangered Species of Wild Fauna and Flora	MOEJ, Ministry of Agriculture, Forestry and Fisheries (Forestry Agency), etc.	Established for contributing to the appropriate and effective implementation of the protection and recovery program.	The goals, areas, contents, and other necessary matters to ensure appropriate and effective implementation of the protection and recovery program.
Amami Island Group Promotion and Development Plan	Article 5 of the Act on Special Measures Concerning Promotion and Development of the Amami Island Group	Kagoshima Prefecture	A plan that presents the directions of promotion and development of the Amami Island Group pursuant to the Basic Policy on Promotion and Development of the Amami Island Group, set by the national government.	With the basic principle set on taking advantage of the geographical and natural features of the Amami Island Group and enhancing its appeal, the plan promotes local initiatives to encourage relocation and enhance communication exchange.
Amami-Oshima Island Regional Forestry Plan	Article 5 of the Forest Act	Kagoshima Prefecture	A 10-year plan, developed every five years, on prefectural, municipal, and private forests in the Amami-Oshima Island Forest Planning Zone for formulating and promoting the directions and objectives of forestry operations.	The plan defines the boundaries of forest areas to be covered, goals of forest development and conservation by the function of each forest, scheduled volumes of logging, afforestation, etc., and also describes guidelines and criteria for municipal forest development plans.
Phase 2 Mongoose Control Plan for Amami-Oshima Island	Act on the Prevention of Adverse Ecological Impacts Caused by Designated Invasive Alien Species	MOEJ	A plan focused on the complete elimination of the small Indian mongoose, a Designated Invasive Alien Species, from Amami-Oshima Island for the purpose of recovering the native species on Amami-Oshima Island.	The plan states the region in which control action is to be taken, control goals, control structure, a description of actions to be implemented, etc.

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Feral Cat Management Plan for Ecosystems Conservation on Amami-Oshima Island		MOEJ Kagoshima Prefecture Five municipalities of Amami-Oshima Island	A plan to conserve indigenous ecosystems in the island, by removing impacts of feral cats on ecosystems, including endemic/rare species on Amami-Oshima Island, and by undertaking countermeasures against sources of the issue.	The plan describes basic policies of the plan, relevant points regarding capturing and elimination of feral cats in habitats for rare species, including implementing structure, implementing areas, how to proceed with capturing and monitoring, responses after the capturing, together with relevant measures regarding sources of the issue, including implementing structure, implementing areas, initiatives and how to promote them, etc.

Table 5-6-2: Plans concerning the nominated property and the buffer zones (Tokunoshima Island)

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Amamigunto National Park Park Plan	Same as Amami-Oshima Island			
Regional Administration and Management Plan (Amami-Oshima Island Forest Planning Zone)	Same as Amami-Oshima Island			
Amamigunto Forest Ecosystem Reserve Preservation Management Plan	Same as Amami-Oshima Island			
Plan for Protection and Recovery Program (Amami woodcock, Amami rabbit)	Same as Amami-Oshima Island			
Amami Island Group Promotion and Development Plan	Same as Amami-Oshima Island			
Amami-Oshima Island Regional Forestry Plan	Same as Amami-Oshima Island			

Table 5-6-3: Plans concerning the nominated property and the buffer zones (Northern part of Okinawa Island)

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Yambaru National Park Plan	Article 7 of the National Parks Act	Ministry of the Environment	To serve as basic guidelines for appropriate operation of a National Park by clarifying policies to maintain the scenic beauty and landscapes, and to promote suitable use as a park.	The plan presents the regulation and utilization plan required for appropriately protecting the unique ecosystem, fauna and flora, landscapes, etc. that Yambaru National Park contains, and actively promoting park utilization based on such protective actions.
Regional Administration and Management Plan (Northern Okinawa Forest Planning Zone)[*1]	Article 6, paragraph 1 of the Act on the Administration and Management of National Forests	Forestry Agency	A five-year plan that provides basic matters regarding the administration and management of national forest in the northern part of Okinawa Island Forest Planning Zone, in light of the National Forest Management Basic Plan. National forest administration and management should be performed appropriately pursuant to this plan.	Basic matters regarding the maintenance and conservation of national forest including Forest Ecosystem Reserve; matters regarding supplies of forest products; and matters regarding utilization of the national forest are described.
Yambaru Forest Ecosystem Reserve Conservation Management Plan (tentative)[*1]		Forestry Agency	A plan that aims at leaving the unique nature in Northern part of Okinawa Island to the next generations without letting it deteriorate from the current conditions, together with its gradual restoration to primeval nature at the same time. It also clarifies the way conservation management of national forests should be conducted, based on the characteristics of Northern part of Okinawa Island.	Systematic promotion of measures against alien species for the conservation of ecosystems that are endemic to Northern part of Okinawa Island. Coordination between use and protection for mitigating adverse impacts that use may have on endemic ecosystems.

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Yambaru (Ada area) National Wildlife Protection Area Designation Plan; Yambaru (Ada area) National Wildlife Protection Area Yambaru (Ada area) Special Protection Zone Designation Plan; Yambaru (Aha area) National Wildlife Protection Area Designation Plan	Article 28 and 29 of the Wildlife Protection, Control and Hunting Management Act	Ministry of the Environment	To protect wildlife found significant from both international and national viewpoints, and their habitats.	The plan states the zone being designated, its area, thewildlife living there, guidelines on protection, etc.
Plan for Protection and Recovery Program (Okinawa rail, Okinawa woodpecker, Yanbaru long-armed scarab beetle)	Article 45 of the Act on Conservation of Endangered Species of Wild Fauna and Flora	Ministry of the Environment, Ministry of Agriculture, Forestry and Fisheries (Forestry Agency), etc.	Established for contributing to the appropriate and effective implementation of the protection and recovery program.	The goals, areas, contents, and other necessary matters to ensure appropriate and effective implementation of the protection and recovery program.
Okinawa Promotion and Development Plan	Act on Special Measures Concerning Promotion and Development of Okinawa	Okinawa Prefecture	A plan about the directions that promotion of Okinawa should take and basic measures to be taken, as set pursuant to the Basic Policy on Promotion and Development of Okinawa, set by the national government.	With the aim set for shaping fundamental conditions for Okinawa's self-reliant development and building a prosperous community, the plan states the directions and approaches to promotion.
Northern Okinawa Regional Forestry Plan	Article 5 of the Forest Act	Okinawa Prefecture	A 10-year plan, developed every five years, on private forests in the northen part of Okinawa Island Forest Planning Zone that states the goals of forest development and conservation of private forests, scheduled volumes of logging, afforestation, etc.	The plan defines the boundaries of forest areas to be covered, goals of forest development and conservation by the function of each forest, policies on measures to control forest disease and pest damage, etc.
Phase 3 Mongoose Control Plan for the Northern Part of Okinawa Island	Act on the Prevention of Adverse Ecological Impacts Caused by Designated Invasive Alien Species	Ministry of the Environment, Okinawa Prefecture	A plan focused on the complete elimination of the small Indian mongoose north of the first northward movement prevention fences, and on the prevention of re-invasion for the purpose of restoring and conserving the ecosystem of the Yambaru region in a stable condition.	The plan states the region in which control action is to be taken, control goals, control structure, a description of actions to be implemented, etc.

*1 : The plan is under development toward finalization by March 2019.

Table 5-6-4: Plans concerning the nominated property and the buffer zones (Iriomote Island)

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Iriomote-Ishigaki National Park Park Plan	Article 7 of the National Parks Act	MOEJ	To serve as basic guidelines for appropriate operation of a National Park by clarifying policies to maintain the scenic beauty and landscapes, and to promote suitable use as a park.	The plan presents the regulation and utilization plan required for appropriately protecting the unique ecosystem, fauna and flora, landscapes, etc. that Iriomote-Ishigaki National Park contains, and actively promoting park utilization based on such protective actions.
Regional Administration and Management Plan (Miyako-Yaeyama Forest Planning Zone)	Article 6, paragraph 1 of the Act on the Administration and Management of National Forests	Forestry Agency	A five-year plan that provides basic matters regarding the administration and management of national forest in Miyako-Yaeyama Forest Planning Zone, in light of the National Forest Management Basic Plan. National forest administration and management should be performed appropriately pursuant to this plan.	Basic matters regading the maintenance and conservation of national forest including Forest Ecosystem Reserve; matters regarding supplies of forest products; and matters regarding utilization of the national forest are described.To conserve the unique ecosystem of the Miyako-Yaeyama region in an integrated manner, the existing protected forest is to be reorganized and appropriate protection will be ensured by designating it as the Iriomote Forest Ecosystem Reserve.
Iriomote Forest Ecosystem Reserve Preservation Management Plan		Forestry Agency	A plan that clarifies how national forest conservation management should be designed in consideration of the features of Iriomote Island, with the aim of handing down the unique nature of Iriomote Island to posterity without letting it further deteriorate, and also gradually restoring it to a pristine state, in the Iriomote Forest Ecosystem Reserve.	- Systematic promotion of countermeasures against alien species in order to protect the endemic ecosystem of Iriomote Island. - Coordination of use and protection for the purpose of mitigating impacts on the endemic ecosystem as a result of its use.

Plan name	Legal foundation	Responsible agency	Purpose	Summary
Iriomote National Wildlife Protection Area Designation Plan; Iriomote Wildlife Protection Area Yuwandake Special Protection Zone Designation Plan	Article 28 and 29 of the Wildlife Protection, Control and Hunting Management Act	MOEJ	To protect wildlife found significant from both international and national viewpoints, and their habitats.	The plan states the zone being designated, its area, the wildlife living there, guidelines on protection, etc.
Plan for Protection and Recovery Program (Iriomote cat)	Article 45 of the Act on Conservation of Endangered Species of Wild Fauna and Flora	MOEJ, Ministry of Agriculture, Forestry and Fisheries (Forestry Agency), etc.	Established for contributing to the appropriate and effective implementation of the protection and recovery program.	The goals, areas, contents, and other necessary matters to ensure appropriate and effective implementation of the protection and recovery program.
Okinawa Promotion and Development Plan	Act on Special Measures Concerning Promotion and Development of Okinawa	Okinawa Prefecture	A plan about the directions that promotion of Okinawa should take and basic measures to be taken, as set pursuant to the Basic Policy on Promotion and Development of Okinawa, set by the national government.	With the aim set for shaping fundamental conditions for Okinawa's self-reliant development and building a prosperous community, the plan states the directions and approaches to promotion.
Miyako-Yaeyama Regional Forestry Plan	Article 5 of the Forest Act	Okinawa Prefecture	A 10-year plan, developed every five years, on private forests in the Miyako-Yaeyama Forest Planning Zone that states the goals of forest development and conservation of private forests, scheduled volumes of logging, afforestation, etc.	The plan defines the boundaries of forest areas to be covered, goals of forest development and conervation by the function of each forest, policies on measures to control forest disease and pest damage, etc.
Cane Toad Control Plan for the Yaeyama region in Okinawa Prefecture	Act on the Prevention of Adverse Ecological Impacts Caused by Designated Invasive Alien Species	MOEJ	A plan for establishment of a monitoring system, conducting preventive control at an early stage after the invasion, and implementing intensive control at an earlier stage when the invasion is confirmed.	The plan defines describes areas, purposes, implementing structures, and contents to be implemented for the control.

5.e. Property Management Plan or Other Management System

5.e.1. Management plan for the nominated property

The Comprehensive Management Plan (hereinafter, referred to as the "Management Plan") was formulated as a comprehensive policy for the management of the four regions containing the nominated property. It aims at appropriate long-term conservation and management of the natural environment in the nominated property that boasts highly diverse and unique values.

The Management Plan is intended to clarify the basic policies for the operation of legal systems concerning conservation of the nominated property and the promotion of various projects so that the administrative organs can manage the nominated property in a proper and smooth way, while ensuring close mutual collaboration and cooperation with the relevant agencies, local residents, related businesses from the tourism, agricultural, forestry and other industrial sectors, researchers, NPOs, etc. (hereinafter referred to as "concerned parties"). An outline of the Management Plan is provided below. The entire text of the Management Plan is also attached to Annex 2-1.

a. Scope of application of the Management Plan

For conserving the natural environment of the nominated property, it is necessary to take such actions as preventing and eliminating new invasive alien species, securing continuity of endemic or threatened species habitats, and enhancing buffer functions. In the Management Plan, together with the nominated property and buffer zones, a Surrounding Conservation Area shall be defined in their neighborhood (Figure 1-7 to 1-10). Since their adjacent Surrounding Conservation Area contributes to future maintenance and conservation management of OUV, which is similar to the buffer zones, effective organic management of the nominated property is possible in cooperation with a number of concerned parties, by setting three different categories of the four regions containing the nominated property in which the nominated property is situated and considering the area as a whole to be the target area for the Management Plan.

- **Nominated property**
  - The area representing the OUV including a conditions of integrity.
  - It is an area in which appropriate legal protection measures are undertaken by the government, to secure the maintenance and strengthening of the conditions of the property as they are at the time of inscription on the World Heritage List. Mainly, it has been designated as a Special Protection Zone and Class I Special Zone of national park, or a Preservation Zone of Forest Ecosystem Reserve. Meanwhile, Class II Special Zones of national park and Conservation and Utilization Zones of Forest Ecosystem Reserve are partially included. It has been agreed among land owners and stakeholders that due procedures shall be promoted in accordance with relevant laws to upgrade them to Class I Special Zones by the end of JFY2019 (March 2020), and that these areas shall be treated in the similar manner as the Class I Special Zone before the completion of procedures. In addition to them, it is designated as a National Wildlife Protection Area and Natural Monument.

- **Buffer Zone**
  - It is an area that is directly adjacent to the nominated property and is situated to surround it, embracing

locality and characteristics that function to support the property and its protection.

- It is an area that is supplementary regulated by legal or customary approaches in terms of use and development, for the purpose of effective protection of the nominated property. They are mainly designated as Class II Special Zones of national park and/or Conservation and Utilization Zone of Forest Ecosystem Reserve. It partly includes Special Protection Zones or Class I Special Zones of national park that are not connected to the nominated property, and national forest, public land, or Class III Special Zones of national park that are adjacent to the nominated property, where it is agreed to conduct forest management considering biodiversity. In addition, it also includes Ordinary Zones of national park that are surrounded by the nominated property, where conservation activities, such as measures against alien species, shall be intensively conducted.
- Especially, with regard to the abovementioned Special Protection Zone or Class I Special Zone, they are regarded as buffer zones since they are not connected to the nominated property. However, these areas possess a good natural environment of subtropical rainforests, where the same conservation management as the nominated property has been operated. In addition, since these areas have an ecological continuity with the nominated property via subtropical rainforests in other buffer zones, they contribute to the nominated property's values and integrity in terms of the conservation of metapopulations.

● Surrounding Conservation Area

- Neighboring areas of the nominated property and buffer zones.
- Conservation efforts such as raising tourists' awareness and taking countermeasures against alien species at the port and on the ferry on the route to the nominated property, if necessary.
- It is an area where necessary measures are undertaken for diverse purposes, including the conservation and management by legal or customary approaches, sustainable use, and raising public awareness on the conservation of the heritage site. Those purposes also include maintenance, strengthening, conservation and management of the property, such as countermeasures against alien species and illegal collection, environmental education, measures for tourism management, and so on. Similar to buffer zones, it contributes to the future maintenance and conservation management of OUV.
- As for the abovementioned matter, since wide-range initiatives are required, administrative districts of the related municipalities shall be designated as Surrounding Conservation Areas for Amami-Oshima Island, Tokunoshima Island, and Northern part of Okinawa Island, while the entire area of the island for Iriomote Island.

● Details about the target scope of the Management Plan

Details about the nominated property, buffer zones, and Surrounding Conservation Areas are as follows (Figure 1-7 to 1-10).

1) Amami-Oshima Island

Amami-Oshima Island is the second largest island among the Ryukyu Chain after Okinawa Island. There are relatively large undulations with complicated valleys and topography, and eroded low-relief surfaces with an altitude of around 300 m are expanded in mountain ridges (Machida et al. 2001). The surrounding areas of the island are topographically complicated with developed rias coastlines, and marine terraces and lower land are only distributed in limited areas. Marine terraces are distributed in the northeastern part of the island (Ikeda

1977). In Amami-Oshima Island, there are diverse terrestrial fauna and flora species that show speciation patterns of the Central Ryukyus, represented by relict endemic species, such as the Amami rabbit, Amami jay, *Arisaema heterocephalum*, etc., together with relict and new endemic species, including the Amami spiny rat, etc.

The nominated property is mainly situated in a mountainous area at the center of the island, with buffer zones roughly surrounding the nominated property, together with Surrounding Conservation Areas that are the remaining parts of Amami-Oshima Island.

2) Tokunoshima Island

Tokunoshima Island has mountainous areas in its central and northern parts, with lower and flat slopes that are widely extended and well developed marine terraces in the southern to western parts surrounding the mountains. In Tokunoshima Island, there are diverse terrestrial species that show speciation patterns of the Central Ryukyus, represented by relict endemic species, such as the Amami rabbit, together with relict and new endemic species, including the Tokunoshima spiny rat, banded ground gecko, etc. The nominated property is situated in a mountainous area at the center of the island, with buffer zones roughly surrounding the nominated property, together with Surrounding Conservation Areas that are the remaining parts of Tokunoshima Island.

3) Northern part of Okinawa Island

Okinawa Island is the largest island in the Ryukyu Chain, which is elongated in north and south, with wider distribution of mountainous areas and marine terraces in the northern part of the island. In Okinawa Island, there are diverse terrestrial species that show speciation patterns of the Central Ryukyus, represented by relict endemic species, such as the Ryukyu black-breasted leaf turtle, Namie's frog, Yanbaru long-armed scarab beetle, etc., together with relict and new endemic species, including the Okinawa spiny rat.

The nominated property is a mountainous area comprising three Yambaru villages. Topographic features there include large undulations as a whole, with complicated valleys. Main mountainous ranges with an altitude of around 400 m are extended in the northeast and southwest direction. Several marine terraces are developed below the altitude of 240 m (Koba 1980). The buffer zones are situated in parallel to the northwest of the nominated property, and Surrounding Conservation Areas are three Yambaru villages, excluding the US Forces NTA, apart from the nominated property and buffer zones. The Surrounding Conservation Areas include small areas, called Mt. Hedo and Mt. Nekumachijidake, which do not satisfy the requirement of integrity or fall into OUV but have characteristic vegetations specific to paleozoic strata limestone land that is academically valued. Meanwhile, the US Forces NTA, is adjacent to the nominated property in the Northern part of Okinawa Island. With regard to the natural environment in NTA, its conservation has been managed, as explained in detail in 5. c. 7. It acts as an important *de facto* buffer zone to the nominated property, while contributing to the continuity of landscapes and offering an important habitat for endemic species and threatened species.

4) Iriomote Island

Except in a part of the eastern edge, almost the entire area of Iriomote Island is covered by low-relief surfaces ranging from 300 to 450 m in altitude. The rivers, including Urauchi River and Nakama River, have eroded mountains covered by developed low-relief surfaces into deep gutter-shaped valleys. At the mouths of these

rivers, mangrove forests are developed in brackish waters due to influences of the tide. The island as a whole is mountainous, with sea cliffs in the southern coast, lower land nearby the river mouths, and developed marine terraces in the northern to southeast of the island (Machida et al. 2001). In Iriomote Island, there are diverse terrestrial fauna and flora, including endemic species and subspecies that are closely related to the continent, such as the Iriomote cat.

The nominated property embraces mountainous parts including basins, and most parts of the island are designated as the nominated property. Buffer zones are set in the neighboring areas, and the Surrounding Conservation Areas cover the remaining areas on Iriomote Island.

b. Management framework and structure

The Management Plan will set an overall objective, management policies, and other comprehensive matters common in four regions containing the nominated property. Further, in light of characteristic features and challenges of respective regions, the Management Plan will draw up regional action plans that lay out goals and concrete contents of measures to be taken (Figure 5-3). In addition to properly implementing the protective measures described in 5.c and conserving the outstanding value of the nominated property, the administrative organs and stakeholders will collectively carry out a series of conservation and management efforts, the main examples being measures to control alien species and measures to conserve rare species, in accordance with the Management Plan. Sections 5.e.2 to 5.e.3 describe the structure designed for that purpose.

c. Basic management approaches and measures

● Conservation of the natural environment

The administrative organs charged with the various protection systems listed in 5.c will protect values relevant to Criteria (x) through appropriate operation of the systems. The administrative organs and local stakeholders will promote conservation and management, in an active collaboration and cooperation, presenting basic policies and directions of concrete measures of each effort, including rare species protection and recovery; elimination and mitigation of alien species impacts; balanced coordination with industry; appropriate use and ecotourism; participation and collaboration of local communities; and effective monitoring.

● Implementation of adaptive conservation and management

The implementing bodies of adaptive conservation and management will conduct monitoring in order to appropriately understand changes in the natural environment resulting from the implementation of conservation and management measures, scientifically assessing the findings in accordance with the advice from experts, and reflecting the monitoring results in measures to be taken thereafter.

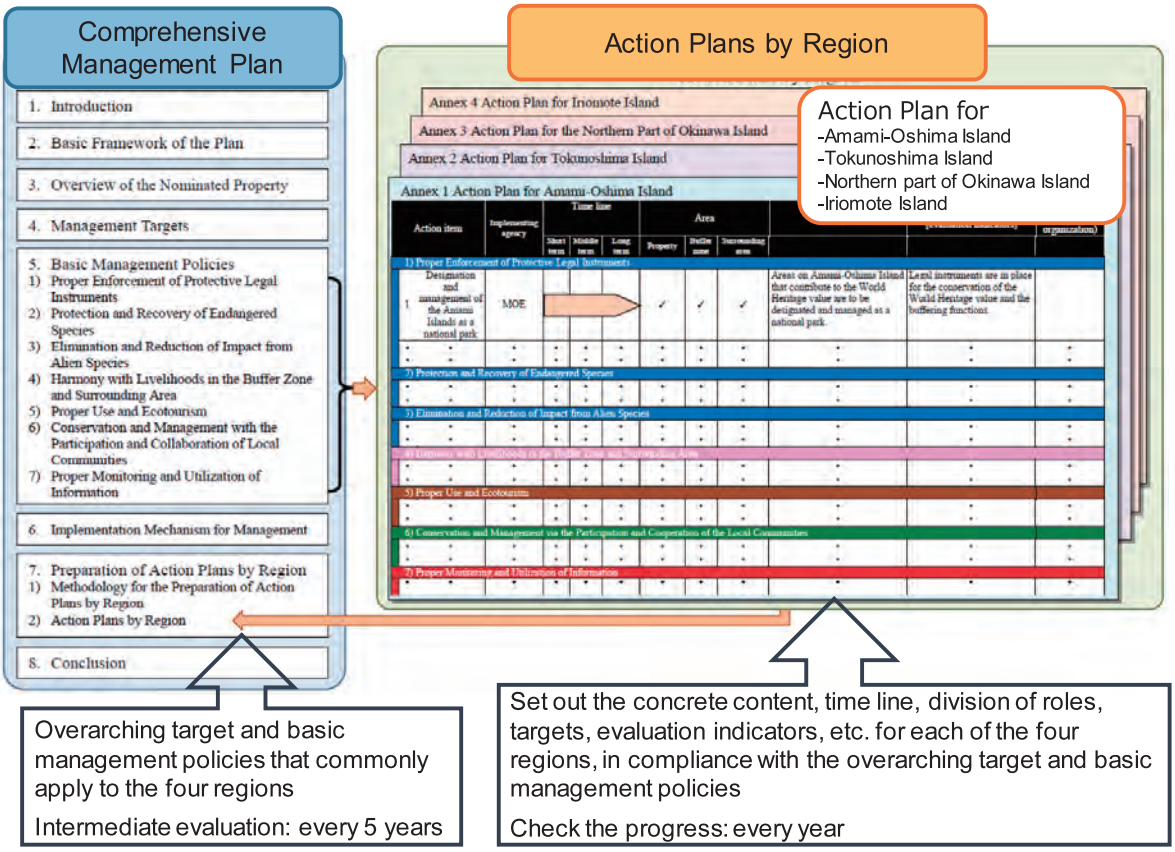


Figure 5-3: Framework of management plan for the nominated property

5.e.2. Comprehensive management of the nominated property

The nominated property is a serial property cosisting of five component parts in the four islands that are subject to multi-layered legal systems. It is important for administrative organs in charge of respective systems to integrally and smoothly undertake relevant measures, such as management of the protected areas, countermeasures against alien species, promotion of appropriate use, etc. to conserve the nominated property in close coordination among themselves.

Therefore, successful governing mechanisms in the management of other natural World Heritage sites in Japan are applied into the nominated property. In addition, based on the characteristics of this nomination, namely that it covers four regions and mobilizes diverse concerned parties, an overall management structure of the nominated property is established as follows. In order to secure feasibility and mobility of the management at a field level, some devices, such as sub-local meetings and Working Groups, are included (Figure 5-4).

Meanwhile, regarding this overall management, the Director of the Naha Nature Conservation Office, MOEJ, plays a central role as the Secretary General of the Regional Liaison Committee.

1) Regional Liaison Committee and sub-local meetings on Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island natural World Heritage nominated property

Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island extend across many administrative areas containing 12 municipalities within two prefectures. All the islands are inhabited, and many people reside and live around the nominated property. As the environment in which the threatened and endemic species representing heritage value occur is situated adjacent to, or in some cases overlaps the locations where the residents live and industrial activities take place, coordination with the lives of residents and industry is imperative; in other words, the nominated property cannot be properly managed without understanding and cooperation from the residents.

Therefore, the Regional Liaison Committee has been established, comprising all relevant agencies, as administrative organs, including the national government, prefectures, and 12 local municipalities. The Committee has formulated and reviewed the Management Plan, and built the consensus regarding the management of this property. Furthermore, under the Regional Liaison Committee, in addition to administrative organs, sub-local meetings, comprising local relevant agencies, related groups, NPOs, etc. are established in all four areas, respectively. They have promoted the conservation and management of the nominated property, in a division of work and mutual cooperation among those partner organizations, through discussions based on actual local situations, as well as monitoring activities as to progresses of local action plans in respective areas that are developed based on the Management Plan.

2) Scientific Committee on Amami-Oshima Island, Tokunoshima Island, the northern part of Okinawa Island, and Iriomote Island natural World Heritage nominated property

In terms of management of the nominated property, it is necessary to conduct monitoring, assess the status of OUV, and provide proper feedback to the conservation measures, on the basis of the latest scientific knowledge. For this reason, a Scientific Committee has been established, comprising experts with knowledge on nature in this area, under which two Working Groups were formed for respective prefectures. This is to secure the management based on scientific knowledge, through the establishment of a structure enabling expert advice to be given, in terms of formulating and reviewing the Management Plan and local action plans in the Regional Liaison Committee and sub-local meetings, together with implementing various projects.

Meeting and field visit of the Scientific Committee (Photo: JWRC)

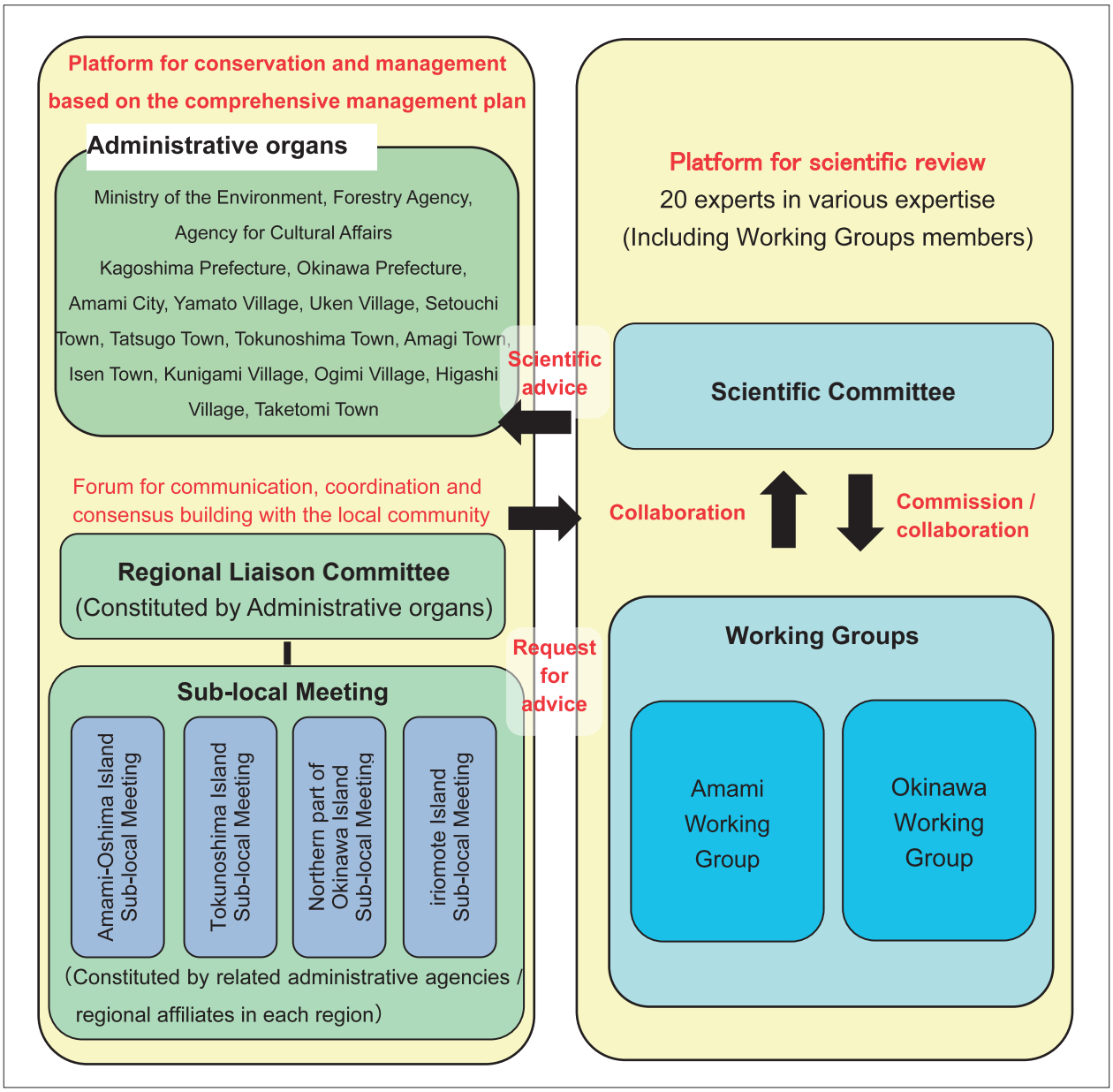


Figure 5-4: Comprehensive management system of the nominated property

5.e.3. Daily management at a field level

Daily management at a field level has been promoted by various concerned parties, such as related organizations and local residents, in accordance with systems that administrative organs are in charge of in respective areas. A Ranger Office for Nature Conservation, a suborganization of the Naha Nature Conservation Office of MOEJ, is situated in the respective four regions. Rangers play a key role in daily management at the field level, as well as in daily coordination and consensus building with forest managers in respective islands, prefectures, municipalities, other relevant agencies, NPOs, and other private organizations in respective islands.

In addition, there are review conferences comprising relevant agencies, related organizations, and experts, for individual issues, such as countermeasures against mongooses, preventive measures for poaching of rare species,

promotion of appropriate use, etc. These review conferences consider strategies, share relevant information, and coordinate with stakeholders.

These daily management tasks at the field level are positioned in the Action Plans that are defined in respective areas, and their progresses are monitored by the Regional Liaison Committee and sub-local meetings. In addition, with regard to important information, such as the state of rare and threatened species relating to OUV, the abovementioned review conferences share the information with the Regional Liaison Committee and sub-local meetings and coordinate among themselves.

Figure 5-5 shows the relation between daily management at the field level and the comprehensive management of the nominated property, taking the "Management System Concerning the Prevention of Illegal Collection of Rare Species on Amami-Oshima Island" as a concrete example.

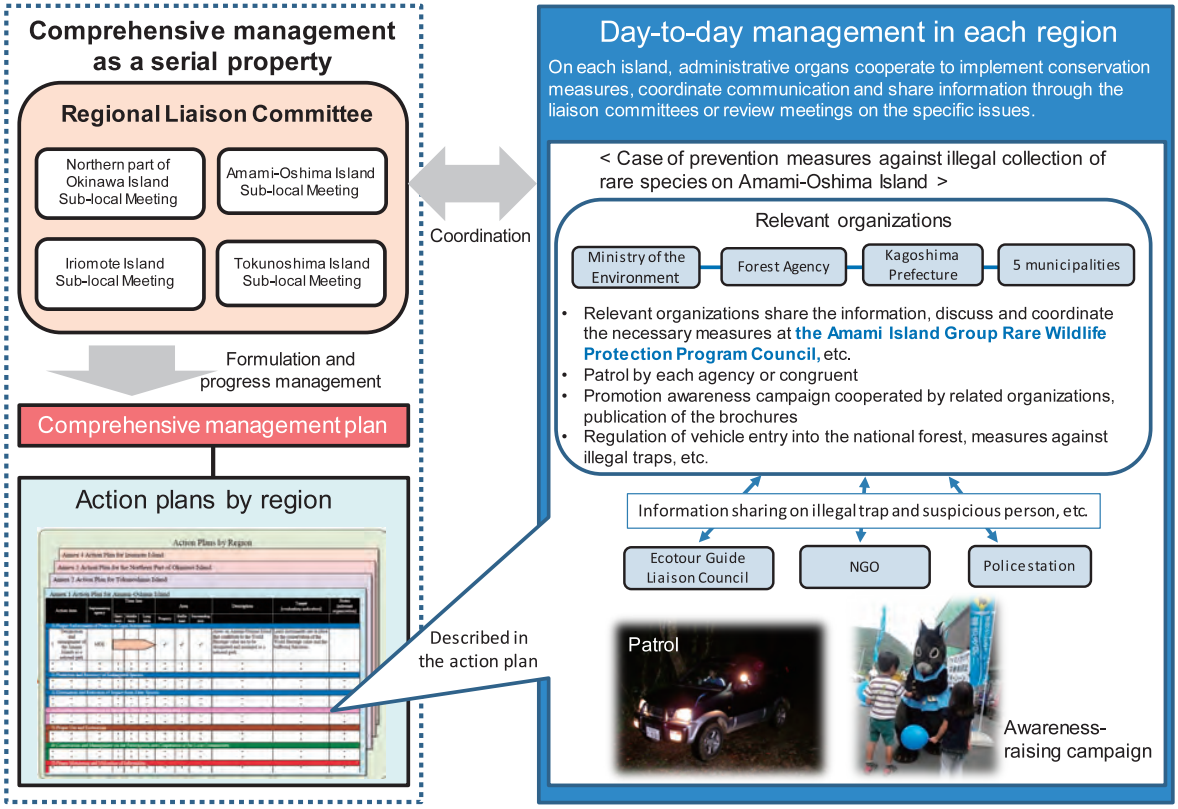


Figure 5-5: Relationship between comprehensive management and day-to-day management

5.f. Sources and Levels of Finance

The nominated property is managed by each of the managing authorities charged with the respective systems, facilities, etc. The sources and amounts of their funding, as well as the actions to be taken in JFY2018 are summarized below.

5.f.1. Ministry of the Environment

National Parks and National Wildlife Protection Areas are managed by the Ministry of the Environment, with an annual budget of approximately 1,136,183,000 yen (approx. 10,020,000 dollars). National parks are managed jointly with respective prefectures.

The budget covers the following items:

- Establishment of adaptive conservation management framework
- Protection and recovery of the rare species including National Endangered Species, such as Amami rabbit, Okinawa rail, and Iriomote cat
- Patrol operation and awareness-raising program to prevent illegal poaching/picking of the National Endangered Species
- Control of alien species, such as the small Indian mongoose and cane toad, and awareness-raising program
- Cat control measures in the rare species habitats (in forests) and promotion of appropriate pet cat care
- Management and operation of Wildlife Conservation Centers and Ranger Offices for Nature Conservation
- Management of National Parks and raising public awareness
- Facility maintenance related to protection and use of National Parks
- Partial purchase of private lands within the nominated property

The budget will be secured into the future to continue supporting necessary projects.

5.f.2. Forestry Agency

The Forest Ecosystem Reserves, which account for about 60% of the nominated property, and other national forests in the vicinity of the nominated property is managed by the Forestry Agency, with an annual budget for conservation and management of National Forests amounting to approximately 49,069,000 yen (approx. 430,000 dollars).

The budget covers the following items:

- Nature restoration and vegetation recovery surveys, such as for mangrove forests
- Rare species protection and management surveys and patrol
- Removal and monitoring alien plant species, such as Leucaena and Casuarina, for the purpose of forest restoration
- Raising public awareness regarding the conservation management of forest ecosystems
- Forest road management within national forests in the nominated property
- Examination of forest management methods considering the conservation of forest ecosystems

The budget will be secured into the future to continue supporting necessary projects.

5.f.3. Agency for Cultural Affairs

The Agency for Cultural Affairs provides subsidy to support projects implemented by municipalities for the conservation and utilization of Natural Monuments, with an annual budget amounting to approximately 3,444,000 yen (approx. 30,370 dollars).

The following project related to the nominated property is being subsidized under this budget.

- Research carried out by Okinawa Prefecture on Ryukyu long-haired rat (*Diplothrix legata*).

The subsidy budget is entirely funded by the national treasury and will be secured into the future to continue supporting necessary projects.

5.f.4. Kagoshima Prefecture

Kagoshima Prefecture engages in a range of actions, including those intended to contribute to long-term maintenance of attributes of the OUV in the nominated property, strike a good balance between environment conservation and sustainable use for tourism, etc. and foster momentum among local residents, for which approximately 637,351,000 yen (approx. 5,620,000 dollars) is budgeted annually (on the basis of JFY2018 budget).

The budget covers the following items:

- Management of progress concerning measures based on local action plans
- Partial purchase of private lands within the nominated property and management of purchased land
- Implementation of awareness raising activities on protection of rare species
- Monitoring on status of alien species and development of manuals to remove alien species
- Development of rules for model districts to optimize use
- Development of Amami Trail to disperse use and information dissemination
- Support to municipalities for redevelop Amami Nature Observation Forest as base facility for mass tourism (subsidy for maintenance)
- Establish a framework to promote public projects considering natural environments
- Raising public awareness by holding events toward the inscription on the World Heritage List
- Management of national parks

The budget is funded by Amami Island Group promotion and development subsidies (e.g., 1/2 from national government funds, 1/2 from prefectural government funds) or solely by prefectural government funds; and will be secured into the future to continue supporting necessary projects.

5.f.5. Okinawa Prefecture

Okinawa Prefecture collaborates with MOEJ in the measures for maintenance of values of the nominated property and its sustainable use for conservation and management of the nominated property, with an annual budget amounting to approximately 416,777,000 yen (approx. 3,680,000 dollars) on the basis of the JFY2018 budget (as of September 2018).

The budget covers the following items:

- Examination and review of area-specific action plans
- Implementation of measures to prevent traffic accidents involving Iriomote cats
- Consideration of capturing and transferring of feral cats, concentrated capturing of feral dogs, and raising public awareness on the prevention of abandonment of dogs and cats
- Establishment of a system to promoted sustainable ecotours in Iriomote Island
- Formulation of Master Plans for Sustainable Tourism in Northern part of Okinawa Island and Iriomote Island
- Promotion and awareness-raising about the inscription as a natural World Heritage site
- Alien species control measures against mongooses, etc.
- Education exchanges for children in the four Islands of Amami and Okinawa
- Situation surveys of biodiversity in Okinawa, information dissemination on biodiversity, and raising public awareness

The budget is funded by Okinawa promotion and development subsidies (e.g., 8/10 from national government funds, 2/10 from prefectural government funds) or solely by prefectural government funds; and will be secured into the future to continue supporting necessary projects.

5.f.6. Municipalities

Amami-Oshima Island (Amami City, Tatsugo Town, Setouchi Town, Yamato Village, and Uken Village)

The five municipalities with local government functions on Amami-Oshima Island are engaged in patrol operation to prevent illegal capture and collection, alien species eradication, and measures to control cats as an alien species, with public organizations working hand-in-hand with local residents. The municipalities also undertake promotion and awareness-raising efforts to further understanding the importance and preciousness of the natural environment of Amami-Oshima Island, and foster a mindset conducive to acting on one's own accord to conserve precious nature while ensuring coexistence with nature. Approximately 81,606,000 yen (approx. 720,000 dollars) is budgeted annually.

The budget covers the following item:

- Operation of Amami-Oshima Nature Protection Council (patrolling, alien plant control, awareness-raising)
- Capture of the feral goat by four municipalities on Amami-Oshima Island
- Operation of the Amami-Oshima Island Cat Control Council, which is responsible for the operation of facilities to accommodate captured and eliminated cats from forests that are habitats for rare species, TNR (Trap cats, Neuter them, and Return them to where they were) activities around settlements, and raising public awareness regarding appropriate keeping of pet cats.

The budget is funded by Amami Island Group growth strategy promotion subsidies (e.g., 5/10 from national government funds, 1/10 from prefectural government funds, 4/10 from municipal government funds); and will be secured into the future to continue supporting necessary projects.

The Amami Island Group, which includes Amami-Oshima Island, also has a special local public entity pursuant

to Article 1-3 of the Local Autonomy Act—the Wide Area Administration Association of Amami Islands—that was established to address common region-wide issues. As an effort to popularize and promote eco-tourism, the Wide Area Administration Association of Amami Islands works on formulating the overall concept for promoting ecotourism of Amami Island Group eco-tourism promotion, which sets policies for desirable eco-tourism, as well as on other actions, including fostering eco-tour guides who are conscious about the region's nature and culture, and also capable of conveying their appeal, for all of which approximately 21,807,000 yen (approx. 190,000 dollars) is budgeted annually.

Tokunoshima Island (Tokunoshima Town, Amagi Town, and Isen Town)

The three municipalities with local government functions on Tokunoshima Island engage in rare species protection activities, including patrol operation to prevent illegal capture and collection, and measures to control cats and other alien species, with the initiative being taken by local residents. The municipalities also undertake promotion and awareness-raising efforts to further understanding the importance and preciousness of the natural environment of Tokunoshima Island, and foster a mindset conducive to acting on one's own accord to conserve the precious nature while ensuring coexistence with nature. Approximately 34,115,000 yen (approx. 300,000 dollars) is budgeted annually.

The budget covers the following items:

- Operation of Tokunoshima District Nature Protection Council (patrolling, alien plant control, promotion and awareness-raising)
- Operation of Tokunoshima Three Towns Cat Control Council (Operation of shelter for feral cat captured or removed in rare species habitats (in forests), stray cat TNR (Trap, Neuter, and Return) activities, awareness-raising about how to properly take care of pet cats)

The budget is financed by town government funds, etc.; and will be secured into the future to continue supporting necessary projects.

In addition, actions being taken by the Wide Area Administration Association of the Amami Islands described above also include activities on Tokunoshima Island.

Northern part of Okinawa Island (Kunigami Village, Ogimi Village, and Higashi Village)

The three villages in Northern part of Okinawa Island undertake promotion and awareness-raising efforts so that local residents may better understand the importance and preciousness of the natural environment of Yambaru, and foster a mindset conducive to acting on one's own accord to conserve the precious nature while ensuring coexistence with nature. Approximately 57,830,000 yen (approx. 600,000 dollars) is budgeted annually.

The budget covers the following items:

- Projects for promotion of environmental conservation and beautification (cat control, etc.)
- The operation of the Yambaru Three Villages Council for World Heritage Promotion (Yambaru Three Villages Forest Tourism Meeting)
  (Projects for raising public awareness and tourism management)

- Project for Okinawa rail conservation
- Okinawa Rail Wild Forest management and administration costs
- Operation of the Yambaru Hands-On Nature Activity Committee

The budget is entirely financed by village government funds; and will be secured into the future to continue supporting necessary projects.

Iriomote Island (Taketomi Town)

Taketomi Town engages in the protection of Iriomote cats and other rare species, takes measures to control alien species, and also undertakes promotion and awareness-raising efforts so that residents may better understand the importance and preciousness of the natural environment of Iriomote Island, and foster a mindset conducive to acting on one's own accord to conserve the precious nature while ensuring coexistence with nature. Approximately 29,708,000 yen (approx. 260,000 dollars) is budgeted annually.

The budget covers the following items:

- Taketomi Town Appropriate Pet Care Promotion Project (stray cat control measures)
- Iriomote Cat Traffic Accident Occurrence Prevention Liaison Conference (joint secretariat with MOEJ)
- Beach cleanup activities, natural recreation forest cleanup activities (island resident volunteer activity cost)
- Biodiversity conservation and promotion project (measures to control alien species, including the Indian peafowl (*Pavo cristatus*), boar-pig hybrids, and alien frogs)
- Environmental conservation awareness-raising project (promotion and awareness-raising)
- Projects based on Taketomi Town Natural Environment Protection Ordinance, etc.

The budget will be secured into the future to continue supporting necessary projects.

5.g. Sources of Expertise and Training in Conservation and Management Techniques

5.g.1. Ministry of the Environment

Naha Nature Conservation Office of MOEJ and the respective Ranger Offices for Nature Conservation in Amami-Oshima, Tokunoshima, Yambaru and Iriomote are staffed with personnel versed in nature protection systems and protection and management techniques required for the purpose of conservation management of the nominated property. They provide expert advice to construction businesses and program operators in the process of performing permit and authorization services under the National Parks Act and other applicable acts and regulations, etc., and services associated with protection and recovery program for National Endangered Species.

They also engage in other activities, including promotion and awareness-raising activities in the form of planning and operating nature viewing tours.

As needed in the course of their services, they ensure a higher level of expertise by seeking advice from experts in universities and other external sources (Table 5-7).

Table 5-7: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Amami Rare Species Protection and Recovery Review Conference	Conducts reviews on the protection and recovery of the Amami woodcock, Amami thrush and Amami rabbit
Yambaru Rare Species Protection and Recovery Review Conference	Conducts reviews on the protection and recovery of the Okinawa rail, Okinawa woodpecker and Yanbaru long-armed scarab beetle
Iriomote Cat Protection and Recovery Review Conference	Conducts reviews on the protection and recovery of the Iriomote cat
Liaison Meeting on Prevention of Traffic Accident Occurrences Involving Iriomote Cats	Conducts reviews, communication and coordination on protective measures taken by the organizations concerned and local residents for the purpose of preventing occurrences of traffic accidents involving Iriomote cats (held jointly with Taketomi Town)
Yaeyama Region Liaison Meeting on Measures to Protect Crested Serpent Eagles	Conducts reviews, communication and coordination on crested serpent eagle surveys and protective measures in the Yaeyama region
Meeting on Measures to Control Cane Toads, etc. in the Yaeyama Region	Conducts reviews on projects for controlling cane toads, white-lipped treefrogs and other animals in the Yaeyama region
Amami-Oshima Island Mongoose Control Project Review Conference	Conducts reviews on the mongoose control project on Amami-Oshima Island
Northern Part of Okinawa Island Mongoose Control Project Review Conference	Conducts reviews on the mongoose control project in the northern Okinawa region (held jointly with Okinawa Prefecture)
Liaison Meeting Regarding the Prevention of Occurrence of Roadkill in Yambaru	In order to prevent roadkill of rare wildlife, including the Okinawa rail, in the Yambaru Area, a close coordination system shall be established between relevant agencies and related organizations in nature conservation, road management, and road use.
Council for the Prevention of Poaching of Yambaru Long-armed Scarab Beetles, etc .	In order to effectively promote the conservation of target species, such as the Yanbaru long-armed scarab beetle and *Neolucanus okinawanus*, information sharing shall be conducted among related organizations regarding the target species and their habitats. Through this initiative, poaching of the target species in their habitats shall be prevented.
Review Conference for Amami-Oshima Island Ecosystem Maintenance and Restoration	It considers relevant measures to be undertaken for cats on Amami-Oshima Island.

Prevention fence against mongooses' northward invasion, Northern part of Okinawa Island (Photo: MOEJ)

5.g.2. Forestry Agency

The Kyushu Regional Forest Office is staffed with personnel versed in programs, techniques and other matters required for the purpose of conservation management of forests and wild animals and plants, as well as the appropriate management of national forests pursuant to the Forest Act, the Act on the Administration and Management of National Forests and other applicable laws and regulations. They provide expert advice required in the process of implementing related services.

In the course of performing the protection and management of Forest Ecosystem Reserves, and implementing protective measures for the Iriomote cat and other endangered species of wild fauna and flora, projects for controlling alien plant species, etc., they exercise a higher level of expertise by, for instance, seeking advice from experts in universities and other external sources (Table 5-8).

Table 5-8: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Kyushu Regional Forest Office Protected Forest Management Committee	Implements matters concerning the designation, amendment, abolition, management, and monitoring related to protected forests including Forest Ecosystem Reserve, and conservation of biodiversity related to protected forests.

5.g.3. Agency for Cultural Affairs

The Agency for Cultural Affairs is principal national agency in charge of protection of cultural properties in Japan. As it does not have its own local offices unlike the MOEJ and the Forestry Agency, the conservation and management of the nominated property has been implemented by the Board of Education of Okinawa Prefecture and Kagoshima Prefecture. Based on the Law for the Protection and Cultural Properties, the Agency for Cultural Affairs manages services associated with permit related to Natural Monument and provides professional advice on project for the conservation and utilization of Natural Monuments implemented by municipalities. It also ensures a high level of expertise by obtaining advice from external experts as necessary.

5.g.4. Kagoshima Prefecture

The Nature Conservation Division, Environment and Forestry Affairs Department, Kagoshima Prefecture, and the Hygiene and Environment Office, Oshima Branch Office are staffed with personnel versed in nature protection programs as well as protection and management techniques required for the purpose of conservation management of the nominated property, and engage in rare wild fauna and flora protection and recovery projects, alien species control projects, and services associated with permit and authorization under the National Parks Act. As needed in the course of their services, it also ensures a high level of expertise by obtaining advice from external experts as necessary (Table 5-9).

Table 5-9: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Amami Island Group Natural World Heritage Nominated Property Conservation and Utilization Review Conference	Conducts reviews on environmental conservation, sustainable use and other actions required for inscription, such as public works with attention paid to the natural environment and steps to make the use for tourism appropriate.
Kagoshima Prefecture Review Committee on Rare Wild Fauna and Flora Protection Measures	Established for the purpose of engaging in the selection and other actions for the designation of rare wild fauna and flora as prescribed in the Kagoshima Prefectural Ordinance to Protect Endangered Wild Fauna and Flora.
Kagoshima Prefecture Alien Species Control Measures Review Committee	Examines measures required for the purpose of preventing damage caused by alien species on ecosystems, people's lives and health, or agriculture, forestry and fisheries, in the prefecture.
Council on Amami Island Group Rare Wild Fauna and Flora Protection Measures	Organizations concerned are engaged in discussing necessary measures with respect to the protection of rare species so as to ensure the maintenance and improvement of value held by the Amami Island Group as a Natural World Heritage nominated property.
Feral Dog and Feral Cat Control Measures Review Conference (Amami district, Tokunoshima district)	Organizations concerned are engaged in examining measures against feral cats that prey on rare species, and against supply sources of feral cats.

5.g.5. Okinawa Prefecture

The Nature Conservation Division, Department of Environmental Affairs is staffed with personnel versed in nature protection programs as well as protection and management techniques required for the purpose of conservation management of the nominated property, and engages in services related to the permission and certification based on Natural Parks Act, endangered wild fauna and flora protection and recovery, alien species control projects, and appropriate use of natural environment. As needed in the course of their services, it also ensures a high level of expertise by obtaining advice from external experts as necessary (Table 5-10).

Table 5-10: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Iriomote Cat Traffic Accident Prevention Measures Review Committee	Conducts reviews concerning prevention of traffic accidents involving Iriomote cats, such as examining validation testing methods and effects validation methods, in order to enhance measures to address traffic accidents involving Iriomote cats.
Dog Control Measures Review Committee	Conducts reviews concerning methods of estimating dog populations in forests that pose concerns about predation damage on rare wild animals, and concerning the actual state of predation damage and effective measures to address it, in order to conserve heritage value in the Yambaru region.
Feral Cat Control Measures Review Committee	Considers appropriate methods to estimate the number of cats inhabiting the forests, as their predation damages on rare wildlife are a concern, to conserve the heritage values of the Yambaru Area. The actual state of predation damages and effective measures shall be considered as well.
Northern Okinawa Region Mongoose Control Project Review Conference	Conducts reviews on the mongoose control project in the northern part of Okinawa Island (held jointly with MOEJ).
Alien Species Control Review Committee	Conduct reviews concerning establishment of alien species control action plans, effective capture methods of green anoles, etc.

Name of the review conference, etc.	Description
Review Conference toward the Establishment of a Promotion System for Appropriate Use and Ecotourism	Consider issues, such as user rules of the field, monitoring methods, organizational structure, etc. for the purpose of appropriate use of the natural environment on Iriomote Island shall be considered.

5.g.6. Municipalities

For the continuous conservation of the World Heritage property, obtaining cooperation from local communities is essential. In particular, administrative districts (municipalities) are expected to play a central role. Examples of pioneering initiatives by municipalities include the biodiversity conservation strategy (Amami-Oshima Regional Biodiversity Strategy) developed by Amami-Oshima Island's five municipalities, and the regional biodiversity conservation plan (Ogimi Village Regional Collaboration-Based Conservation Action Plan) worked out by Ogimi Village, an administrative district located in the northern part of Okinawa Island. Other conservation measures are also underway by Amami-Oshima Island's five municipalities and Tokunoshima Island's three municipalities, including the enforcement of an Ordinance for the Protection of Endangered Species of Wild Fauna and Flora and the designation of species to be protected under the Ordinance. In Taketomi Town, special rare wild fauna and flora and specified alien species are designated by the Natural Environment Conservation Ordinance in Taketomi Town. Furthermore, all administrative districts in the nominated property have designated Natural Monuments and enacted an Ordinance for the Protection of Cultural Properties as well as an Ordinance for the Proper Keeping of Domestic Cats. In the future, a variety of other initiatives including the removal of alien species and public relations activities will be launched with the aim of conserving the region's nature and raising environmental conservation awareness.

Amami-Oshima Island

The offices of the five municipalities on Amami-Oshima Island are engaged in protective activities that only locals can deliver, with dedicated personnel placed so as to ensure the supply of accurate information to local residents about conservation management of the nominated property, and cooperation with other public organizations. The Wide Area Administration Association of the Amami Islands is also active in offering entry-level instruction and training for people who wish to become eco-tour guides (Table 5-11).

Table 5-11: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Amami-Oshima Nature Protection Council	Mainly engages in protective measures for species designated under the Ordinance to Protect Endangered Wild Fauna and Flora (2013) (patrolling for prevention of illegal capture and collection), alien plant control measures, and promotion and awareness-raising activities.
Amami-Oshima Island Cat Control Council	Considers activities, including TNR of cats in the villages, the operation of facilities to temporarily accommodate cats that are captured in forests, i.e. habitats for rare species, and transfer them to those who wish to adopt them, and awareness raising for appropriate keeping of pet cats, for the purpose of conserving rare species such as the Amami rabbit.
Amami Island Group Ecotourism Promotion Council	Engages in preparation of the overall concept for promoting ecotourism of the Amami Island Group and an eco-tour guide accreditation program.

Tokunoshima Island

The offices of the three municipalities on Tokunoshima Island are engaged in protective activities that only locals can deliver, with dedicated personnel placed so as to ensure the supply of accurate information to local residents about conservation management of the nominated property, and cooperation with other public organizations. The Wide Area Administration Association of the Amami Islands is also active in offering entry-level instruction and training for people who wish to become eco-tour guides (Table 5-12).

Table 5-12: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Tokunoshima District Nature Protection Council	Mainly reviews protective measures for species designated under the Ordinance to Protect Endangered Wild Fauna and Flora (2012) (patrolling for prevention of illegal digging and picking, alien plant control measures and promotion and awareness-raising activities).
Council for Cat Control in Three Villages of Tokunoshima	Conducts reviews on feral cat TNR activities near settlements, shelter operation of feral cats captured and removed in the rare species habitats (in forests) and appropriate pet cat care for the purpose of protecting Amami rabbits, etc.
Amami Island Group Ecotourism Promotion Council [second mention]	Engages in preparation of the overall concept for promoting ecotourism of the Amami Island Group, eco-tour guide certification system, etc.

Northern part of Okinawa Island

The offices of the three municipalities in the northern part of Okinawa Island encourage protective activities that only locals can deliver, with dedicated personnel placed so as to ensure the supply of accurate information to local residents about conservation management of the nominated property, and cooperation with other public organizations (Table 5-13).

Table 5-13: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Okinawa Rail Wild Forest Management and Operation Conference	Conducts reviews and discussions about the management and operation of Okinawa Rail Forest, a protective shelter for the Okinawa rail.
Yambaru District Cat Control Measures Liaison Conference	Engages in reviews, communication and coordination with respect to feral cat control measures taken by the organizations concerned.
Four-Party Conference on the Okinawa Rail Ecology Exhibition and Learning Facilities	Conducts reviews and discussions about promotion and awareness-raising about Okinawa rail protection, individual bird care, facilities management and operation.
Yambaru Three Villages Council for World Heritage Promotion	Raises public awareness regarding World Heritage inscription, conservation activities, and accepts CSR activities of private companies
Operation of the Yambaru Three Villages Forest Tourism Section	Promotes forest tourism

Iriomote Island

The office of Taketomi Town engages in protective activities that only locals can deliver, with personnel placed so as to ensure the implementation of nature protection programs required for conservation management of the nominated property, conservation management in general, the supply of accurate information to local residents, and cooperation with other public organizations (Table 5-14).

Table 5-14: Review conferences for implementation purposes

Name of the review conference, etc.	Description
Iriomote Appropriate Pet Keeping Promotion Conference	Conducts reviews on proper pet keeping on Iriomote Island, in order to prevent impacts caused by domestic cats on Iriomote cats.
Iriomote Cat Traffic Accident Occurrence Prevention Liaison Conference	Engages in reviews, communication and coordination with respect to protective measures taken by the organizations concerned and local residents, in order to prevent occurrences of traffic accidents involving Iriomote cats (held jointly with the Ministry of the Environment).
Taketomi Town Nature Protection Council	Holds deliberations about revisions of the Taketomi Town Natural Environment Protection Ordinance, a protection system designed to contribute to the protection and management of the ecosystem and biodiversity of Taketomi Town.

5.g.7. Universities, etc.

Amami-Oshima Island is home to the Amami Branch of the Research Center for the Pacific Islands of Kagoshima University; Northern part of Okinawa Island is home to Yona Field of the Subtropical Field Science Center of the University of the Ryukyus and; Iriomote Island is home to the Iriomote Station of the Tropical Biosphere Research Center of the University of the Ryukyus and the Okinawa Regional Research Center of Tokai University. All being research center facilities available for use by researchers and students, these facilities contribute to driving research activities for which this region serves as a field study site and to accumulating information on the natural environment.

In addition, in Northern part of Okinawa Island, 14 educational and research organizations coordinated to establish a project called “ALL YAMBARU Discovery City”. The project has conducted various community-based activities, such as joint development of educational contents, information dissemination, organizing events, etc., regarding human resources development in the field of natural science, environmental conservation, and so on.

5.h. Visitor Facilities and Infrastructure

The numbers of visitors to the four islands containing the nominated property are as shown in 4.b (iv).

5.h.1. Main centers for use

There are the following facilities in the buffer zones or the Surrounding Conservation Areas, as main centers for use, and they are open and available to tourists to visit freely. In addition, in order to effectively promote raising public awareness regarding the heritage values, measures to be undertaken against alien species and for rare species, and tourism management, the construction of relevant facilities in some areas that are lacking those facilities as management centers at nominated property to be inscribed on the World Heritage List in buffer zones or Surrounding Conservation Areas is under consideration.

5.h.1.1. Wildlife Conservation Centers

Wildlife Conservation Centers have been established by MOEJ on Amami-Oshima Island, in Northern part of Okinawa Island, and on Iriomote Island (Tables 5-15-1 to 5-15-3). These facilities are built as centers designed

to offer explanations to, and engage in promotion and awareness-raising activities for, visitors through exhibitions, videos, etc. about National Endangered Species and other wild living organisms unique to the region, as well as to push forward protection and breeding projects, survey research and other such activities for National Endangered Species in a comprehensive way. These centers organize a wide variety of activities, including themed exhibits, talks, craft activities and nature viewing tours, so that everyone, adults and children alike, can gain an understanding and knowledge of the nature of the respective regions in a fun way. Their exhibition facilities are made open to the public free of charge.

Table 5-15-1: Amami Wildlife Conservation Center

Location	551 Koshinohata, Ongachi, Yamato-son, Oshima-gun, Kagoshima
Year opened	2000 (*Heisei* 12)
Size	・Exhibition building 508.47㎡ (total floor area) ・Research building 297.75㎡ (total floor area)
Exhibition details	Wall picture; exhibition rooms (insect section, plant section, survey research section); themed exhibition room; library, etc.

Table 5-15-2: Yambaru Wildlife Conservation Center: Ufugi Nature Museum

Location	Hiji 263-1, Kunigami-son, Kunigami-gun, Okinawa
Year opened	1999 (*Heisei* 11)
Size	・Exhibition building 605.88㎡ (total floor area) ・Research building 264.20㎡ (total floor area)
Exhibition details	Exhibition room (nature and living creatures in Yambaru); audiovisual and lecture room; library, etc.

Table 5-15-3: Iriomote Wildlife Conservation Center

Location	Komi, Taketomi-cho, Yaeyama-gun, Okinawa
Year opened	1995 (*Heisei* 7)
Size	・Main building 704.22㎡ (total floor area) ・Quarantine building 67.00㎡ (total floor area)
Exhibition details	Exhibition room (natural environment and wild living organisms on Iriomote Island; explanations on the Iriomote cat); videos; library, etc.

5.h.1.2. Important base facilities for use

Some important facilities for use have been constructed in buffer zones and Surrounding Conservation Areas, as an entrance for experience-type tourism such as ecotourism in the nominated property, and as centers for mass tourism type tours (Table 5-16-1 to 5-16-4). These facilities conduct information dissemination regarding values of nature in the areas, through exhibitions and interpretations, together with announcement of rules for

the use of the nominated property. They also offer casual venues where visitors can feel closer to a natural environment of the nominated districts.

Table 5-16-1: Important visitor facilities (Amami-Oshima Island)

Name of facility	Function of facility	Zone category
Amami Park (Kagoshima Prefecture)	・This facility offers exhibitions regarding of the history, culture, and nature of Amami, introduction of respective islands in the Amami Island Group, and video shows. ・Located near the airport, it functions as a center of information dissemination for the entire Amami Island Group and as an entrance facility to the heritage area.	Surrounding Conservation Area
Amami Nature Observation Forest (Tatsugo Town)	・Equipped with trails and an observatory for nature exploration, this facility functions as a center for visitors to freely enjoy Amami's forests.	Surrounding Conservation Area
"Kuroshio no Mori" Mangrove Park (Amami City)	・This facility offers exhibitions on nature of Amami-Oshima Island, a restaurant, and a shop. ・It is used as a base for canoe experience in the mangrove forests.	Buffer zone
Amami Museum (Amami City)	・This facility offers exhibitions regarding nature, history, and culture based on "Environmental Culture" ・It Exhibits live Amami Ishikawa's frogs (*Odorrana splendida*). ・It plays a role as information base on nature and culture of Amami-Oshima Island.	Surrounding Conservation Area

Table 5-16-2: Important visitor facilities (Tokunoshima Island)

Name of facility	Function of facility	Zone category
Amami Rabbit Observatory (Amagi Town)	・This facility shows videos of the Amami rabbit, taken by fixed cameras. ・It displays stuffed Amami rabbits and provides explanation of the rabbit's ecology.	Buffer zone

Table 5-16-3: Important visitor facilities (Northern part of Okinawa Island)

Name of facility	Function of facility	Zone category
Daisekirinzan (Nanto Corporation)	・This facility displays relevant information regarding the geology in northern part of Okinawa Island, together with pedestrian walkways where visitors can physically feel the geological features and vegetation of calclithite, an observatory, etc.	Surrounding Conservation Area
Okinawa Rail Ecology Center (Kunigami Village)	・This facility displays the ecology of the Okinawa rail. ・It provides a material booth to show ecology and habitat environment of the bird, as well as an observatory booth that replicates the bird's habitat environment. ・The observatory booth exhibit ecology of the bird and provide information on protection activities.	Surrounding Conservation Area
Yambaru Discovery Forest (Kunigami Village)	・This base facility provides programs such as canoe tours, guided walks, environmental learning, etc. for sharing and disseminating wisdom for correctly understanding and conserving the nature of Yambaru. ・It offers accommodation facilities and restaurants, and within the park there are walking trails where visitors can enjoy the nature of Yambaru freely.	Buffer zone
Higashi Museum (Higashi Village)	・This facility exhibit displays regarding the history, culture, livelihood, and natural environment in Higashi Village (folk craft articles, agriculture tools, stuffed animals, and living animals).	Surrounding Conservation Area

Table 5-16-4: Important visitor facilities (Iriomote Island)

Name of facility	Function of facility	Zone category
Iriomote Island Eco-Tourism Center (Iriomote Island Ecotourism Association)	・This is a base facility for promoting ecotourism on Iriomote Island. A wide range of information on ecotourism is available.	Surrounding Conservation Area

5.h.2. Trails, guided tourism, signage, printed information

As for national park zones within the scope of the Management Plan, walkways and roadways are properly paved and maintained, based on the Park Plan.

5.h.2.1. Trails, etc.

The following major trails and recreation site, which are subject to appropriate management, within the scope of the Management Plan (Table 5-17-1 to 5-17-4).

Table 5-17-1: Amami-Oshima Island

Name of facility	Function of facility	Zone category
Major trails		
Yuwandake Climbing Trail	There is a boardwalk built that takes one from the northern side of Mt. Yuwandake all the way to its summit. Wind-beaten shrubs typically found in the alpine belt of Amami-Oshima Island dominate the forest here, in which plants endemic to Mt. Yuwandake can also be seen.	Nominated property and buffer zone
Amami Gunto Long Trail (Sumiyo Area)	Nature walkways in Sumiyo Area of Amami City enabling visitors to interact with nature and culture	Nominated property, buffer zone and Surrounding Conservation Area
Amami Gunto Long Trail (Uken Village Area)	Nature walkways in Uken Village enabling visitors to interact with nature and culture	Nominated property, buffer zone and Surrounding Conservation Area
Recreation sites		
Fukumoto Recreation Site	A recreation site that can be a useful base for visitors coming to experience nature in the forests and streams, etc. surrounding it, including Mt. Yuwandake, and that provides easy opportunities to have a hands-on encounter with nature in a forest environment setting. A camp site and an athletic field are also adjacent to the park.	Nominated property and buffer zone
Yuwandake Recreation Site	Located at the entrance to the climb to Mt. Yuwandake, it has a lookout where visitors can enjoy a view of the subtropical evergreen broadleaved forest in the core region.	Nominated property and buffer zone
Sumiyo Recreation Site (Sumiyo Facility Complex Zone)	As a center for utilizing adjacent mangrove forests and the natural environment, there is a restaurant, parking space, toilet, observatory facility, etc.	Buffer zone
Mt. Yuidake Recreation Site	Being situated in the south of Mt. Yuidake, it is equipped with trails with a view of Oshima Strait, a toilet, and so on.	Buffer zone
Mt. Kochiyama Recreation Site	Being situated in the south of Mt. Yuidake, it is equipped with an observatory and trails with a view of Oshima Strait, a toilet, and so on.	Buffer zone

Table 5-17-2: Tokunoshima Island

Name of facility	Function of facility	Zone to locate
Major trails		
Matsubara trail	It enables visitors to enjoy a view of the hillside of Mt. Amagidake that is one of the core parts of forests in Tokunoshima Island.	Nominated property
Mikyo trail	It enables visitors to enjoy aged subtropical laurel forests comprising *Quercus miyagii*, etc.	Nominated property
Amami Gunto Long Trail (Tokunoshima Town Area)	Nature walkways in residential areas of Tokunoshima Town, enabling visitors to interact with nature and culture.	Surrounding Conservation Area
Amami Gunto Long Trail (Isen Town Area)	Nature walkways in residential areas of Isen Town, enabling visitors to interact with nature and culture.	Surrounding Conservation Area
Recreation sites		
Ginayama Recreation sites	Trails and toilets are available, enabling visitors to conduct nature watching in the forests of southern Tokunoshima Island.	Surrounding Conservation Area

Table 5-17-3: Northern part of Okinawa Island

Name of facility	Function of facility	Zone to locate
Major trails		
Ada-Mt. Ibudake trail	A trail that offers a scenic walk through natural surroundings of the subtropical evergreen broadleaved forest and ruins of bygone lives. The Okinawa rail and other endemic or rare animals and plants make a habitat here.	Nominated property and buffer zone
Hiji-Otaki waterfall trail	It is a walkway for nature sightseeing leading to Hiji-Otaki Falls; visitors can watch plants and wild birds in the neighborhood of Hiji River on the way. Endemic species and rare species, including the Okinawa woodpecker, inhabit and breed.	Buffer zone
Mt. Yonahadake trail	A trail that connects to the summit of Mt. Yonahadake, the highest mountain on Okinawa Island, situated in the core of the Yambaru region. The Okinawa rail and other endemic or rare animals and plants make a habitat here.	Nominated property and buffer zone
Mt. Nekumachijidake/ Mt. Shioya-fuji Trail	A trail for climbing Mt. Nekumachijidake and Mt. Shioya-fuji, which are limestone mountains. Rare plants that are unique to limestone terrains grow here.	Surrounding Conservation Area
Mt. Tamatsuji trail	It is a trail for climbing Mt. Tamatsuji. Endemic species and rare species, including the Okinawa rail, inhabit and breed.	Nominated property and Surrounding Conservation Area
Recreation sites		
Kunigami Village Forest Park (Kunigami Village)	Various facilities, such as trails, camping sites, bungalows, and a multi-purpose square, are arranged to enable visitors to enjoy nature sightseeing in tropical forests of northern Okinawa Island.	Surrounding Conservation Area
Gesashi Mangrove Park (Higashi Village)	By utilizing canoes and wooden footpaths, visitors can enjoy wildlife watching in mangrove ecosystems and tidal flats.	Surrounding Conservation Area

Table 5-17-4: Iriomote Island

Name of facility	Function of facility	Zone to locate
Major trails		
Iriomote Trans-Island Trail	A climbing trail that runs across Iriomote Island, starting from Gunkan-iwa Rock upstream of the Urauchi River and leading to Otomi. The magnificent nature of Iriomote Island can be savored in the thick of its subtropical evergreen broadleaved forest formed by trees like Castanopsis and *Quercus miyagii*. It offers views of mighty waterfalls, including Mariudu Falls, Kampire Falls, and Mayagusuku Falls.	Nominated property, buffer zone and Surrounding Conservation Area
Recreation sites		
Nishi-Funatsuki Recreation Site	It has a lookout built on Otomi Forestry Road (Iriomote Trans-Island Trail), which commands a sweeping view overlooking a mangrove forest, among the largest in Japan, alongside the Nakama River.	Nominated property
Hinai waterfall Recreation sites	Visitors can physically feel the diverse natural environment of Iriomote Island, such as Pinaisara Waterfall that is the longest fall in the prefecture, tropical laurel forests, mangrove forests of Hinai River, etc.	Nominated property
Omija Recreation Site	Located at the mouth of the Omija River, it has a boardwalk built for scenic views of a mangrove forest that is home to an abundance of benthic organisms, as well as a lookout with a sweeping tideland view.	Nominated property
Komi Recreation Site	It has a boardwalk built for scenic views of the *Heritiera littoralis* communities in Komi and mangrove forests. Looking from the ocean to the inland, the transition of the forests from the grey mangrove (*Avicennia marina*) to Asiatic mangrove (*Rhizophora stylosa*), *Kandelia obovata* and the oriental mangrove (*Bruguiera gymnorhiza*) can be observed.	Nominated property

5.h.2.2. Guided tourism, signage, and printed information

In terms of the numbers of annual visitors in the respective islands, it is estimated that there are around 470,000 in Amami-Oshima Island, around 130,000 in Tokunoshima Island, around 520,000 in Northern part of Okinawa Island, and around 390,000 in Iriomote Island. Most tourists visiting the respective islands are participants of individual trips, eco-tours arranged by small guide operators, or individual tours by rented cars. The number of guides in the respective islands are 83 in Amami-Oshima Island, 22 in Tokunoshima Island, 85 in northern Okinawa Island, and 136 in Iriomote Island.

The main pamphlets and images issued by public organizations regarding the nominated property are shown below (Table 5-18).

Table 5-18: Publications and information sources related to the nominated property

Title	Publisher
Tropical Islands and Shining Forests of Life Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island, natural World Heritage candidate site	MOEJ
Natural World Heritage and Amami	Kagoshima Prefecture
Here We Go to the World - Globally Precious Nature in the Ryukyu Chain	Okinawa Prefecture
Yambaru World Heritage Newsletter	Okinawa Prefecture, Kunigami Village, Ogimi Village and Higashi Village
Iriomote World Heritage Newsletter	Okinawa Prefecture and Taketomi Town
Basic concepts concerning the national park in the Yambaru Area	MOEJ

Title	Publisher
Eight promises that we want you to know	MOEJ
Amami Island Group Manner Guide	Kagoshima Prefecture
Amami Island Group Guideline Handbook Considering Nature	Kagoshima Prefecture
Biodiversity in Amami and the Ryukyu Chain	MOEJ
Okinawa Woodpecker - Woodpeckers living in Yambaru Forest -	MOEJ
Mother Nature of Okinawa	Okinawa Prefecture
Rare wild fauna and flora are treasures for all people in Okinawa.	Kagoshima Prefecture
Rare Insects and Wild Flora in Tokunoshima Island (Tokunoshima Island Red List)	Tokunoshima Nature Conservation Council
Alien species of the Amami Island Group	MOEJ
Protecting Amami that is an only one in the world Amami-Oshima Island Mongoose Control Project	MOEJ
Alien species of the Okinawa Island Group	MOEJ
Forever Yambaru: Countermeasures against Mongooses in Yambaru	MOEJ and Okinawa Prefecture
Countermeasures against Mongooses in Yambaru	MOEJ and Okinawa Prefecture
Values of Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island as a World Heritage	MOEJ
Amami Island Group Promotional Video “Sound of AMAMI”	Kagoshima Prefecture
“Here We Go to the World” Natural World Heritage Promotional Video	Okinawa Prefecture
Amami-Oshima Island, Tokunoshima Island, Northern part of Okinawa Island, and Iriomote Island: World Natural Heritage candidate sites http://kyushu.env.go.jp/naha/amami-okinawa/	MOEJ
Weaving Times, Coloring Islands -Amami and Ryukyu - http://amamiryukyu.jp/	Kagoshima Prefecture, Okinawa Prefecture, Kagoshima Prefectural Visitors Bureau and Okinawa Convention & Visitors Bureau
Amami-Oshima Island Nature Protection Guidebook	Amami-Oshima Nature Conservation Council
THE NATURE, HISTORY AND CULTURE OF AMAMI CITY	Amami City Amami Museum
Let’s have “Amami and Ryukyu” inscribed on the World Heritage List. http://amami-ancc.com	Amami-Oshima Nature Conservation Council

5.h.3. Accommodations

Amami-Oshima Island

As of August 2018, there are 158 accommodation establishments on Amami-Oshima Island. The total capacity of those accommodations is 3,347 per day. While the number of inbound visitors and travelers on Amami-Oshima Island has been on the increase recently due to a low-cost carrier (LCC) now serving the island. The largest number of monthly inbound visitors thus far being 51,006 (in August 2017). There is one camp site in the buffer zone (Yamato Village), along with two camp sites in the coastal area.

Tokunoshima Island

There are 33 accommodation establishments on Tokunoshima Island as of August 2017. The total capacity of those accommodations is 1,033 per day. The number of inbound visitors on Tokunoshima Island has been on the increase recently due to lower airfares and sea fares through the use of Amami Islands promotion subsidies. The

largest number of monthly inbound visitors and travelers thus far being 13,638 (in August 2017) (Oshima Branch, Kagoshima Prefecture 2018). There are four camp sites in the coastal area outside the buffer zone.

Northern part of Okinawa Island

There are 44 accommodation establishments in the northern part of Okinawa Island (surveys by the respective village offices). The total capacity of those accommodations is 1,456 per day. Of all visitors to the Yambaru region, 70% are day-trippers from accommodations located outside of the Yambaru region (JFY2013 Tourism Statistics and Actual Status Survey Report (Okinawa Prefecture)). There is a large resort hotel (capacity: 550 persons per day) in Kunigami Village, in which roughly two-thirds of people staying overnight in Kunigami Village take up lodgings. Apart from that hotel, most of the accommodations are relatively small, with the capacity ranging from 5 to 30 per day. In addition to the accommodation establishments, camp sites are also used (two within the buffer zone and two outside the buffer zone).

Iriomote Island

As camping is prohibited on Iriomote Island, except in a designated camp site, most tourists stay in the accommodations on the island. There are 30 accommodation establishments on Iriomote Island, but are located outside of the nominated property and buffer zone (December 2012 Chamber of Commerce and Industry Directory).

5.h.4. Restaurants, eating and drinking establishments, etc.

There are 1,102 wholesale/retail stores and eating/drinking establishments on Amami-Oshima Island, 390 on Tokunoshima Island, 58 in the northern part of Okinawa Island, and 32 on Iriomote Island, all of which are located outside of the nominated property.

5.i. Policies and Programmes Related to the Presentation and Promotion of the Property

In order to maintain human activities in the social, production and economic spheres in a sustainable manner in future years, while appropriately managing the heritage value of the nominated property, actions will be taken proactively with a view toward promoting the region in harmony with nature through ecotourism, etc. To that end, the promotional and awareness-raising activities now being carried out to make ecotourism approaches and rules known to island visitors and business operators will be continued in the years to come as well, along with efforts to train nature guides as supporters of such activities. Concrete contents are described in 4.b. (iv), 5.h, and 5.5, and these policies and initiatives are compiled as tourism management strategies.

In addition, an official page of the nominated property as a whole has been established, to integrally disseminate relevant information regarding the property, such as values of the nominated property, initiatives for its conservation management, materials from the Regional Liaison Committee and Scientific Committee, leaflets, videos, monitoring results, etc. Information disclosure shall be continued and enhanced in the coming period. (English Version: http://kyushu.env.go.jp/naha/amami-okinawa/index-en.html)

5.j. Staffing Levels and Expertise

For the management of the nominated property, mainly, employees of MOEJ, Forestry Agency, Kagoshima Prefecture and Okinawa Prefecture have coordinated and cooperated with various stakeholders such as municipalities, NPOs, and so on, to work on conservation measures, raising public awareness, etc.

Ministry of the Environment

Naha Nature Conservation Office: Park Facilities and Conservation Technology Division: 2 persons
National Park Department: 4 persons
Wildlife Department: 6 persons

Amami Ranger Office for Nature Conservation: 7 persons
Tokunoshima Ranger Office for Nature Conservation: 2 persons
Yambaru Ranger Office for Nature Conservation: 5 persons
Iriomote Ranger Office for Nature Conservation: 5 persons

In terms of the nomination, the Naha Nature Conservation Office of MOEJ, as well as rangers dispatched to respective islands have been playing key roles in comprehensive management of the nominated property, communication, coordination, and consensus building with related administrative organizations and stakeholders in the respective islands for daily management at the field (Figure 5-6). Meanwhile, MOEJ has implemented various projects and activities during the three years from 2016, such as new designation of Amamigunto National Park, new designation of Yambaru National Park and its expansion in a large scale, and the large expansion of Iriomote-Ishigaki National Park. In addition to the promotion of appropriate management of these national parks, the ministry has undertaken measures to eliminate and reduce threats to the nominated property,

Kyushu Regional Environment Office

Naha Nature Conservation Office

Director	Park Facilities and Conservation Technology Division	National Park Division	Wildlife Division
1	2	4	6

Ranger Offices

	Ranger	Active Ranger (Assistant Ranger)	Acting Ranger (Expert of Wildlife)
Amami-Oshima Island	3	3	1
Tokunoshima Island	1	1	—
The Northern Part of Okinawa Island (Yambaru)	2	2	1
Iriomote Island	2	2	1

Figure 5-6: Local organization and staffing (MOEJ)

by promoting countermeasures against alien species and appropriate use. Accordingly, the ministry increased the number of rangers to two in the Iriomote Ranger Office for Nature Conservation in July 2018, resulting in an increased number of staff from four to five. Furthermore, it is planned to additionally employ an Expert Officer for the Natural World Heritage in the Naha Nature Conservation Office, together with a ranger in the Amami Ranger Office for Nature Conservation, for the purpose of strengthening the system for the future.

Forestry Agency

Kyushu Regional Forest Office: Planning and Conservation Department: 6 persons

Kagoshima District Forest Office: 4 persons

Naze Forest Office: 1 person

Tokunoshima Forest Office : 1 person

Okinawa District Forest Office: 3 persons

Aha Forest Office : 1 person*

Takae Forest Office : 1 person*

Ohara Forest Office : 1 person

Sonai Forest Office : 1 person

Iriomote Forest Ecosystem Conservation Center: 4 persons

*For the time being, one officer shall be responsible for two Forest Offices.

Under the Forestry Agency, practical tasks for the conservation management of national forests are handled by

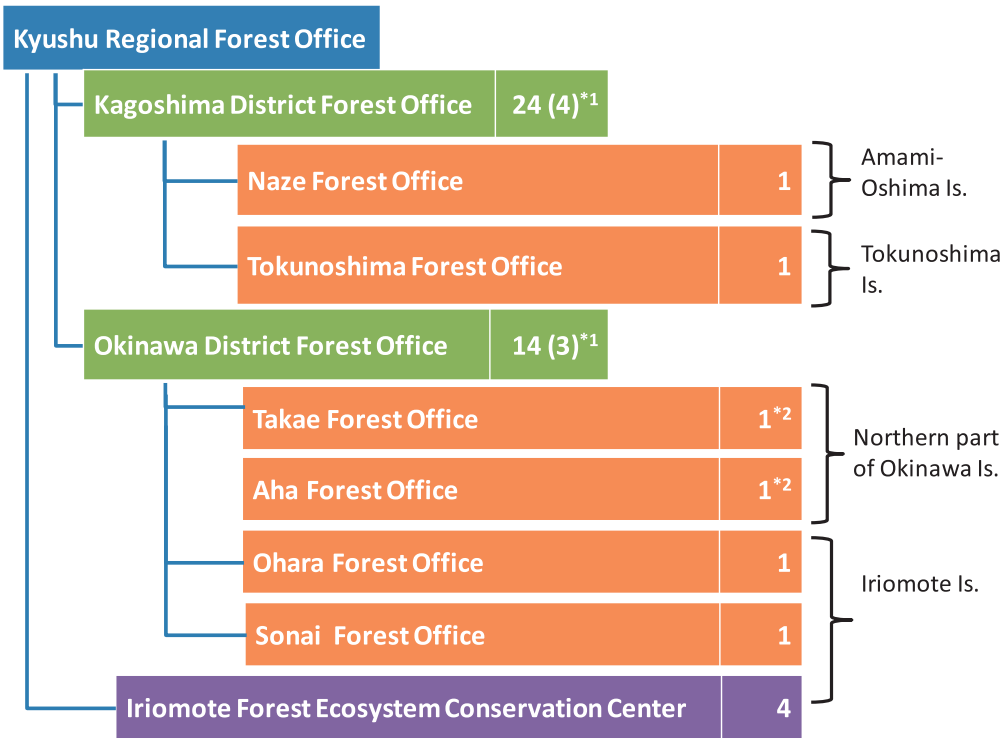


Figure 5-7: Local organization and staffing (Forestry Agency)

*1: Numbers in parentheses indicate the number of staff involved in conservation and management of the nominated property among the all staff.

*2: For the time being, one officer shall be responsible for two Forest Offices.

Kyushu Regional Forest Office, Kagoshima District Forest Office, Okinawa District Forest Office, Iriomote Forest Ecosystem Conservation Center, and other local Forest Offices located in respective nominated regions. Regarding the returned land of Northern Training Area (NTA), the Forestry Agency designated the Yambaru Forest Ecosystem Reserve in December 2017. Based on this, it newly appointed a Coordination Officer for Natural Heritage Conservation in the Kyushu Regional Forest Office in 2017, and a Forest Officer in Aha Forest Office in 2018, for strengthening the management system of the nominated property (Figure 5-7).

Kagoshima Prefecture

Environment and Forestry Affairs Department: 1 person
Nature Conservation Division: 3 persons
Amami Natural World Heritage Inscription Promotion Section: 5 persons
Planning Division, Oshima Branch Office: 3 persons
Hygiene and Environment Section: 2 persons
Cultural Assets Division: 3 persons

In Kagoshima Prefecture, the Nature Conservation Division of the Environment and Citizen Affairs Department has been responsible for handling practical tasks pertaining to conservation, in coordination with Oshima Branch Office. The Office of the Director General for Amami World Natural Heritage was established in 2015, followed by the recent establishment of Amami World Natural Heritage Inscription Promotion Section in 2017, as a dedicated organization for promoting necessary initiatives for simultaneously achieving the conservation and use of the natural environment.

Okinawa Prefecture

Nature Conservation Division, Department of Environmental Affairs: 18 persons
Cultural Assets Division, Board of Education: 1 person

In Okinawa Prefecture, the Nature Conservation Division of the Department of Environmental Affairs has been responsible for handling practical tasks pertaining to management, in coordination with the Yaeyama Regional Public Works Office. In 2018, as a dedicated organization, the Natural World Heritage Inscription Promotion Section was established, for maintaining and strengthening the management system of the nominated property.

Municipalities

Amami-Oshima Island

- Amami City: Natural World Heritage Promotion Office, Environmental Measure Section: 3 persons
  Sumiyo General Branch Office: 3 persons
  Kasari General Branch Office: 1 person
- Yamato Village: Planning and Tourism Division: 1 person
  Taxation Division: 1 person (responsible for cats)
- Uken Village: General Affairs and Planning Division: 1 person
  Fisheries Division: 1 person
  Taxation Division: 1 person (responsible for cats)

・Setouchi Town: Setouchi Board of Education Department of Social Education Natural World Heritage Setouchi Promotion Office: 2 persons
Setouchi Townsmen Affairs Division: 1 person (responsible for cats)
・Tatsugo Town: Planning and Tourism Division: 1 person
Consumer & Environment Protection Division: 1 person
・Amami Promotion Division, Wide Area Administration Association of Amami Islands: 3 persons

Tokunoshima Island

・Tokunoshima Town: Planning Division: 1 person
Resident Life Department: 1 person (responsible for cats)
・Amagi Town: Planning Division: 2 persons
Resident Life Department: 1 person (responsible for cats)
・Isen Town: Kyura-Machi Tourism Division: 1 person
Kyura-Machi Tourism Department: 1 person (responsible for cats)
・Amami Promotion Division, Wide Area Administration Association of Amami Islands [second mention]: 3 persons

Northern part of Okinawa Island

・Kunigami Village Natural World Heritage Promotion Division: 4 persons
・Kunigami Village Board of Education, Education Division: 1 person
・Ogimi Village Planning and Tourism Division: 2 persons
・Higashi Village Planning and Tourism Division: 2 persons

Iriomote Island

・Taketomi Town: Policy Promotion Division: 5 persons
Social and Cultural Properties Section, Board of Education: 1 person

*: As the Agency for Cultural Affairs does not have local offices, no staff is stationed in the local areas of the nominated property (There are three officers in charge of Natural Monument belong to the Second Cultural Properties Division at the headquarter office).

Amami thrush (*Zoothera dauma major*)
(Photo: MOEJ)

6

Monitoring

6.a. Key Indicators for Measuring State of Conservation

6.b. Administrative Arrangements for Monitoring Property

6.c. Results of Previous Reporting Exercises

Banded ground gecko (*Goniurosaurus splendens*), Tokunoshima Island (Photo: MOEJ)

6. Monitoring

Mainly in the nominated property, buffer zones, and Surrounding Conservation Areas, monitoring will be implemented on conservation status of ecosystems and natural environment, as well as the affecting factors, with viewpoints of emergency response to those factors that may affect the OUV, or future risks that have not become evident yet. The results will be synthetically assessed by qualitative and quantitative parameters, in order to reflect them in the adaptive management.

6.a. Key Indicators for Measuring State of Conservation

Table 6-1 shows a list of key indicators that are thought to serve as measures of the nominated property's conservation status.

The Okinawa rail, Amami rabbit, and Iriomote cat are the species that depend on subtropical broadleaved forests in good condition and therefore are key species to indicate soundness of the forest ecosystems. As these species are designated as National Endangered Species under the Act on Conservation of Endangered Species of Wild Fauna and Flora, actions are underway according to protection and recovery program plan, in cooperation with a broad range of organizations concerned, to monitor their status and to combat traffic accidents, alien species, and other threats. In addition, the number of visitors is expected to increase after inscription on the World Heritage List. While tourism use offers opportunities to deepen understanding of the values of the property, it may induce disorderly business expansion or over-exploitation which eventually impair their heritage values.

These species will be monitored as key indicators in order to track the conservation status of the nominated property's values and the effects of protection management measures, and reflect the findings obtained in the work to administer proper management. As for monitoring results, quantitative and / or qualitative assessments shall be conducted. Those results shall be comprehensively examined to assess the state of conservation of Outstanding Universal Value (OUV). Since the endemic species and threatened species, as well as alien species and tourism use selected as the key indicators, interact the Surrounding Conservation Areas outside of the nominated property and the buffer zones, the work of monitoring will be performed with those zones covered as well.

Table 6-1: List of key indicators for the nominated property's conservation status

Monitoring viewpoints	Key indicator	Locations covered				Specifics	Survey period	Organization to store information (Implementing organization)
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island			
Whether the major endemic species and threatened species indicating OUV are maintained	Amami rabbit	●	●	–	–	•Distribution status	Every year/every 5 years	•Naha Nature Conservation Office •Kyushu Regional Forest Office •Okinawa Prefecture
	Okinawa rail	–	–	●	–			
	Iriomote cat	–	–	–	●			

Monitoring viewpoints	Key indicator	Locations covered				Specifics	Survey period	Organization to store information (Implementing organization)
		Amami-Oshima Island	Tokunoshima Island (a) (b)	Northern part of Okinawa Island	Iriomote Island			
Whether anthropogenic impacts on the major endemic species and threatened species indicating OUV are reduced, or past impacts improved	Amami rabbit	●	●	–	–	・Number of traffic accidents ・Number of dead individuals	Every year/every 5 years	・Naha Nature Conservation Office ・Okinawa Prefecture ・Kagoshima Prefecture
	Okinawa rail	–	–	●	–			
	Iriomote cat	–	–	–	●			
Whether the number of alien species posing a threat is reduced	Mongoose	●	–	●	–	・Catch Per Unit Effort (CPUE) as relative population density	Every year	・Naha Nature Conservation Office ・Okinawa Prefecture
	Cats	●	●	●	●	・Distribution status ・Number and percentage of microchipped pet cats	Every year	・Naha Nature Conservation Office ・Kagoshima Prefecture ・Okinawa Prefecture ・Municipalities concerned ・Veterinary Medical Association
Whether tourism use of the nominated property and surrounding areas is done in a sustainable way	Tourism users	●	●	●	●	・Number of inbound visitors per island ・Number of users of major visitor facilities ・Number of ecotour participants within national forests	Every year	・Naha Nature Conservation Office ・Kyushu Regional Forest Office ・Kagoshima Prefecture ・Okinawa Prefecture ・Municipalities concerned
	Eco-tour guides and businesses	●	●	●	●	・Number of certified guides ・Number of businesses that have signed a conservation and utilization agreement etc.	Every year	・Wide Area Administration Association of Amami Islands ・Kagoshima Prefecture ・Okinawa Prefecture ・Municipalities concerned
Whether any impact or any sign of impact of climate change or disasters is detected early	Meteorological change of nominated property	●	●	●	●	・Meteorological data, including temperatures, precipitation, number of typhoons ・Forecast data regarding climate change	Every year	・Japan Meteorological Agency
	Changes in the vegetation and/or in the fauna of nominated property	●	●	●	●	Species composition, numbers and populations of the species, etc.	Every year/every 5 years	・Biodiversity Center of Japan ・Kyushu Regional Forest Office

6.b. Administrative Arrangements for Monitoring Property

Relevant agencies, concerned groups, and researchers have coordinated and cooperated in implementing the monitoring, targeting trends of the main indicators, etc. that are considered to be a standard for the state of conservation and protection management in the nominated property. It is important to reflect assessment results on adaptive management by the administrative organs, together with securing continuous monitoring that are necessary for the assessment of the state of conservation of the OUV of the nominated property.

Therefore, with scientific advice from the Scientific Committee, the administrative organs have been promoting preparations towards the formulation of a monitoring plan that shows concrete assessment methods over the state of conservation of the OUV of the nominated property (see Annex 2-2 for the basic policy). In addition to the main indicators that are mentioned in 6.a., the plan shall select necessary indicators for monitoring the OUV of the nominated property. It shall properly manage and accumulate monitoring results, together with sharing information with relevant agencies, concerned groups, and researchers. It defines that the monitoring results shall be effectively used for conservation and management.

6.c. Results of Previous Reporting Exercises

Many studies, research and conservation projects have been conducted in the nominated property up until now. The papers and reports that have relevance to the key indicators listed in Table 6-1 concerning to the nominated property's conservation status are listed below, together with summary descriptions (Table 6-2).

Table 6-2: Previous studies on key indicators for the nominated property's conservation status

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Relevant to the Amami rabbit			
Kagoshima Prefecture Board of Education (1977)	Study on the Actual Condition of the Special Natural Monument Amami Rabbit	Kagoshima Prefecture Board of Education	For the purpose of obtaining basic data on protection management measures for the Amami rabbit as a special natural monument, the ecology of the Amami rabbit was grasped on the basis of resident questionnaires and field surveys, along with estimating their distribution range and population.
Nature Conservation Bureau, Environment Agency (1994)	Study on the Actual Condition of Rare Wildlife in the Amami Island Group	Nature Conservation Bureau, Environment Agency	A survey was conducted on the status and habitat environments of rare species in the Amami Island Group that are particularly important for conservation purposes (e.g., Amami rabbit, Ryukyu long-haired rat, spiny rats), as well as of alien species causing impacts on them, along with deliberations about conservation measures.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Nature Conservation Bureau, Environment Agency (1995)	Report on the Survey in Areas with Biodiversity (Amami Island Group Region)	Environment Agency	From the standpoint of biodiversity conservation, a survey was conducted on Amami-Oshima Island and Tokunoshima Island of the Amami Island Group to investigate the status and habitat environments of rare mammals for which there were particular concerns over population declines (six species including the Amami rabbit), along with deliberations about conservation measures.
Nature Conservation Bureau, Environment Agency (1999)	Survey on the Actual Condition for Designation as a National Endangered Species: the Amami Rabbit	Environment Agency	With the aim of developing basic data for selection as a National Endangered Species under the Act on the Conservation of Endangered Species of Wild Fauna and Flora, a report is issued on the findings from a survey conducted on Amami-Oshima Island and Tokunoshima Island to comprehend the status of the Amami rabbit, the current condition of their habitats, and impacting factors.
Relevant to the Okinawa rail			
Agency for Cultural Affairs (1983)	Special Study Report on the Natural Monument Okinawa Rail (*Rallus okinawae*)	Agency for Cultural Affairs	A report on the findings from studies conducted after discovery of the species in 1981 for natural monument designation purposes, to investigate its taxonomic position, developments leading to the discovery, the distribution of locations where it was spotted and its carcass collected, its habitat environment, issues for conservation purposes, etc.
Nature Conservation Division, Department of the Environment and Public Health (1989 - 1994), Okinawa Prefecture	Habitat Environment Survey I to VII on Special Birds and Other Species	Nature Conservation Division, Department of the Environment and Public Health, Okinawa Prefecture	For the purpose of expanding the Wildlife Protection Area designated by Okinawa Prefecture in the northern part of Okinawa Island, a report is issued on the findings from a survey of the distribution of animals, including mainly special birds under the (now-repealed) "Act on Regulation of Transfers, etc. of Special Birds, etc." (Okinawa rail, Okinawa woodpecker, Amami woodcock and others), and some amphibians.
Environment Agency (1982, 84, 85, 86, 88, 89, 91, 92, 93)	Survey Report on Special Birds	Environment Agency	A report on the findings from a survey conducted to investigate the status of special birds, etc. under the (now-repealed) "Act on Regulation of Transfers, etc. of Special Birds, etc." (Okinawa rail, Okinawa woodpecker, Amami jay, Amami thrush, Ryukyu robin and white-backed woodpecker (*Dendrocopos leucotos owstoni*)).
Naha Nature Conservation Office Ministry of the Environment (2008 - 2018)	Okinawa Rail Status Survey Report (2007 - 2014) Report on Control Project of Small Indian Mongoose in the Northern Part of Okinawa Island (2015 - 2017)	Naha Nature Conservation Office, Ministry of the Environment	To understand the distribution of the species, play-back study is conducted in three Yambaru villages.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Relevant to the Iriomote cat			
Environment Agency (1975 - 1977)	Research on the Ecology and Protection of the Iriomote Cat: First to Third Reports (1975 - 1977)	Environment Agency	The first set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
Environment Agency (1983 - 1985)	Survey for the Purpose of Measures to Conserve the Habitat Environments, etc. of the Iriomote Cat (1983 - 1985)	Environment Agency	The second set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
Environment Agency (1993 - 1994)	Special Survey Project Report on Iriomote Cat Habitats (1993 - 1994)	Environment Agency	The third set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
University of the Ryukyus (2008)	(Fourth) Comprehensive Survey Report on the Status, etc. of the Iriomote Cat	Ministry of the Environment	The fourth set of findings from the comprehensive survey conducted by the Ministry of the Environment at approximately ten-year intervals starting in 1973 in order to reveal the ecology of the Iriomote cat and comprehend its status.
Okinawa District Forest Office, Kumamoto Regional Forest Office, Forestry Agency (1994 - 1998)	Endangered Species of Wild Fauna and Flora Protection Management Measure Study Report on the Iriomote Cat: First to Fourth Reports	Okinawa District Forest Office, Kumamoto Regional Forest Office, Forestry Agency	As a protection management project for National Endangered Species under the Act on the Conservation of Endangered Species of Wild Fauna and Flora, a survey was conducted to develop a general outline of the status and habitat environments of the Iriomote cat and its prey animals, along with deliberations about impacting factors for conservation purposes and protection management measures.
Naha Nature Conservation Office, Ministry of the Environment / Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency (1996 - 2009)	Iriomote Cat Protection and Recovery Project Implementation Report	Naha Nature Conservation Office, Ministry of the Environment / Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency	A detailed summary of the project implemented by the Ministry of the Environment and the Forestry Agency pursuant to the protection and recovery project plan. A report on the findings from a monitoring survey based on automated photography and spotting information, and surveys on traffic accident prevention steps and cat situations.
Naha Nature Conservation Office, Ministry of the Environment (2014 - 2018)	Report on Automatic Photography-based Survey on Iriomote Cat (2013-2014) Report on Automatic Photography-based Survey on Iriomote Cat (2015-2017) Report on Individual Identification of Iriomote Cat (2015-2017)	Naha Nature Conservation Office, Ministry of the Environment	A summary of the projects implemented by the Ministry of the Environment. A report on the findings from monitoring surveys based on automated photography.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Relevant to mongooses and feral cats			
Sadao Ikehara (1991)	Influence upon wildlife by introduced animals in the Nansei-Shoto Islands	World Wide Fund for Nature Japan (WWF Japan)	A report on the findings from studies conducted to obtain basic data for wildlife species conservation on the major islands of the Nansei-Shoto Islands - Amami-Oshima Island, Okinawa Island and Iriomote Island - with respect to the types and distribution ranges of alien animals, and their impacts on biota.
Kagoshima Prefecture (1996 - 2000)	Study Report for the Introduced Species (Mongoose) Elimination and Control Model Project in the Insular Region	Environment Agency / Kagoshima Prefecture	For the purpose of conserving the biota unique to Amami-Oshima Island, the status and biological characteristics of mongooses were grasped, along with the results of deliberations about their impacts on native species and countermeasures, capture methods, and elimination and control structure developments, etc.
Ministry of the Environment (2001- 2004)	Introduced Species (Mongoose) Elimination Project Report	Ministry of the Environment	As a result of the above model project, a shift to a full-scale elimination project followed as prompt action was required. Based on the outcomes of elimination efforts over three years, a report is issued on the results of deliberations about population reduction, the possibility of eradication, and elimination policy and planning.
Ministry of the Environment (2005 - 2018)	Report on the Javan Mongoose Control Project on Amami-Oshima Island (2005 - 2014) Report on the Small Indian Mongoose Control Project on Amami-Oshima Island (2015 - 2017)	Ministry of the Environment	A report on the results of the mongoose control project implemented on Amami-Oshima Island by the Ministry of the Environment (e.g., capturing mongooses and tracking their status, examining effective control methods, monitoring the recovery of native species) pursuant to a control implementation plan under the Invasive Alien Species Act.
Northern Dam Administration Office, Okinawa General Bureau (1994 - 1997)	Biological Environment Study Data in the Northern Region of Okinawa's Main Island (Mongoose)	Northern Dam Administration Office, Okinawa General Bureau	Results of surveys conducted on the capture and feeding habits of alien mammals (mongooses and cats), which are considered among the factors inhibiting the distribution of native species in the northern part of Okinawa Island.
Nature Conservation Division, Department of Environmental Affairs, Okinawa Prefecture (2001 - 2017)	Mongoose Elimination Contract Work Report	Nature Conservation Division, Department of Environmental Affairs	Results of a survey on mongoose control implemented by Okinawa Prefecture in order to recover the habitat range of rare wildlife in the northern part of Okinawa Island, and on the progress of rare species recovery.
Naha Nature Conservation Office, Ministry of the Environment (2010 - 2018)	Report on the Project for Controlling Javan Mongooses, etc. in the Northern Region of Okinawa Island (2010 - 2014) Report on the Project for Controlling Small Indian Mongooses, etc. in the Northern Region of Okinawa Island (2015 - 2017)	Naha Nature Conservation Office, Ministry of the Environment	Results of the mongoose control project implemented in the northern part of Okinawa Island by the Ministry of the Environment (e.g., capturing mongooses and tracking their status, examining effective control methods, monitoring the recovery of rare native species) in accordance with a control implementation plan developed pursuant to the Invasive Alien Species Act.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Naha Nature Conservation Office, Ministry of the Environment (2014 - 2017)	Report on the Alien Mammal Status Survey Work Aimed at Recovering the Ecological System of Tokunoshima Island (2014) Report on the Feral Cat Control Implementation Aimed at Recovering the Ecological System of Tokunoshima Island (2014 - 2017)	Naha Nature Conservation Office, Ministry of the Environment	Results of a survey on the status of cats that are affecting the Amami rabbit and other rare species on Tokunoshima Island, the estimation of cats population, distribution range, distribution density, etc., and deliberations about future measures.
Naha Nature Conservation Office, Ministry of the Environment (2017 to 2018)	Report Concerning Measures Against Feral Cat in the Amami-Oshima Island Ecosystem Maintenance and Restoration Project (2016) Report Concerning Amami-Oshima Island Ecosystem Maintenance and Restoration (2018)	Naha Nature Conservation Office, Ministry of the Environment	Results of the examination regarding surveys on the state of cats that affect wildlife including endemic species in Amami-Oshima Island, as well as measures that shall be undertaken in the coming period.
Watari et al. (2013)	Evaluating the "recovery level" of endangered species without prior information before alien invasion. Ecology and Evolution. 3(14): 4711–4721.	John Wiley & Sons Ltd.	A method of calculating numerical targets to evaluate the level of recovery of indigenous species was developed. In reference to the mongoose control project on Amami-Oshima Island, it was demonstrated that the populations of the Amami rabbit and three indigenous frog species had made a remarkable recovery.
Fukasawa et al. (2013)	Differential population responses of native and alien rodents to an invasive predator, habitat alteration, and plant masting. Proceedings of Royal Society B: Biological Sciences. 280: 2013-2075.	The Royal Society	A method of calculating numerical targets to evaluate the level of recovery of indigenous species was developed. In reference to the mongoose control project on Amami-Oshima Island, it was demonstrated that the populations of the Ryukyu long-haired rat and the Amami spiny rat, both indigenous species, had made a remarkable recovery and that there had been no sign of increases of black rats, an alien species.
General research, etc. on the natural environment and wildlife			
WWF Japan Scientific Committee (1984 - 1985)	The Nansei-Shoto Islands and Their Nature Protection: I - II	World Wildlife Fund Japan	Results of a basic survey on the fauna of the Nansei-Shoto Islands, which were expected to see various problems between nature protection and development arise in the future (species list, distribution data, literature list), and a biological and sociological survey on the islands inhabited by major internationally rare species (the Amami rabbit for Amami-Oshima Island and the Iriomote cat for Iriomote Island).
Nature Conservation Bureau, Environment Agency (1989 - 1991)	Research on the Conditions Essential for the Preservation of Wildlife Species in the Nansei-Shoto Islands Survey Report on the Northern Part of Okinawa Island (1989) Survey Report on the Sakiyama Peninsula District of Iriomote Island (1990) Survey Report on Amami-Oshima Island (1990) Summary Report (1991)	Nature Conservation Bureau, Environment Agency	Results of surveys with the aim of summarizing the conservation measures in the important regions of the Nansei-Shoto Islands (Amami-Oshima Island, northern part of Okinawa Island, Iriomote Island). Overviews of the weather and geographical and geological formations of each region, the findings from survey data on the distribution of vegetation, flora and fauna (vertebrate animals, insects, and invertebrate animals), and a summary thereof.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Nature Conservation Bureau, Environment Agency (1994)	Study on the Actual Condition of Rare Wildlife in the Amami Island Group	Nature Conservation Bureau, Environment Agency	A survey was conducted on the status and habitat environments of rare species in the Amami Island Group that are particularly important for conservation purposes (e.g., Amami rabbit, Ryukyu long-haired rat, spiny rats), as well as of alien species causing impacts on those rare species, along with deliberations about conservation measures.
Kagoshima Prefectural Museum (1996)	Kagoshima Nature Study Project Report III: Nature in Amami	Kagoshima Prefectural Museum	Overviews of the weather, geographical and geological formations of the Amami Island Group, and island-specific data on the vegetation, flora and fauna (e.g., vertebrates, insects, land snails, crustaceans), and on the findings from a field survey on Tokunoshima Island.
Environment Agency (2000)	Amami-Oshima Island Rare Wildlife Survey Report	Environment Agency	A report on the findings from survey data on the distribution of rare species (e.g., vertebrates, insects, land snails, myriapods, higher plants) on Amami-Oshima Island and Tokunoshima Island.
Okinawa District Nature Conservation Office, Nature Conservation Bureau, Ministry of the Environment (2001)	Iriomote National Wildlife Protection Area Survey Report	Okinawa District Nature Conservation Office, Nature Conservation Bureau, Ministry of the Environment,	For the purpose of elucidating the status of the Iriomote cat and the status within the inland wildlife protection area, for which surveys had been scarce, a report is issued on a survey using automated photography, census, etc. and on the results of deliberations about impacting factors and conservation measures.
Naha Nature Conservation Office, Ministry of the Environment (2005)	Mt. Yuwandake National Wildlife Protection Area Survey Report	Okinawa District Nature Conservation Office, Nature Conservation Bureau, Ministry of the Environment,	A report on the findings from a survey on the status of birds and animals, including rare species, conducted as basic data for the purpose of designating a national wildlife protection area in Mt. Yuwandake on Amami-Oshima Island.
Ministry of the Environment (2004)	Survey Report on the Formulation of the National Park Designation Plan in the Yambaru Area	Naha Nature Conservation Office, Ministry of the Environment	A report based on the organization of existing survey results, the consideration of national park designated areas on the foundation of their capacities, and hearing results regarding intentions of local governments, local residents, business operators, etc.
Ministry of the Environment (2005)	Survey Report on the Formulation of the National Park Designation Plan in the Yambaru Area	Naha Nature Conservation Office, Ministry of the Environment	A report regarding the results of consideration of the national park plan and how to promote monitoring activities.
Shigeki Yasumura, WWF Japan (2009)	A Collection of Reports on Biodiversity Evaluation Projects in the Nansei-Shoto Islands	World Wide Fund for Nature Japan	A report on the selection and mapping of areas of priority for biodiversity conservation purposes on the Nansei-Shoto Islands, and on the findings from a field survey, including the distribution range of Okinawa spiny rats.

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Ministry of the Environment (2010)	Task Report Regarding Surveys and Material Collection on the Forest Environment of Subtropical Laurel Forests in the Yambaru Area	Naha Nature Conservation Office, Ministry of the Environment	Information and material collection on the forest environment of subtropical laurel forests, actual situations of forest use, forest plans, and general conditions of forestry operations and forest use in the Yambaru Area.
Ministry of the Environment (2011)	Survey Report on the Conservation of the Natural Environment Focusing on Subtropical Laurel Forests in the Yambaru Area	Naha Nature Conservation Office, Ministry of the Environment	Collection of additional information regarding the natural environment, and hearing reports regarding zoning.
Ministry of the Environment (2018)	Environment Research and Technology Development Fund "Research on threatened species and biodiversity conservation in forest areas of Amami and the Ryukyus "	Forestry and Forest Products Research Institute, Forest Research and Management Organization	Technological development for the monitoring of impacts that secondary nature caused by tree logging have on sustainability of threatened species and biodiversity conservation in Amami and the Ryukyus, integrated management methods, etc.
Relevant to sustainable use in tourism			
Environment Agency (1996)	Survey Report on General Conditions of the Natural Environment in the Yambaru Area	Environment Agency	Collection of basic information concerning the Yambaru area, field survey regarding the utilization of resources and awareness of residents, and the formulation of resource distribution maps.
Environment Agency (1997)	Survey Report to Consider Measures for the Conservation and Utilization of the Yambaru Area	Environment Agency	Organization of lists of references, local resources, and human resources in the Yambaru area.
Environment Agency (1998)	Survey Report to Consider a Basic Plan for the Conservation and Utilization of the Yambaru Area	Environment Agency	Collection of information regarding current conditions in the Yambaru area, understanding of traditional perceptions of nature, organization of local issues and future directions, and consideration of measures for conservation and utilization.
Environment Agency (1999)	Survey Report to Formulate a Basic Conception for Enhancement in the Yambaru Area	Environment Agency	Actual situations and trends of tourism surrounding the Yambaru area, challenges, current conditions and directions of ecotourism in the Yambaru area, facility enhancement conception and residents' initiatives in operation and raising public awareness.
Environment Agency (2000)	Survey Report to Formulate a Basic Conception for Enhancement in the Yambaru Area	Environment Agency	Trends and challenges of Okinawa tourism, trends and characteristics of tourism in the Yambaru area, future directions of a Yambaru model of tourism, organization of local directions in conservation and utilization and prerequisites for zoning.
Environment Agency (2003)	Survey Report to Formulate a Plan for Conservation and Enhancement in the Yambaru Area	Environment Agency	Formulation of a draft of a conservation enhancement plan in the Yambaru area (aspirations as a conservation and utilization area, zoning plan, and utilization plan).

Editor/author, year of publication	Paper or report title	Issuer	Summary description
Amami Tourism & Products Federation/ Oshima Branch Office, Kagoshima Prefecture (- 2018)	Trends of Tourism in the Amami Island Group	Amami Tourism & Products Federation/ Oshima Branch Office, Kagoshima Prefecture	A report on various statistical surveys conducted every year to grasp the trends of tourism in the Amami Island Group, including the number of inbound visitors, total number of travelers, number of inbound visitors by island, by month and by point of departure, number of users of establishments, etc.
Okinawa Prefecture (- 2016)	Tourism Directory	Okinawa Prefecture	A report on various statistical surveys conducted every year to grasp the trends of tourism in Okinawa Prefecture, including the number of inbound visitors, tourist trends, tourism revenues, accommodations, etc.
Okinawa Prefecture (- 2016)	Yaeyama Tourism Statistics	Okinawa Prefecture	A report on the statistical survey conducted every year about tourism trends in the Yaeyama region of Okinawa Prefecture, including the number of inbound visitors by island.
Kagoshima Prefecture (2016)	Master Plan of the Amami Island Group Sustainable Toursim	Kagoshima Prefecture	Direction of systematic tourism management, for the purpose of promoting sustainable tourism use of the Amami Island Group, together with its basic information, main locations of tourism use and the number of users in Amami-Oshima Island and Tokunoshima Island.
Okinawa Prefecture (2014)	Investigation on the Current State and Future Prediction of Use and Conservation of the Natural Environment toward Inscription of Amami and Ryukyu in the World Heritage List	Okinawa Prefecture	A report on the understanding of actual situations, such as the number of visitors to the entire area of Iriomote Island, purposes of their visits, and management conditions, together with opinion exchanges with local residents towards appropriate use of parks.
Ministry of the Environment (2016)	Task Report based on a Survey and Consideration Regarding the Conservation and Use of the Natural Environment in Iriomote Island, JFY2016	Ministry of the Environment	A report on the understanding of actual situations, such as the number of visitors to the entire area of Iriomote Island, purposes of their visits, and management conditions, together with opinion exchanges with local residents towards appropriate use of parks.

Quercus miyagii (Photo: MOEJ)

7

Documentation

7. a. Photographs and Audiovisual Image Inventory and Authorization Form

7.b. Texts Relating to Protective Designation, Copies of Property Management Plans or Documented Management System and Extracts of Other Plans Relevant to the Property

7.c. Form and Date of Most Recent Records or Inventory of Property

7.d. Address Where Inventory, Records and Archives are Held

7.e. Bibliography

Okinawa rail (*Gallirallus okinawae*), the Northern part of Okinawa Island (Photo: MOEJ)

7. Documentation

7.a. Photographs and Audiovisual Image Inventory and Authorization Form

No.	Format	Caption	Date	Photographer	Copyright owner	Contact detail of copyright owner	Nonexclusive cession of rights
1	jpg	Evergreen broadleaved forest (Amami-Oshima Is.)	2011		MOEJ*1	MOEJ	yes
2	jpg	Mt. Inokawadake (Tokunohsima Is.)	2008		JWRC*2	JWRC	yes
3	jpg	Evergreen broadleaved forest (Northern part of Okinawa Island)	2016		MOEJ	MOEJ	yes
4	jpg	Mt. Komidake (Iriomote Is.)	2010		MOEJ	MOEJ	yes
5	jpg	View from Funaura Bay (Iriomote Is.)	2010		MOEJ	MOEJ	yes
6	jpg	Cloud forest (Northern part of Okinawa Is.)	2003		MOEJ	MOEJ	yes
7	jpg	Mountains stream (Amami-Oshima Is.)	2012		MOEJ	MOEJ	yes
8	jpg	Mangrove forest (Nakama River, Iriomote Is.)	2009		MOEJ	MOEJ	yes
9	jpg	*Cardiandra amamiohsimensis*	2012		MOEJ	MOEJ	yes
10	jpg	*Arisaema heterocephalum*	2012		MOEJ	MOEJ	yes
11	jpg	*Viola amamiana*	2010		MOEJ	MOEJ	yes
12	jpg	*Asarum simile*	2013		MOEJ	MOEJ	yes
13	jpg	*Platanthera sonoharae*	2010		MOEJ	MOEJ	yes
14	jpg	*Solenogyne mikadoi*	2013		MOEJ	MOEJ	yes
15	jpg	*Dendrobium okinawense*	2007		MOEJ	MOEJ	yes
16	jpg	Amami rabbit (*Pentalagus furnessi*)	2012		MOEJ	MOEJ	yes
17	jpg	Iriomote cat (*Prionailurus bengalensis iriomotensis*)	2006		MOEJ	MOEJ	yes
18	jpg	Amami spiny rat (*Tokudaia osimensis*)	2014		MOEJ	MOEJ	yes
19	jpg	Tokunoshima spiny rat (*Tokudaia tokunoshimensis*)	2015		MOEJ	MOEJ	yes
20	jpg	Okinawa spiny rat (*Tokudaia muenninki*)	2009		MOEJ	MOEJ	yes
21	jpg	Ryukyu long-haired rat (*Diplothrix legata*)	2008		MOEJ	MOEJ	yes
22	jpg	Amami jay (*Garrulus lidthi*)	2015		MOEJ	MOEJ	yes
23	jpg	Okinawa rail (*Gallirallus okinawae*)	2007		MOEJ	MOEJ	yes
24	jpg	Okinawa woodpecker (*Sapheopipo noguchii*)	2012		MOEJ	MOEJ	yes
25	jpg	Amami woodcock (*Scolopax mira*)	2014		MOEJ	MOEJ	yes
26	jpg	Amami thrush (*Zoothera dauma major*)	2007		MOEJ	MOEJ	yes
27	jpg	White-backed woodpecker (*Dendrocopos leucotos owstoni*)	2013		MOEJ	MOEJ	yes
28	jpg	Ryukyu black-breasted leaf turtle (*Geoemyda japonica*)	2008		MOEJ	MOEJ	yes
29	jpg	Yellow-margined box turtle (*Cuora flavomarginata*)	2011		MOEJ	MOEJ	yes
30	jpg	Banded ground gecko (*Goniurosaurus splendens*)	2014		MOEJ	MOEJ	yes
31	jpg	Kuroiwa's ground gecko (*Goniurosaurus kuroiwae*)	2009		MOEJ	MOEJ	yes
32	jpg	Kishinoue's giant skink (*Plestiodon kishinouyei*)	2008		MOEJ	MOEJ	yes
33	jpg	Anderson's crocodile newt (*Echinotriton andersoni*)	2015		MOEJ	MOEJ	yes
34	jpg	Amami tip-nosed frog (*Odorrana amamiensis*)	2014		MOEJ	MOEJ	yes
35	jpg	Okinawa tip-nosed frog (*Odorrana narina*)	2009		MOEJ	MOEJ	yes
36	jpg	Greater tip-nosed frog (*Odorrana supranarina*)	2006		MOEJ	MOEJ	yes
37	jpg	Utsunomiya's tip-nosed frog (*Odorrana utsunomiyaorum*)	2007		MOEJ	MOEJ	yes
38	jpg	Amami Ishikawa's frog (*Odorrana splendida*)	2012		MOEJ	MOEJ	yes
39	jpg	Okinawa Ishikawa's frog (*Odorrana ishikawae*)	2009		MOEJ	MOEJ	yes
40	jpg	Namie's frog (*Limnonectes namiyei*)	2008		MOEJ	MOEJ	yes
41	jpg	Otton frog (*Babina subaspera*)	2008		MOEJ	MOEJ	yes
42	jpg	Holst's frog (*Babina holsti*)	2008		MOEJ	MOEJ	yes
43	jpg	Yanbaru long-armed scarab beetle (*Cheirotonus jambar*)	2005		MOEJ	MOEJ	yes
44	jpg	Damsel fly (*Rhinocypha uenoi*)	2016		MOEJ	MOEJ	yes
45	mp4	Animation that introduces OUV of the nominated property	2017		MOEJ	MOEJ	no

*1: Ministry of the Environment of Japan *2: Japan Wildlife Research Center

7.b. Texts Relating to Protective Designation, Copies of Property Management Plans or Documented Management System and Extracts of Other Plans Relevant to the Property

Annex 4: Legal instruments of protection applying to the nominated property

Annex 2 and 5: Management Plan and other plans applying to the nominated property

7.c. Form and Date of Most Recent Records or Inventory of Property

Article	Content	Implementing organization	Form	Date
Geology	Seamless Digital Geological Map of Japan (1:200,000)	Geological survey of Japan, AIST	https://gbank.gsj.jp/seamless/index_en.html?	2015
Climate	Automated Meteorological Data Acquisition System (AMeDAS) In order to observe weather conditions such as rain, wind, snow, observations at manned stations cover amount of precipitation, wind direction/speed, air temperature, sunshine duration. All of these elements are observed automatically.	Japan Meteorological Agency	http://www.jma.go.jp/jma/indexe.html	every 10 minutes - hours
	Past Weather Data Search	Japan Meteorological Agency	http://www.data.jma.go.jp/obd/stats/data/en/index.html	2018
	Radar-AMeDAS rainfall	Japan Meteorological Agency	DVD	2018
Plant	National Survey on the Natural Environment - vegetation survey, etc.	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2016
	National Survey on the Natural Environment - vegetation survey. Browse Vegetation Map · Download GIS data	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/trialSystem/top_en.html	2016
	Threatened Wildlife of Japan -Red list - Plant I (vascular plant)	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
	Threatened Wildlife of Japan -Red list - Plant II (nonvascular plant)	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
Mammal	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (mammal)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2002
	Threatened Wildlife of Japan - Red list - Mammalia	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
Aves	Threatened Wildlife of Japan - Red list - Aves	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Aves)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2004

Article	Content	Implementing organization	Form	Date
Amphibia / Reptile	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Amphibia / Reptile)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2001
	Threatened Wildlife of Japan - Red list - Amphibia / Reptile	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/l	2018
Fish	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Fresh water fish)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/kiso/fnd_f.html	2002
	Threatened Wildlife of Japan - Red list - Brackish /Fresh water fish	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
Crustacean	Threatened Wildlife of Japan - Red list - Crustacean, etc.	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
Insect	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (beetles)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2002
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Cicadas & Aquatic Hemiptera)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2002
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Butterflies)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2002
	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Dragonflies)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2002
	Threatened Wildlife of Japan - Red list - Insect	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
Arachnida / Myriapoda	Threatened Wildlife of Japan - Red list - Arachnida / Myriapoda	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018
Land & Fresh Water Mollusks	Distribution Map The National Survey on the Natural Environment Report of the distributional survey of Japanese animals (Land & Fresh Water Mollusks)	Biodiversity Center of Japan, Ministry of the Environment	http://www.biodic.go.jp/ne_research_e.html	2002
	Threatened Wildlife of Japan - Red list - Land / Fresh water mollusks	Biodiversity Center of Japan, Ministry of the Environment	https://ikilog.biodic.go.jp/Rdb/	2018

7.d. Address Where Inventory, Records and Archives are Held

Biodiversity Center of Japan, Nature Conservation Bureau, Ministry of the Environment
5597-1 Kenmarubi, Kamiyoshida, Fujiyoshida City, Yamanashi Prefecture 403-0005
TEL: +81-555-72-6031 FAX: +81-555-72-6035

Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology
1-1-1 Higashi, Tsukuba City, Ibaraki Prefecture 305-8567
TEL: +81-29-861-3540 FAX: +81-29-861-3746

Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-Ku, Tokyo 100-8122
TEL: +81-3-3212-8341

Liparis viridiflora (Photo: JWRC)

7.e. Bibliography

(Note: English translations of titles in Japanese are tentative, unauthorized, and only for information purposes)

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2. Description

2.a.Description of Property

2.a.1. Overview of the natural environment of the nominated property

2.a.1.1. Geology and geography

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Box 2. Amami rabbit (*Pentalagus furnessi*)

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Box 3. Three spiny rat species belonging to the genus *Tokudaia*

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4.a.Present State of Conservation

4.a.1. Present conservation state of species subject to monitoring

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4.b.(i). Development pressures

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5. Protection and Management of the Property
5.h. Visitor Facilities and Infrustracture
5.h.3. Accommodations

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8

Contact Information of Responsible Authorities

8. a. Preparer

8. b. Official Local Institution / Agency

8. c. Other Local Institutions

8. d. Official Web Address

Iriomote cat (*Prionailurus bengalensis iriomotensis*), Iriomote Island (Photo: MOEJ)

8. Contact Information of Responsible Authorites

8.a. Preparer

8.a.1. The Ministry of the Environment

Nature Conservation Bureau

Adress: Chuou Godochosha No. 5, 1-2-2 Kasumigaseki, Chiyoda-ku, Tokyo 100-8975

TEL: +81-3-3581-3351 FAX: +81-3-3591-3228

Naha Regional Office for Nature Conservation

Address: Naha Daiichi Chihou Godochosha, 1-15-15 Higawa, Naha City, Okinawa Prefecture 900-0022

TEL: +81-98-836-6400 FAX: +81-98-836-6401

8.a.2. The Forestry Agency

Forestry Agency

Address: 1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8952

TEL: +81-3-3502-8111 FAX: +81-3-3502-2887

Kyushu Regional Forest Office

Address: 2-7 Kyomachi-honcho, Nishi-ku, Kumamoto City, Kumamoto Prefecture 860-0081

TEL: +81-96-328-3500 FAX: +81-96-355-3891

8.a.3. Kagoshima Prefecture

Amami World Natural Heritage Promotion Office, Nature Conservation Division, Environment and Forestry Affairs Department

Address: 10-1, Kamoike-Shinmachi, Kagoshima City, Kagoshima Prefecture 890-8577

TEL: +81-99-286-2759 FAX: +81-99-286-5546

Oshima Branch Office

Address: 17-3 Naze Nagata-cho, Amami City, Kagoshima Prefecture 894-8501

TEL: +81-997-52-5411 FAX: +81-997-53-7874

8.a.4. Okinawa Prefecture

Nature Conservation Division, Department of Environmental Affairs

Address: 1-2-2 Izumizaki, Naha City, Okinawa Prefecture 900-8570

TEL: +81-98-866-2333 FAX: +81-98-866-2855

Yaeyama Regional Public Works Office

Address: Yaeyama Godochosha, 438-1 Maezato, Ishigaki City, Okinawa Prefecture 907-0002

TEL: +81-980-82-2217 FAX: +81-980-82-1954

8.b. Official Local Institution / Agency

Amami Ranger Office for Nature Conservation, Ministry of the Environment

Address: 551 Koshinohata, Ongachi, Yamato Village, Oshima County, Kagoshima Prefecture 894-3104

TEL: +81-997-55-8620 FAX: +81-997-55-8621

Tokunoshima Ranger Office for Nature Conservation, Ministry of the Environment

Address: Amagi Town Office 4F, 2691-1 Hetono, Amagi Town, Oshima County, Kagoshima Prefecture 891-7692

TEL: +81-997-85-2919 FAX: +81-997-85-2045

Yambaru Ranger Office for Nature Conservation, Ministry of the Environment

Address: 263-1 Hiji, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1413

TEL: +81- 980- 50-1025 FAX: +81-980-50-1026

Iriomote Ranger Office for Nature Conservation, Ministry of the Environment

Address: Komi, Taketomi Town, Yaeyama County, Okinawa Prefecture 907-1432

TEL: +81-980-84-7130 FAX: +81-980-85-5582

Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency

Address: 12-1 Hama-machi, Kagoshima City, Kagoshima Prefecture 892-0812

TEL: +81-99-247-7111 FAX: +81-99-247-6571

Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency

Address: Tsubogawa Building, 3-2-6 Tsubogawa, Naha City, Okinawa Prefecture 900-0025

TEL: +81-98-918-0210 FAX: +81-98-918-0211

Iriomote Forest Ecosystem Conservation Center, Kyushu Regional Forest Office, Forestry Agency

Address: Ishigaki chihou Godochosha 1F, 55-4 Tonoshiro, Ishigaki City, Okinawa Prefecture 907-0004

TEL: +81-980-88-0747 FAX: +81-980-83-7108

Naze Forest Office, Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency

Address: 1-17 Naze Manatsu-machi, Amami City, Kagoshima Prefecture 894-0015

TEL: +81-997-52-4531 FAX: +81-997-52-4531

Tokunoshima Forest Office, Kagoshima District Forest Office, Kyushu Regional Forest Office, Forestry Agency

Address: 7111-2 Kametsu, Tokunoshima Town, Oshima County, Kagoshima Prefecture 891-7101

TEL: +81-997-82-0027 FAX: +81-997-82-0027

Takae Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency

Address: 466-1 Takae, Higashi Village, Kunigami County, Okinawa Prefecture 905-1201

TEL: +81-980-43-2123 FAX: +81-980-43-2123

Aha Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 209 Aha, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1504
TEL: +81-980-41-7328 FAX: +81-980-41-7328

Sonai Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 689 Iriomote, Taketmomi Town, Yaeyama County, Okinawa Prefecture 907-1542
TEL: +81-980-85-6201 FAX: +81-980-85-6201

Ohara Forest Office, Okinawa District Forest Office, Kyushu Regional Forest Office, Forestry Agency
Address: 201 Haemi, Taketmomi Town, Yaeyama County, Okinawa Prefecture 907-1434
TEL: +81-980-85-5308 FAX: +81-980-85-5308

Oshima Branch Office, Kagoshima Prefecture
Address: 17-3 Naze Nagata-cho, Amami City, Kagoshima Prefecture 894-8501
TEL: +81-997-52-5411 FAX: +81-997-53-7874

Yaeyama Regional Public Works Office, Okinawa Prefecture
Address: Yaeyama Godochosha, 438-1 Maezato, Ishigaki City, Okinawa Prefecture 907-0002
TEL: +81-980-82-2217 FAX: +81-980-82-1954

Amami City
Address: 25-8 Naze Saiwai-cho, Amami City, Kagoshima Prefecture 894-8555
TEL: +81-997-52-1111 FAX: +81-997-52-1001

Yamato Village
Address: 100 Yamatohama, Yamato Village, Oshima County, Kagoshima Prefecture 894-3192
TEL: +81-997-57-2111 FAX: +81-997-57-2161

Uken Village
Address: 915 Yuwan, Uken Village, Oshima County, Kagoshima Prefecture 894-3392
TEL: +81-997-67-2211 FAX: +81-997-67-2262

Setouchi Town
Address: 23 Koniya-Funatsu, Setouchi Town, Oshima County, Kagoshima Prefecture 894-1592
TEL: +81-997-72-1111 FAX: +81-997-72-1120

Tatsugou Town
Address: 110 Ura, Tatsugo Town, Oshima County, Kagoshima Prefecture 894-0192
TEL: +81-997-62-3111 FAX: +81-997-62-2535

Tokunoshima Town

Address: 7203 Kametsu, Tokunoshima Town, Oshima County, Kagoshima Prefecture 891-7192

TEL: +81-997-82-1111 FAX: +81-997-82-1101

Amagi Town

Address: 2691-1 Hetono, Amagi Town, Oshima County, Kagoshima Prefecture 891-7692

TEL: +81-997-85-3111 FAX: +81-997-85-3110

Isen Town

Address: 1842 Isen, Isen Town, Oshima County, Kagoshima Prefecture 891-8293

TEL: +81-997-86-3111 FAX: +81-997-86-2301

Kunigami Village

Address: 121 Hentona, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1495

TEL: +81-980-41-2101 FAX: +81-980-41-5910

Ogimi Village

Address: 157 Oganeku, Ogimi Village, Kunigami County, Okinawa Prefecture 905-1392

TEL: +81-980-44-3001 FAX: +81-980-44-3139

Higashi Village

Address: 804 Taira, Higashi Village, Kunigami County, Okinawa Prefecture 905-1292

TEL: +81-980-43-2201 FAX: +81-980-43-2457

Taketomi Town

Address: 11-1 Misaki-cho, Isigaki City, Okinawa Prefecture 907-8503

TEL: +81-980-82-6191 FAX: +81-980-82-6199

8.c. Other Local Institutions

Amami Wildlife Conservation Center

Address: 551 Koshinohata, Ongachi, Yamato Village, Oshima County, Kagoshima Prefecture 894-3104

TEL: +81-997-55-8620 FAX: +81-997-55-8621

Amami Park

Address: 1834 Kasari-cho Setsuta, Amami City, Kagoshima Prefecture 894-0027

TEL: +81-997-55-2333 FAX: +81-997-55-2612

Kagoshima Prefectural Amami Library

Address: 1-1 Naze Furuta-cho, Amami City, Kagoshima Prefecture 894-0016

TEL: +81-997-52-0244 FAX: +81-997-52-9634

Amami Museum

Address: 517 Naze Nagahama-cho, Amami City, Kagoshima Prefecture 894-0036

TEL: +81-997-54-1210 FAX: +81-997-53-6206

Amami Seaside Museum

Address: 701-1 Naze Koshuku-ohama, Amami City, Kagoshima Prefecture 894-0046

TEL: +81-997-55-6000 FAX: +81-997-54-8005

“Kuroshio-no Mori” Mangrove Park

Address: 478 Sumiyo-cho Ishihara, Amami City, Kagoshima Prefecture 894-1201

TEL: +81-997-56-3355 FAX: +81-997-56-3377

Setouchi Municipal Museum and Library

Address: 1283-17 Koniya, Setouchi Town, Kagoshima Prefecture 894-1508

TEL: +81- 997-72-3799 FAX: +81-997-72-3999

Amami Tourism & Products Federation

Address: AiAi Hiroba, 14-10 Naze Suehiro-cho, Amami City, Kagoshima Prefecture 894-0027

TEL: +81-997-53-3240 FAX: +81-997-57-6244

Amami-Oshima Tourism Association

Address: 19-15 Naze Saiwai-cho, Amami City, Kagoshima Prefecture 894-0025

TEL: +81-997-54-4991 FAX: +81-997-55-1181

Uken Tourism & Products Association

Address: 2937-34 Yuwan, Uken Village, Kagoshima Prefecture 894-3301

TEL: +81-997-67-2071

Amami Setouchi Tourism Association

Address: Setouchi Seaside Station, 26-14 Koniya Ominato, Setouchi Town, Kagoshima Prefecture 894-1503

TEL: +81-997-72-1199

Tokunoshima Tourism Organization

Address: 1-1 Asama, Amagi Town, Kagoshima Prefecture 891-7605

TEL: +81-997-81-2010

Yambaru Wildlife Conservation Center “Ufugi Nature Museum”

Address: 263-1 Hiji, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1413

TEL: +81-980-50-1025 FAX: +81-980-50-1026

Okinawa Rail Ecology Exhibition Learning Facility “Kuina-no Mori”

Address: 1477-35 Ada, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1503

TEL: +81- 980-41-7788

Kunigami Environmental Education Center “Yambaru Discovery Forest”

Address: 1301-7 Aha, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1504

TEL: +81-980-41-7979

Higashi Museum

Address: 61-1 Kawada, Higashi Village, Kunigami County, Okinawa Prefecture 905-1203

TEL: +81-980-51-2828

Roadside Station “Yui Yui Kunigami”

Address: 1569-1 Okuma, Kunigami Village, Kunigami County, Okinawa Prefecture 905-1412

TEL: +81-980-41-2420

Ogimi Tourism Association

Address: 1357-18 Taminato, Ogimi Village, Kunigami County, Okinawa Prefecture 905-1314

TEL: +81-980-44-1960

Higashi Village Tourism Promotion Council

Address: 471-24 Taira, Higashi Village, Kunigami County, Okinawa Prefecture 905-1205

TEL: +81- 980-51-2655

Iriomote Wildlife Conservation Center

Address: Komi, Taketomi Town, Yaeyama County, Okinawa Prefecture 907-1432

TEL: +81-980-85-5581

Taketomi Town Tourist Assosiation

Address: 1-5 Misaki-cho, Ishigaki City, Okinawa Prefecture 907-0012

TEL: +81-980-82-5445 FAX: +81-980-82-5472

Iriomote Island Ecotourism Association

Address: 870-277 Uehara, Taketomi Town, Yaeyama County, Okinawa Prefecture 907-1541

TEL: +81-980-85-6331 FAX: +81-980-85-6442

8.d. Official Web Address

About the nominated property

URL: http://kyushu.env.go.jp/naha/amami-okinawa/index-en.html

About regional information

URL: http://amamiryukyu.jp/ (in Japanese)

Heritiera littoralis (Photo: MOEJ)

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Signature on behalf of the State Party

Humid subtropical rainforest (Photo: MOEJ)

SHODA Yutaka

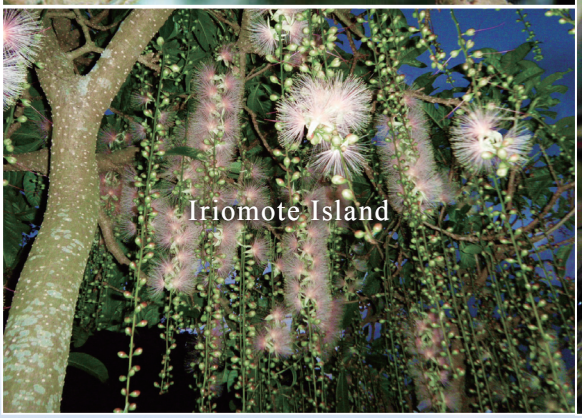
Director-General
Nature Conservation Bureau
Ministry of the Environment
Government of Japan

MAKIMOTO Koji

Director-General
Forestry Agency
Government of Japan


Amami-Oshima Island


Tokunoshima Island


Iriomote Island


Northern Part of
Okinawa Island