HOKKAIDO UNIVERSITY

Potential conservation value of less-intensively managed human modified forests in and around National park

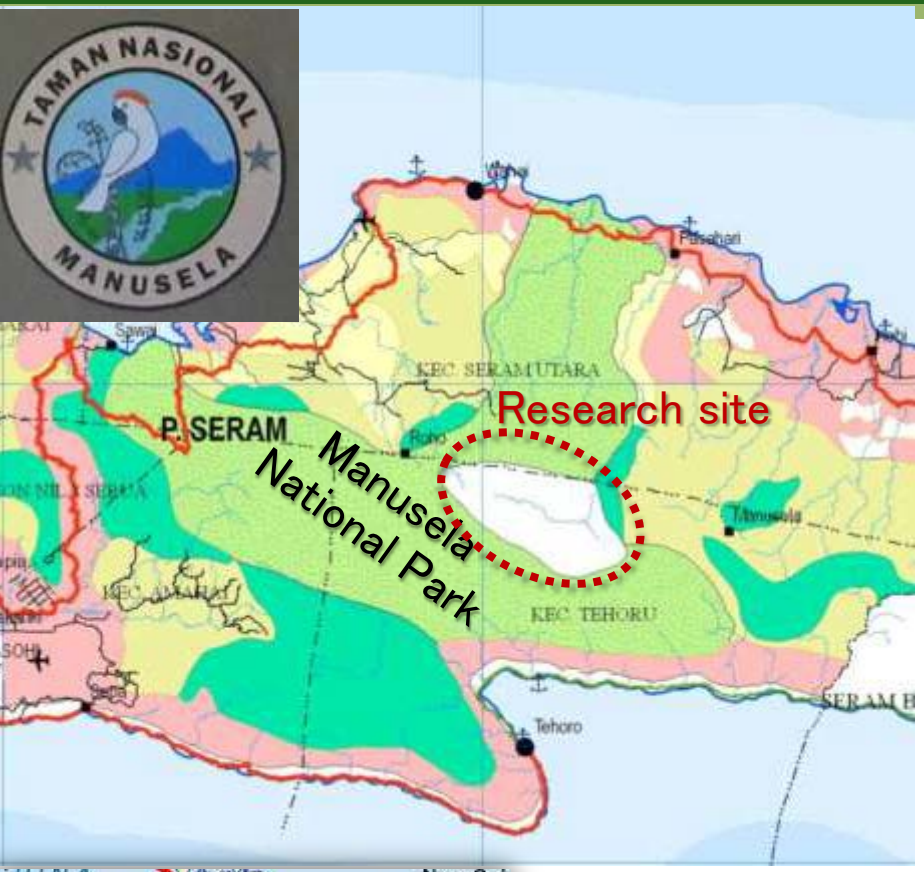
Focusing on interrelationships between local people and wild animal species formed through traditional arboricultural practices

The 1st Asia National Parks Congress

14 November 2013

Masatoshi Sasaoka (Hokkaido Univ.) & Yves Laumonier (CIFOR/CIRAD)

Manusela NP, Parrots and People



- Established in 1989. One of its main expected functions: to help conserve a flagship species, Moluccan cockatoo

CITES1–listed, protected parrot, Moluccan cockatoo (*Cacatua moluccensis*)

- Arboreal-based economy (Latinis 2000): subsistence economy whose practitioners meet the majority of their dietary, nutritional and economic needs through the utilization of arboreal resources

→ Many Human-Modified Forests (HMFs) are created and maintained through arboriculture --- utilization, cultivation, and protection of useful arboreal plants --- in and around the NP

Useful arboreal plants:

- Plants directly used for food, medicine, construction, handicrafts, etc.
- Plants indirectly used for shade, windbreaks, and attracting animals (for trapping), etc.

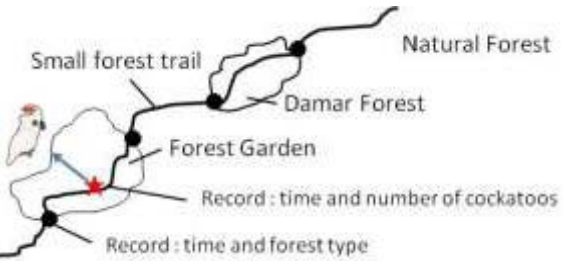
Objectives

- To shed light on how local people create HMFs through arboriculture and use them
- To evaluate the importance of HMFs as habitats for Moluccan cockatoo
- To discuss implications for future conservation and research

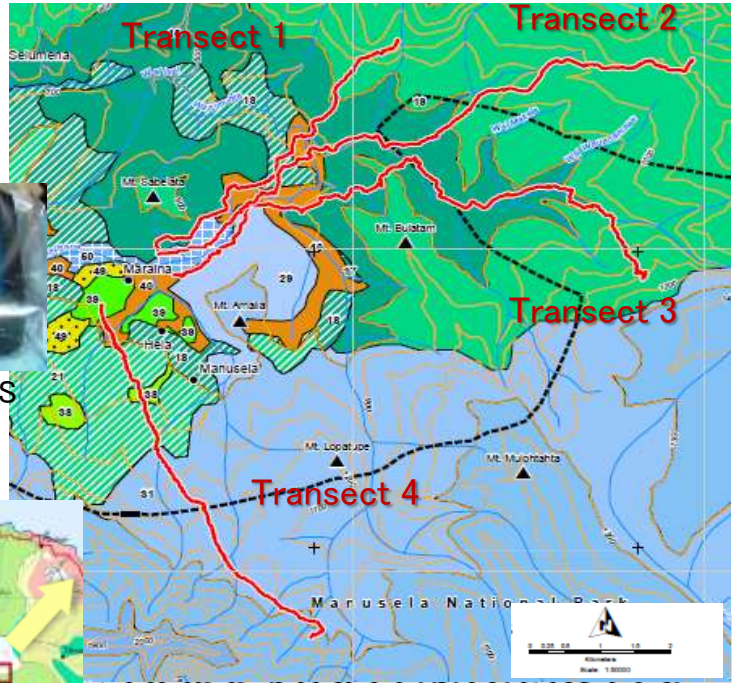
Data collection

- Key informants and group interviews on formation of HMFs , utilization of HMFs, economic acitivities etc. (Oct–Nov 2010, Feb 2012, and Sep 2012)
- Resource inventory surveys (Nov 2003, Oct–Nov 2010, Feb 2012, and Sep 2012)
- Resource utilization & food intake surveys by using self–administered questionnaires (14 house holds for 16 days in Feb 2012 & 14 households for 16 days in Sep 2012)
- Moluccan cockatoo site mapping surveys (26 randomly selected villagers, Feb 2012)
- Participatory parrot transect surveys (Feb 2012 and Sep 2012)

Self–administered questionnaire for food intake survey



Small GPS logger

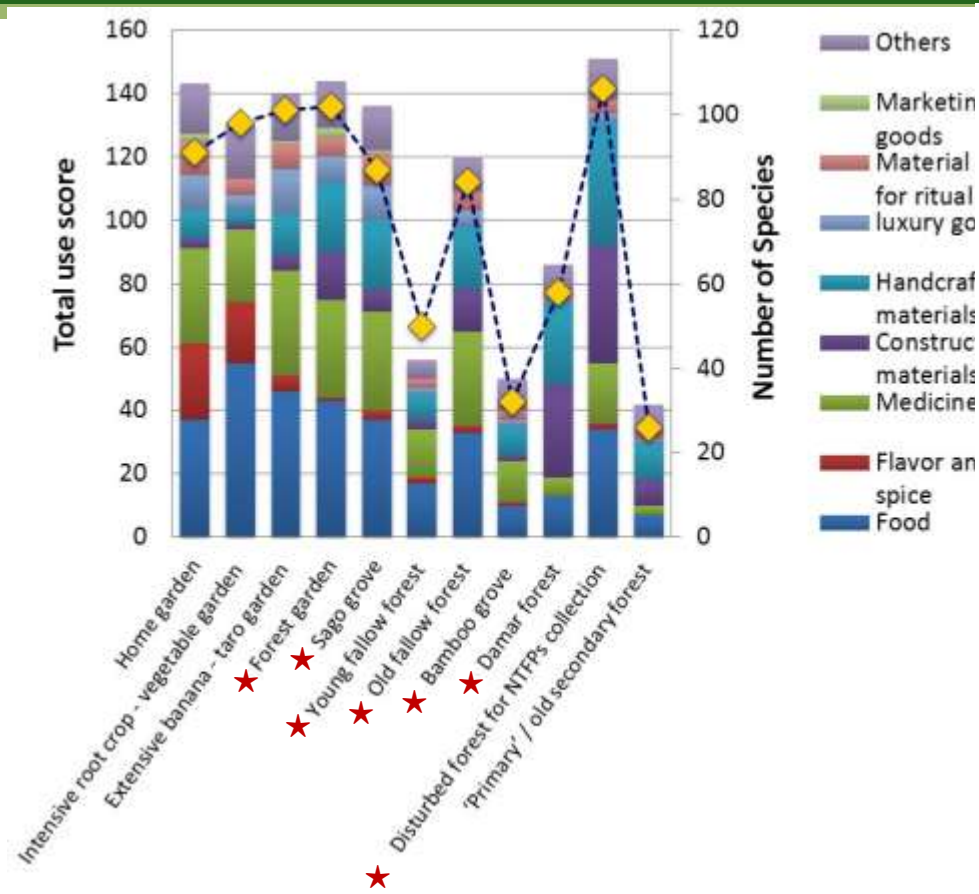


Route	Length of transect(km)	Lowest altitude (m)	Highest altitude (m)	Number of times of survey	
				Fruiting / wet season (Feb. 2012)	Non-fruiting / dry season (Sep. 2012)
Route-1	9.4	860	1190	8	8
Route-2	11.3	800	990	6	10
Route-3	8.5	840	1410	10	10
Route-4	5.6	790	1140	10	10
			Total	34	38

Folk categories of land in Amani oho

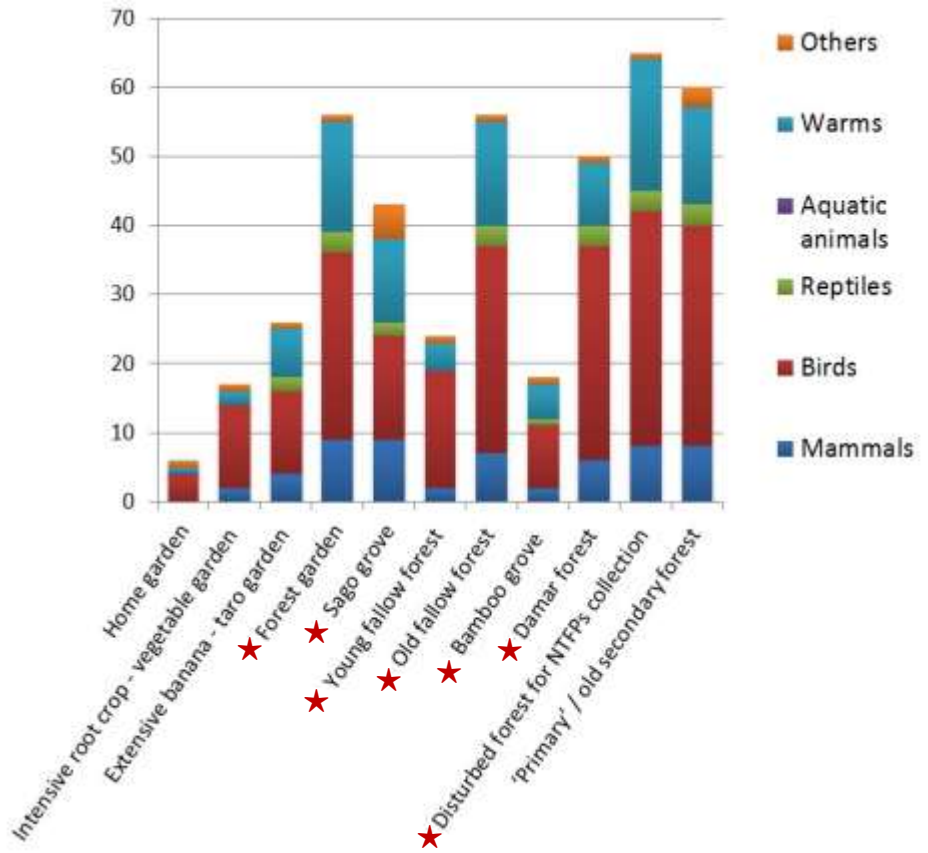
Land types	HMFs	HMFs where the cockatoo often comes	Land use
1. **Residential land and home garden (*Amania*)**			Residential land and home garden with coconut palm, betel nut palm, and various herbs.
2. **Intensive root crop - vegetable garden (*Lela*)**			Intensively managed garden , of which main crops are taro, cassava, sweet potato, vegetables, tobacco, sugar cane, etc.
3. **Extensive banana - taro garden (*Lawa*)**			Extensively managed garden with banana and taro.
4. **Forest garden (Lawa aihua)**	★		Mixed tree garden with fruits trees (durian, jackfruits, etc.) and wild trees
5. **Sago grove (*Soma*)**	★		Sago palm (*Metroxylon sago*)grove that supply sago starch, staple food for local people.
6-7. **Cultivatable land and fallow forest (*Lukapi*)**			Cultivatable land where huge roots of trees have decayed and fallow forest that was formed in the ex-*lela* and ex-l*awa.*
6. **Young fallow forest (*Lukapi holu*)**	★		Fallow forests with relatively small young trees that can be cut by machete (parang).
7. **Old fallow forest (*Lukapi mutuani*)**	★		Fallow forests with relatively large trees that cannot be cut by machete. In old fallow forest area, there are Itawa forest patches - *Litsea mappacea* - dominated forest s that are used as a trapping ground for edible wild birds.
8. **Bamboo grove (*Awa harie* etc.)**	★		Bamboo grove made by local people. Several species of Bamboo are used as handicraft materials, fuel wood, etc.
9. **Damar forest for resin collection (*Kahupe harie*)**	★		*Agathis damara* - dominated forest that has been made and maintained by local people and used for resin (damar) collection.
10. **Disturbed forest for NTFPs collection (*Airima harie*)**	★		Semi-disturbed natural forest used for collecting fuel wood, construction timber, rattan, etc.
11. **'Primary' / old secondary forest for hunting/ trapping (*Kaitahu*)**			'Primary' and mature secondary forest situated far from the village settlement and used for hunting /trapping grounds.

Various forest provisioning services from HMFs (1/2)



Plant resources (★: HMFs)

Note: "Total use scores" were counted in the following way: For example, cassava has 2 use scores for food since the roots as well as the leaves of cassava can be eaten.

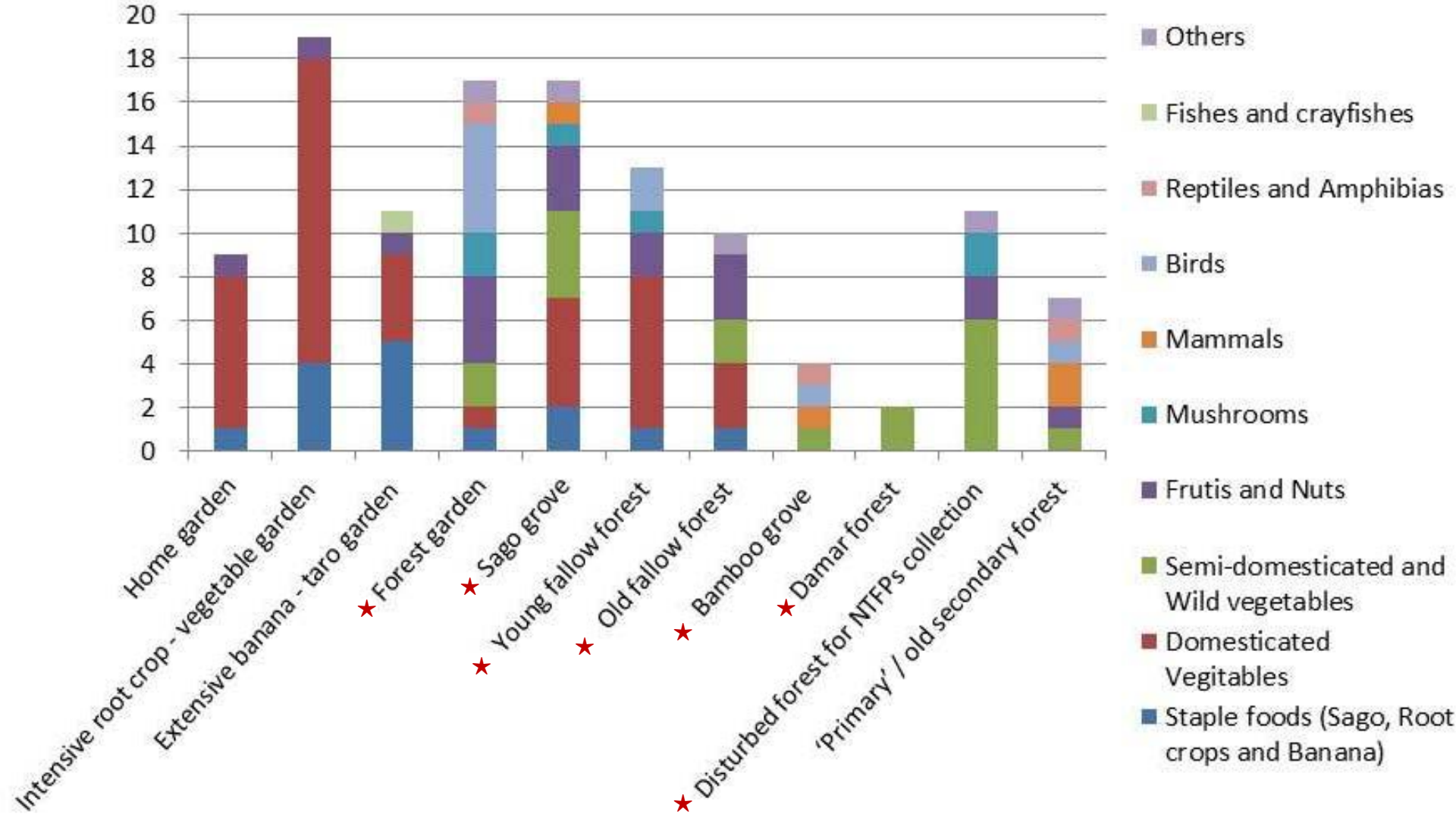


Animal resources (★: HMFs)

Note: These animal resources are mostly used for food.

Number of harvestable wildlife resources in each land type

Various forest provisioning services from HMFs (2/2)



Number of food resources

(14 house holds for 16 days in Feb 2012)

★: HMFs

Utilization of HMFs by Moluccan cockatoo

Forest types	Utilization	Season
Forest garden – mixed fruit tree garden	● Eats fruits of durian, langsat, jackfruit	Jan.–May.
Damar forest– *Agathus damara* dominated forest	● Eats fruits of Agathis damara ● Nests in tree hollows of large dead Agathis damara	All year around

Feeding scars of Moluccan cockatoo on the fruit of durian (left) and *Agathis damara* (right)

Agathis damara

Forest garden

- Mixed fruits tree garden with durian, langsat, jackfruit, water rose apple, etc.
- Formed by planting seedlings or protecting wild seedlings and young trees – mainly dispersed by wild bats (*Pteropus* sp.)
- Mainly distributed in old secondary forest, with a few in 'primary' forest
- Less-intensively managed : Underbrush and vines cut only when harvesting → mixed with many wild plants, no clear boundaries

Forest garden mixed with many wild plants

Villagers harvesting durian

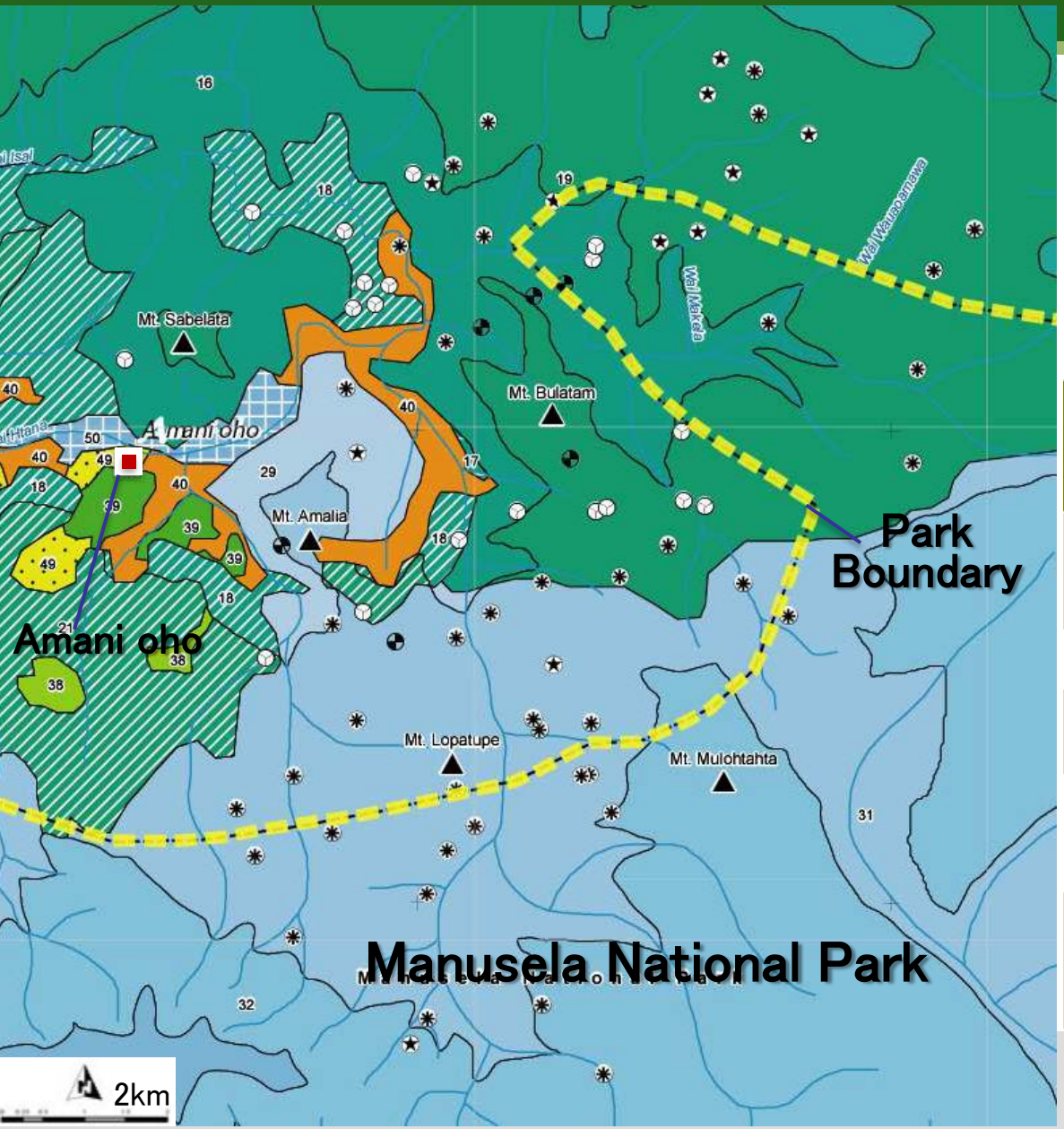
Damar Forest

- *Agathis damara* – dominated forest used for resin (damar) collection
- Formed by selective protection of wild seedlings and young trees
- Patchily distributed in 'primary' and old secondary forests
- Damar is used as a fuel for lamps and kindling; was an important income source up to the mid 1960s
- Felling and barking are strictly forbidden

Damar /copal

Agathis damara-dominated forest

Sites where Moluccan cockatoos frequently seen or heard



: Primary/old secondary forest

: Damar forest

: Forest garden

: Forest garden with damar trees

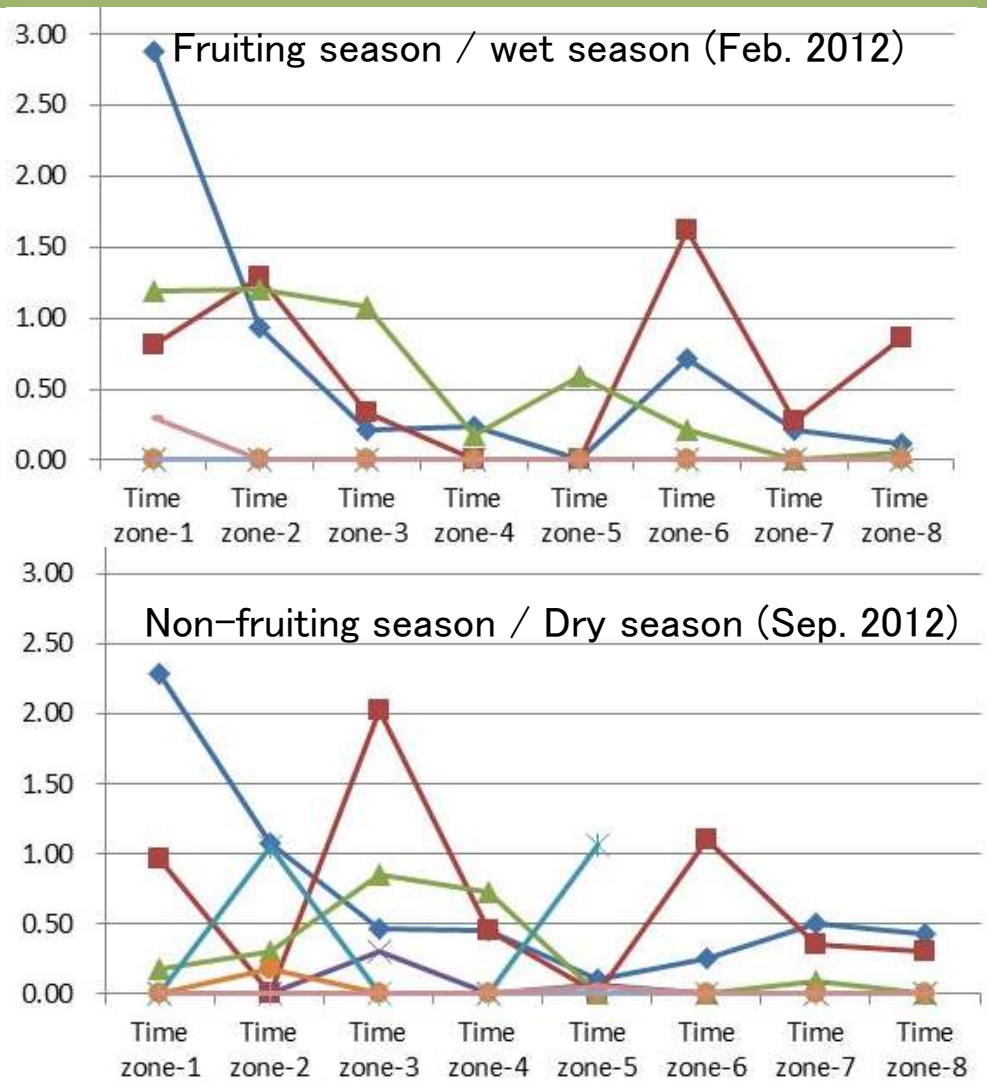
Forest types	Number of the site	Number of the site inside the NP
Primary/old secondary forest	11	3
Damar forest	42	16
Forest garden	19	2
Forest garden with damar trees	6	1

Illegal !

Source: Field work (Feb. 2012)
Note: 78 cockatoo sites were identified by the interviews with 26 villagers.

HOKKAIDO UNIVERSITY

Results of Participatory parrot transect surveys: Relative abundances of Moluccan cockatoo (Number/1000m)



Note: Relative abundance =N/D

N=Number of cockatoos observed

D=Distance observers walked

Note: Time zone-1 6:30-8:00; Time zone-2 8:00-9:00; Time zone-3 9:00-10:00; Time zone-4 10:00-11:00; Time zone-5 11:00-12:30; Time zone-6 14:30-16:00; Time zone-7 16:00-17:00; Time zone-8 17:00-18:00.

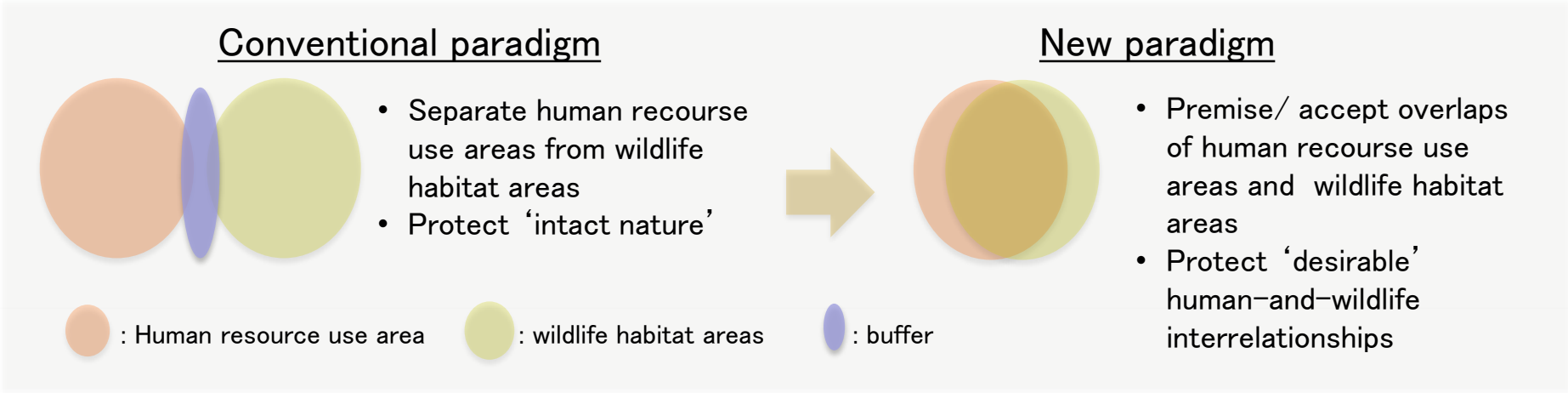
Summing up

- Various HMFs formed through arboriculture enable the local people to enjoy a variety of forest provisioning services

- Among those HMFs, less-intensively managed forest gardens and damar fores are functioning as important parts of the cockatoo's habitats

Implications (1)

- More flexible management measures to allow local people to conduct less-intensive arboriculture under certain conditions inside NP (e.g. limited for subsistence purposes etc.).
- New management paradigm which more focus on human-and-wildlife interrelationships



Implications (2)

- Less-intensive traditional agriculture -> relatively high '*coexistability*' with wildlife.
- 'polarization of landscapes' -> it has become more important to assess conservation value of HMFs

Polarization of landscapes in Tropics

Proses in which rural forest areas are divided and polarized into 'development area' used intensively for agricultural production and resource exploitation, and 'conservation area' where human activities are excluded as much as possible for protect 'intact nature'.

Thank you!

This study was conducted as a part of the CIFOR-Japan project between JFY 2010-2012 (Task manager : Dr. Ken Sugimura (FFPRI)). This study made possible by the grant assistance provided for CIFOR by the Ministry of Foreign Affairs, Japan and Forestry and Forest Products Research Institute, Japan (FFPRI), and also by the facilitation and support of the Collaborative Land Use Planning and Sustainable Institutional Arrangement (CoLUPSIA) Project funded by the EU. We thank these institutions for their assistance and support.

HOKKAIDO UNIVERSITY

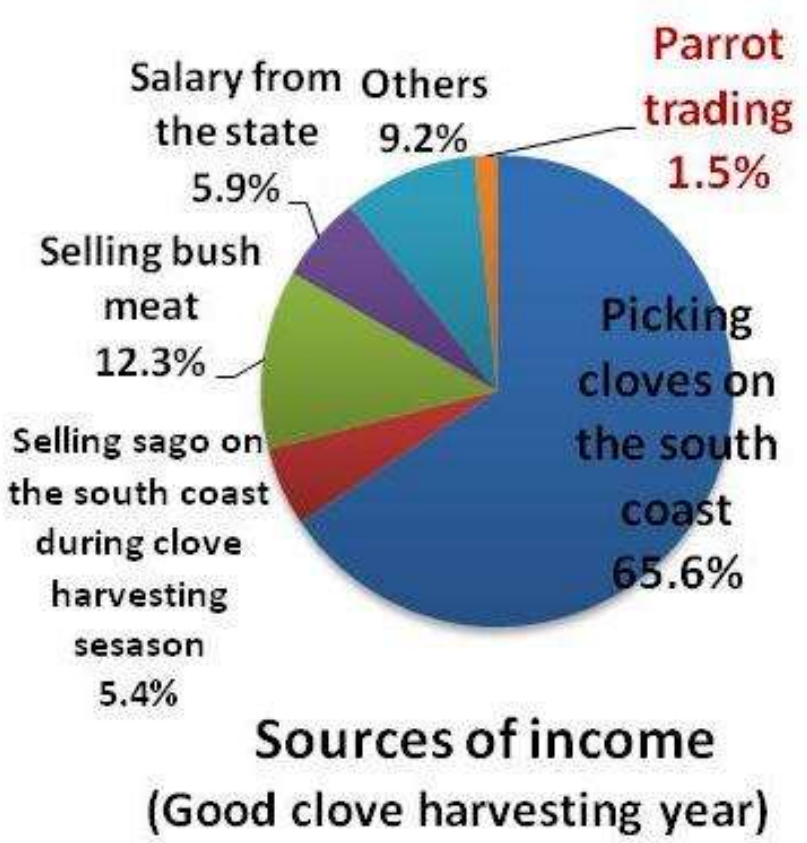
Appendixes

A cockatoo caught by a trap set on a durian tree

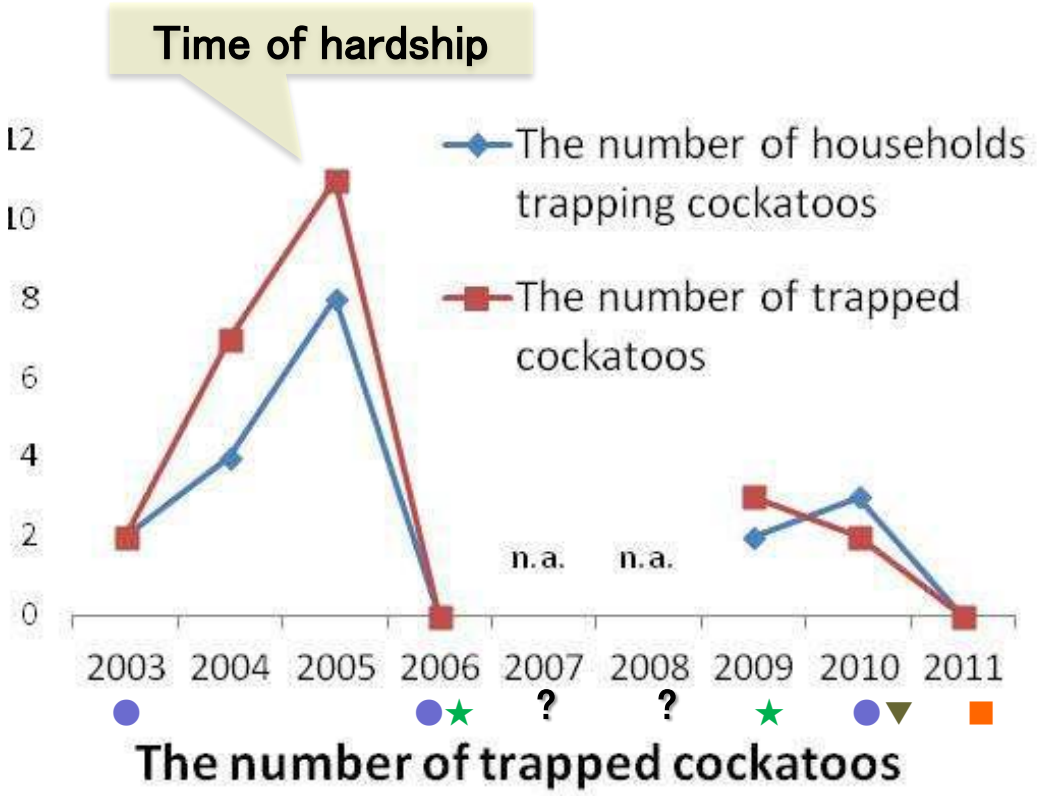
A Moluccan cockatoo trap

A trapped cockatoo for sale at the coast

Parrot: as a supplemental, remedial source of income in times of hardship



Sources of income
(Good clove harvesting year)



The number of trapped cockatoos

●: high clove income, ★: government/NGO –sponsored project, ■: working on oil palm plantations, ▼: selling butterflies

＊ Proportion was estimated based on data collected by using self-administered sheets during 4 data collection periods (total 89 days) in 2003. Informants were14 heads of households.

＊ Data was collected by one-on-one interviews with all heads of households in 2004, 2005, 2007, 2010 and 2012.

Interrelationship between Moluccan cockatoo and humans

Trap the parrots in times of hardship

Provide various forest provisioning services

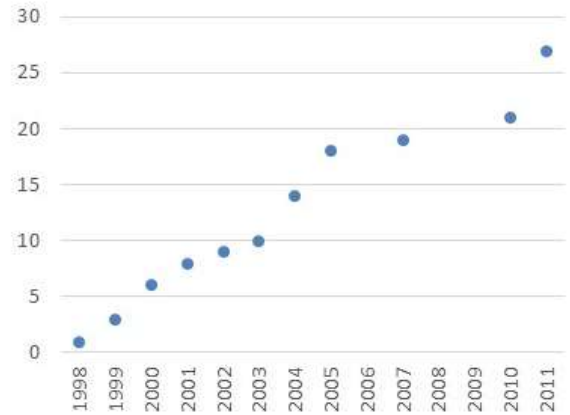
Provide foraging and nesting sites

Arboriculture

HMFs

〈c.f.〉 Moluccan cockatoo: A target of air gun hunting

The number of people who have a air gun

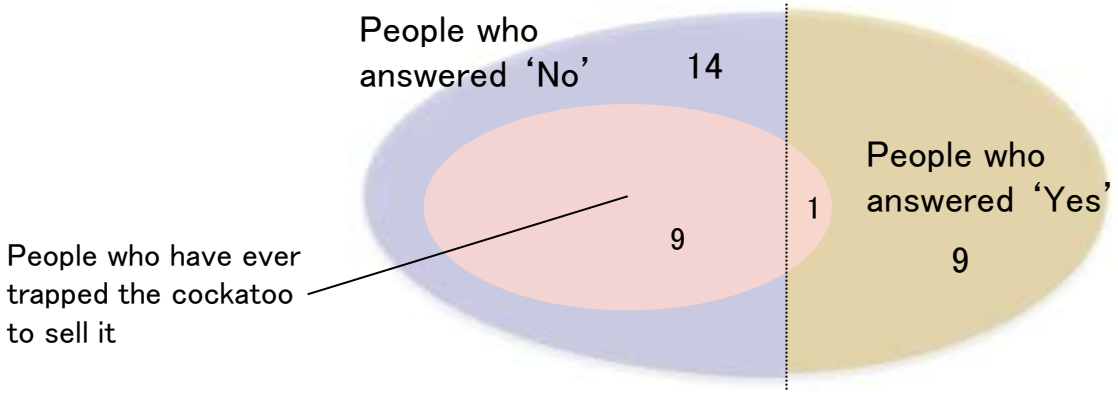


The number of trapped and shot cockatoo

	2003	2004	2005	2006	2007	2008	2009	2010	2011
The number of trapped cockatoo	2	7	11	0	n.a.	n.a.	3	2	0
The number of shot cockatoo(estimated number)	41	35	14	15	n.a.	n.a.	11	2	28

Source: Fieldwork

If you see the cockatoo, will you shoot it?



Source: One-on-one interviews with all villagers who own a air-gun (Feb. 2012)

Relative abundances of Moluccan cockatoo (Number/1000m)

Forest type	Time zone-1 (6:30-8:00)	N	Time zone-2 (8:00-9:00)	N	Time zone-3 (9:00-10:00)	N	Time zone-4 (10:00-11:00)	N	Time zone-5 (11:00-12:30)	N	Time zone-6 (14:30-16:00)	N	Time zone-7 (16:00-17:00)	N	Time zone-8 (17:00-18:00)	N	P
Fruiting season/wet season (Feb. 2012)																	
'Primary' / old secondary forest	2.88	27	0.94	25	0.21	28	0.24	27	0.00	33	0.72	26	0.21	20	0.12	15	0,001***
Damar forest	0.81	30	1.29	14	0.34	11	0.00	13	0.00	7	1.62	8	0.27	13	0.86	22	0,308
Forest garden	1.19	35	1.20	25	1.08	14	0.18	19	0.59	17	0.21	13	0.00	20	0.06	20	0,052*
NTFP collection forest	0.00	4	0.00	9	0.00	12	0.00	7	0.00	8	0.00	9	0.00	15	0.00	8	1000
Old fallow forest	0.00	15	0.00	6	0.00	3	0.00	3	0.00	6	0.00	3	0.00	6	0.00	9	1000
Bamboo grove	0.00	12	0.00	19	0.00	14	0.00	8	0.00	6	0.00	10	0.00	19	0.00	10	1000
Cacao garden	0.00	9	0.00	2	0.00	1	0.00	14	0.00	14	0.00	6	0.00	2	0.00	5	1000
Sago grove	0.30	21	0.00	14	0.00	9	0.00	10	0.00	18	0.00	18	0.00	6	0.00	14	0,286
P	0,009***		0,029**		0,141		0,799		0,142		0,044**		0,254		0,239		
Non-fruiting season / dry season (Sep. 2012)																	
'Primary' / old secondary forest	2.29	34	1.08	24	0.47	25	0.45	33	0.10	39	0.26	24	0.51	29	0.43	28	0,010**
Damar forest	0.97	40	0.00	14	2.03	10	0.45	11	0.00	12	1.10	12	0.36	19	0.31	30	0,036**
Forest garden	0.18	31	0.30	22	0.85	12	0.73	11	0.00	19	0.00	17	0.09	17	0.00	17	0,747
NTFP collection forest	0.00	4	0.00	4	0.30	12	0.00	12	0.07	13	0.00	10	0.00	13	0.00	4	0,412
Old fallow forest	0.00	11	1.05	17	0.00	2	0.00	3	1.07	9		0	0.00	9	0.00	12	0,763
Bamboo grove	0.00	17	0.18	22	0.00	11	0.00	10	0.00	15	0.00	9	0.00	16	0.00	20	0,726
Cacao garden	0.00	21	0.00	8	0.00	2	0.00	7	0.00	17	0.00	9	0.00	5	0.00	14	1000
Sago grove	0.00	25	0.00	11	0.00	20	0.00	5	0.06	27	0.00	19	0.00	3	0.00	18	0,809
P	0,000***		0,000***		0,008***		0,134		0,574		0,081*		0,158		0,054*		

Note1: Kruskal Wallis test.

Note 2: * Significant level 10 %; ** Significant level 5 %; *** Significant level 1 %.

Note 3: Relative abandance = [numbers of observed cockatoo]/[length of a transect unit].

Use of HMFs by other wild animals

Species	Type of HMFs	Utilization
Celebes Wild Boar (Sus celebensis)	Fallow forest (*lukapi*), sago groves, bamboo grove	Eating fruits of durian and jackfruits (fruits fallen on the ground), bamboo shoot, etc.
Grey Cuscus (Phalanger orientalis)	Fallow forest , sago groves, forest garden, human-modified forest parches in old natural forest	Eating leaf stalk of sago palm, fruits of *atau (Syzygium luzonense)*, *masapa (Syzygium malaccense)* etc. Licking sap of *solaoto* (*?*)
Bat (*Pteropus sp*)	Forest garden, bamboo grove, forest garden, sago grove, *lukapi*	Eating fruits of sugar palm, langsat, jackfruits, oma, guava, water rose apple etc.
Malayan Civet (*Viverra tangalunga*)	Forest garden, fallow forest	Eating banana, fruits of durian, jackfruits, papaya, pine apple, etc.
Lories (*Eos bornea, Alisterusamboinensis etc)*	Forest garden	Eating Banana and durian
Papuan Hornbill (*Aceros plicatus)*	*Itawa* (*Litsea mappacea)* dominated forest	Eating fruits of Itawa
Wild birds (*Gymnophaps mada, Ptilinopus superbus etc.)*	*Itawa* (*Litsea mappacea)* dominated forest, edges of garden	Eating fruits of Itawa, leha (*Symplocos cochinchinensis*), awou (*Prunus grisea*), ketapi (*Geniostoma* sp.) etc.