F-6 Global taxonomy initiative for conservation of biodiversity in Asia and Oceania (Abstract of the Final Report)

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1. Introduction

Asia-Oceania region is rich in animals, plants and microorganisms. Their diversity and the endemism in geographically isolated/connected area are concerned to protect as healthy as possible in natural environment .To understand the complexity of biodiversity and possible best decision making on the conservation of such complex and unique nature in the region, exciting set of those components of biodiversity need to be monitored in large. However, the capacity in the world to carry out this is limited[1-2]. Taking this into account, the Convention on Biological Diversity has developed a programme called Global Taxonomy Initiative (GTI)[2] to overcome the limited capacity in taxonomy to develop and provide information on biodiversity and therefore to assist decision making in thematic programmes and cross-cutting issues of the Convention. In response to Convention on Biological Diversity COP decisions V/9[4] and VI/8[5], Global Taxonomy Initiative pilot project through the regional cooperation was carried out by this project in the region. This project included monitoring on selected group of organisms and capacity building in taxonomy at two sites in Asia and studies on information sharing mechanism which required for inventorying and monitoring of biodiversity in the region. In accordance with the GTI programme of work, an assessment on taxonomic needs and capacity, building capacity for generating taxonomic knowledge and facilitating access to taxonomic information were carried out. The result of this project is opened on the GTI Japan web sites (http://www.gti.nies.go.jp, http://www.gtiao.nies.go.jp).

2.Research Objective

In accordance with the GTI Programme of Work, an exemplified model, which is cost effective and extendable to the wide area in Asia and Oceania needs to be established through a

GTI pilot project to build a capacity in taxonomic research associated with appropriate information technology. This project targets to identify the existing taxonomic impediment in the Asia-Oceania region through the regional collaboration and to develop possible solution in information management to meet the needs in the GTI programme of Work. Two countries, Indonesia and Thailand were selected as collaborators. The existing international research/information networks were involved as large as possible to facilitate the activities in the region to fill the gaps of human capacity and information required for the implementation of the GTI programme of work.

2. Research Method

2-1 General scheme of GTI pilot project

By surveying taxonomic needs and capacity, agreement on how to initiate GTI pilot project to be hammered out regionally. In concordance with such regionally agreed Programme of Work for GTI, collaborative research on the possible widest coverage of taxa can be implemented regionally. Assessment of needs and capacity in taxonomy was carried out and followed by regional workshops to develop and monitor the GTI in the region. The observation sites, Lombok and Slaweshi in Indonesia, Puket, Libong and other coastal area in Thailand were selected to study on appropriate collaboration in the pilot project for building capacity in classification and identification in selected group of organisms such as vascular plants, coastal animals, marine invertebrates, microalgae and fungi. In parallel to the taxonomic research, digitization of taxonomic information and sharing mechanism on internet was studied.

2-2. Taxonomic needs and capacity assessment and GTI regional workshop in Asia and Oceania

Assessment was carried out by sending the questionnaire[6)] and providing electronic questionnaire file on WWW. Collection of completed questionnaire and statistics was performed prior to the GTI regional workshop in Asia (Putrajaya, Malaysia, September 2002). Selected topics highly relevant to GTI pilot project ; Identifying gaps in taxonomic coverage: lessons learnt from previous GEF funded project: invasive species: access and benefit sharing: open source/free software: Global Biodiversity Information Facility, were discussed at the working group sessions[6)].

2-3 Collaboration of Japanese and counterparts in Indonesia and Thailand in taxonomic research.

Thailand (Phuket and some other sites) and Indonesia (Libong island and Sulawesi) were selected to collaboratively establish a model project with Japanese experts in taxonomy in vascular plants, coastal animals (fishes and crustaceans), marine invertebrates, and fungi. Shallow water fishes and marine invertebrates were collected in eastern-north tip of Slawesh, and/or Libong island in Indonesia. Microalgae were collected and isolated in Thailand. Sampling and isolation of mangrove inhabiting oomycetes, endophytic fugi and soil fungi were

carried out in Indonesia. In both countries the sampling and isolation technology were transferred to the local young scientists. Trainings on microscopic sorting on marine invertebrates and on fixed specimens of microalgae (diatoms and chrysophytes) were provided. Training of scanning electron microscope and transmission electron microscope on culturable microalgae strains were also provided in Thailand.

2-4. Information sharing

The fish expert digitalized countable characters of fishes from publications to develop electronic identification of fishes. The information scientists' group made a hearing from taxonomists and other biologists regarding impediment of providing data publicly available and difficulties on digitizing specimens and other important data for taxonomic studies. International standards on data exchange used on existing distributed databases systems and useful informatics resources which can be incorporated into GTI portal site were scrutinized.

Digitization of original description in Nematoda (761 species, 7GB) and microalgae (444 species, 3GB) were carried out by scanning and these electronic files were uploaded to the GTI web server. These files are accessible within the use for research and education purposes and protected by an authentication mechanism by password on the web server.

Specimen and species name information are stored in PostgreSQL 7.1 on Red Hat Linux 9. To develop GBIF data provider, field matching was done by referencing to TDWG standard, Darwin Core2[7] and open source software DiGIR[8] was implemented.

3. Results

3-1 Taxonomic capacity in Asia-Oceania

Taxonomic impediment found in Asia through the assessment was shown in the publication[6] below. Briefly,communication and networking is still premature although existing and planned networks are many. Collections(140) and experts(831)were identified in Asia. Lacking of experts in microorganisms,protozoa,invertebrates was more serious than those in plants and vertebrates.Infrastructure for microbiology was less adequate compared to the facility for studying higher organisms.Aging of taxonomic community was observed. The type specimens which were originally found in the region are kept in the remote countries and both specimens and the corresponding references are hardly accessible from the researchers and specialists who are involved in inventorying and monitoring of biodiversity in the region. It was stressed at the regional workshop in Asia(2002) and in Asia-Oceania(2004) that information on type specimens and location and images of those types would greatly help taxonomic studies in the region.The results of the workshop were complied and reported back to the secretariat of CBD and the regionally agreed GTI programme of work was published.Publication is available either at National Institute for Environmental Studies or at the following download site. (http://www.nies.go.jp/kanko/kenkyu/pdf/r-175-2003.pdf file size:>27MB).

3-2 Vascular plants collection and identification

In 2002 we surveyed possible research sites in both Indonesia and Thailand, and found Lombok island of Indonesia to be suitable as a model site for this project in 2003 and onward. In 2003 we executed field works at Lombok in July and November and collected and identified 492 collections. They included specimens of 337 angiosperm species in 269 genera of 98 families. Among them, 196 genera (72%) and 293 species (87%) were new record. They were kept as database record and greatly increased our knowledge on plant diversity of Lombok. Also, we invited a researcher from Thailand to the GTI International Workshop and discussed GTI work program in Thailand. In 2004 we executed field works at Lombok in February of 2005 and collected 600 specimens in total including of those of a new species of Euphorbiaceae.

3-3 Marine invertebrates collection and identification

Based on the training of young Thai staff working in PMBC, they finished processing samples collected from coasts of Thailand as well as Japan for further taxonomic studies using microscopy. The number of specimens prepared by them was 669,978 individuals, and 10,742 specimens of nematodes were whole mounted for microscope examination. Based on the collaborations among Japanese and Thai scientists, a field guide of 26 species of the Arcidae (one molluscan bivalve family) from Thailand was published, and one database about nematode fauna of Libong Island was established. In addition, a complete list of nematode species with original publication in digital format was provided from Kyoto University to Thailand for further taxonomic study of nematode specimens collected during this GTI project. Also collaboration with Prince of Sonkura University regarding taxonomy of macroalgae has started, and for the next step of capacity building on macroalgae taxonomy in Asia region including Thailand and Indonesia, 5th Asian Pacific Phycological Forum (APPF) will be held at Bangkok, Thailand during 29 October to 4 November 2005.

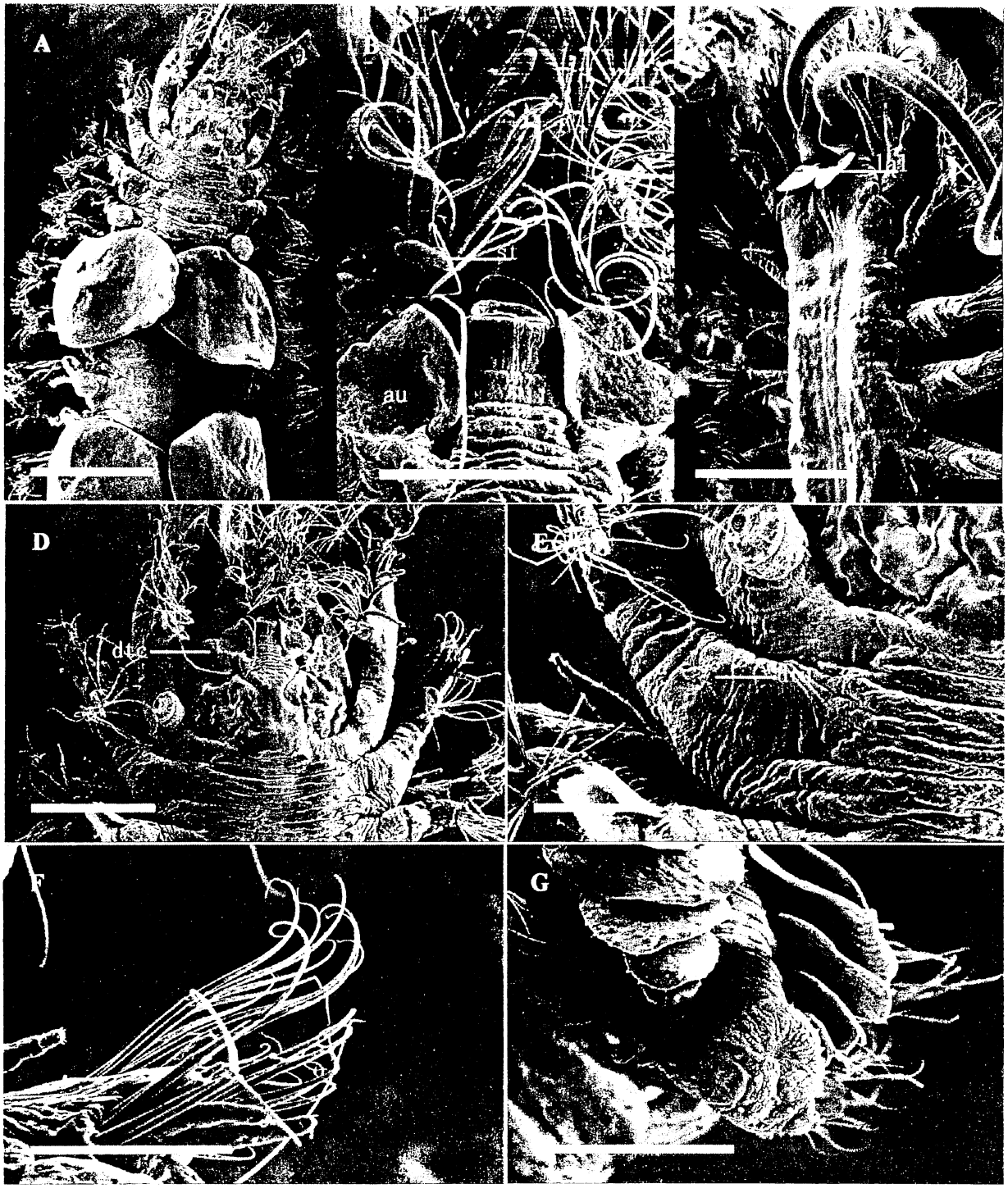
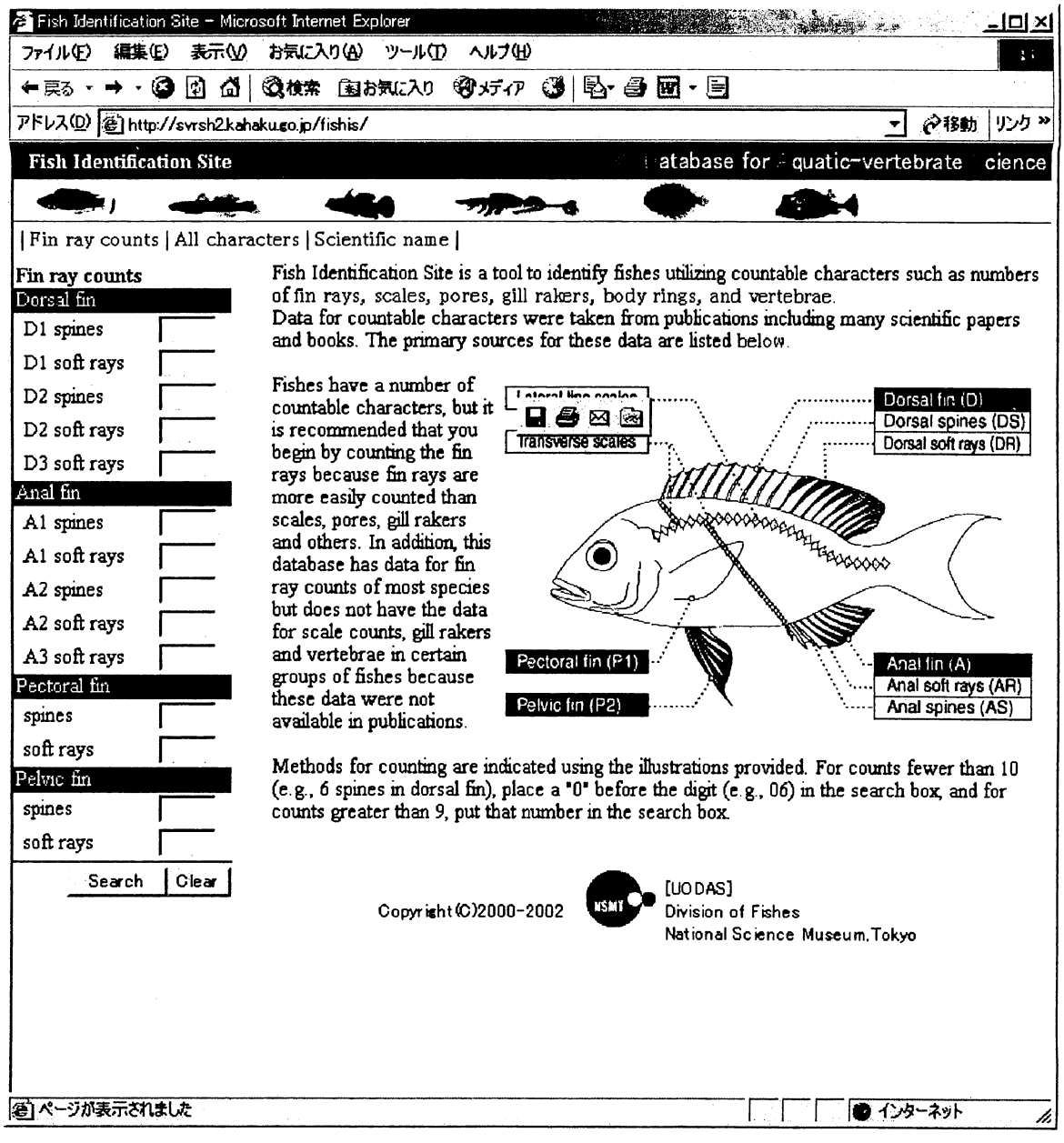


Fig 1. Scanning Electron Microscopy taken by Charatsee Aungtonya of Thailand during the training at Kyoto University. *Labiosthenolepis* sp.

A–D. Anterior segments, dorsal view, style of median antenna lost (A–B, D), close-up of auricles (B), ventral view (C); E. Segment III; F. Parapodia from middle region, anterioventral view; G. Posterior end, dorsolateral view. – Specimen no. 1: A–B, D–G; specimen no. 2: C. Scales = 500 μm (A, C), 250 μm (D), 200 μm (G), 100 μm (B, E–F).

3-3 Fish collection and identification

Electronic versions of the field guide for fishes of Lombok and Sulawesi in Indonesia, and Libong Island in Thailand cover representative fishes found in coral reefs, mangroves, seagrass beds, and sandy beaches. The electronic identification tool for fishes was expanded to cover more than 4,000 species found in temperate and tropical waters in the western Pacific and Indian Ocean. An identification tool for shallow water shrimps was also produced. These identification tools are greatly helpful not only for fish specialists but also for people working for biodiversity conservation because they can identify fishes and shrimps by using these tools without detailed taxonomic knowledge.



3-4 Microalgae collection and Identification

First, we conducted taxonomic needs assessment in Thailand and Indonesia, and found that the Thai inventory is lacking several algal groups (Lewmanomont et al. 1995, Peerapornpisal 2005), such as Glaucophyceae, Prasinophyceae, Prymnesiophyceae, etc. Accordingly, we focused on such groups for taxonomic study during this study period. From the samples collected during the two field trips with local researchers in Thailand, we found eight divisions and eleven classes of microalgae that were new record. We also collected original descriptions for such species to facilitate local researchers to access such original papers [9-10]. Thus the taxonomic data compiled would be available for publication of a field guide. We also transferred our taxonomic techniques to local researchers during the field survey and training courses. We established the methods for sampling, cell number estimation and observation of benthic microalgae by enrichment techniques and the most probable number method. In September 2003 we collected 26 surface sediment samples in the Ranong Biosphere Reserve. The benthic microalgae composition revealed a high diversity of the flora with more than 69 different genus/species. Benthic microalgae composition, cell abundance and biodiversity indexes vary with each microhabitat with no clear trend, more likely due to the fact that microalgae living in mangroves area are developing strategies to survive in this particularly stressful ecosystem.

3-5 Fungi collection and identification

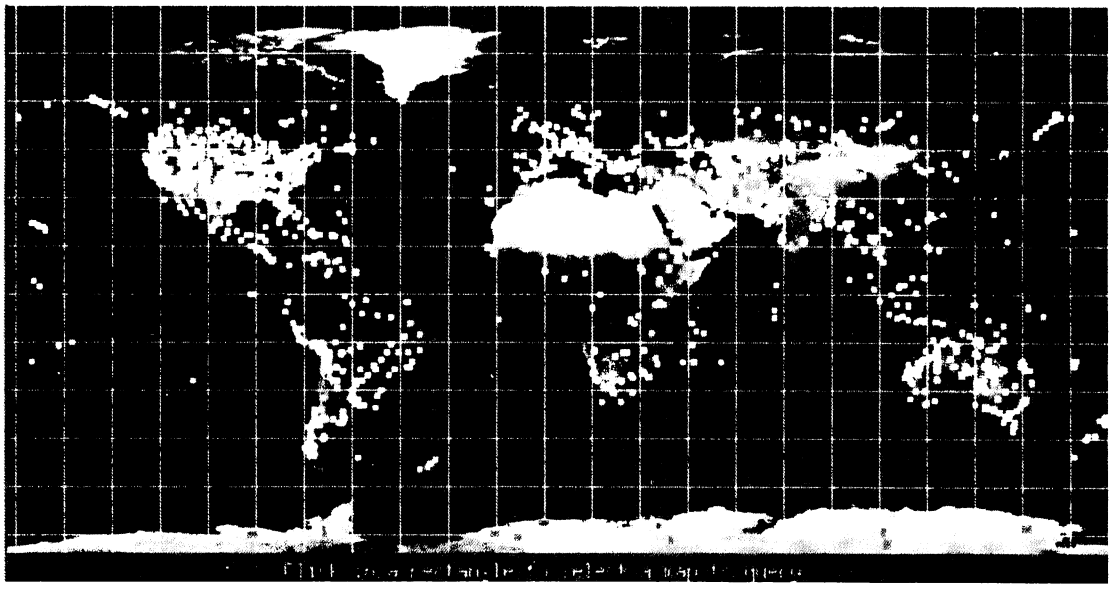
We, each three mycologists from Indonesia and Japan, carried out identification and taxonomic study of 440 fungal strains, which were isolated from mangroves in Indonesia during this project. Their taxonomic data were compiled into an identification guidebook, "A Guidebook to Identification of Fungi Inhabiting Mangroves and Surrounding Area in Indonesia". In addition to the species lists found in this study, the guidebook contains description about taxonomy, ecology, phylogeny of the targeted fungal groups and methodology for isolation, incubation, observation, identification and classification. Thus, we hopefully expect this guidebook can be used as a study guide by Indonesian mycologists to promote further research on taxonomy of fungi in Indonesia. At the end of the project, we held a workshop, "GTI Training Workshop on Diversity of Fungi Inhabiting Mangroves and Surrounding Area in Indonesia" at Bogor in February, 2005. We also hope this activity would contribute for capacity building of fungal taxonomy in Indonesia.

3-6 Information sharing

To facilitate communication and disseminating information on GTI in general, GTI Web site (http://www.gti.nies.go.jp/) and listserv (gtiao@nies.go.jp) were developed. The databases and web sites implemented/updated through this project were listed in the table 1.

URL	Contents	Record number (in database only)	Remarks
http://www.gti.nies.go.jp/	GTI Web pages		English and Japanese
http://www.gtijp.nies.go.jp/	GTI Japan data provider for GBIF	66,000 records	National Science Muerum Fish Collection, JTYPES, Kyoto Univ. Museum, EASIANET Accessible from GBIF
http://www.bios.nies.go.jp/	Bacterial names	13,000	Accessible from GBIF
http://www.easianet.nies.go.jp/	EASIANET Web pages		English
http://www-gtiao.nies.go.jp/	Taxonomic literature	(1,100 taxa, PDF files searchable by name)	Password required to access

To collect data from remote researchers, a process of data flow using worksheet (MS excel etc.) was developed and applied for data collection from EASIANET. To collaborate with wider area in Asia-Oceania region. The system architecture to map nature occurrence was designed. To test the prototype architecture, data was collected from various information resources available on internet and the specimens collected by Japanese scientists were applied to this system (Fig).



3-7. Facilitation of research and information networks

The result of the survey on taxonomic needs and capacity was sent to SBSTTA9 then to COP7 of the Convention on Biological Diversity. The COP decision included to reflct the report from the regional workshops held in 2002 and 2004 under this project on the review process of the GTI porgramme of work. The human network which is necessary for appropriate taxonomic work and information sharing, EASIANET and PBIF (Pacific Biodiversity Information Forum) were established and started to disseminate information on web as of collaboration with the

projects under the auspice of a NGO, BioNET INTERNATIONAL, and Pacific Science Association, respectively. EASIANET covers East Asian 7 countries and economies and PBIF covers the Asia and Oceania including island countries in the Pacific.

5. Discussion

Taxonomic impediment found in Asia through the assessment was that communication and networking is still premature although existing and planned networks are many. In the process of digitizing information, many participated scientists in Asia expressed that training in information science is necessary for supporting taxonomy to become more useful in nature conservation. This is mostly related to the issue that databasing and visibility of taxonomic work on internet to help in facilitation of identifying species. And at the sametime, it increases public awareness on the biodiversity in their own region. Non-English languages used in the wide area in Aisa-Oceania need to be more carefully concerned in the process of developing databases and information sharing systems. Large numbers of computer tools for developing taxonomic database or sharing information on internet are designed for the gonfiguration on the English operating system. Taxonomists and parataxonomists who are trained in this project expressed that the problems exist in not-so-friendly user interface and difficulty to handle the data items on vernacular names of organisms, locality of specimens, collectors and/or collection information in the process of digitization of data.

We found that social needs for the taxonomy are high and it is urgent need to build capacity for taxonomy and train young scientist to be established taxonomists. It is major issue to overcome in the future to confirm continuity of funding in international framework even though funding system in Japan is strictly yearly basis.

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