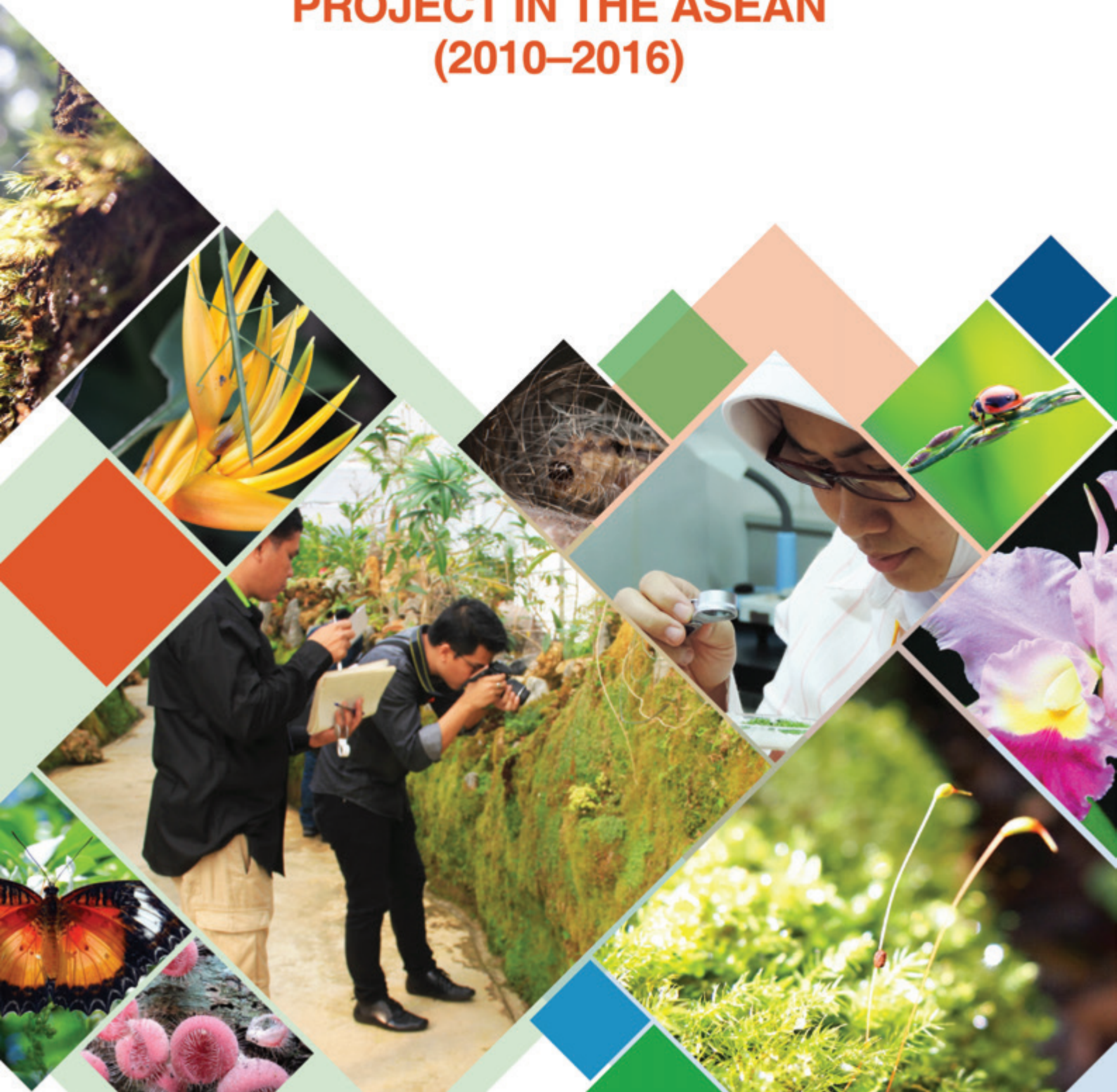




IMPACT ASSESSMENT OF TAXONOMIC CAPACITY BUILDING ACTIVITIES OF THE JAPAN-ASEAN INTEGRATION FUND PROJECT IN THE ASEAN (2010–2016)



Impact Assessment of Taxonomic Capacity Building Activities of the Japan-ASEAN Integration Fund Project (2010–2016)



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A group of people, including students and researchers, are walking across a wooden bridge in a lush, green forest. They are dressed in casual attire, and some are carrying backpacks. The scene is bright and natural, with sunlight filtering through the trees.

Executive Summary

The *Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity* project was conducted in response to the call of the Convention on Biological Diversity (CBD) to strengthen taxonomy in the ASEAN region. The project was conducted by the ASEAN Centre for Biodiversity (ACB), in partnership with the Ministry of the Environment-Government of Japan (MoE-J), Biodiversity Center of Japan, and East and Southeast Asia Biodiversity Information Initiative (ESABII), and supported by the Japan-ASEAN Integration Fund (JAIF). The project conducted 18 training workshops and four internship programs from 2010 to 2016, following the Global Taxonomy Initiative (GTI) Regional Action Plan 2010–2015. It provided representatives of the ASEAN Member States (AMS) with training on the scientific knowledge and methods of species collection, identification, and specimen management, which had significantly enhanced knowledge and skills of 449 trainees on the taxonomy of selected plants (bryophytes, pteridophytes, palms, invasive alien species, orchids, and palms), freshwater and brackish water fish, corals, and reptiles. Other significant outputs of the project include the development of four guidebooks and six training manuals, which were printed and distributed for reference to the AMS. New discoveries were also made in the course of the taxonomy trainings—an undescribed species of palm was found by participants in the herbarium of Lembaga Ilmu Pengetahuan Indonesia (LIPI), and one new record each of bryophyte and pteridophyte were uncovered in northern Thailand.

During the 25th Meeting of the ASEAN Working Group on Nature Conservation and Biodiversity (AWGNCB) held from 8 to 9 June 2015 in Bangkok, Thailand, ACB was requested to evaluate the relevance and usefulness of these training workshops and internship programs on taxonomy. This initiated the *Impact Assessment of Taxonomic Capacity Building Activities of the Japan-ASEAN Integration Fund Project in the ASEAN (2010–2016)*. Specifically, it aimed to: (a) determine the impacts of the training courses and internship programs on taxonomy to the AMS and the participants; (b) identify gaps and needs in taxonomy in the AMS; (c) identify interventions initiated by the participants and AMS to further strengthen capacities on taxonomy; and (d) document stories, good practices, and lessons learned for possible sharing and replication to other AMS.

Participants in the impact assessment study, especially those working in herbaria, museums, botanic gardens, and the academe, strongly considered the trainings very relevant. These capacity building activities enhanced their knowledge on the collection, identification, and management of specimens and motivated them to conduct similar activities in their respective countries. Some participants conducted short seminars and field work about the training and collected more specimens for their herbarium. Participants working in the academe expanded lectures and laboratory exercises to include lessons learned from the training.

The training workshops and internship programs provided a venue to share experiences and good practices of AMS. It also enhanced collaboration and the creation of informal networks among participants, resource persons, and other experts on taxonomy in the region. The trainees worked hard to properly accomplish projects, which improved their discipline and punctuality.

The trainees found their participation in the development of the field guidebooks and training manuals very fulfilling because of the need to produce tangible and usable outputs of research work such as field guides and other publications. Visits to botanic gardens, herbaria, and national parks in Indonesia, Malaysia, and Thailand allowed the participants to appreciate the variety of biodiversity in the region and observe good practices in biodiversity conservation and management. The trainees also recognized the expertise of the resource persons from Indonesia, Malaysia, Philippines, Singapore, Thailand, China, and Japan and their capability to conduct the taxonomy training programs and internship programs.

Mission visits revealed that Indonesia, Malaysia, Philippines, Singapore, and Thailand had already developed their own small pool of taxonomists. These AMS also have significant collections of plant and animal specimens in herbaria, museums, botanic gardens, and wildlife centers. Collaboration with these partners provided a source of competent resource persons, sample specimens for laboratory exercises, and references for the JAIF Project.

There is still a low level of awareness on the importance of taxonomy and biodiversity conservation. Thus, the demand for enhanced public awareness programs and conduct of more and advanced trainings on priority species remains high among AMS. The development of a local pool of experts in the AMS is highly recommended as recognized experts can help generate commitment and support from government officials, colleagues, and indigenous peoples and local communities (IPLCs). They are attuned to national conditions and priorities and can clarify issues and concerns among various stakeholders. They can lead and facilitate the conduct of public awareness and other capacity building programs.

There is also a need to strengthen national and regional networks and ensure the active involvement of various stakeholders, which include, among others, the officials of relevant government sectors, including National Focal Points; policy and decision makers; research scientists; conservation managers and those involved in sustainable use and access and benefit sharing issues; funding agencies; IPLCs; and the general public. Mainstreaming or integrating these activities in national environmental and development plans will ensure that funding is directed to taxonomic activities.

Overall, ACB, in partnership with the AMS, Biodiversity Center of Japan, MoE-J, ESABII, and JAIF helped strengthen and enhance the capacity of AMS on taxonomy through the conduct of the *Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity*. The JAIF Project has helped reduce knowledge gaps, increase the number of taxonomists in the region, and ensure the conservation and sustainable use of biodiversity. ACB is well-positioned to spearhead the conduct of taxonomic activities because it has: (a) developed a strong relationship with the Government of Japan and ESABII; (b) a strong and productive working relationship with international, regional, and national experts on taxonomy who are willing to provide time and expertise for the conduct of taxonomic activities; and (c) established collaboration with organizations and research institutions with herbaria, botanic gardens, and fully equipped laboratories and facilities for use in hands-on training. Likewise, ACB, as a full-fledged regional organization and center of excellence on biodiversity conservation, has a good working relationship with the AMS.

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Acronyms and Abbreviations

ACB	ASEAN Centre for Biodiversity	IUCN	International Union for Conservation of Nature and Natural Resources
AHP	ASEAN Heritage Park	JAIF	Japan-ASEAN Integration Fund
AMS	ASEAN Member State	KEHATI	Yayasan Keanekaragaman Hayati Indonesia/Indonesian Biodiversity Foundation
AP-BON	Asia-Pacific Biodiversity Observation Network	LIPI	Lembaga Ilmu Pengetahuan Indonesia/Indonesian Institute of Sciences
ASEAN	Association of Southeast Asian Nations	MIBNP	Mts. Iglit-Baco National Park
ASEAN + 3	ASEAN plus China, Korea, and Japan	NAFRI	National Agriculture and Forestry Research Institute, Lao PDR
AWGNCB	ASEAN Working Group on Nature Conservation and Biodiversity	NBSAP	National Biodiversity Strategy and Action Plan
BKF	The Forest Herbarium	NHNPA	Nam Ha National Protected Area, Lao PDR
BMB	Biodiversity Management Bureau	NParks	National Parks Board, Singapore
CBD	Convention on Biological Diversity	NRE	Ministry of Natural Resources and Environment, Malaysia
CEPA	Communication, Education and Public Awareness	ONEP	Office of Natural Resources and Environment Policy and Planning, Thailand
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora	PA	Protected Area
CMS	Convention on the Conservation of Migratory Species of Wild Animals	PROSEA	Plant Resources of South-East Asia
COP	Conference of Parties	QSBG	Queen Sirikit Botanic Garden, Thailand
CSC-LIPI	Cibinong Science Center-Indonesian Institute of Sciences (Lembaga Ilmu Pengetahuan Indonesia)	RAP	Regional Action Plan
DENR	Department of Environment and Natural Resources, Philippines	SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
DNP	Department of National Parks, Wildlife and Plant Conservation, Thailand	SCBD	Secretariat of the Convention on Biological Diversity
ESABII	East and Southeast Asia Biodiversity Information Initiative	SEA	Southeast Asia
FRIM	Forest Research Institute Malaysia	SEABAL	South East Asian Bryophytes and Lichens
GBIF	Global Biodiversity Information Facility	WTRC	Wildlife Trade Regulations Course
GMNP	Gunung Mulu National Park, Malaysia	TMP	Training Management Package
GSPC	Global Strategy for Plant Conservation	TNP	Tarutao National Park, Thailand
GTI	Global Taxonomy Initiative	ToT	Training of Trainers
GTI RAP	GTI Regional Action Plan	UNEP	United Nations Environment Programme
IAS	Invasive Alien Species	UPLB	University of the Philippines Los Baños
IISD	International Institute for Sustainable Development	WCMC	World Conservation Monitoring Centre
IPLC	Indigenous Peoples and Local Communities	WWF	World Wide Fund for Nature



Introduction

The world's biodiversity, named and described by taxonomists for the past 250 years of research is estimated to include some 1.78 million species of animals, plants, and microorganisms; yet the total number of species is still unknown and estimated to be between 5 to 30 million species (SCBD, 2008).

The globally significant and spectacular biodiversity of the ASEAN region forms a great part of the world's biodiversity. The ASEAN region has three of the world's 17 megadiverse countries, namely Indonesia, Malaysia and Philippines. Together, these countries have been identified as the most biodiversity-rich in the world, with a particular focus on endemic biodiversity (UNEP WCMC, 2014).

The ASEAN region contains the highest mean proportion of country-endemic bird (9 percent) and mammal species (11 percent), and the second highest mean proportion of country endemic vascular plant species (25 percent), compared to other tropical regions of Meso-America, South

America, and Sub-Saharan Africa. On the other hand, amphibians and reptiles are estimated at 28 percent and 18 percent, respectively. Indonesia, Malaysia, and the Philippines, located within the Coral Triangle, are renowned for their rich and colorful marine diversity, with Philippines as the center of marine shore fish diversity in the world (Sodhi et al., 2010).

Fernando (2017) reported that the ASEAN region is experiencing a wave of species discovery, including: (a) more than 290 new plants, three (3) mammals, 24 species of fish, 28 reptiles, and 21 amphibians in the Greater Mekong region from 2012 to 2014; (b) a new city-dwelling bird (*Orthotomus chaktomuk*) in Cambodia; (c) salmon orchid in Lao PDR and Viet Nam; (d) 28 new unique species of mammals and 12 new species of *Nepenthes* in the Philippines; (e) 160 new species of fungi, snails, and spiders in Mt. Kinabalu in Sabah, Malaysia; (f) new mammal species in Mt. Dako, Sulawesi, Indonesia; and (g) new species of rattan in Java, Indonesia.

Despite these species richness, the region is reported to have seven (7) of the world's recognized biodiversity hotspots. In terms of threatened species, the ASEAN region has the highest proportion across all taxonomic groups (vascular plants, birds, mammals, and amphibians), except for reptiles. These biodiversity resources are reported to have been lost at an unprecedented rate due to climate change, introduction of invasive alien species, pollution, and illegal wildlife trade, among others. These have contributed to an increased number of threatened species (vulnerable, endangered, and critically endangered) and in 2017, the International Union for Conservation of Nature and Natural Resources (IUCN) reported that the megadiverse countries of the ASEAN have the highest distribution of endangered species in the region, especially for the plant group (**Table 1**). In each species group, there are still many species that have not yet been assessed by the IUCN; therefore their status are still not known.



Table 1. Distribution of Threatened Species in the ASEAN

AMS	Mammals	Birds	Reptiles	Amphibians	Fishes	Molluscs	Other Invertebrates	Plants	Fungi & Protists	TOTAL
Brunei Darussalam	33	25	8	3	13	0	8	104	0	194
Cambodia	38	28	20	7	47	1	78	35	0	254
Indonesia	188	153	33	32	161	6	284	428	0	1,285
Lao PDR	45	24	18	6	55	16	5	41	0	210
Malaysia	72	54	31	48	85	37	227	720	0	1,274
Myanmar	48	52	30	3	51	3	74	61	0	322
Philippines	39	92	39	48	92	3	235	239	0	787
Singapore	12	17	6	0	28	0	173	57	0	293
Thailand	58	54	28	7	108	15	196	152	0	616
Viet Nam	55	47	49	43	60	30	122	205	0	631

Source: IUCN, 2017



The Taxonomic Impediment and the Need for Taxonomy

Taxonomy is the science of naming, describing, and classifying organisms, and it covers all plants, animals, and microorganisms of the world. It is a tool by which the components of biological diversity are identified and enumerated; therefore, it provides basic knowledge underpinning the management of biodiversity. It provides basic understanding about the components of biodiversity, which is necessary for effective decision-making about conservation and sustainable use. Taxonomic information is also needed to assess the biological impact of climate change, detect invasive alien species, and meet obligations under the CBD, among others. The inability to identify species is a major component of the taxonomic impediment (CBD, n.d.).

Understanding taxonomic information is of vital importance in effective management and designing of national biodiversity strategies and action plans (NBSAPs). Once the needs are

identified, the available resources, and results used to set goals and priorities can be assessed for the necessary capacity training. If countries are involved in regional taxonomic networks, needs can be assessed within the context of those collaborations, especially when participation may include complementarities and sharing of research efforts, thus the need for taxonomy (CBD, 2012).

Research on biodiversity, ecosystem services, and climate change relies on taxonomy in investigating biodiversity, monitoring changes, and modelling vulnerability. However, for most countries in the world, taxonomic expertise, information, and infrastructure available are scarce - taxonomic information are widely scattered and most are not accessible, and taxonomists are scattered among governments, universities, museums, and private organizations. There is likely fewer taxonomists in ASEAN and there are still millions of species waiting to be


discovered and described. There is a persistently high demand for taxonomic expertise particularly since more than 3 billion specimens are kept in museums, botanical gardens, and zoos (Butler and Macllwain, 1998 & Suarez and Tsutsu, 2004 as cited by Graham, 2005).

These taxonomic impediments are most acute in developing countries in the tropics, which contain most of the world's biodiversity, yet produce far fewer taxonomists than developed countries. Most taxonomists work in developed, industrialized countries, which typically have less diverse biota than in more tropical, developing countries. Collection institutions, such as herbaria in industrialized countries, hold most of the specimens and associated taxonomic information from developing countries (SCBD, 2008; Fernando, 2017).

The Fourth Conference of Parties (COP 4) to the CBD agreed, through the Darwin Declaration in 1998 (CBD, 1998), that removal of these impediments is a crucial rate-determining step in the proper implementation of the CBD's objectives. In view of this declaration, the COP established some initiatives to contribute to the following statements of the CBD: (a) identifying and monitoring the important components of

biodiversity that need to be conserved and used sustainably; (b) preventing the introduction of, controlling, and eradicating alien species that could threaten ecosystems, habitats, and species (Aichi Biodiversity Target 9); (c) preventing the extinction of threatened species and improving and sustaining their conservation status (Aichi Biodiversity Target 12); and (d) educating people and raising awareness about the importance of biodiversity and the need to conserve it (Aichi Biodiversity Target 1).

On 2–7 July 2018, in the session on Capacity Building, Technical and Scientific Cooperation and Technology Transfer at the Twenty-second meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA), Parties requested the CBD Secretariat to further promote and facilitate technical scientific cooperation, including through the GTI (IISD Reporting Services, 2018). This emphasizes the continuing need to train and support more taxonomic experts and strengthen the infrastructure required to discover and understand the relationships among the world's biological diversity.



International and Regional Initiatives on Taxonomy

There are a number of international and regional initiatives that recognize the need for taxonomic expertise and resources for the conservation, sustainable use, and access to genetic resources and the fair and equitable sharing of benefits arising from their utilization. They provide direction in the planning of the taxonomic activities and help prioritize programs and activities, such as in the study of specific taxonomic groups. These include the following:

The Global Taxonomy Initiative

The Global Taxonomy Initiative (GTI) was established through COP 4 Decision IV/1 in 1998 to reduce or remove taxonomic impediments, which include: (a) knowledge gaps in the taxonomic system; (b) shortage of trained taxonomists and curators; and (c) impact these deficiencies have on the conservation, sustainable use, and equitable sharing of biological diversity.

The GTI is specifically intended to support the implementation of the work program of the CBD on its thematic and cross-cutting issues.

Taxonomists have already produced vast amounts of basic, valuable information. However, the practices of information dissemination have not always done justice to the importance of that information. GTI ensures that taxonomic information reaches not only the taxonomists but also decision makers and other non-taxonomist users and in a format that they can employ (SCBD, 2008).

The GTI specifically aims to: (a) identify taxonomic needs and priorities; (b) develop and strengthen human capacity to generate taxonomic information; (c) develop and strengthen infrastructure and mechanisms for generating taxonomic information, and for facilitating sharing and access to that information; and (d) provide taxonomic information needed

for decision-making regarding the conservation of biological diversity, sustainable use of its components, and the fair and equitable sharing of benefits arising from the utilization of genetic resources, the three objectives of the CBD.

The GTI Programme of Work outlines strategies, planned activities, expected products, timelines, lead actors, and resources needed. Its objectives are to: (a) assess taxonomic needs and capacities at national, regional, and global levels; (b) provide focus to help build and maintain the human resources, systems, and infrastructures needed to obtain, collate, and curate the biological specimens that are the basis of taxonomic knowledge; (c) facilitate an improved and effective infrastructure/system for access to taxonomic information, particularly for countries of origin; and (d) include key taxonomic objectives to generate information needed for decision-making in the conservation and sustainable use of biological diversity and its components within the major thematic work programs and cross-cutting issues of the Convention.

The GTI supports the implementation of the CBD in: (a) developing NBSAPs; (b) monitoring and assessing the effects of management practices and impacts of environmental and use of changes; (c) identifying appropriate in situ conservation areas; (d) developing protocols for the sustainable use of biodiversity; (e) conducting training and research programs in the conservation and sustainable use of biodiversity; (f) promoting understanding of the importance

of biodiversity; (g) enabling access to genetic resources; (h) facilitating information exchange and technical and scientific cooperation; (i) managing the distribution of benefits of biotechnology; (j) addressing issues on biosafety; and (k) addressing problems within the thematic and cross-cutting areas of the CBD (CBD, n.d.)

The Global Strategy for Plant Conservation 2011–2020

Adopted in 2002, the vision of the Global Strategy for Plant Conservation (GSPC) is to halt the continuing loss of plant diversity and secure a positive sustainable future where human activities support the diversity of plant life (including the endurance of plant genetic diversity and survival of plant species and communities and their associated habitats and ecological associations), and where, in turn, the diversity of plants supports and improves livelihoods and well-being.

The GSPC 2011–2020 was adopted in 2010, which aims to ensure that plant diversity is: (a) well understood, documented, and recognized; (b) urgently and effectively conserved; (c) used in a sustainable and equitable manner; and (d) widely promoted, particularly its role in sustainable livelihoods and importance to all life on Earth. It also describes the capacities and public engagement necessary to implement the Strategy (GSPC, 2012a and 2012b).

Convention on International Trade in Endangered Species of Wild Fauna and Flora

Under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), countries work together to regulate the international trade of animal and plant species and ensure that this trade is not detrimental to the survival of wild populations (CITES. n.d.-a). This contributes to the significant reduction of the rate of biodiversity loss and achievement of Aichi Biodiversity Targets 1 (awareness), and 12 (species conservation).

CITES places species into three (3) categories based on conservation status, risk from trade, and levels of protection. Species listed in Appendix I are threatened with extinction and banned from international commercial trade, except for scientific research. Appendix II lists species that are not necessarily threatened with extinction but may become so, unless trade is closely controlled. Trade in these species may be authorized by an export permit or re-export certificate. Appendix III lists species that is regulated by a Party and needs the cooperation of other countries to prevent unsustainable or illegal exploitation. International trade in specimens of species listed in this Appendix is allowed only upon presentation of appropriate permits or certificates (CITES. n.d.-b).

Convention on the Conservation of Migratory Species of Wild Animals

Under the aegis of the United Nations Environment Programme (UNEP), the Convention on the Conservation of Migratory Species of Wild Animals (CMS), also known as the Bonn Convention, provides a global platform for the conservation and sustainable use of migratory animals and their habitats. CMS lays the legal foundation for internationally coordinated conservation measures throughout a species' migratory range. It aims to conserve terrestrial, marine, and avian migratory species throughout their range.

Appendix I of the CMS comprises migratory species that are in danger of extinction throughout all or a significant portion of their range. CMS obliges Parties and promotes concerted action to protect these species, conserve and restore their habitats, mitigate obstacles to migration, and addressing other threats to the survival of the species.

Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II. This covers migratory species that have an unfavorable conservation status and require international agreements for their conservation and management (CMS, n.d.).

East and Southeast Asia Biodiversity Information Initiative

The East and Southeast Asia Biodiversity Information Initiative (ESABII) was launched by 14 countries to pursue capacity building in taxonomy and the development of an information system on biodiversity in East and Southeast Asia to contribute to the promotion of biodiversity conservation and implementation of the CBD Strategic Plan in the region. ESABII has the following strategies, which are: (a) development of structures for the implementation of ESABII activities; (b) improvement of biodiversity information through the development of an interface for biodiversity information and provision of information via the web; and (c) taxonomy capacity building, which includes the development of programs for taxonomic capacity building and manuals for identification (ESABII, n.d.).

In 2009, ESABII began collaborating with the ASEAN, China, Japan, Mongolia, and the Republic of Korea and other organizations (SCBD, Global Biodiversity Information Facility, and ACB) to support the GTI.


The Japan-ASEAN Integration Fund

The Japan-ASEAN Integration Fund (JAIF) was established on 27 March 2006 based on a commitment made by then Prime Minister Koizumi of Japan during the ASEAN Summit Day to support the ASEAN integration.

JAIF aims to: (a) support the efforts of the ASEAN countries to realize ASEAN integration; (b) support the ASEAN Security Community, ASEAN Economic Community, and the ASEAN Social and Cultural Community to achieve the correction of intra-regional disparities; (c) promote cooperation between Japan and ASEAN; and (d) support the activities of regional institutions and sub-regional organizations and other implementation activities between Japan and ASEAN.

JAIF initiatives for the ASEAN Region include the Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity Project, which was conducted with ACB.

Other international organizations that support taxonomy in ASEAN include the Asia-Pacific Biodiversity Observation Network (AP-BON), which supports taxonomy projects that identify, monitor, and conduct research on biodiversity, establishes databases on biodiversity, and provides trainings on new methods and analyses for biodiversity studies. The Global Biodiversity Information Facility (GBIF) works with organizations on taxonomy specimens database.



The JAIF Project: Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity Project

Project Background

Biodiversity conservation in ASEAN covers a wide range of issues including taxonomy—the science of identifying and classifying species. Taxonomy is integral to conservation as it provides the very foundation for knowing and understanding species and their role in the ecosystem.

ASEAN has responded to the challenge of strengthening taxonomy in the region through the Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity Project. The project was implemented by the ACB in partnership with the Biodiversity Center of Japan, MoE-J, and the ESABII and supported by the JAIF.

The first ASEAN + 3 meeting workshop on the GTI for Southeast Asia was conducted in 2009 in response to the call of the CBD for greater attention to the GTI. The output of this workshop

was the Regional Action Plan for the Global Taxonomy Initiative (GTI RAP) in Southeast Asia 2010–2015. The Regional Action Plan was implemented by ACB to support the AMS and served as the basis for taxonomy activities in the ASEAN.

Project Objectives

The specific objectives of the JAIF Project were to: (a) develop and carry out an expanded taxonomic capacity building program urgently needed to implement NBSAPs, national laws, and relevant international agreements, such as the CBD and CITES, that will contribute to the conservation and sustainable use of biodiversity resources in the ASEAN region through training workshops and internship programs; (b) increase public awareness on the relevance and importance of

taxonomy in conservation, law enforcement, and other issues; (c) establish and strengthen information and knowledge networks; and (d) develop or improve an existing database.

Project Accomplishments and Outputs (2010–2016)

The JAIF Project enhanced the role and capacity of the ACB in promoting biodiversity conservation and management in the AMS through the conduct of capacity building activities on taxonomy in the region. With the involvement of the AMS, China, Korea, and Japan, the project promoted regional cooperation on biodiversity conservation through the exchange of information and experiences, research results, experts, and trainings. The project was able to leverage resources and worked well with other organizations working on taxonomy such as AP-BON, GBIF, and research institutions in the AMS.

The activities of the JAIF Project were planned through the conduct of three inception meetings

and planning workshops. The first phase of the JAIF Project (2010–2011) focused on coral and plant taxonomy. The second phase of the project (2012–2014) was dedicated to biodiversity data organization and management. The third phase (2015–2016) concentrated on management planning and biodiversity assessment of ASEAN Heritage Parks (AHPs). All the activities were conducted in line with the GTI Regional Action Plan (2010–2015).

A series of JAIF training workshops and internship programs on various species and families were conducted to enhance the capabilities of not only the ASEAN and ESABII network scientists but also officials and staff of AHPs and other protected areas (PAs). Experts from the ASEAN region and Japan took the lead in discussing the nomenclature and application of taxonomic methods and principles. The hands-on activities provided actual experiences on the collection, identification, and management of specimens.





Training workshops and internship programs

The JAIF Project conducted 18 training workshops and four (4) internship programs from 2010–2016. The 18 training workshops were distributed as follows: taxonomy (8); data organization and management (3); communication, education, and public awareness (CEPA) (2); management planning of AHPs (4); and CITES policies (1). Species/species groups and families studied include freshwater fish (1), hard corals (1), reptiles (1), plants (5), insect predators and parasitoids (1). The four internship programs focused on hard corals, monocots, dicots, and bryophytes, and pteridophytes and their allies (Training activities and outputs are attached in **Annex 1**). Seven (7) training workshops and two (2) internship programs were conducted in collaboration with ESABII. Five (5) training workshops were conducted each in Indonesia, Malaysia, and Thailand; two (2) in the Philippines; and one (1) in Lao PDR.

Participants from AMS

A total of 449 participants completed the training workshops (388) and internship programs (61), including the training workshops on management planning of selected AHPs, which are included in the JAIF project. AHP/protected area and other government officials and staff made up the most (73.50 percent) number of participants in the capacity building activities conducted by the ACB. The other participants came from museum/herbaria (5.35 percent); botanic gardens (4.45 percent); academe/university (10.02 percent); and NGOs, villages/communities, media, tour operators, tour guides, homestay operators, and tourism agencies (6.68 percent). Of the total participants, 29.17 percent are females (distribution of participants under the JAIF Project are in **Annex 2**).

Partner organizations

The training workshops and internship programs were conducted in AMS with partners with very good botanic gardens, large collections in museums and herbaria, accessible protected areas with rich biodiversity, and taxonomic facilities and equipment. Taxonomic facilities refer to herbaria, laboratories, libraries, and others, and equipment includes collection and preservation tools, microscopes, dryers and refrigerators, and others. These institutions are the Bogor Botanic Garden, Bali Botanic Garden, Cibodas Botanic Garden, Herbarium Bogoriense, and Universitas Dhayana Pura in Indonesia; Forest Research Institute of Malaysia, Marine Science Laboratory of the University of Malaysia,

and Gunung Mulu National Park in Malaysia; and Queen Sirikit Botanic Garden, The Forest Herbarium (BKF), Ban Rom Klao Botanic Garden, Ubon Ratchathani University, and Doi Inthanon National Park in Thailand.

Resource persons and taxonomy experts

Experts on taxonomy and related fields from Indonesia, Malaysia, the Philippines, Thailand, and Japan led the list of resource persons, peer reviewers, and mentors of the participants. They are recognized experts in their respective fields and contributed to the knowledge and enthusiasm for taxonomy among participants in the training courses.



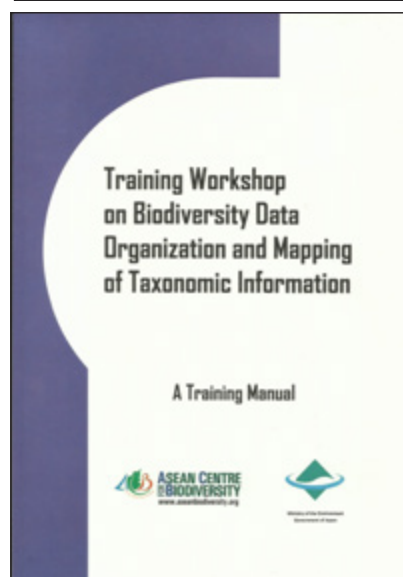
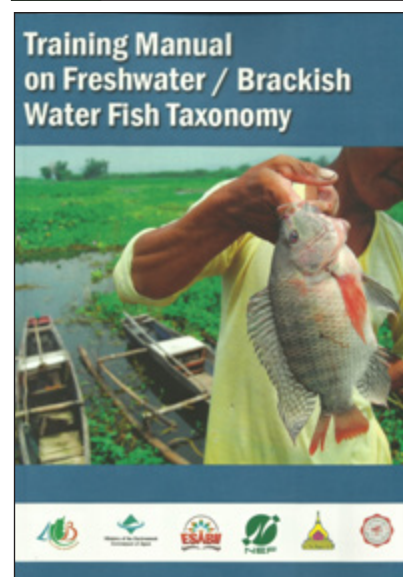
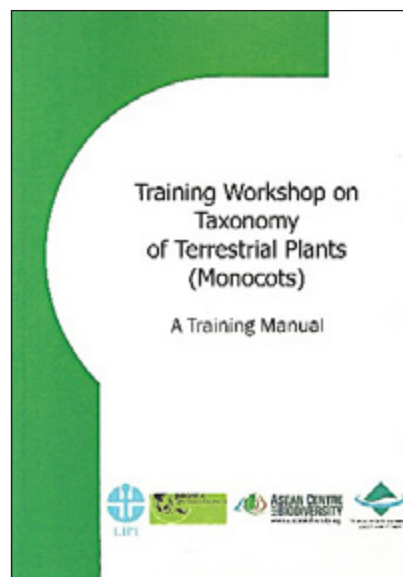
ASEAN experts in taxonomy guide workshop participants.

Publications and knowledge materials

Proceedings and completion reports were developed and distributed for each training workshop and internship program. Six (6) training manuals and four (4) field guides were developed, printed, and distributed. The trainees served as contributing authors of the field guides. The publications include the following:

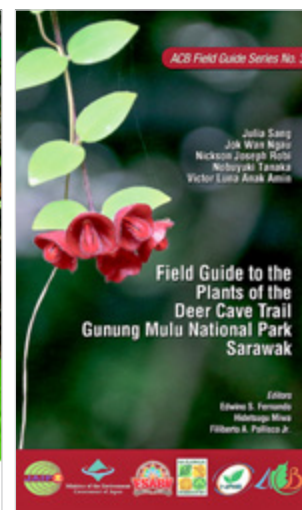
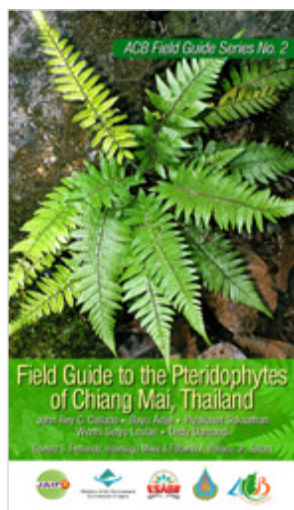
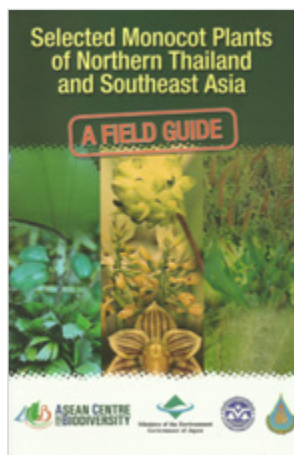
Training Manuals

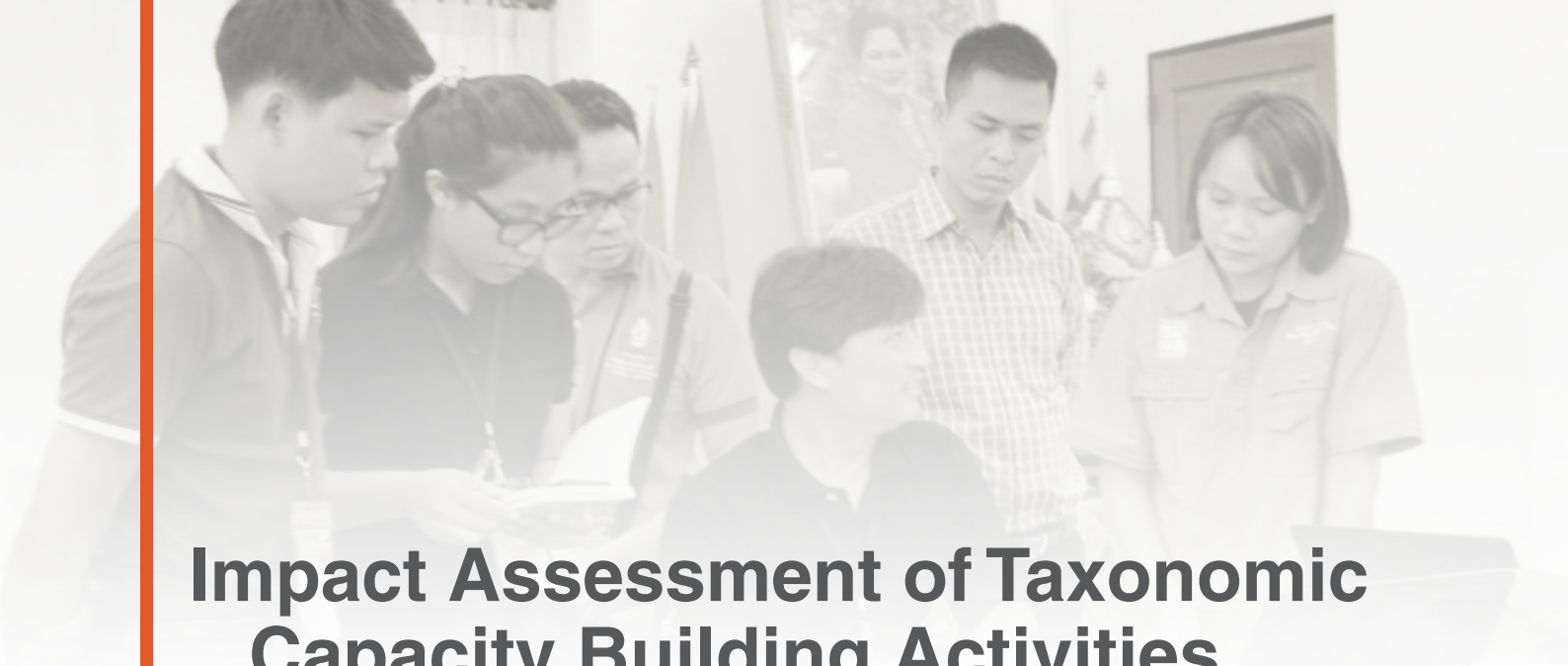
1. Training Manual on Corals Taxonomy in Southeast Asia
2. Training Manual on Plant Taxonomy (Dicots) in Southeast Asia
3. Training Workshop on Taxonomy of Terrestrial Plants (Monocots): A Training Manual
4. Training of Trainers Manual on CITES Policies and Identification of Threatened Species (Reptiles)
5. Training Manual on Freshwater /Brackish Water Fish Taxonomy
6. Training Workshop on Biodiversity Data Organization and Mapping of Taxonomic Information: A Training Manual



Field Guides

1. Selected Monocot Plants of Northern Thailand and Southeast Asia: A Field Guide. (Fernando, E. S., Pollisco Jr., F. A., & M. T. Uriarte, Editors).
2. Ho, B. C., Tan, B. C. & Luong, T. T. 2015. Guide to the Bryophytes in the Limestone Glass House of Queen Sirikit Botanic Garden. ACB Field Guide Series No.1. (Fernando, E. S., Miwa, H., & Pollisco, Jr., F. A., Editors). ASEAN Centre for Biodiversity and Japan-ASEAN Integration Fund. Los Baños, Philippines. 108 p.
3. Callado, J. R. C., Adjie, B., Suksathan, P., Lestari, W. S., & Darnaedi, D. 2016. Field Guide to the Pteridophytes of Chiang Mai, Thailand. ACB Field Guide Series No. 2. (Fernando, E. S., Miwa, H., Pollisco, Jr., F. A., Editors). ASEAN Centre for Biodiversity and Japan-ASEAN Integration Fund. Los Baños, Philippines. 174 p.
4. Julia, S., Ngau, J. W. Robi, N. J., Tanaka, N., & Anak, Amin, V. L. 2017. Field Guide to the Plants of the Deer Cave Trail, Gunung Mulu National Park, Sarawak. ACB Field Guide Series No.3. (Fernando, E. S., Miwa, H., Pollisco, Jr., F. A., Editors). ASEAN Centre for Biodiversity and Japan-ASEAN Integration Fund. Los Baños, Philippines. 164 p.





Impact Assessment of Taxonomic Capacity Building Activities in the ASEAN under the JAIF Project (2010–2016)

During the 25th Meeting of the AWGNCB in June 2015, ACB was instructed to evaluate the relevance and usefulness of the training courses and internship programs conducted under the JAIF Project. This initiated the Impact Assessment of Taxonomic Capacity Building Activities in the ASEAN under the Japan-ASEAN Integration Project (2010–2016).

Objectives of the Study

The main objective of the assessment study is to determine the impacts of the training courses and internship programs on taxonomy to the AMS and project participants. It also aims to: (a) identify gaps and needs in taxonomy in the AMS; (b) identify interventions initiated by the participants/AMS to further strengthen capacities on taxonomy; and (c) document stories, good practices, and lessons learned for possible sharing with other AMS.

Respondents of the Study

A total of 90 respondents composed of trainees of the various training workshops and internship programs (61.11 percent), partners and implementers (5.56 percent), and experts in taxonomy and related fields (33.33 percent) participated in the assessment study (**Annex 3**). Eighteen (20 percent) of the total respondents were working in herbaria/museum/botanic gardens; 12 (13 percent) in the academe; and 60 (67 percent) in AHP/PAs and other government organizations. Twenty-four (27.67 percent) of the respondents are female. Thirty-five (39 percent) of the total respondents were interviewed in countries visited (Lao PDR, Malaysia, Philippines, Thailand, and Viet Nam). Experts, partners, and implementers were included as respondents to ensure that appropriate needs and concerns in taxonomy in the region were taken into account.

Data Collection Methods

The assessment study was conducted in close coordination with the ACB National Contact Point and the national GTI Focal Point in the AMS, especially in convening participants for key informant interviews during visits in the AMS.

Document Review

Available documents related to the Taxonomic Capacity Building and Governance for Conservation and Sustainable Use of Biodiversity Project were reviewed including activity designs and proceedings of training courses and internship programs, pre- and post-evaluation training surveys, project completion reports, GTI RAP (2010–2015), publications, and CBD and GTI documents. Additional information were obtained from partner agencies and other relevant sources.

Conduct of Questionnaire Survey and Key Informant Interviews

Survey questionnaires were developed for the participants, experts on taxonomy and related fields, and partners of ACB regarding the conduct of the training courses and internship programs. The questions focused on the implementation process and the effects of the activities on participants. The survey questionnaires were either sent through emails or administered personally.

Key informant interviews were conducted to get more in-depth insights of the impacts of the capacity building activities and needs and gaps in taxonomy, especially in countries visited. Likewise, interviews with high level government officials and taxonomy experts in ASEAN were conducted in some AMS to discuss challenges in taxonomy and proposals on how to strengthen taxonomy in the AMS and in the region (**Annex 4**). The following organizations were visited in the AMS:

- Lao PDR - Ministry of Agriculture and Forestry; National University of Lao PDR; Provincial Agriculture, Forestry (Luang Namtha Province); and Nam Ha National Protected Area Office
- Malaysia - Forest Research Institute of Malaysia; Ministry of Natural Resources and Environment (NRE)
- Philippines - Biodiversity Management Bureau (BMB); Department of Environment and Natural Resources, Philippines (DENR); Philippine National Museum
- Thailand - The Forest Herbarium (BKF); Queen Sirikit Botanic Garden
- Viet Nam - Biodiversity Conservation Agency; Vietnam Environment Administration



Limitations of the Study

The most significant limitation in the assessment was the availability and participation of the training participants. Although survey questionnaires were sent to all training participants, only a few sent back the questionnaires. Many participants were re-assigned to other units or areas of assignment; on leave; out on official business such as field work, trainings, or conferences; had changed their contact information; or had resigned from their organizations. As such, 90 survey questionnaires were received and used in the study.





Results of the Impact Assessment Study

The following are the key findings of the impact assessment of the various training workshops and internship programs of the JAIF Project:

1. High appreciation for the design and content of training modules – The participants considered the modules of all training workshops and internship programs necessary (84 percent), and the contents relevant (91 percent).
2. A little more than half (58 percent) of the respondents considered the length of the training adequate. Majority of key informants interviewed recommended that more time should be allotted to field work, practical exercises, and development of field guides. Lectures and topics were interesting, relevant (91 percent) and educational (91 percent) but most favored the practical exercises and site visits to herbaria, museum, botanic gardens, and national parks.
3. Relevance of the training activities – The respondents strongly considered the trainings relevant. The activities under the JAIF Project were useful because of the limited number of trainings on taxonomy in their home countries and the benefits of these programs to their work. These capacity building activities have expanded their knowledge and skills, most especially on the proper collection and management of specimens. Some of the modules were new to some participants, but they appreciated the new knowledge on species identification, management of specimens, and development of guidebooks.
4. Satisfaction with the training activities – The respondents expressed their appreciation and satisfaction with the taxonomy training activities. The development of the guidebooks and training manuals were considered particularly fulfilling. The

lectures and discussions on the development of scientific papers and guidebooks were important as the participants need to publish their research. Critiques allowed the participants to defend their work and learn from the comments and suggestions of fellow participants and experts. The participants were glad of the opportunity to become contributing authors to the field guides produced as a result of the training program.

The participants also appreciated learning how to digitize species and PA information and map species and habitats based on available information with the use of new technologies on geo-referencing. These enhanced awareness of the importance of sharing information and capacities to manage and share data.

5. Recognized competence of resource persons – Ninety-one (91) percent of the respondents agreed that the resource persons/experts were very knowledgeable and well-equipped to conduct training workshops and internship programs on taxonomy. They improved the knowledge and skills on taxonomy of the participants. They were very responsive to questions and eager to provide guidance to trainees. The resource persons were willing to discuss topics in detail, but also demanded



discipline, cooperation, participation, and hard work from the participants. Discussions with the experts provided the participants with firsthand information on proper scientific processes on taxonomy.

6. Appreciation for the inclusion of taxonomy field guides as outputs of training – The field guides serve as concrete results of training with participants as contributing authors. The production of the guidebook is a practical application of knowledge and skills gained from the training. This has generated a sense of pride and ownership among the participants.

7. Improved collaboration and networking – The training workshops and internship programs enhanced collaboration and the creation of informal networks among the participants and taxonomy experts. The friendships generated in the course of the training activities were considered a major bonus by the participants. The program provided opportunities for participants to hear, share, and learn from stories, experiences, and good practices not only on taxonomy, but also about the culture and traditions of other AMS.





Impacts of Capacity Building Activities

Respondents reported various benefits from participating in the workshops.

1. Increased confidence – Developing new skills and interaction with colleagues from other AMS strengthened the confidence of the participants.
2. Recognition of additional expertise – A number of participants were given additional responsibilities at work or have been tapped as resource persons in trainings on taxonomy.
3. Replication of training activities – The participants conducted short seminars to share knowledge and information with colleagues.
4. Expansion of knowledge – Some participants undertook fieldwork to collect and identify

specimens for their herbarium. Others used their new skills to establish baseline information of species in their protected areas.

Those connected with the academe expanded their lectures and laboratory exercises to include knowledge gained from the training and internship programs. Updated and appropriate methods were introduced to undergraduate and graduate students.

Through their organizations, some of the participants were able to accommodate graduate and undergraduate students who need to conduct taxonomic field survey and biodiversity assessment monitoring activities as part of their on-the-job-training or these requirements. The information generated

from these activities added to the baseline data of the involved protected area.

5. Revision of conservation strategy – The participants were able to contribute to the revision of conservation of management strategies in their place of work.
6. Opportunities for additional training – In some cases, the taxonomy trainings opened doors for in-depth training with the support of the taxonomy experts and resource persons.
7. Development of taxonomy publications – The training activities gave the participants the confidence to develop simple pocket guidebooks, publish scientific articles, and serve as contributing authors to taxonomy publications. Trainees from Malaysia served as contributing authors to Flora of Peninsula Malaysia and Tree Flora of Sabah and Sarawak. A trainee from Lao PDR served as editor of a book on indigenous fish species of Lao PDR.
8. Request for publications – Three (3) institutions outside ASEAN have requested copies of publications for their archives, illustrating global interest in taxonomy publications. These are the New York Botanical Garden and Washington D.C. Botanic Garden in the United States, and Real Jardín Botánico de Madrid in Spain.
9. Increased pride and appreciation for biodiversity – Some participants have noted that the field guides have increased pride and appreciation for biodiversity among both the experts and training participants. Colleagues



from QSBG stated that management and staff of Doi Inthanon National Park were eager to cooperate with the project particularly after learning that the project would publish a field guide to plants in the park. Such publications are expected to likewise generate awareness, pride, and appreciation for species among visitors to the park.

10. Contribution to new scientific discoveries – Himmah Rustiami, a trainee from Herbarium Bogoriense, LIPI, Indonesia has published in Kew Bulletin 2014 one of the new species discovered in the course of the laboratory work in the LIPI Herbarium in Indonesia with her mentors, Dr. John Dransfield (Denmark), and Dr. Edwino Fernando (Philippines). In some field activities, some unrecognized species, and possibly new to science, were found and are undergoing further study.
11. Enhanced understanding of the relationship between taxonomy and databases – Information generated in taxonomic research and activities are generally stored in databases, which have their own technical language. With the trainings in the JAIF project, database development and taxonomy were brought closer together and this has resulted in a better understanding and greater appreciation of both groups in their respective line of work.
12. Concrete contribution of ACB to taxonomy and biodiversity conservation – Participants and partners knew of ACB, but mostly

considered the Centre as an abstract concept. The capacity building activities organized by ACB made it an organization that provided real benefits to stakeholders.

13. Increased funding, staff, and equipment for taxonomy activities – Capacitated staff facilitated funding for taxonomy-related activities or additional staff for the taxonomy unit. Acquired expertise also allowed the purchase of additional equipment for laboratories.
14. Further collaboration and networking – Participants have been able to forge partnerships with research and academic institutions in the conduct of taxonomy-related and CEPA activities. Some participants continue to communicate beyond the training activity through social media and emails. In 2007, Dr. Benito Tan created a Facebook page called South East Asian Bryophytes and Lichens (SEABAL), which is currently being managed by Dr. Boon-Chuan Ho, NParks, Singapore. Participants of the bryophytes and pteridophytes training program in 2014 have been invited and joined the SEABAL group and this has facilitated the exchange of information, experiences, and good practices and lessons learned among the participants after the training. Some were able to visit herbaria and botanic gardens of their co-trainees.



Gaps and Needs on Taxonomy in the AMS

The capacity building activities conducted by ACB through the JAIF Project focused on selected terrestrial plants, fish, corals, CEPA, database management, and PA management planning. However, more projects are needed to enhance awareness and reduce knowledge gaps on taxonomy in ASEAN. The assessment revealed the following gaps and needs on taxonomy in the AMS:

1. There is a limited number of taxonomists and curators in the AMS – Feedback from key informants revealed that only a few are interested or motivated to study taxonomy in their country because taxonomy is not a priority, compared to forest management and logging.
2. Low level of awareness on taxonomy in the AMS – The level of awareness of the importance of taxonomic information and biodiversity conservation remains low in the AMS. There are few channels for information dissemination on taxonomy. Respondents stated that awareness raising activities on taxonomy and biodiversity conservation remains in the initial stage of implementation. Some AMS still have no CEPA strategy for taxonomy and biodiversity conservation.
3. Lack of available trainings on specific priority species and other related topics in the AMS – Key informants highlighted that trainings should consider the needs of the AMS, which include, among others, trainings on important and priority species in the country. Some participants noted the significance

of the trainings for most of the AMS, but sometimes these were not particularly relevant in their own country.

The respondents cited the need for training programs on the establishment of herbaria/ botanic gardens, information sharing and data integration, data storage and processing, and development of baseline data in AHPs and other PAs. They also stressed that more activities be conducted in AHPs or PAs.

4. Limited proficiency in the English language in some AMS – Some participants were not fluent in English, which curbed interest and participation since English is the medium of instruction in the conduct of training workshops and internship programs. Some find it difficult to prepare and present a report. This limits gains in knowledge and skills, and constrains replication of activities in their own AMS.
5. Limited fund allocation for trainings and research on taxonomy in the AMS – Some key informants reported that taxonomy was not considered a priority in their AMS, thus hindering financial support for research and trainings in taxonomy.
6. Uneven capacity for data storage, retrieval, and processing in the ASEAN region – Document reviews revealed that some AMS had advanced taxonomy and database management capabilities, while others have yet to develop the facilities to collect, store,

and share information. Most biodiversity information data are likewise held in different formats, hindering the sharing of information among AMS.

7. Limited ability to generate taxonomic information and access biological collections – There are few references such as books, journals and other scientific publications, on taxonomy in some AMS. Likewise, some AMS have limited biological collections, in herbaria and botanic gardens, which could serve as important references and comparative materials for research and other taxonomic activities.
8. Limited networks with taxonomy experts and institutions – Some AMS have limited networks with regional and international experts on taxonomy and those managing herbaria, museums, botanic gardens, and other taxonomy institutions. This makes it difficult for AMS to access references, taxonomic information, and biological collections. Collaboration with other organizations facilitates loans of specimens, exchange of information and experiences, and request for experts to assist in the conduct of taxonomic activities.

Interventions Initiated by the AMS and Participants to Further Strengthen Capacities on Taxonomy

Other than attending and actively participating in conferences, training workshops and internship programs on taxonomy, especially those conducted by ACB, the AMS have initiated various interventions to further enhance taxonomy in their countries. These include the following:

1. Awareness on taxonomy is enhanced through social and traditional media, seminars, and dialogues with various stakeholders.

Thailand promoted taxonomy through The Forest Herbarium (BKF) Facebook page and website and published Herbarium News for school children. It has provided lectures and guided tours to visitors at botanical gardens and herbaria including QSBG. Malaysia has ongoing projects to document the flora of Malaysia such as the Tree Flora of Sabah and Sarawak and the Tree Flora of Peninsular Malaysia. Singapore continues to manage botanic gardens and organize seminars and workshops on taxonomy-related topics. The Philippines conducted conferences to emphasize the importance of taxonomy and highlight research and studies on taxonomy.

2. Trainings are regularly conducted for conservation staff and other stakeholders to expand knowledge on taxonomy.

These include the conduct of courses with field work to identify, process, and manage collected specimens. Local and regional taxonomists are invited to serve as resource persons and mentors. The Philippines has conducted trainings on plants for students, teachers, and researchers, in collaboration with the Philippine National Museum. FRIM, NRE and other institutions in Malaysia regularly conduct trainings for its staff to ensure continuous sharing of updated information and modern technologies on taxonomy.

3. Collaboration with various institutions have been undertaken to expand cooperation on taxonomy concerns.

Continuous collaboration with national, regional, and international organizations such as research centers, NGOs, and government organizations with herbaria,

museums, botanic gardens, and other institutions are undertaken to facilitate the exchange of information, references, and loans of specimens. Thailand, through QSBG, conducts field work with Lao PDR and Myanmar.

The AMS also identified potential partner agencies for ACB in the conduct of training workshops and internship programs. These include the University of Brunei Darussalam; University of Phnom Penh and the University of Agriculture in Cambodia; Department of Forestry, Bali and Bogor Botanic Gardens, and LIPI in Indonesia; National University of Laos and the National Agriculture and Forestry Research Institute (NAFRI) in Lao PDR; Kepong Herbarium in Malaysia; University of Myanmar; University of the Philippines Los Baños and Diliman, and the Philippine National Museum in the Philippines; Singapore Botanic Gardens, NParks, and

Lee Kong Chian Natural History Museum in Singapore; QSBG and other botanic gardens, The Forest Herbarium (BKF), and DNP in Thailand; and the Institute of Ecology and Biological Resources in Viet Nam.

4. Technical working committees and professional organizations are created and/or strengthened to spearhead taxonomic activities in the country.

The Office of Natural Resources and Environmental Policy and Planning (ONEP) of Thailand has established the Thailand Taxonomy Working Committee, which has formulated guidelines in personnel development in taxonomy. The Biodiversity Management Bureau of the DENR of the Philippines established the Philippine Plant Conservation Society while Indonesia created the Indonesian Plant Taxonomy Association to expand taxonomic activities.



5. Additional support is provided to taxonomy research particularly of priority species.

Botanical expeditions, explorations, and research on taxonomy of important and endangered species are being conducted to provide baseline inventories and update information of biodiversity databases. Sarawak conducts regular exploration of species in national parks.

6. Taxonomy students are being supported.

Some AMS are supporting students interested in undertaking graduate studies or short courses on taxonomy and related fields to increase the number of taxonomists/botanists in ASEAN.

7. Research institutions are being established or improved to house biological collections.

More institutions, such as herbaria, natural history museums, and botanic gardens, are

being established to enhance biodiversity conservation. Indonesia has established 25 new local botanic gardens to facilitate information sharing and support the national strategy to conserve the genetic diversity of plant species. The Philippines has renovated the Philippine National Museum to accommodate more animal and plant specimens. Most of these institutions are open to the public, especially for students, to enhance awareness and appreciation for species and the importance of research in taxonomy and biodiversity conservation.

8. Databases for plant and animal species from AHPs and other PAs were created by some AMS.

Some of these databases were developed with the assistance of the ACB Biodiversity Information Management (BIM) Unit. Thailand has created two database networks on biodiversity and taxonomy.



Stories, Good Practices, and Lessons Learned

The QSBG, and The Forest Herbarium (BKF), Thailand; Herbarium Bogoriense and CSC-LIPI, Indonesia; and Forest Research Institute Malaysia provided excellent laboratories, extensive research facilities, and references for taxonomic capacity building activities for the participants of the various training workshops and internship programs. They also have competent and supportive experts and staff who were always ready to assist the participants, particularly in laboratory work. Participants were able to learn updated methods of identification and management of specimens. The Doi Inthanon National Park, Ban Rom Klao Botanic Gardens, and Khao Yai National Park in Thailand and Bali Botanic Garden and Cibodas Botanic Garden in Indonesia were very rich field sites for the participants. These areas facilitated the hands-on exercises in specimen collection, identification, and management. The field trips and the collection expeditions were considered by the participants as the most educational and interesting part of the training workshop and internship programs.

The respondents shared their experiences during the training workshops/internship programs. They were grateful to their mother organization for sending them to the workshop. Participation in the taxonomy training activities enhanced knowledge and skills on taxonomy and allowed AMS representatives to meet new friends and colleagues and share cultures and experiences.

Personal narratives include the following:

“I am a curator of monocot collections at Herbarium Bogoriense, so this training is very relevant to my daily responsibilities, as well as plant taxonomy of palms, mainly on rattans. I published one of my new species together with my colleagues, Dr. John Dransfield and Dr. Edwino Fernando, at Kew Bulletin in 2014 (*Daemonorops sedispirituum*, a new species of *Daemonorops Blume* (Araceae: Calamoideae) from Java. Kew Bulletin (2014) 69:9531. DOI 10.1007/512225-014-9531-Z. Summary: A new species of the rattan genus *Daemonorops* is recorded for Java, *Daemonorops sedispirituum*. *D. sedispirituum* is closely allied to *D. hirsute* and *D. oblonga* but differs in stem size, sheath, armature, and seed surface.” – **Himmah Rustiana, Herbarium Bogoriense, Indonesia**



“Using the knowledge and skills I obtained from the training, I plan to assess the plants in Lao PDR, especially those in Nam Ha National Protected Area, Himnamno National Park, and Namtading National Park. Using the knowledge gained from the workshop, I will collect plant specimens for our herbarium at the National University of Laos, which at present, has more than 5,000 specimens. I continuously keep in touch with my co-trainees, share experiences, and request for references, especially the course outline for Botany and Taxonomy offered in other countries, including the topics required in the courses. Our group has a Facebook page and the more active members are participants-trainees from Malaysia, Indonesia, and Viet Nam.” – **Phetlasy Souladeth, National University of Laos, Lao PDR**

“The training was relevant to my work at the Marine Park. It was well-organized. It was a mix of classroom lectures and hands-on training. The mini-project attracted me a lot. Participants need to identify few species of Scleractinia corals and presented the findings with scientific evidence by analyzing the skeletons. It was a good teaching approach. We conducted a short training course for my colleagues using the Coral Finder as a toolkit. We taught them the morphology of corals to aid them during the identification process.” – **Mohammed Nizam Bin Ismail, Department of Marine Park Malaysia, Malaysia**

“We are in the process of preparing a similar guidebook for plants in national parks in Sarawak. Preparing the guidebook together with other participants that are not from the same botany background was very interesting. They helped to capture interesting plant characters that are often overlooked by the botanists/taxonomists and they also assisted in reducing botanical terminologies used in describing the plants. In the future, taxonomic training on other plant groups other than Dipterocarpaceae and Sapotaceae should be organized particularly on plant groups that are highly diverse in ASEAN countries. Such trainings should include aspects such as basic identification, field collection techniques, photographing important characters, conservation, and training on writing taxonomic papers.” – **Julia Sang, Sarawak Forestry Corporation, Malaysia**



“The information I learned from the training activities are very useful in my work and studies since I am pursuing my graduate studies in Systematics. As a result of the training program, graduate and undergraduate students of the Biology Department of Central Mindanao University and Research Assistants were trained on the basic taxonomic identification and classification of pteridophytes (ferns and lycophytes) and bryophytes using the taxonomic keys and books provided during the training-workshop in Bali, Indonesia and Chiang Mai, Thailand. Standard database format for the flora and fauna introduced by the ASEAN Centre for Biodiversity were also presented to the participants and basic skills on how to extract data from online sources and how to manage data gathered from the field. I also discussed basic knowledge on GIS mapping and preparation of CEPA materials such as field guides, flyers, and handbooks. The training also allowed me to build friendships, connections, and linkages with other nationalities for potential collaboration and/or consultation in the future.” – **Fulgent P. Coritico, Central Mindanao University, Philippines**

“I had a fantastic experience during the Chiang Mai workshop, which included laboratory sessions at Queen Sirikit Botanic Garden. In addition to an enriching field trip to Doi Inthanon National Park, I joined the bryophytes group and learned so much from the late Dr. Benito Tan, as well as from his former students, Dr. Ho Boon Chuan and Ms. Luong Thien Tam. The most memorable part of the trip was the ‘moss race,’ which Dr. Benito especially organized to make the training more interesting. This saw us working in groups to collect as many species as possible per locality visited and then identifying these back at the laboratory. This experience trained my eyes for detail, and also provided an opportunity to be acquainted with the different species of bryophytes. To our surprise, our group won second prize.” – **Woo Pui Min Henrietta, National Parks Board, Singapore**

Summary and Conclusions

Overall, the participants were satisfied with the design, content, and conduct of the training-internship programs in taxonomy. They considered the training activities highly relevant to their work and were also appreciative of the competence of the taxonomy experts involved. The program added to their confidence in conducting taxonomy projects, leading to the recognition of improved knowledge and skills, replication of training activities, increase in local taxonomy knowledge, increased international interest in taxonomy knowledge products, and development of opportunities for advanced training in taxonomy.

Respondents and taxonomy experts stated that despite ongoing efforts, gaps remain in taxonomy in ASEAN. These include the limited number of taxonomists and curators in the AMS, low level of awareness on taxonomy, lack of available trainings on specific priority species, limited fund allocation for trainings and research on taxonomy, uneven capacity for data storage and processing, limited ability to generate taxonomic information and access biological collections, and limited networks with taxonomy experts and institutions. Limitations in proficiency in the English language in some AMS is also a concern, as most capacity building activities are conducted in English.

AMS address these challenges by raising awareness of taxonomy through social and traditional media tools, seminars, and training activities; collaboration with regional and international research institutions; creation of technical working committees and professional organizations to expand taxonomy activities; establishment and improvement of research facilities and institutions; and provision of additional support for taxonomy students.

The assessment indicates important gains during the project, including the discovery of new species and taxonomic records; expanded scientific knowledge through increased publication of articles, field guides, and research in taxonomy; and appreciation and understanding of taxonomy beyond the training program. There has also been an interest in the outputs of the training programs beyond ASEAN, through requests for publications from international research institutions, and appreciation for the program through side events at SBSTTA Meetings and CBD Conference of Parties. The capacity development activities are particularly beneficial to ASEAN Heritage Parks and their stakeholders, largely in the development of field guides on species in the AHPs.



Recommendations and Ways Forward

The respondents in the study recognize that more has to be done to address challenges to taxonomy in ASEAN. Recommendations to strengthen taxonomy in the region include the following:

1. Conduct needs assessment on taxonomy – The AMS should conduct a national needs assessment on taxonomy to determine priority activities. These should consider the activities identified in the Global Taxonomy Initiative Regional Action Plan for Southeast Asia formulated by the ASEAN Centre for Biodiversity and AMS (**Annex 5**). The national assessment should look at human capacities; financial resources; infrastructure such as herbaria, museums, botanic gardens, arboreta, wildlife centers, natural and cultural collections, and seed banks, among others; reference and research materials; and facilities such as offices, research areas, laboratories, and libraries and complementary equipment; among others. Direct interaction and discussion with partners in the AMS will enable ACB to identify necessary interventions.
2. Continue to enhance awareness on taxonomy and secure commitment of various stakeholders – Programs to promote public awareness on the importance of taxonomy and biodiversity conservation should be sustained and strengthened through the involvement of various stakeholders including policy and decision makers and representatives of relevant government sectors, researchers and scientists, conservation managers and staff, media, funding agencies, indigenous peoples and local communities, and the general public.

Awareness of the significance of taxonomy can help spur support for taxonomy and conservation and the sustainable use of

biodiversity. CEPA materials on taxonomy and biodiversity conservation should be developed and distributed to various stakeholders. Social (such as Facebook, Twitter, Instagram, and others) and traditional media (print, broadcast, film, and others) should be used extensively to promote taxonomy and biodiversity conservation.

A CEPA strategy on taxonomy and biodiversity conservation should be developed by the AMS to include objectives and expected results, target audiences, appropriate messages and communication tools, and relevant partners.

3. Continue capacity building activities on taxonomy in AMS – More capacity building activities need to be conducted to identify species and increase the number of para-taxonomists in ASEAN as well as respond to specific taxonomy needs of the AMS, AHPs, and PAs. Appleton (2003) stressed the need to train AHP/PA managers on taxonomy so that they can lead specialized taxonomic, habitat, and ecosystem surveys especially on faunal groups, higher and lower altitude plants, and vegetation/plant communities.

The approach of the JAIF program to conduct training workshops followed by the internship program is worth replicating in other capacity building activities of ACB. Training-internship programs combine basic information and instruction with hands-on experience and practice, ensuring deeper learning and understanding of the training. The participants gain applicable

knowledge and skills upon completion of the internship program, increasing interest and commitment of participants to study taxonomy.

Continuous and regular trainings to enhance taxonomic, curatorial, and information management skills are needed. These training courses could be conducted through formal and informal approaches. A combination of formal education, such as degree programs, and on-the-job trainings increases the skills-base of the trainees. SCBD (2008) emphasized that capacity building should also include trainings on how to manage and support taxonomic institutions, budgets, and how to generate funds for taxonomic activities.

The following are some topics identified and recommended for future training workshops and internship programs: (a) assessment of plant and animal species in AHPs and PAs; (b) establishment and management of herbaria, arboreta, and botanic gardens; (c) writing of technical reports, research proposals, guidebooks, and other scientific papers on taxonomy; (d) development of management plans; (e) curation and documentation of species collections; (f) establishment and management of database on flora and fauna; and (g) conduct of botanical explorations/expeditions.

Some respondents recommended species for trainings include arboreal mammals; fungi; corals; fish; large important families such as Leguminosae, Dipterocarpaceae, and Sapotaceae; plants and animals in high

elevation; and plant groups that are highly diverse in AMS. Indigenous peoples and local communities should be engaged in biodiversity conservation so that IPLCs and taxonomists can learn from each other.

There should also be a mechanism to follow up and evaluate benefits and progress gained by trainees and AMS from the program. Those already trained should be supported and given the chance to work with taxonomy experts who can serve as mentors. Training of trainers should be prioritized over one training event to ensure development and sustainability of a pool of para-taxonomists in the region.

4. Attend national, regional, and international conferences on taxonomy and related fields – Attendance to national, regional and international conferences enables participants to update and widen their knowledge on taxonomy through sharing

of information, experiences, and good practices. This will also expand networks and collaboration with experts on taxonomy in other countries.

5. Work with institutions with impressive collections of specimens within and outside AMS – Hands-on experience with actual specimens is very important for botanists and taxonomists, especially those who are only starting to study, and these specimens are found in herbaria, museums, botanic gardens, and other collection institutions. A major need of taxonomists is a collection containing specimens or cultures that have been authoritatively named, ideally by comparison with the type. Herbaria, museums, botanic gardens, wildlife centers, and seed banks provide the most reliable records and information of species distribution, whether at the national or regional level, and these are vital tools for taxonomists.



Visits to herbaria, natural history museums, and botanic gardens provide opportunities to observe and learn good management practices and facilitate collaboration and linkages with taxonomists, para-taxonomists, and other staff in related fields.

If funding is available, botanists and taxonomists from AMS could be sent to international herbaria such as the National Herbarium Netherland, Leiden, and the Royal Botanic Gardens, Kew. These visits are important and will allow botanists to access type specimens and other older collections, which are often not available in AMS herbaria. They will have the opportunity to examine specimens at a regional or global scale and better understand variation and delimit species. They can also access excellent library facilities. The visits will also provide good opportunities for interaction and networking between AMS botanists and international experts.

Thousands of species of plants, animals, and organisms are still waiting to be discovered, identified, and protected. Knowledge and understanding of the species obtained through research are needed to plan and implement appropriate biodiversity conservation efforts.

Exploration and field expeditions to critical habitats and protected areas and institutions, such as herbaria and botanic gardens, could help initiate taxonomic research.

6. Enrich libraries and biological collections in AMS – Thousands of journals, books, and other literature on taxonomy have been published over the past 250 years. These scientific publications are needed by taxonomists, especially in the correct identification of species. Taxonomic literature is a necessary tool and to maintain any functional taxonomic activity, there must be access to the appropriate specialist literature. Field guides and other publications pertaining to the biota of the country have considerable value, particularly to non-taxonomists charged with implementation work (SCBD, 2008). Libraries with references should be established by the AMS.

Another key element in capacity building is the development of biological collections. Such collections in the country or region are vital for local identification capacity. These collections should contain specimens that have been identified authoritatively, preferably compared by taxonomic experts with type specimens and exhibiting as broad a range of morphological variation from the same area as possible.

The proceedings, reports, training manuals, and field guides developed by ACB as outputs of the training workshops and internship programs are very good reference materials for the AMS and are available on the ACB website at https://aseanbiodiversity.org/key_programme/japan-asean-integration-fund-projects/.

7. Strengthen national, regional, and international collaboration and network of taxonomists and organizations in-charge of natural history collections – Strengthen partnerships with regional partners such as LIPI, QSBG, Philippine National Museum, and others. Many of these institutions have existing partnerships with international organizations with large plant and animal collections such as the Royal Botanic Gardens (Kew), Royal Botanic Gardens (Edinburgh), Natural History Museum (London), National Herbarium of the Netherlands (Leiden); and Arnold Arboretum of Harvard University, USA.

Networking with experts on taxonomy, co-participants, and managers of natural history collections could expand geographical reach to institutions with highly advanced facilities and experts outside ASEAN. Experts with international repute can keep ASEAN taxonomists up to date in new research on taxonomic nomenclature, which makes changes in the taxonomy of species. Networking could facilitate access to library facilities, references, and literature; exchange of information; conduct of taxonomic activities; loan of herbarium specimens; and other activities on taxonomy.

8. Enhance information sharing and data integration at national, regional, and international levels – Some AMS are far more advanced and equipped with exceptional skills in taxonomy and database management, while others need facilities to collect, store, and share information. Available species and protected area/habitat information are likewise fragmented and

held in different formats, vocabularies, and matrix. AMS should be equipped on database management especially in their capacity for biodiversity related data storage, retrieval, and processing. This will facilitate information sharing and data integration and analysis across locations (ACB and JAIF, 2012).

Hands-on orientation on Clearing-House Mechanisms management, to include topics on management of biodiversity database, managing bulk data and stakeholders-contributors, should be undertaken in some AMS.

9. Mainstream taxonomy in national programs and projects to ensure sustainable funding for taxonomic activities in the AMS – Highlight taxonomy in NBSAPs, reports to the CBD, and among illegal wildlife trade and customs and quarantines units to stress the importance of proper identification of and knowledge of species. Dialogues with decision and policy makers and senior officials of national organizations should be initiated to enhance their awareness of the importance of taxonomy in biodiversity conservation. Working closely with decision makers to mainstream taxonomic activities in national development and financial plans will ensure that taxonomy is recognized and activities are funded.

Funding from other sources should also be sought to continue and expand capacity building activities in the region. ACB could facilitate or leverage financial assistance and technical support to continue work on taxonomy.

10. Develop local pool of botanists/taxonomists in AMS – While this recommendation is difficult and faces numerous challenges, many taxonomists have emphasized that strengthening formal education in taxonomy is key to developing a local pool of taxonomists/botanists that can help facilitate the conduct of taxonomic activities. This will require lobbying state educational institutions to include biodiversity and taxonomy in environmental education at the primary and secondary educational levels. At the tertiary level, students can be encouraged to take courses in taxonomy. Some universities already offer subjects related to taxonomy, such as plant morphology and molecular systematics. Such courses should be more widely offered. A career in taxonomy should also be made attractive to increase taxonomy practitioners. English language lessons may also be considered a requirement, given the international nature of taxonomic work.

For conservation staff who are candidates to international and regional conferences, workshops, and training activities, they should be encouraged to learn English to facilitate learning and participation.

Trainings of trainers programs could train botanists/taxonomists and para-taxonomists, their colleagues, and in turn, future generations of practitioners equipped with updated skills and knowledge in taxonomy.

AMS could utilize the modules developed by ACB or these could be tailored to the needs and priorities of the AMS, most particularly to the needs of the AHPs and other PAs and IPLCs.

The national GTI Focal Point in the AMS should be instrumental in developing the local pool of botanists/taxonomists. Their awareness of the state of taxonomy and its significance to biodiversity conservation place them in the best position to discuss measures to strengthen taxonomy with key stakeholders, including policy and decision-makers, relevant government organizations, academic institutions, funding organizations, and others.

Social media has been used to stimulate interest in taxonomy among both experts and enthusiasts, including Facebook groups such as SEBAL and Leonard Co's Digital Flora of the Philippines.

These and other efforts in AMS such as Indonesia, Malaysia, Philippines, Singapore, Thailand, and other countries can help provide insights on how to encourage interest in taxonomy and stimulate the development a local pool of taxonomy experts.

ACB is committed to strengthening taxonomy in the region by building on positive impacts generated in close collaboration with taxonomy institutions from Japan, AMS, and other partner countries and organizations.

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Outputs of Activities under the JAIF Project

Training Workshops and Internship Programs	Participants	Output
1. Training Workshop on Corals Taxonomy in Southeast Asia (Penang, Malaysia, 4–8 December 2010)	30	The Training Manual on Corals Taxonomy in Southeast Asia
2. Training of Trainers (ToT) on CITES Policies and Identification of Threatened Species (Reptiles) (Kuala Lumpur, Malaysia, 17–20 January 2011)	33	The participants were introduced to the Wildlife Trade Regulations Course (WTRC) and the Training of Trainers' Training Management Package (TMP). The WTRC and the TMP were peer reviewed, finalized and distributed to the ASEAN Member States for their reference and guide in the conduct of their trainings on CITES.
3. Training Workshop on Taxonomy of Terrestrial Plants (Bogor, Indonesia, 15–23 February 2011)	18	Training Manual on Plant Taxonomy (Dicots) in Southeast Asia
4. Capacity Building and Orientation Meeting/Workshop of ASEAN GTI's National Focal Points on Species and Protected Areas Database Interface (Makati, Philippines, 22 June 2011)	7	Report and proceedings
5. Training Workshop on Taxonomy of Terrestrial Plants (Monocots) (Bogor, Indonesia, 12–16 March 2012)	21	Training Workshop on Taxonomy of Terrestrial Plants (Monocots): A Training Manual
6. Training Workshop on Biodiversity Data Organization and Mapping of Taxonomic Information (Sabah, Malaysia, 23–25 July 2012)	10	Training Workshop on Biodiversity Data Organization and Mapping of Taxonomic Information: A Training Manual
7. Training Course on Freshwater/Brackish Water Fish Taxonomy (Bangkok and Ubon, Rachathani, Thailand, 5–11 November 2012)	16	Training Manual on Freshwater/Brackish Water Fish Taxonomy
8. ASEAN Meeting Workshop on Communication, Education and Public Awareness for Taxonomy and Biodiversity (Surabaya, Indonesia, 19–21 November 2012)	21	Plans for CEPA Strategy and Action Plan for Taxonomy and Biodiversity Conservation in respective AMS

Training Workshops and Internship Programs	Participants	Output
9. Taxonomic Capacity Building for Sustainable Use of Biodiversity: Bryophytes and Pteridophytes (Bogor, Indonesia, 20–24 February 2014)	17	Report and proceedings
10. Taxonomic Capacity Building for Sustainable Use of Biodiversity: Economically Important Insects (Predators and Parasitoids) (Chiang Mai, Thailand, 1–5 September 2014)	22	Report and proceedings
11. Advanced Course on Taxonomy of Bryophytes and Pteridophytes and Data Organization (Bali, Indonesia, 24 November –2 December 2014)	28	Guide to the Bryophytes in the Limestone Glass House of the Queen Sirikit Botanic Garden Field Guide to the Pteridophytes of Chiang Mai, Thailand
12. Training Workshop on the Biodiversity Assessment Methodologies, Data Gathering and Communication, Education, and Public Awareness for Park Management Staff (Sarawak, Malaysia, 12–22 October 2015)	26	Field Guide to the Plants of the Deer Cave Trail in Gunung Mulu National Park, Sarawak, Malaysia
Management Planning	Participants	Output
1. Orientation Workshop on Management Planning for Mts. Iglit-Baco National Park, Philippines (7–9 July 2015)	35	Report and proceedings
2. Orientation Workshop on Management Planning for Nam Ha National Protected Area (Luang Namtha, Lao PDR, 9 November 2015)	30	Report and proceedings
3. Orientation Workshop on Management Planning Tarutao National Park, Thailand (26–27 November 2015)	39	Report and proceedings
4. Orientation Workshop on Management Planning for Gunung Mulu, National Park, Malaysia (2–3 February 2016)	35	Report and proceedings

**Distribution of participants under the JAIF Project (2010–2016)
by training workshop/internship program by AMS**

Training Workshops	Participants										
	Bru	Cam	Ind	Lao	Mal	Mya	Phi	Sin	Tha	Vie	Total
1. Training Workshop on Corals Taxonomy in Southeast Asia	3	4	4	4	3	0	3	4	4	1	30
2. Training of Trainers (ToT) on CITES Policies and Identification of Threatened Species	2	4	3	3	6	3	3	2	3	4	33
3. Training Workshop on Taxonomy of Terrestrial Plants	0	2	5	-	2	1	2	2	2	2	18
4. Capacity Building and Orientation Meeting/Workshop of ASEAN GTI's National Focal Points on Species and Protected Areas Database Interface	0	0	1	1	1	0	1	1	1	1	7
5. Training Workshop on Taxonomy of Terrestrial Plants (Monocots)	2	2	2	2	3	2	2	2	2	2	21
6. Training Workshop on Biodiversity Data Organization and Mapping of Taxonomic Information	0	1	0	0	3	2	2	1	1	0	10
7. Training Course on Freshwater/ Brackish Water Fish Taxonomy	0	2	1	2	1	2	2	2	2	2	16

Training Workshops	Participants										
	Bru	Cam	Ind	Lao	Mal	Mya	Phi	Sin	Tha	Vie	Total
8. ASEAN Meeting Workshop on Communication, Education and Public Awareness for Taxonomy and Biodiversity	0	2	1	2	1	2	2	2	2	2	16
9. Taxonomic Capacity Building for Sustainable Use of Biodiversity: Bryophytes and Pteridophytes	0	0	4	2	2	2	1	2	2	2	17
10. Taxonomic Capacity Building for Sustainable Use of Biodiversity: Economically Important Insects (Predators and Parasitoids)	2	1	0	2	2	2	5	2	4	2	22
11. Advanced Course on Taxonomy of Bryophytes and Pteridophytes and Data Organization	2	2	10	0	2	2	3	3	2	2	28
12. Training Workshop on the Biodiversity Assessment Methodologies, Data Gathering and Communication, Education, and Public Awareness for Park Management Staff	0	2	2	0	11	2	4	2	2	1	26
SUBTOTAL	13	23	37	16	36	20	31	26	28	19	249

Internship Programs	Participants										
	Bru	Cam	Ind	Lao	Mal	Mya	Phi	Sin	Tha	Vie	Total
1. Training Workshop on Taxonomy of Terrestrial Plants	0	2	0	2	0	2	0	0	1	2	9
2. Training Workshop on Corals Taxonomy in Southeast Asia Corals Taxonomy	0	0	0	0	0	2	0	0	2	2	6
3. Training Workshop on Taxonomy of Terrestrial Plants (Monocots)	2	1	1	2	1	1	1	1	2	-	12
4. Advanced Course on Taxonomy of Bryophytes and Pteridophytes and Data Organization	2	3	4	3	3	3	3	3	7	3	34
Subtotal	4	6	5	7	4	8	4	4	12	7	61
Total	17	29	42	23	40	28	35	30	40	26	310
Percentage (%)	5.48	9.36	13.55	7.42	12.90	9.03	11.29	9.68	12.90	8.39	100

Management Planning	Participants										
	Bru	Cam	Ind	Lao	Mal	Mya	Phi	Sin	Tha	Vie	Total
1. Orientation Workshop on Management Planning for Mts. Iglit-Baco National Park, Philippines	0	0	0	0	0	0	35	0	0	0	35
2. Orientation Workshop on Management Planning for Nam Ha National Protected Area	0	0	0	30	0	0	0	0	0	0	30

Management Planning	Participants										
	Bru	Cam	Ind	Lao	Mal	Mya	Phi	Sin	Tha	Vie	Total
3. Orientation Workshop on Management Planning Tarutao National Park, Thailand	0	0	0	0	0	0	0	0	39	0	39
4. Orientation Workshop on Management Planning for Gunung Mulu, National Park, Malaysia	0	0	0	0	35	0	0	0	0	0	35
Total	0	0	0	30	35	0	35	0	39	0	139
Grand Total	17	29	42	53	75	28	70	30	79	26	449

Distribution of participants under the JAIF Project (2010–2016) by type/location of work

Training Workshops	Participants						
	Museum/ Herbaria	Botanical Garden	Academe	AHP/PA & Government Conservation Agencies	Others	Total	Female
1. Training Workshop on Corals Taxonomy in Southeast Asia	0	0	12	17	1	30	11
2. Training of Trainers (ToT) on CITES Policies and Identification of Threatened Species	2		1	30	0	33	9
3. Training Workshop on Taxonomy of Terrestrial Plants	3	2	6	7	0	18	7
4. Capacity Building and Orientation Meeting/ Workshop of ASEAN GTI's National Focal Points on Species and Protected Areas Database Interface	0	0	0	6	1	7	4
5. Training Workshop on Taxonomy of Terrestrial Plants (Monocots)	2	1	2	16	0	21	7
6. Training Workshop on Biodiversity Data Organization and Mapping of Taxonomic Information	3	0	0	3	4	10	8
7. Training Course on Freshwater/Brackish Water Fish Taxonomy	3	2	6	5	0	16	7
8. ASEAN Meeting Workshop on Communication, Education and Public Awareness for Taxonomy and Biodiversity	0	3	2	16	0	21	11

Training Workshops	Participants						
	Museum/ Herbaria	Botanical Garden	Academe	AHP/PA & Government Conservation Agencies	Others	Total	Female
9. Taxonomic Capacity Building for Sustainable Use of Biodiversity: Bryophytes and Pteridophytes	1	2	0	14	0	17	12
10. Taxonomic Capacity Building for Sustainable Use of Biodiversity: Economically Important Insects (Predators and Parasitoids)	4	4	6	8	0	22	12
11. Advanced Course on Taxonomy of Bryophytes and Pteridophytes and Data Organization	4	3	6	15	0	28	12
12. Training Workshop on the Biodiversity Assessment Methodologies, Data Gathering and Communication, Education, and Public Awareness for Park Management Staff	0	0	0	26	0	26	0
13. Training Workshop on Taxonomy of Terrestrial Plants	0	0	0	9	0	9	0
14. Training Workshop on Corals Taxonomy in Southeast Asia Corals Taxonomy	0	0	0	6	0	6	0
15. Training Workshop on Taxonomy of Terrestrial Plants (Monocots)	1	1	0	11	0	12	4

Training Workshops	Participants						
	Museum/ Herbaria	Botanical Garden	Academe	AHP/PA & Government Conservation Agencies	Others	Total	Female
16. Advanced Course on Taxonomy of Bryophytes and Pteridophytes and Data Organization	1	2	4	27	0	34	12
17. Orientation Workshop on Management Planning for Mts. Iglit-Baco National Park, Philippines	0	1	0	24	10	35	10
18. Orientation Workshop on Management Planning for Nam Ha National Protected Area	0	0	0	30	0	30	0
19. Orientation Workshop on Management Planning Tarutao National Park, Thailand	0	0	0	39	0	39	0
20. Orientation Workshop on Management Planning for Gunung Mulu, National Park, Malaysia	0	0	0	21	14	35	5
Total	24	20	45	330	30	449	131
Percentage (%)	5.35%	4.45%	10.02%	73.50%	6.68%	100%	29.17%

*Others include NGOs, members of media, village heads, boat operators, tour guides, homestay operators, and staff of tourism companies.

ANNEX 3

Distribution of Participants/Respondents of the JAIF Project Assessment Study

AMS	Respondents				Gender	
	Trainees	Partners	Experts	Total	M	F
Brunei Darussalam	3	-	2	5	3	2
Cambodia	3	-	2	5	5	-
Indonesia	4	-	2	6	3	3
Lao PDR	12	-	11	23	23	-
Malaysia	4	1	6	11	4	7
Myanmar	4	-	1	5	4	1
Philippines	9	1	2	12	9	3
Singapore	3	-	2	5	4	1
Thailand	9	3	1	13	9	4
Viet Nam	4	-	1	5	2	3
TOTAL	55	5	30	90	66	24
Percentage	61.11%	5.56%	33.33%	100%	73.33%	26.67%

Trainees - Participants of the training workshops and internship programs.

Partners - Implementers and resource persons in the conduct of training workshops and internship programs.

Experts - Those practicing taxonomy or related fields and have not joined any training workshops and internship programs of the JAIF Project.

Interview Guide

**Impact Assessment of Taxonomic Capacity Building Activities of the
Japan-ASEAN Integration Fund Project in the ASEAN (2010–2016)**

Date : _____
 Name : _____
 Agency : _____
 Phone/Mobile No. : _____
 Email Address : _____
 Sex : Male _____ Female _____
 Country : _____
 Affiliation : Government _____ Private _____
 Civil Society _____ NGO _____
 Others (Please specify) _____

1. How would you assess the importance of taxonomy in your country?
2. What do you identify as key challenges to taxonomy in your country?
3. What activities are being conducted in your country to address these challenges?
4. How familiar are you to the activities of the ACB on taxonomy?
5. Have you participated or collaborated in any of activity of ACB? In what capacity?
6. If yes, how would you rate the overall quality of your collaboration with ACB?
7. If you collaborated in any taxonomy courses conducted by ACB, how would you rate the effectiveness of the course in reducing the challenges in taxonomy? In what way?
8. How would you assess the capacity of ACB to strengthen taxonomy in the ASEAN region?
9. How would you assess the training courses on taxonomy?
10. Could you suggest any good practice that ACB must pursue to strengthen capacity of AMS on taxonomy?
11. Can you suggest any groups or institutions that should be partners of ACB in its interventions on taxonomy? How should they be involved?
12. Has gender been adequately factored into the taxonomy program in your country?
13. Do you have any additional thoughts to share with us?

THANK YOU VERY MUCH FOR YOUR COOPERATION.



Global Taxonomy Initiative
**REGIONAL ACTION PLAN
FOR SOUTHEAST ASIA
2017–2025**



THE REGIONAL ACTION PLAN

The 1992 Earth Summit in Rio de Janeiro gave birth to the Convention on Biological Diversity (CBD). The three goals of this convention — conservation of biological diversity, sustainable use of its components, and fair and equitable sharing of the benefits arising from the use of genetic resources — have become prime points on the political agenda of most of the world's governments. Achieving these goals depends largely on our understanding of biodiversity. Yet, in many countries of the world, particularly in the tropics, many species remain poorly known or undescribed and unnamed. Taxonomy, the science of describing, naming, and classifying organisms, has been hampered by the shortage or lack of expertise at regional or local levels leading to the worldwide efforts of addressing this concern through the Global Taxonomy Initiative (GTI). In fact, a summary report of the First GTI Workshop in Asia stated, “it was a global consensus that no single country has the expertise or funding to fully document its biodiversity, although as a basis for sustainable management of resources, and to ensure adequate access to these genetic resources and the protection of rights at national and sub-national levels (CBD Art. 15), adequate knowledge in taxonomy is vital” (Wilson et al., 2003).

Taxonomic classifications of these biological resources, therefore, will be vital; first, in the comprehensive identification of these potential resources, and second, in the formulation of suitable mechanisms that will regulate industrial and commercial utilization and production of these resources to ensure use efficiency and sustainability in the future, in compliance with the CBD and the attainment of the Sustainable Development Goals (SDGs). It will also protect and strengthen the cultural identity, spiritual values, and appreciation of biodiversity among the peoples of ASEAN Member States (AMS) while boosting opportunities for livelihood, business, ecotourism, education, and research in the region. Ultimately, it will contribute significantly to the global efforts to meet the SDGs 2030 on the environment and achieve a significant reduction in the rate of biodiversity loss by 2025.

The lack of trained human resources and inadequate capacities on taxonomy has been stressed as one of the obstacles in the implementation of CBD commitments, especially in the ASEAN region. ASEAN's dynamic growth in recent years has increased the pressure on its natural resources. Human activities, the driving force behind the regional growth, threaten biological resources. Lack of scientific information on biodiversity in the region is a crucial issue in the assessment and prediction of biodiversity changes, caused mainly by the lack of taxonomic capacity in data collection and analysis.

The CBD in its Ninth Meeting of the Conference of the Parties (COP 9) has recognized that the global taxonomic impediment constrains the global biodiversity agenda. In response, a GTI Regional Action Plan for South East Asia 2010–2015 was developed by the AMS with China, Japan, and Korea through the ACB. The action plan served as the roadmap in addressing the GTI as implemented in the ASEAN region.

This Regional Action Plan 2017–2025 is a continuation of the first regional action plan 2010–2015 and was developed through a workshop with GTI national focal points, some members of the ACB Scientific Advisory Committee, and prominent taxonomists of the ASEAN Member States as participants. The current RAP 2017–2025 will also serve as the roadmap for taxonomy in the region for the next eight years.



Purpose of the GTI RAP 2017–2025

The GTI Regional Action Plan 2017–2025 shall serve as the roadmap for ASEAN Member States to address the taxonomic impediment in the region. Specifically, the GTI RAP 2017–2025 shall:

1. Guide GTI national focal points in planning activities related to taxonomy;
2. Serve as an instrument in seeking funds for its implementation and other related activities; and
3. Help identify activities that will contribute to the achievement of Aichi Biodiversity Targets 12 (species extinction) and 19 (science-based information and transfer).



Goals

The GTI RAP 2017–2025 embodies four goals.

1. Address taxonomic needs and strengthen capacities at the national and regional levels based on the priority needs assessment;
2. Support the establishment and maintenance of systems and infrastructures needed to obtain, collate, and curate the biological specimens that are the basis of taxonomic knowledge;
3. Facilitate an improved and effective infrastructure/system for accessing taxonomic information through the existing platforms such as the Regional and National Clearing-House Mechanisms (CHMs), among others; and
4. Assist the AMS in generating information needed for decision-making in the conservation and sustainable use of biological diversity and its components.

GOAL 1

Address taxonomic needs and strengthen capacities at national and regional levels based on priority needs assessment.

Objectives:

- 1.1. Identify taxonomic priorities of each AMS and the ASEAN region through needs assessment.
- 1.2. Enhance the taxonomic capacity of the AMS.
- 1.3. Increase public awareness of the AMS on taxonomy.

Objectives	Strategic Actions	Specific Actions	Timeline
1.1. Identify taxonomic priorities of each AMS and the ASEAN region through needs assessment	1.1.1. Assess taxonomic needs and identify gap priorities of the AMS	1.1.1.1. Conduct consultation workshops for specific target sectors (agriculture, forestry, fisheries, etc.), government and non-government organizations, including academe, policy-makers, indigenous and local communities, and others.	2017-2020
		1.1.1.2. Prepare National Taxonomic Needs Assessment Report.	2017-2020
	1.1.2. Assess taxonomic needs and identify gap priorities of the region	1.1.2.1. Conduct consultation workshops to facilitate sharing and identification of taxonomic priorities by experts on taxonomy from ASEAN.	2018-2020
		1.1.2.2. Prepare a Regional Taxonomic Needs Assessment Report.	2018-2020
1.2. Enhance the taxonomic capacity of the AMS	1.2.1. Develop and implement human capacity building program on taxonomy for AMS	1.2.1.1. Conduct national and international training courses, internships, fellowship programs, etc.	2017-2025
		1.2.1.2. Conduct para-taxonomic trainings.	2017-2025
		1.2.1.3. Conduct taxonomic research.	2017-2025
		1.2.1.4. Sponsor graduate studies on taxonomy.	2017-2025
		1.2.1.5. Create scholarships for graduate studies.	2017-2025
		1.2.1.6. Leverage support for graduate studies scholarships.	2017-2025
		1.2.1.7. Develop training modules on the use of existing tool kits e.g species identification, species image recognition, and others.	2017-2025
		1.2.1.8. Facilitate exchange programs for taxonomy students and taxonomy practitioners between universities, herbaria, and other research institutions.	2017-2025
		1.2.1.9. Encourage local staff to attend national and international symposiums on taxonomy.	2017-2025
		1.2.1.10. Conduct training course on methodology assessment for identification of conservation status for national and international red data lists.	2018-2025
		1.2.1.11. Build capacity in DNA barcoding and phylogenetic research.	2018-2025
		1.2.1.12. Conduct training on specimen collection processes (e.g photography, field notes, DNA material, and others).	2018-2025
		1.2.1.13. Craft a Communication, Education, and Public Awareness (CEPA) Plan on Taxonomy <ul style="list-style-type: none"> - Produce CEPA materials - Translate and popularize technical documents on taxonomy - Develop mobile applications for taxonomy - Promote taxonomy on various channels (social media, print, broadcast, online, and others) - Promote of taxonomy through celebrity endorsers - Consider edutainment in production of CEPA materials - Produce audio-visual materials - Promote Citizen Science on biodiversity appreciation and conservation - Promote iconic species to inspire various stakeholders to do conservation activities/actions - Produce events (festivals) to celebrate taxonomy and biodiversity 	2017-2019
		1.2.1.14. Develop policy briefs and strategies for taxonomy at the national level	2018-2025

GOAL 2

Support the establishment and maintenance of systems and infrastructures needed to obtain, collate, and curate the biological specimens that are the basis of taxonomic knowledge.

Objectives:

- 2.1. Provide access to taxonomic information.
- 2.2. Improve biological collections as sources of taxonomic information.
- 2.3. Increase quantity of specimen collections and available taxonomic information.
- 2.4. Identify and establish taxonomic reference centers.

Objectives	Strategic Actions	Specific Actions	Timeline	
2.1. Provide access to taxonomic information to AMS	2.1.1. Support access to and generation of taxonomic information	2.1.1.1. Gain access to online/digital taxonomic literature, publications, and taxonomic specimens.	2017-2025	
		2.1.1.2. Digitize type specimens and integrate to the CHM.	2017-2025	
		2.1.1.3. Upgrade libraries by digitizing publications and integrating to the CHM.	2017-2025	
		2.1.1.4. Standardize the interoperability of databases / platforms in the AMS for data management.	2017-2025	
	2.1.2. Support access to and generation of taxonomic information.	2.1.2.1. Conduct workshops, symposia, and consultation meetings.	2.1.2.2. Establish a program for exchange of materials between institutions / researchers.	2017-2025
			2.1.2.3. Facilitate/Develop specimen loan programs among AMS.	2017-2025
			2.1.3.1. Institutionalize connection between the GTI focal point person and CBD focal institution.	2017-2025
	2.2.3. Strengthen the coordination/facilitative roles of GTI National Focal Points		2.1.3.2. Allocate resources for operational activities of the GTI focal point.	2018-2025
2.2. Improve biological collections as sources of taxonomic information	2.2.1. Strengthen the coordination/facilitative roles of GTI National Focal Points	2.2.1.1. Improve facilities (building, cabinets, air conditioning, microscopes, and others).	2017-2025	
		2.2.1.2. Conduct training on herbarium and museum curatorship.	2017-2025	
		2.2.1.3. Establish standard pest (insects / fungi / bacteria) management protocol of collected specimens (poisoning and other treatments).	2017-2025	
2.3. Increase quantity of specimen collections and available taxonomic information	2.3.1. Rationalize/simplify the permit system for specimen collection and transport	2.3.1.1. Facilitate sharing of different permit-securing systems of each AMS for inter- and intra-country specimen collection activities.	2017-2020	
	2.3.2. Facilitate collections and exchange of specimens through national and regional policy development underpinning mutual benefit between the source and receiver of specimens.	2.3.2.1. Initiate discussion towards crafting policy recommendations in terms of developing protocols for regional movement of specimens for national museums / botanic gardens / herbaria (e.g. EU policy in specimen movement).	2021-2025	
		2.3.2.2. Conduct training on specimen collection processes (e.g. photography, field notes, DNA material, and others).	2018-2025	
2.4. Identify and establish taxonomic reference centers	2.4.1. Strengthen existing networks for regional cooperation in the development and establishment of taxonomic reference centers	2.4.1.1. Assist in the establishment and improvement of existing taxonomic reference centers (herbaria, botanic gardens, museums, arboreta, aquaria, culture collections, and others).	2018-2025	

GOAL 3

Facilitate an improved and effective infrastructure/system for accessing taxonomic information through the existing platforms such as the Regional and National Clearing-House Mechanisms (CHMs), among others.

Objectives:

- 3.1. Establish and maintain national CHMs containing species database.
- 3.2. Improve the cooperation of the AMS through sharing of information through the ASEAN CHM, other Multilateral Environmental Agreements (MEAs), and among GTI, CHM, and CBD Focal Points.

Objectives	Strategic Actions	Specific Actions	Timeline
3.1. Establish and maintain national CHMs containing species database	3.1.1. Establish and maintain national CHMs containing species database	3.1.1.1. Identify organizations and individuals with species information and establish data sharing protocols . <i>(Data sharing protocols refer to agreements among stakeholders' network in the collection, updating, and access of data contributed to the CHM species database).</i>	2017-2019
		3.1.1.2. Establish and update species checklist . <i>(Species checklist refers to the collated list of species [with taxonomic information] of all member organizations in a CHM network. Information on species abundance and distribution may be included if readily available).</i>	2017-2020
		3.1.1.3. Conduct national level trainings in data encoding, species database organization and management, and CHM establishment and maintenance.	2017-2020
		3.1.1.4. Develop and update species database in the national CHMs based on the species checklist.	2017-2025
		3.1.1.5. Identify and develop new knowledge products and tools (products derived from the database).	2018-2025
3.2. Improve the cooperation of the AMS through sharing of information through the ASEAN CHM and other Multilateral Environmental Agreements (MEAs)	3.2.1. Develop and implement capacity building program on the establishment and maintenance of CHMs	3.2.1.1. Conduct regional trainings in data encoding, species database organization and management, and CHM establishment and maintenance.	2017-2025
		3.2.1.2. Develop and update species databases in the ASEAN CHM.	2017-2025
		3.2.1.3. Translate species data to English language.	2017-2025
	3.2.2. Establish linkage with other Multilateral Environmental Agreements (CITES, CMS, Nagoya Protocol, Cartagena Protocol)	3.2.2.1. Conduct consultation workshops with MEAs to ensure the interoperability of species information at the national level.	2017-2020
3.2.3. Strengthen cooperation among the CHM, GTI, and CBD focal points	3.2.3.1. Facilitate information exchange activities for the CHM, GTI, and CBD focal points.	2017-2025	



GOAL 4

Assist AMS in generating information needed for decision-making in the conservation and sustainable use of biological diversity and its components.

Objectives:

- 4.1. Conduct taxonomic inventory in AHPs, protected areas (PAs), and other conservation areas.
- 4.2. Conduct national assessment of the conservation status of species of AMS.
- 4.3. Address cross cutting issues in the CBD such as Climate Change, Agrobiodiversity, Crop Wild Relatives, Access and Benefit Sharing (ABS), Invasive Alien Species, and Traditional Knowledge, among others.

Objectives	Strategic Actions	Specific Actions	Timeline
4.1. Conduct taxonomic inventory in AHPs, PAs, and other conservation areas	4.1.1. Generate information needed for decision-making in the conservation and sustainable use of biological diversity and its components.	4.1.1.1. Conduct research and development activities in priority conservation areas.	2017-2025
		4.1.1.2. Identify biodiversity hotspot areas and critical ecosystems.	2017-2025
		4.1.1.3. Develop / update geo-maps of species and habitats.	2017-2025
4.2. Conduct national assessment of the conservation status of species of AMS	4.2.1. Review and assess conservation status of species (IUCN, IAS, CITES, CMS, etc.)	4.2.1.1. Conduct research and development activities.	2018-2025
4.3. Address cross cutting issues in the CBD such as Climate Change, Agrobiodiversity, Crop Wild Relatives, Access and Benefit Sharing (ABS), Invasive Alien Species, and Traditional Knowledge, among others	4.3.1. Develop programs to address cross cutting issues	4.3.1.1. Conduct assessment studies of crop wild relatives, traditional varieties, and others.	2018-2025
		4.3.1.2. Conduct studies on species responses to climate change.	2018-2025
		4.3.1.3. Conduct studies on the impacts of IAS on native biodiversity.	2018-2025
		4.3.1.4. Conduct studies on the impacts of GMOs on native biodiversity.	2019-2025
		4.3.1.5. Conduct ethno-biological studies (relationship between human and biological resources).	2018-2025

The **ASEAN Centre for Biodiversity (ACB)** is ASEAN's response to the challenge of biodiversity loss. It is an intergovernmental regional centre of excellence that facilitates cooperation and coordination among the ASEAN Member States and with relevant national governments and regional and international organizations on the conservation and sustainable use of biological diversity, as well as the fair and equitable sharing of benefits arising from the use of such national treasures.

For more information, log on to www.aseanbiodiversity.org or chm.aseanbiodiversity.org

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Championing Biodiversity Conservation in the ASEAN Region



2011-2020
United Nations Decade on Biodiversity

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