[6th AP-BON Workshop in Incheon Korea on 10-11 October 2014]

Day	Time	Agenda	Speaker
10/10 (Fri)	9:40-9:50	Opening	Ryo Mabuchi (Secretariat of AP-BON, MOEJ)
	9:50-10:00	Welcoming	Byoung-Yoon Lee (Director of Plant Resources Division, NIBR)
	Session 1 : Tightening linkage of AP-BON and GEO BON		
	10:00-10:20	Achievements and challenges of AP-BON	Tetsukazu Yahara
	10:20-10:40	Follow-up Measures for IUCN Resolution for AP-BON	Eun-Shik Kim
	10:40-11:00	Developing AP-BON potential products	Sheila Vergara
	Break		
	11:10-11:40	Progress in GEO BON and Essential Biodiversity Variables	Jörg Freyhof
	11:40-12:00	Discussion on GEO BON and Essential Biodiversity Variables	
	Lunch		
	Session 2 : Contribution to Red List by tightening linkage of AP-BON with ESABII and GBIF		
	13:00-13:20	Progress in ESABII	Filiberto Pollisco (ACB)
	13:20-13:40	Integration of a local checklists for conservation biological interest	Tsuyoshi Hosoya (NMNS) and Yu-Huang Wang (TFRI)
	13:40-14:00	GBIF and data publishing	Yu-Huang Wang (TFRI)
	14:00-14:20	Redlisting of Asian Bryophytes	Benito Tan (UC Berkeley)
	Break		
	15:00-15:20	K-BON and Red List in Korea	Chan-Ho Park (NIBR)
	15:20-15:40	Plant species database in Japan	Motomi Ito (U Tokyo)
	15:40-16:00	Plant diversity observations in tropical Asia	Shuichiro Tagane (Kyushu U)
	Break		
	16:30-17:30	Discussion on Regional Red List and KBAs	
	18:00	Participants will leave NIBR and move to the hotel.	
	Dinner		
10/11 (Sat)	Session 3 : Developing AP-BON as a network of national BONs		
	9:00-10:00	Reports on national BON activities	Nepal: Mangal Man Shakya Myanmar: San Thwin K-BON web platform: Jongsun Park (K-BON)
	10:00-10:20	From CForBio to SinoBON	Keping Ma
	10:30-10:50	Phillippines	Perry Ong
	11:00-12:00	Discussion	
	Lunch		
	Session 4 : Contribution to IPBES regional assessment		
	13:00-13:20	Scoping of IPBES regional assessment	Tetsukazu Yahara
	13:30-13:50	Networking observations of ecosystem	Tohru Nakashizuka
	14:00-15:00	Discussion	

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Day 1

The 6th Asia-Pacific Biodiversity Observation Network Meeting began with an introduction by Mr. Ryo Mabuchi of the Ministry of the Environment, Japan. He apologized for Ryuji Nakayama's absence, and gave the address in his absence.

Mr. Nakayama thanked the participants for his invitation, and apologized profusely for being unable to attend. He first extended his gratitude to NIBR for providing accommodation, facilitation, and hospitality. He also expressed his thanks to Mr. Lee Byoung-Yoon, and Dr. Park Chanho, NIBR, and the members of K-BON for holding the workshop.

Second, he wished to express his gratitude to the ASEAN Centre for Biodiversity for hosting the workshop last year, which was a great success. Third, he expressed gratitude to all the participants at the event today, especially for those who made the long journey and back to Pyeongchang the previous day. In particular, he wished to thank Dr. Kim Eun-Shik and Dr. Vergara, and everyone else for contributing their precious time. AP-BON was expected to contribute to the activities of IPBES in the ASEAN region by providing technical knowledge; one of the primary themes of the workshop. Furthermore, it was expected to develop further with regional networks, such as K-BON. The Biodiversity Center of Japan was pleased to work with AP-BON and others in the Asia-Pacific region to further develop biodiversity activities. He hoped the workshop would be fruitful, and thanked them again for their invitation. With that, Mr. Mabuchi concluded Dr. Nakayama's message.

Next on the agenda was the welcoming address by Lee Byoung-Yoon. Dr. Lee welcomed all of the delegates from Korea and overseas, welcoming all to his institute. GEO BON coordinated activities by nearly 100 organizations, and in Asia, the Government of Japan in particular opened their eyes to the importance of GEO BON, and invited several specialists from neighboring countries, leading to the establishment of AP-BON. Dr. Lee himself was invited to that meeting. They met now in Korea to consider further activities to conserve biodiversity in Asia, and work on policy initiatives. GEO BON was recognized by the Convention on Biodiversity, and its data was used to contribute to meeting the Aichi Targets for 2020. He hoped the meeting today would further that agenda. With that, he concluded his address.

Session 1: Tightening Linkage of AP-BON and GEO BON

Mr. Tet Yahara began the session, briefly introducing the achievements and challenges of AP-BON. GEO BON was organized in 2008 as a coordinated network of many global entities. On a global scale, there were many international activities. In their first conference, they stressed avoiding competition, as they wished to focus on conservation. CBD in the meantime focused on policy, and IPBES focused on assessment. There were several global bodies involved. In the Asia-Pacific region, usually the same people were working in research, assessment, policy, and so on. In the research statement of AP-BON, they included not just research, but also assessment.

AP-BON was organized under the core of GEO BON, and had held numerous meetings already. After the first conference of GEO BON in 2008, not long afterwards they held the first AP-BON workshop. A very important recent change was that IPBES was established in 2013 for regional assessment. Additionally, CBD COP10 established the Aichi Targets; and they were now midway on the path to achieving compliance. Their important achievements included the publishing of two AP-BON books. Those were The Biodiversity Observation Network in the Asia-Pacific Region, and Integrative Observations and Assessments. They were planning to publish a third volume. In the second volume, they published on the challenges and assessments of AP-BON.

The missions of AP-BON were mainly to facilitate linkages among many countries, organizations, and individuals to contribute to global biodiversity. They had already made good progress in database structure

and data sharing, along with a network of programs, national BONs, and institutes. The next steps for AP-BON were to establish better governance, and a stronger, collaborative secretariat mechanism. Japan made a great effort in this area, but budget allocations had diminished, and they hoped to garner more support. In Japan, they were working on integrative observations and assessments of Asian biodiversity projects, and hoped to further observation projects throughout Asia. They held a workshop on freshwater biodiversity, and a workshop on coastal marine habitats. Several suggestions for AP-BON in their 4th workshop included editing and networking the national biodiversity outlook together, as in some countries they were published but not based on good science. In the 5th workshop, they discussed potential products from 2014 onwards, which Dr. Vergara would discuss.

Points to be discussed in the workshop included how to develop collaboration with GEO BON, GBIF, IUCN and ILTER; coordinating national BONs, capacity building in collaboration with ESABII, compliance with Aichi Targets, and contributing to IPBES. They would discuss at the end of the 6th workshop on how to further those points, including publishing the AP-BON book. With that, Dr. Yahara concluded his presentation.

Afterward, Dr. Kim Eun-Shik spoke on follow-up measures for IUCN Resolution for AP-BON. He was thrilled that the workshop was held in South Korea this time. Although this was the 6th meeting, he expected that NIBR could further contribute in the future. Although they had previous CBDs, such as that in COP10 where the Aichi Targets were formulated, he thought it was quite important they hold this meeting as well. They hoped to work with Japan to promote AP-BON along with GEO BON as well, building up regional bonds. First, they needed the structural aspect of a network based on regional bonds, and to be linked with GEO BON in terms of function in order to contribute to the conservation of biodiversity and conservation. He tried to find ways to contribute to AP-BON, including his thoughts on how far they had progressed already.

Dr. Kim showed a timeline of major global events and issues on the environment. Most were kick-started in 1972 with the UN Stockholm Conference on the Human and Environment. They had to figure out what kind of role they wanted to play in the future, given the events in the past. He pointed out the IBPES establishment in 2012, and described its four functions. He mentioned major sponsors and co-sponsors of their initiative; the Nature Policy Division, Ministry of Environment, Korea; the Ministry of the Environment, Japan; and many others. Key resolution items were that they urged state and government agency members of IUCN to support currently existing biodiversity observation network activities, to encourage non-governmental organization members of IUCN to actively participate, to encourage all governments to participate and support the networks, and to request the director general to cooperate.

His questions for AP-BON were: were there national BONS with secretariats and relevant committees? Was AP-BON a regional network of the national BONs with secretariats? Was GEO BON a network of regional BONs? What was the niche of AP-BON in the conservation of biodiversity? Dr. Kim stressed that they needed to clarify that. He thought they needed more structure, and to fully discuss roles. There were many gaps that needed to be filled that K-BON and J-BON alone could not cover. What should a national BON involve, what kinds of activities? What inter-linkages could they create with other BONs, regional or otherwise? What were the benefits of networking?

Governance and infrastructure was one of the points to stress, he thought; as well as their service to society (including communication to society). Potential partners for AP-BON included institutes like NIBR, the ASEAN Biodiversity Center, GEO BON and regional BONs, IUCN members, headquarters, the Asia Regional office; and more.

Dr. Kim said they should think of two things. First, which of the Aichi Targets did AP-BON aim for? What was its contribution? Also, with the IPBES Work Programme, in which area should they contribute to? Follow-up measures included finding the gaps that needed to be filled. That included a network of networks, perhaps; key issues of governance, funding, and infrastructure; activities in research and science; and service to society. He also discussed whether strong linkages would be important factors for success, and suggested again to collaborate with governments. They discussed some of those issues at the side event at COP12, but needed to discuss more.

Many other items related to the status of AP-BON included assessment, policy support, capacity building, PR, and more. He also suggested they link their activities to the Essential Biodiversity Variables, and as global variables they would be more effective than regional. Biodiversity was so extremely complex and unpredictable, so variables would be key in monitoring. In conclusion, he asked if they had specified the questions and problems to address and solve by AP-BON. He suggested the ecological questions asked by William J. Sutherland *et al.* by the British Ecological Society as a framework to follow, such as the 100 Ecological Questions of High Policy Relevance to the UK, one hundred questions to conserve global biodiversity, and identification of 100 fundamental ecological questions. With that, he finished his presentation.

Next up was Dr. Sheila Vergara, who presented on developing AP-BON potential products. She thanked NIBR for hosting the meeting, and all of the participants who came from afar to attend. She hoped to build on the last meeting held in the Philippines. She was to discuss AP-BON activities and challenges, as well as the future. Suggestions included organizing a regional red list, identifying key biodiversity areas, establishing essential biodiversity variables, support for work on mosses, and amassing more data.

For a regional red list, they hoped to encourage more countries in the region to establish such lists and prioritize biodiversity conservation. The components of these included capacity building, with taxonomy, skills in data entry, and conservation assessment; monitoring conservation threats at the national level in particular; having a common database, having national elected categories that included ‘rare’, and being conservative in their efforts.

Key Biodiversity Areas were meant to encourage Asia Pacific countries to identify the KBAs with their national red lists, so as to identify other areas as a base of map-based site selection. They could constitute one AP-BON contribution to IPBES, CBD, and GEO BON. They were a cost-effective means for AP countries to identify special areas that need protection. The Centre was developing tools for plotting protected areas already. They needed to agree on the methodology, and think about the mechanics of how to improve upon the current process of monitoring to include KBAs at the national, sub-regional, and regional levels. Next, Dr. Vergara showed a map of areas that had already adopted the KBA schema. The same process was implemented in Malaysia. Terrestrial and marine KBAs had been identified, but there was still a need to overlay more data on the ASEAN IBAs to further identify KBAs.

The next suggestion was to adopt the essential biodiversity variables. The purpose of implementing these was to establish baselines to understand and document changes and impacts in the region, to be able to select six clear variables which everyone could agree upon, to be an important AP-BON product to feed to IBPES; and so on. Challenges of implementing EBVs was that it was complex to implement, that there were some difficulties in using global tools, that ecosystems were difficult to measure, among others. Suggestions included having regional EBVs, and to network with developers of global EBVs to inform regional identification processes through identifying AP-BON members to take charge of those discussions. Other suggestions include monitoring the rate of species extinction, the rate of conservation threats, and the use of satellite images.

They also agreed to support work on mosses. Databases did already exist, but they wanted to emphasize the applications of that work, in relation to indications of climate change. To provide an incentive for scientists to share their work and contribute data, they also thought it was important to mobilize data paper preparation. It was also emphasized to have AP-BON members collaborate on preparing data papers. There was initially a suggestion to have at least two data papers for 2014 as preparation for COP12, and also suggestions to publish through GBIF’s global tools. Other suggestions included opening existing databases for access. They also agreed on a timeline of implementation: work was to begin immediately on red lists until 2020. A subsequent presentation would clarify the timeline even further. Dr. Vergara concluded her presentation there.

After a short break of ten minutes, they continued the presentations, beginning with Jorg Freyhof’s presentation on progress in GEO BON and Essential Biodiversity Variables. He discussed that the secretariat of GEO BON had moved from South Africa to Leipzig, Germany. The German government supports GEO BON financially and with Internet management, positioning them in a good spot to carry out its activities. He

found it difficult to present on EBVs, since they were described at the side event at COP12 already; but would do his best.

The background of EBVs was clear: they needed solid data on biodiversity and ecosystem service status and change. Previous data was very limited. The 2020 CBD goals were a major opportunity for biodiversity monitoring: many countries were still only just starting up monitoring programs, still considering what biodiversity areas they would study in the long run. Many countries, even, did not fully know what species existed in their countries. CBD focused on biodiversity change, however, but for that to be fully studied, they needed a place to start from. Thus the BONs faced a major challenge in collecting data.

GEO BON was all about biodiversity *change*, not assessment. They asked what was changing, why was it changing, and what were the impacts. In some cases, it was easy to tell, such as in the case of a particular beetle in Southeast Asia, which spread out of control. However, many times it was not so clear, because biodiversity change was a very complex topic; more complex than climate change. There were many dimensions to biodiversity change. GEO BON's key products included a global network of BO systems, technologies that facilitated more cost-effective and powerful observations (BON in a Box), and the Essential Biodiversity Variables. Linkages were a major part, helping to make biodiversity initiatives visible. BON in a Box was an online toolkit for monitoring biodiversity, an easy way to contribute and start building up monitoring.

Indicators for biodiversity change included the living planet index, the red list index, the wild bird index, and the water bird population status index. Bird data was particularly effective for understanding biodiversity change, and he provided data showing that. However, they still had a very limited knowledge of what was happening on a global scale. Each of the data sets he provided was not a global trend; one was expert opinion, one was data biased to popular regions, one was only North America and Europe. There was poor taxonomic coverage of many regions around the world, like Southeast Asia and South America. If they had to recommend a biodiversity for a government to measure in the long term, the choices were genetic composition, ecosystem structure/function, species population, species traits that could change, and community composition.

What to measure, however? Which data was available, and should the measurements of biodiversity be driven purely by available data? What was really essential for understanding biodiversity change—did we need to measure absolutely everything? Who was the data essential for?

In 2012, specialists gathered to discuss the issue, and came up with the Essential Biodiversity Variables: what needed to be monitored to describe and analyze the different dimensions of biodiversity change. The questions that EBVs had to help answer are: how was biodiversity changing, why was biodiversity changing, what were the consequences for human well-being, were responses being taken effectively, and what was the future risk of harmful biodiversity? The characteristics of EBVs were that they covered the different levels of biodiversity: genetic diversity, species populations, distributions, extinction risk, ecosystem functioning, and ecosystem services. The key to these was that pressures are being monitored by other initiatives. EBVs needed to detect change, quantifiable, repeatable, allow aggregation and disaggregation, biological, and with emphasis on state. Users of EBVs include policymakers, scientists, conservation professionals, and NGOs.

Mr. Freyhof then gave a list of the examples of candidate essential biodiversity variables, but they were still in the phase of development. Everything was oriented to CBD and the Aichi Targets, which made it easy to consider how to serve the Aichi Targets. EBVs were an intermediate layer between primary observations and high-level indicators. They needed to be globally developed, which was a great challenge. Mr. Freyhof gave several examples of EBVs, such as time-lapse maps.

How far had EBV development come? The first steps were the GEO BON adequacy report in 2011, workshop identifying the EBVs in 2012, and a paper with the concept in 2013. In 2014, the Darwin Core would be changed to account for abundances developed by GBIF, to host trend data that could then be developed into EBVs. Future milestones included invitations to communities to develop specific EBVs, a workshop on remote sensing of EBVs, and analysis of Target 15 based on EBVs. Next, he discussed the data flow. Would

they go directly to GBIF, if it were even ready to accept data? Mr. Freyhof concluded his presentation at that point.

Following his presentation, the participants began a discussion on the matters he raised. Dr. Kim thanked Mr. Freyhof for his presentation first of all, and agreed that they needed to have some focus on the Aichi Targets. He also agreed they had limited time to work, as they were witnessing biodiversity loss around the globe. Dr. Kim thought that it would be prudent to analyze regions closer, instead of a global map; and national levels had to be extremely precise. National BONs should work on local areas, creating even more detailed data. Dr. Kim thought that ecosystems were flexible and difficult to define in precise borders, and thought that finding bigger ecosystems (landscapes) were essential to understanding the functional and structural aspects of an ecosystem.

In response, Mr. Freyhof responded to the question of scale. He wished that there would be a data set with a large amount available, that there was one set that was global and could be scaled down locally. However, no one was aware of such a data set that actually existed. Even in published papers, because of limitations in actual data available there were gaps in information. As a first step, they had to take what was available and link it to what was available, but even that was still a challenge. Most activities in biodiversity were national or regional, with huge amounts of data collected on that scale, but they were not made available globally.

For the second question, he agreed that the definitions of an ecosystem were very poor, very broad and not specific enough. Those working on the ecosystem EBVs were quite eager to change this.

Next. Dr. Ma Keping asked about the organization of GEO BON at the global level. He understood that the priority of GEO BON was to guide national or regional activities, such as to set up and select essential activities to monitor biodiversity change. As a next step, compared to other international initiatives or organizations, what would GEO BON do? Mr. Freyhof replied that it was admittedly a bit vague, as he noted the rise of ‘grassroots’ BONs, such as Nepal BON. That was a sign to him that they were not linked enough. Regional networks like AP-BON found their own ways somehow. He admitted he was not quite sure about the next step, but that one of their key aims was to engage with regional and national BONs, but they had no real structure until now about how to do it. They liked the idea of national BONs being closely related to national governments, as governments develop strategic plans, and deliver data to CBDs. They still had to figure out how to effectively link and share their projects. It was their wish and aim to engage with national BONs, and they hoped to develop strategic framework soon to do so. Funding and incentives had not really come into the question yet.

Next was a question by Dr. Park Jongsun of K-BON, who first expressed his gratitude being invited to the workshop. He was curious about how to interpret the diverse data, such as the data from the paper on EBVs. How were they able to combine diverse data and interpret it coherently? Mr. Freyhof first replied that they need the data, and that for instance in genetic diversity analysis, it was not clear how to distinguish that data. Dr. Yahara added that they had many discussions about linking genetic diversity with species diversity and so on, and that they would publish a consensus paper on that issue. It was not easy to summarize briefly, but they already had a great deal of evidence linking genetic diversity with species diversity. The key challenge was to develop models to describe the relationship between loss in genetic diversity and loss in habitat, etc. They had a great deal of data, but relationships were not quite clear.

Dr. Park discussed models, that they still had limitations: that it was difficult and complex to compare two layers, and that they ought to seek out the unexpected instead of looking for an orthodox answer. If there was any chance to find new relationships, he hoped they would take it. Mr. Freyhof replied that they all, of course, come from a scientific background, and always interested in young scientists who were thinking of new things.

Another question came from Mr. Mangal Man Shakya from Nepal regarding the evolution of GEO BON, and wondering if it had clear agendas like AP-BON. He also asked about links to the government. Government was always claimed to be everywhere, but sometimes nowhere. That was why it *was* government. BONs should not be part of governments, but supporting governments when necessary. Mr. Freyhof replied that he

was of course aware of those issues. His impression from the trial was that there was a lot of data collected in countries by NGOs, and even those who came from outside to research, who went back with their research data and that it could possibly be available for a national BON, for a government to fulfill its needs, and so on. However, there were no connections between any of these, and he hoped to avoid situations where data was collected and never got where it needed to go. The structure of AP-BON and GEO BON was not so different, mostly that they tackled different things; GEO BON had its own scientists and working groups, with its own ideas. They focused on certain products, however, so as to make actual concrete progress instead of focusing a little bit on everything.

On a closing note for the morning, Dr. Yahara closed the session and dismissed everyone for lunch.

Session 2: Contribution to Red List by tightening linkage of AP-BON with ESABII and GBIF

The afternoon began with a brief outline by Dr. Yahara, introducing the first session by Dr. Filiberto Pollisco of the ASEAN Centre for Biodiversity on the progress in ESABII. He described the activities in Southeast Asia in relation to ESABII, and how far those had come in advancing biodiversity initiatives.

He started off with a brief timeline with the Centre's meeting with ESABII, which began in 2009 with the ASEAN +3 Regional Meeting on Global Taxonomy Initiative. Five years afterward, he thought it was a good opportunity to discuss those issues once again. In 2010, the Japan ASEAN Integration Fund Project on Taxonomic Capacity Building, and the Inception Meeting in Manila with ESABII were held. Following that meeting was the Coral Taxonomy Training in Penang, Malaysia with ESABII; then in 2011 came the Dicot Taxonomy Training in LIPI, in Bogor, Indonesia, with ESABII. Next in 2011 was the Training of Trainers Course on wildlife trade and identification of CITES listed species in Kuala Lumpur, Malaysia, largely with Japan; and the database and mapping of taxonomic information in Kota Kinabalu, Sabah, Malaysia. There was no ESABII in the last event, but they did invite some to learn about taxonomy and how it related to the coding they did for software.

Next was the internship programme for dicot taxonomy in Bangkok, Thailand. One thing they learned from taxonomy training was that ASEAN nationals had a very difficult time coming up with scientific articles, because one of the outputs they had for the program was that participants should come up with scientific articles; the participants found it difficult to overcome the language barrier to submit something in English, translated from their own language. That meant they had to change their approach to internship programmes.

In 2012, they got approval of the Y2 JAIF project on taxonomic capacity building; and the Monocot taxonomy training in LIPI Bogor, Indonesia, with ESABII. After that was the GTI regional capacity building workshop to address IAS and to reach the Aichi Targets, conducted with Japanese organizations. There was also the freshwater and brackish water fish taxonomy in Ubon Ratchathani, Thailand, with ESABII and the Nagao Natural Environment Foundation and the URU. They also had the ASEAN meeting workshop on communication, education, and public awareness for taxonomy and biodiversity in partnership with UPH, Surabaya, Indonesia. Those involved were communication specialists, because they wanted to demystify taxonomy for the mass population. Next was the Monocot taxonomy internship programme in Queen Sirikit Botanic Garden, Chiangmai, Thailand. They learned from the workshop in Bangkok, and aimed for the participants to just come out with a field-guide book; which worked out much better than scientific articles.

In 2013 there was no activity regarding taxonomy or ESABII, since they had to write the training manuals, procedures, and all else. ESABII and Japan were also still in crisis due to the aftermath of the Tohoku Earthquake. In 2014 was the bryophyte and pteridophyte training in LIPI, Bogor, Indonesia, now sponsored by ESABII and MOE-Japan. Next came the approval of the Y3 JAIF Project on Taxonomic Capacity Building, and the taxonomy of beneficial and economically important insects. Remaining activities for 2014 included an advance course on bryophytes and pteridophytes taxonomy back-to-back with databasing of taxonomic information, which was to be joined by the same participants from the training in Bogor. The participants of the previous session would carry over and encode the information to the database themselves, instead of simply handing over the information to an IT team without any context.

Remaining activity of the Y3 JAIF project for 2015 would be the January internship programme for the taxonomy of bryophytes and pteridophytes in Queen Sirikit Botanic Garden. They wanted to do more, but could not squeeze out any more events. Dr. Pollisco showed some of the publications they put out in 2013, put out mostly by the participants themselves. Some were already uploaded onto their website, and he encouraged the participants in the 6th meeting to take a look. Another recent project in 2014 was the Japan-ASEAN Integration Fund-approved project, for ASEAN Heritage Parks Development through Capacity Building and Information Management. They were targeting park rangers and workers in particular to better be able to collect information.

Activities for 2015 would include the inception meeting with the AHP committee members and management, updating management plans of selected AHPs, information management and database building capacity, assessment methodologies and data gathering in AHPs, and communication, education, and public awareness. That concluded Dr. Pollisco's presentation.

Next up to present was Dr. Hosoya Tsuyoshi, discussing the integration of local checklists for conservation biological interest. Dr. Hosoya elaborated on the background of the talk, and the progress they made since their last meeting. They identified several challenges and made proposals on how to overcome them. He also hoped to discuss future plans.

GBIF, the Global Biodiversity Information Facility, was an international organization focused on making biodiversity data available through the Internet. Membership was open to countries, international organizations; and a fee was charged for members. Regions were separated into nodes. Recently, GBIF was engaged in regionalization procedures, because of a rapid increase in participants and regionalization becoming necessary as a result of limited manpower. Some of the regions were making their own strategic plans, working along with GBIF's. They mainly paid attention to two things: making a species checklist at the national level for invasive, red list, endemic species. They needed national checklists, but integrated checklists required time and it was almost impossible. Some countries did not even have a checklist. Thus they started from a species list of conversation biological interest, such as with a red list or invasive species.

At the same time they noticed ESABII, the East and Southeast Asia Biodiversity Information Initiative. They found that other initiatives were moving in the same directions regarding information gathering and taxonomy databases. Thus GBIF Japan began working on integrating the checklists, first with red lists and invasive alien species. They held a workshop in Tsukuba, Japan to promote understanding of the checklists, to survey current status of each of these in East Asia, and to determine strategies for integrations of the red lists and more in East Asia. Some countries had their own lists, but they were not at all uniform in their format; some were in Excel, some PDF, some even in print. They had to figure out the required elements and decide on a format.

To ensure compatibility, they discussed minimum elements in the same format. Those elements included taxonomy, with scientific name, kingdom, family, common name; their red list status; and their invasive alien species list. Since their last meeting, they identified some of the challenges that were posed to their work.

GBIF had already collected the fundamental data for the materials. They needed clearance from each region for integration. Data integration was already finished, largely through outsourcing funded by ESABII. However, problematic data was revealed. The range of red lists was extremely vast and vague, often times simply 'animals and plants'. Larger, higher rank groups needed to be a matter of discussion.

The procedure was rather simple. They made an OCR/manual into Excel data, converted PDFs into Excel as well, and combined them into a single integrated spreadsheet. Some countries gave higher taxonomy in each data, but they did not always follow the same system. Based on that, they eliminated synonyms to standardize names. However, they needed to develop protocols (SOPs, guidelines, or manual) for future applications.

Problematic data included simple typos, abbreviations, different taxonomic systems, "all species of the genus (IAS)," and particular regional population of the species. They corrected names referring to a source, changed the systems to more common ones, but struggled to delineate red lists for particular regional populations. For taxonomy, they used taxa matching services. They settled on the IRMNG Taxamatch, which offered fuzzy

matching that was quite handy. He introduced their homepage, and demonstrated how to use the service. Surprisingly, even more than exactly spelled species, they had far more many items that had no match to species in the database. The cause of no match might have depended on spelling. They had to examine the names individually, finding that names had sometimes been published and did not match official taxonomy.

How did that happen? Names had to go through a nomenclature filter, confirming Latin usage, and validity; however, whether that taxonomy was acceptable or not was the question. If the names were published and the database was intended for nomenclature, it should be included, but for taxonomy it might not be. Even nomenclatural databases did not include all Asian species. There were several reasons for that, because of a lack of attention, the information was not yet reviewed, taxonomic ambiguity, or taxonomic novelty. In any case, that caused a lack of recognition for Asian species. They needed a proposal for inclusion of Asian species. They expected a single textbook, authorized database for the nomenclature where all validly published names were included; however there was no such database, despite the importance of important Asian species. They still needed a tool to check and spell the name. Dr. Hosoya said they should develop a list containing at least the important species from Asia with the help of experts, and provide it to GBIF and IRNMG. With that, he concluded his presentation.

Mr. Freyhof had a comment, that in all the red list stories, he did not mention the IUCN red list. He wondered how interoperable all of the 'national' red lists really were, since European countries generally just made their own. There had been efforts to update Asian lists into the IUCN red lists, but the formats and criteria did not match, particularly with Japan. Dr. Hosoya replied that in Japan they had no direct contact with the IUCN, but he heard that they needed their own criteria. Mr. Freyhof wondered if it wouldn't be a useful step to engage the IUCN, thus their efforts would translate globally. Dr. Hosoya replied they wanted to, but they had no connection. Mr. Freyhof said the hurdle to translate data was not high. Dr. Yahara mentioned that in Japan, in most cases, they had some incompatibilities with the IUCN red list. They still needed some negotiation on how to incorporate global and local needs.

Mr. Ong had a comment, that the IUCN red list was now quantifiable and not so subjective, but it still posed a problem at the local level, where they evaluated species in the Philippines. Some criteria judged particular animals as endangered, but locally were considered pests. If you used wrong criteria, you were misallocating resources, he thought. He did not want threatened species simply because they fell under a category; rather he thought they had to be judged locally. Practical implications were essential.

The next presentation was Mr. Yu-Huang Wang from the Taiwan Forestry Research Institute. He reminded the audience that some issues on Biodiversity/Ecological or Biological/Environmental Big Open Linked Data (BE BOLD) had been presented during the 5th APBON meeting in 2013. However, in this talk, he further discussed essential elements for data publishing: incentives, culture, standards, tools, and platforms for sharing data.

Incentives included academic credit and rewards, like citations. That could be built up through data papers, dataset DOI, and Data Citation Index (DCI), and financial support. In recent years, governmental and private funding agencies have also started to ask researchers to open datasets from funded projects to public. For culture, open and shared data and information are essential for creating open knowledge and networked sciences. He suggested the book Reinventing Discovery by Michael Nielsen for more on the topic. Data are valuable; thus, datasets from projects being funded by public resources should become public domain assets. On managing assets, data management and curation also should become an essential part of research. The US and Australian governments have already implemented data management policy on funding projects.

Data standards also are crucial for open data. Existing controlled vocabularies, e.g., the Darwin Core for biodiversity, the CUHASI hydrological controlled vocabulary for hydrology, and the EARTh for environmental research, will facilitate data sharing on the Web. Tools and platforms included IPT of GBIF Asia nodes and GBIF portal for publishing checklists and occurrence data; Morpho and Metacat of ILTER or JaLTER for publishing ecological observation data. The GEOSS portal or CKAN can be platforms for generic data management. Mr. Wang provided a vision and listed existing ontologies, e.g., the Ecological Observation Ontology (OBOE), Semantic Sensor Network (SSN), Darwin Semantic Web (DSW), and PO & OBO for BE BOLD. Those ontologies could be fused to describe and interlink datasets of biodiversity and ecological

observations.

To promote open data in Asia, he suggested workshops on data publishing and writing data papers, encouraging masters and Ph.D. students to submit their research datasets to open archives before they were granted a degree. Providing challenging events, like the GEOSS hackathon or the Ebbe Nielsen challenging of GBIF, also will stimulate innovative ways of reusing and publishing data.

Dr. Kim had a comment on linking oncologies, and thought it was an intriguing idea. He asked if it had the capacity to integrate observations and synthesis. Mr. Wang replied that for the time being, he did not know. If they wanted to link data sets, at the moment they could use the Darwin Core, but they would need a true expert to help them generate a model to follow as the first step.

Dr. Benito Tan gave the next presentation on the red listing of world endangered bryophytes. He described his work with Asian organizations on studying bryophytes, and his work as a member of the IUCN-Species Survival Committee (SSC) on Bryophyta. First he explained on the organization of IUCN, the International Union for Conservation of Nature, which has helped over 75 countries plan conservation strategies. The IUCN had put out several publications on the topic. The IUCN in 2001 created categories to judge the presence of a species, concentrating particularly on threatened species.

How to red list bryophytes? The IUCN-SSC on Bryophyta suggested to first make a checklist of the local bryophytes, which included a proper assessment of actual population size data, but that information was seldom available for bryophytes. They thus had to use indirect data, such as the decline of old-growth forest naturally correlating to a decline in bryophytes; and how habitats were exploited by man, as well as pollution and air and water quality. Next was to exclude species with far too little knowledge to be evaluated, as well as those with unclear taxonomy; species with a high certainty of survival were also excluded, and the remaining species were evaluated according to the red list criteria.

Some of the IUCN requirements were extremely difficult to apply to bryophytes, simply because they were a group of small plants. It was impossible to count individual specimens, and the length of generation time of a species was another problem. Measuring the area size of distribution was also an issue. But that did not mean it was impossible. For species dependent on trees, the number of colonized trees could be counted. Each entity growing on a boulder or rock could be an entity. For species on the ground, the area size could be measured by counting the grids that have a fixed measurement; and so on. For generation time, as it was very difficult to measure how long moss lived, they proposed different lengths of life: short time of 1-3 years, medium of 4-7 years, long of 8-20 years, and ultra long-lived for time beyond that.

Next was measuring the fragmented size. Populations of a species of bryophytes, within a one kilometer distance from each other, that have frequent production of small and light spores were not considered fragmented; and populations more than 5 km apart with large sized spores and poor dispersal were thought of as fragmented populations.

Their first test case was done with Chinese endangered bryophytes. He elaborated on a three-day meeting in 2004 held in Shanghai, attended by 16 resident Chinese bryologists and 6 invited foreign experts. They came up with a total of 82 species, including 50 mosses, 31 liverworts, and one hornwort. Out of the 82, 8 species were included in the IUCN, and today that red list contains 103 species. In Asia today, only China, Japan, Malaysia, Singapore and the Philippines had red lists for bryophytes.

Dr. Benito C. Tan and his colleagues from the IUCN-SSC on Bryophyta also did a test case for the red-listing of bryophytes in East, Southeast and South Asia, conducted in the Singapore Botanic Gardens in 2008, attended by 18 well-known bryologists. Using the same criteria, the group came up with two separate lists of endangered bryophytes in Asia, including 137 species of mosses, 186 species of hornworts and liverworts. Out of those, 7 mosses and 16 hornwort species were accepted by the IUCN.

Next, Dr. Tan discussed the organizational chart of the IUCN-SSC Bryophyte Specialist Group. The 2014 Steering Committee of the SSC group was headed by Dr. Tomas Hallingback, Dr. Irene Bisang, and Dr. Ariel

Bergamini; and consisted of 25 bryologists from all over the world. They were tasked with reviewing the case presentation for the acceptance or rejection of a bryophyte species nominated, and to determine its proper placement in a category of species endangerment.

In 2010, an action plan was formulated by Dr. T. Hallingback and Dr. B.C. Tan to conserve the world bryophyte diversity, with three approaches: increase knowledge on bryophyte species diversity and identify site of bryophyte hotspots, develop more regional red lists, and to train local specialists in taxonomy. The approach also had to increase public awareness of the ecological presence and economic importance of bryophytes, and to implement all possible practical conservation measures with the available funding provided by the national government and international organizations; essentially a 'beggar' attitude. Following that, the IUCN SSC on Bryophyta wanted to increase two-fold the red list assessments prepared at the national and regional levels. To close his presentation, he showed some pictures of endangered bryophytes in Asia.

Dr. Park Jongsun asked about population size, and was curious about whether the scientists tried to figure out the genetic diversity of the bryophytes. Dr. Tan replied that the species at present in the IUCN red list were chosen due to their endangered habitat mostly; he did not believe genetic diversity was a factor. Mr. Park also asked what they could do when they found bryophytes in Korea or elsewhere. Dr. Tan replied he would be very thankful for any new data on Korean moss diversity, as any data he could receive would be appreciated. The next step, he asserted, was simply getting funding for their research, and promote better understanding of Korean bryophytes.

Dr. Kim asked why bryophytes might not have been included in the NIBR books; the response was that this relies on the knowledge of the authors of the Korean red lists, for which bryophytes were not included. With that, Dr. Yahara announced a short break of ten minutes.

The session started up again, beginning with a presentation by Mr. Tagane Shuichiro, discussing plant diversity observations in tropical Asia. He first discussed biodiversity hotspots for conservation priorities, with Southeast Asia at particularly high risk. The problem was that there was a lack of reliable data, particularly with plant species. To overcome this problem, Dr. Yahara started a new program with the Ministry of the Environment, of integrative observations and assessments of Asian biodiversity, split into five themes. To get data for his group, he used specimen-based, plot-based, and transect-based approaches to gather data. Specimen-based meant that past records were available, but the collection area was limited; plot-based meant they could observe long-term but only for tree species, and the standards were mismatched. Transect-based meant that they collected all plant species, and understand distribution of plants on a local scale. They could finish and collect data quickly with that method; Mr. Tagane mostly worked with the transect-based approach.

The belt-transact method was to record all species within a 100m x 5m scale, where they recorded height and DBH for trees over 4m high, building up a species accumulation logarithmic curve. They gathered nearly 17,300 samples, which could then be used to create taxonomical, ecological and phylogenic studies; picture guides; databases and more, sharing their data over Dropbox. He showed some examples of the species they collected. They worked with numerous partners to collect samples all over Southeast Asia. Borneo had the most species richness, followed by Sumatra. Many more species were found near the equator, decreasing the further away. They used their data to demonstrate the relationship between species richness and altitude in various locations.

Next, he introduced a case study in Bokor National Park, Cambodia, where they performed 21 transects. They collected 3,099 specimens, and identified 770 woody plant species in 108 families. They found 22 new species, 120 new records for Cambodia, and 45 species endemic to Bokor. That showed that plant diversity in Cambodia was widely underestimated. To observe plant diversity accurately, they had to make more effort, particularly in basic taxonomical work. As an example of the diversity, he showed a graph comparing the proportion of undescribed species (candidate new species) of Lauracae at each location.

Mr. Tagane went on to the key message of his presentation. A standardized transect survey was an effective way to describe local flora rapidly. In collecting more than 17,000 records with precise GPS data and images, they better enabled staff of protected areas to develop plans for better conservation management. He thanked

the members of his team for their support, and concluded his presentation.

Mr. Mangal Man Shakya from Nepal asked about the plants they collected during the observation, and if they photographed them and examined the different aspects of the plant in that place, or if they brought it to Japan and studied it there. Mr. Tagane replied they collected three duplications of specimens, keeping one set in their spot and bringing two sets to Japan. Dr. Tan asked if they included bryophytes—Dr. Yahara suggested he look at the database and identify them himself.

Next, Mr. Darnaedi from Indonesia asked about the graph showing the relationship between species richness and altitude, commenting on the various altitude peaks correlating with altitude; Mr. Tagane replied that it would depend on climate, landscape, and any number of factors. Rainy areas tended to have many more, but drier areas had fewer. Mr. Ong commented on the first slide, about biodiversity hotspots, wondering why the Philippines were not selected. Mr. Tagane replied that they did not have a connection with the Philippines and could not select a site. Dr. Yahara added to that, that they were visiting particular locations where historical specimens were available so as to speculate on change.

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After that, Dr. Ito Motomi spoke on plant observation data and fit-for-use biodiversity trends. Generally getting data, standardizing it, creating a database was the final goal; but now they want to be able to optimize that database for actual use. As a member of GBIF, he showed the vast number of materials they had amassed, and showed a statistic showing the affiliation of authors and papers; the United States had the most, followed by the United Kingdom. He elaborated on a data pathway, and how to extend GBIF for sample-based data. It was important for GBIF because in using those data sets, they could compare different data sets and times. Thus, fit-for-use biodiversity surveys: data could be cherry-picked to monitor change.

Next, he introduced two examples of Japanese data. One was the Red Data Book and List, published every ten years; the next update would be in five years. He also displayed a ‘green list’ of Japanese native plants, already completed and compiled. It was a checklist of Japanese angiosperms species, to survey for endangered species, and to confirm their most recent scientific name. It included 6,345 native taxa, excluding forma and hybrids. Next, he displayed the IUCN criteria for establishing endangered species, and compared that against the Japanese plant red list, performing a quantitative analysis as a means to estimate future population change in population numbers. He also showed an example of a census sheet for a species, which included locality, number of population, and number of mature individuals, reduction rate, and main reason of reduction. It was a taxing survey to complete, and most scientists who relied on it were themselves almost ‘extinct’, so it was not used often. He described Japanese mesh categories, and displayed the result of expected extinction over ten years and compared that to species data.

Examining the data of endangered species in Japan was crucial for conservation purposes, but was sensitive for one good reason: the data could be stolen and exploited. Thus it was only available for academic use. If conservation efforts were made, then most endangered species in Japan could be conserved well.

Next, Dr. Ito moved on to introduce the GRENE, Green Network of Excellence, which examined environmental informatics, biodiversity, and ecosystem. It worked on the collection and standardization of plant community information, using plant community census data by the Ministry of the Environment, and vegetation of Japan recorded by Miyawaki Akira, plus the Darwin Core and extensions, allowing for very rich data. He showed an example of that in action, an analysis of a predicted species distribution by ecological niche monitoring. Using that data, they could extrapolate it to estimate past and present distribution to estimate future distribution. He demonstrated another example, comparing the level of species changes in the

Kanto area of Japan during its period of high economic growth, showing how drastically species declined.

To conclude, they needed to compile many independent data for wider coverage of space and time, that establishing databases was not the final goal, for fit-for-use they would use GBIF-defined Darwin Core extension for sample based data, and use sample-based monitoring to further reach more conclusions.

Mr. Freyhof thanked him for his presentation, and commended him on his decision to use Darwin Core. Dr. Ito replied that they were using a database very similar to their plant community data and it was easy to adapt. Mr. Ong asked if the predictions they had made had actually been evaluated and compared in real time. Dr. Ito answered that there was some mismatch between prediction and reality, such as their models predicting more diversity in western Hokkaido than there really was. Mr. Shakya commented on the University of Tokyo collecting specimens from Nepal, and how that would build a database; Dr. Yahara replied that it should be made available.

Finally, Dr. Park Chanho discussed the Korean red list and K-BON. They started their initiative five years ago, with a first publication two years later.

The number of native species in Korea was estimated to be almost 100,000; a total of 41,483 were known, including 2,177 endemic species, which showed a high degree of endemism in the Korean biota. Most of these species were insects, over 15,000; and 527 species were vascular plants. The Korean peninsula served as a migration route during glacial periods, and thus was blessed with a variety of species. Dr. Park showed a table displaying the number of species according to major taxa from 2002 to 2013 in the Republic of Korea.

In the process of preparing the 2014 National Red List, they used the IUCN Red List Categories and Criteria, and the IUCN Red List Categories and Criteria at Regional Levels. The species included were mammals, birds, amphibians, reptiles, fish, vascular plants, and mollusks. Some taxa belonging to insects were included; but invertebrates, algae, and fungi were not included. Only inland indigenous species to Korea were evaluated; and alien species were not assessed.

As a result of the evaluation, 1,021 species were classified on the red list. More than 90% of taxa were estimated on the IUCN criteria B. Out of Korea's 41,500 species, 8,150 were evaluated for the red list. Next, Dr. Park showed another table for the number of species evaluated for the red list, and another one displaying the endangered status of animals and plants species evaluated in the red list. The total number of threatened species in Korea came to 517, about 7.1% of all species; 113 species were endemic to Korea. The Total number of unthreatened species numbered 6,786. Therefore, more than 90% of taxa should be estimated upon criteria B, and he listed statistics showing how many species fit that criteria.

Next, Dr. Park discussed K-BON, and how it gathered information on the red list. Their solution was to create a mobile app for smartphones that allowed for community input to the K-BON server farm. With that, he concluded his presentation.

Mr. Freyhof asked about the remarkably high level of threatened vascular plants. Dr. Park replied that their biological resource situation was not just surveying plants, but many species besides. Dr. Yahara added that the number of threatened vascular plants in Japan was twice the number, and thought maybe even that Korea was more threatened than they thought. Dr. Ma commented on China's assessment of species, finding that their threatened margin was about 12%, similar to Korea's. Mr. Ong asked about the table from 2002-2013, and asked what the reason was for the increase in numbers over the decade. Dr. Park replied that they had been able to identify more species. Dr. Tan asked about one graph where 43 species of amphibians and reptiles were all listed as endangered; Dr. Yahara clarified that the species were candidates for the red list, not those of all the species in Korea itself. Mr. Freyhof expressed confusion about the classification. Dr. Yahara announced a short break before discussion commenced.

Discussion commenced regarding the topics brought up during the discussion, particularly the EBVs and the criteria for listing threatened species, which was defined by the IUCN, although with variations on national levels. They began from the level of species, considering the linkage between EBV and the red list. Even in

the standardized level of species, names were a problem. One idea was to develop a standardized checklist of species, and then develop a regional red list that could be used for further studies. AP-BON could take on that project. Mr. Freyhof asked if they had ever considered working with DOI so that they could keep contact between the old and new names. Dr. Ito responded that GBIF was creating a local checklist first and then aligning with the accepted names, keeping both original name and accepted name.

Mr. Wang added that the database indicates a space for identification, so that they could still trace it back in prior publications. Dr. Hosoya said that they should work on securing the traceability of the names. Dr. Park Jongsun added that sometimes many species were merged into one, and then were suddenly split into two or three species, which made it impossible to trace back since that took extensive time. He said they still had to consider a practical way of processing it in some way. Dr. Yahara brought up rice as an example, as well as a shrub, as one species whose differences were clearly documented and the other which was not. Locality was helpful, of course.

Mr. Shakya wanted to give a different perspective on fauna, on the possibility of delisting a species from the red list. He described the case of the wild rhinoceros in Nepal, whose numbers had rebounded. If they were confident the number had reached its target, could it be delisted from a country independently, but not from the world status? Dr. Tan thought that to delist a name from the IUCN was not difficult, just that they had to appeal to the IUCN to do so.

Dr. Tan then asked about if in Japan or Korea, if they had found an area that had many endangered species, and what the process would be to declare that area protected by the government. Dr. Kim replied that in Korea, they have different ministries that protect the areas by law, making it difficult to get development for those areas. Second, they would ask the EIA, for Environmental Impact Assessment, to make sure it was okay. He supposed it was rather strict in Korea, and that they would need to get a law passed. The President could sometimes modify the procedures to push it through quickly. In Japan, they promoted biodiversity quite a bit and contacted the Ministry of the Environment to suggest potential sites. They used algorithms to identify areas to be protected, and the Ministry handles that data on their own. The next step would be consideration of cost. They would likely need to submit a cost-benefit analysis to convince the Ministry.

Dr. Darnaedi shared his experience in Indonesia. They had many protected areas, with many different classifications. The Forest Ministry made those decisions in Indonesia, but there were huge conflicts between mining and conservation. The government in Indonesia preferred conservation, but it was difficult to reserve an area if it held potential value in that area; it becomes a national and regional issue. If there was no conflict of interest, it was not an issue, since they were required to have a certain amount of land set aside for conservation anyway.

Mr. Freyhof thought that led back to discussion of KBAs, and what led special sites to be red listed due to needs for biodiversity conservation. Dr. Vergara said they already had a map for the Philippines, though it was old. They needed more information for plant species and amphibians too. They would need the efforts of GEO BON to manage their data and gather more information, as the organizations she contacted for data declined to share it. When they looked into protected area assessment in Indonesia, they easily surpassed the 10% protected area target.

Dr. Kim first thanked the Ministry of Environment in Japan for supporting their activities and getting everything started. Common themes and common goals were the target they had to think about. They had to figure out what AP-BON did as a network, and, what kind of network they were. He described gaps in the network, first being their strategy to work with GEO BON and promoting regional BONs. He also said they did not have bylaws that specifically state the qualification of member nations, that they did not have a close relationship with government; and they also had no strategies to promote national BON systems. They also needed a way to promote their members, as well.

Second, he wanted to say that while they discussed data quite a bit, they had to settle on what that data would be used for. Data was useful for making knowledge, but also for policymaking and scientific contribution,

where he thought they could do better in finding more gaps. He also said that they should make it clear that AP-BON was related to the Aichi Targets, with five strategic areas: causes of biodiversity loss, lowering pressure, improving the status, benefitting and increasing biodiversity. He thought they should have a consensus about what area they place on their activities, and that it was the gap in their activities.

Dr. Yahara replied, commenting on strategies first. He said he started from the GEO BON conference in Potsdam for starting AP-BON. There, many people emphasized that it was a network, not a project, in order to avoid competition with other bodies. GEO BON was not a network to provide products originally, but now it was being asked to deliver products. Since then, he thought that GEO BON has thought about projects. AP-BON, working with GEO BON, thought its main role was providing opportunities for discussion and communication; but they needed to identify some particular goals to achieve. In the prior workshop in the Philippines, they discussed some candidate products, including regional EBVs and red lists. He thought those were tentative strategies for AP-BON activities. He asked Dr. Kim if he thought they needed to identify their goals more, or concentrate on other issues like membership. Dr. Kim simply thought they needed to have bylaws to make it clear.

Mr. Freyhof added that GEO BON matured over the years, and the still-developing network should be able to answer questions and deliver products. Working groups had many more products and they were free to develop them—it was not competitive—but he expected from a national or regional BON was to really coordinate the available or developing observation systems. What was there, what data was collected, how to make the data operable, how to make it available in a way such as metadata so that it could be applied within a global network? A national BON was the national coordinator of national activities within the frame of GEO BON, which were able to produce output that could then be integrated on the local level.

Dr. Yahara added that they were working under the form of GEO BON, but were also working with other databases, because human resources were limited on a national level; the same person could be working with many entities. One role of AP-BON or national BON was to coordinate activities with many international bodies or universities, not only with GEO BON, but others; a small but important difference. As for the effort to link from national to global levels, he referenced Dr. Hosoya's talk. If they considered regional risk, then they needed a great deal of effort to adjust their data. They had potentially a huge amount of data, but it was difficult to merge. One way to change the ownership to the public was to publish a data paper, which was why they were considering a workshop on publishing data papers. For instance, they could invite several scientists working on plots in Asia to discuss how they could publish their data, and how that data could be openly accessed. If they could identify particular core sites where they could observe many variables over time, it would be very helpful for GEO BON.

Dr. Vergara understood the difficulties in collecting and summarizing data, but she thought they should consider the suggestions of Dr. Kim to be able to distribute their work in the region. Most were doing the work based on the mandates of their institutions and AP-BON, but nothing had been signed, really. AP-BON was a loose network, but since they wanted governments to consider their recommendations, there had to be a way to tell them that AP-BON contributions were legitimate. Only GEO BON was recognized; not the national BONs, because there were no formal links. She thought they should see how they could work that out.

Dr. Darnaedi added that Aichi biodiversity targets had to be reached by country, so national responsibility was very important to hit the targets. Every country would have to identify in a midterm review what they had done to meet those goals. National BONs had to contribute to government, suggest policies, and that they could monitor what has actually been changed, done, or what has not been done. Governments were not particularly aware of any issue related to the CBD. Any activity on the regional level, if there were something of value for the target that could be implemented in every country, would be very important. He wondered if AP-BON could strengthen national BONs to help them reach their targets, and strengthen awareness of their network.

Mr. Freyhof thought that definitely there were more things outside than what was assessed nationally. He cited an example of deforestation in Indonesia that was done by Americans; so the data was already out, but there

still had to be a way to get downscale from major data sets. There was already globally available data (such as the satellite pictures of Indonesian deforestry), which could then be fed into AP-BON or national BONs. Mr. Wang added that their mission in the session was to solve the problem about KBAs, and currently they had red lists, but checklists alone were not useful. Besides checklists, they also needed location and occurrence data; so why not data for identifying species? They needed a way to identify key variables for generating EBA or EBV, and understand the kind of input they needed to have. Dr. Kim agreed with that approach, saying that they should identify the issues and the steps forward to go. He also mentioned Global Forest Watch to Mr. Freyhof, which was generated by Google, and stressed that they had that kind of access to data and should identify opportunities it grants. Additionally, he thought they should be in some sense functional in terms of AP-BON.

Dr. Yahara said that the next day, they would discuss their contributions to IPBES, discussing their contributions to biodiversity services, as they were very relevant to their activity. He thought the next volume of AP-BON book three would be collecting papers on biodiversity services in the AP region. Dr. Hosoya quickly advertised the GBIO, and asked everyone to take a look, as some of the issues they discussed would be incorporated.

The first day’s discussion came to a close at 17:32.

Day 2

Dr. Yahara began the morning, announcing the agenda for the day, and Dr. Vergara headed the morning session with a brief series of exercises.

Session 3: Developing AP-BON as a network of national BONs

First to present was Dr. Henrique M. Pereira on GEO BON: A Strategic Vision for 2014-2016. GEO BON had been going through transition. It had been around for a long time, and with supporters like Dr. Yahara and Dr. Kim, it had been going on steadily. Now, it had grown to have a bigger secretariat, which meant a few changes for the organization.

The vision for GEO BON was that it was a coordinated global network that gathered and shared information on biodiversity, combining in-situ and remote sensing data, and more. Over the past six years, AP-BON, under the guidance of Dr. Yahara, had come a very long way; Dr. Pereira was happy to see all of the activities happening on the regional level, saying that AP-BON was the most advanced one he had seen. He thought that GEO BON has been successful in getting organizations to harmonize and improve biodiversity observations. They also supported the CBD in identifying data gaps and raised the visibility of biodiversity monitoring, helping to sort and organize the data. They also were working hard on the implementation plan for 2015, and had established working groups towards this: to show that GEO BON has created products that exemplify its mission. Finally, they established the essential biodiversity variables to assist in monitoring.

He elaborated on the governance of GEO BON, and its reorganization. They wanted to make national and regional BONs the central aspect. Most of the work so far had been in thematic working groups, but they now split their main core into an implementation committee, a management committee, and an advisory board. The management committee was a subgroup of the implementation committee, which now had a secretariat and an IT specialist. The implementation committee's responsibilities consisted of implementing the deliverables and implementation plan of GEO BON, budget, and executive function (although most tasks were delegated to the management committee). Next was the advisory board that met once a year to provide strategic direction, and elects the management committee every three years. The working groups' responsibilities were to develop and implement specific thematic aspects of GEO BON and plan out how to carry out its plans and objectives for the next few years. Responsibilities of national and regional BONs included implementing and coordinating activities on their respective levels. Thematic BONs however had to go through a formal approval process to become affiliated with GEO BON, and were composed by regional and national networks.

Priorities for the next three years were to continue developing the Essential Biodiversity Variables. They were preparing criteria to assign development of the EBVs to particular communities, and were creating Wikis for each EBV on the new GEO BON web page. EBV development would focus first on criteria, be created according to sub-discipline, with some being under development for longer than others. Next they would undergo a selection process, with GEO BON coming to a final EBV set, whereupon they could now head to a broad buy-in, endorsement and investment.

GEO BON also wanted to increase strategic engagement with national governments and organizations. They had their new tool, BON in a Box, which would help with that initiative. It was a bottom-up capacity building approach to improve global biodiversity observations, and lowered the threshold for a region to develop its own monitoring network. It was meant to be a digital, downloadable product that any organization could use to set up monitoring of their own.

The third priority for GEO BON was to support the development of regional and national BONs. They wanted to engage all of them in developing the criteria to approve national and regional BONs, as they did not want to impose criteria on all of the regions at once.

How did they see it coming together? They saw the core of GEO BON, with South America BON, AP-BON, and Arctic BON becoming regional hubs, each with their own national BONs. Fourth, they had to develop monitoring-based products relevant to users. For many years he had urged this in GEO BON, but it was not

enough to get resources mobilized; they have to demonstrate what improved monitoring could do. They had certain products, Deliverables, which they had to deliver by 2015 to show what they could do.

One product was an analysis of Target 15. There were two steps to this: identifying degraded ecosystems, and to analyze EBVs from 2000-2015 on those ecosystems, identifying population abundances, habitat extent, and NPP.

Two conceptual paths for GEO BON included a mostly guided path and a mostly opportunistic path; Dr. Pereira thought the guided path was better, likening it to putting together a puzzle of a structure that had to come together. With that, he concluded his presentation.

Mr. Perry Ong asked if the BONs would be government sanctioned. Dr. Pereira replied yes, but not fully. They did not need the Ministry of Environment to formally sign a letter in that regard or anything, but the BON could say that the government endorsed them; no direct link was necessary. Mr. Ong also asked about EBVs, about restoring ecosystems and species, wondering if those were part of the agenda as well. Dr. Pereira responded that it was another way to use the EBVs. For instance, one could look up the living plant index and compare numbers, and find out if an ecosystem was being restored.

Dr. Kim said that one of the major issues they had was promoting their initiatives. He thought one way might be to use the EBVs, since AP-BON was a rather loose network, and by using the variables they could strengthen their network further. He also brought up the guided and opportunistic pathway, but thought they should pick the path that allows for the most support for regional and national BONs to meet their potential. Dr. Pereira agreed that developing national BONS was the way to go, along with identifying opportunities. The EBVs might allow for the more opportunistic goals to be more solidified and guided. The main thing was that they really wanted to emphasize the national and regional BONs as the main core of GEO BON in the coming years.

Dr. Park Jongsun asked if he had considered genetic diversity in his examples. Dr. Pereira replied that he had not, because they did not have the resources to do it globally yet. Dr. Darnaedi brought up the issue of different priorities for different countries, and thought national BONs could be well-designed to complement those targets. He thought they were still in the stage of reorganizing and evaluating what capacity they actually had, and what thematic issues they could tackle. He asked if they could design BON in a Box to address that kind of national problem. Dr. Pereira acknowledged it was challenging, as different BONs would of course want to emphasize different aspects of monitoring. He was not sure yet on how to address those yet, but he emphasized that they had to be flexible to allow for different priorities. One thing was that countries that had already implemented the system could give good feedback, which other countries could build off themselves; that doubly emphasized its bottom-up approach.

Mr. Freyhof added that all kinds of biodiversity monitoring time initiatives were available. They could be compiled from the AP-BON countries, and put online with a description of the initiative.

Dr. Yahara thought an important part of BONs was that they facilitated a network and communication between scientists, who often worked independently. For instance in Japan, taxonomists had been isolated from ecologists, ecologists were isolated from botanists, and so on, spurring collaboration. Next, he invited speakers from each country to discuss their activities.

Dr. Vergara introduced the next presentation by Mr. Mangal Man Shakya from Nepal, speaking on the promotion of the network activities for the biodiversity observation in Nepal and the South Asia region. He introduced his organization, the Wildlife Watch Group. Established in 1993 as an informal group, it was registered as an NGO in 2002, and became a non-profit organization in 2011. It was a member of IUCN, SSN, ITC, GTI, IPPL, and the Satoyama Initiative. It was a watchdog in the context of biodiversity conservation, and was Nepal's first wildlife trade-related NGO that monitors the implementation of CITES. Their mission was the demystification of science, so that common people could understand what scientists did in their field or in the lab.

WWG proposed to become N-BON during the Preparatory Workshop for 2012 Jeju World Conservation Congress in Seoul, Korea, which was held by Dr. Kim, and became interested in AP-BON initiatives. Later, a motion, 'Establishment and Promotion of the AP-BON,' successfully passed the AP-BON, of which WWG was a co-sponsor. Mr. Shakya was a speaker in an AP-BON side event in IUCN WCC in Jeju, in 2012, as N-BON (Nepal-BON) leader.

Next, he highlighted key points of the motion: acknowledging that biodiversity was important for economic, social and sustainable development; that observation and monitoring the status of biodiversity in nature were among key tools in designing and implementing successful interventions toward sustainability; acknowledging integration of current activities on biodiversity observation in the AP region as key to valuing biodiversity; and understanding that regional BONs were being integrated from national level BON activities, and that other BON initiatives were being encouraged.

Next, he described WWG's N-BON activities. They performed, along with IUCN Asia regional office and the Ministry of Forest and Soil Conservation of Nepal, biodiversity observation in assessing climate change impact on flora and fauna in Nepal's Langtang Himalayan range. There they found a decrease in crop production up to 75%, native plants displaced, and more. Based on those observations, they proposed protected areas, such as international convention enlisted sites like Ramsar sites and World Heritage sites, to carry out extensive studies in the remaining protected areas in Nepal and in other countries as well.

In 2012, Dr. Kim visited Nepal, where he discussed extension of AP-BON and promotion of N-BON, and prepared a draft proposal on Promotion of the Network Activities for the Biodiversity Observation in the Asia-Pacific region. They proposed having sub-regional meetings of AP-BON, such as for the central Asia sub region in Kazakhstan, for the East Asia sub region in Mongolia, for the West Asia sub region in Jordan, and for the Pacific region sub region in Papua New Guinea. The Asia-Pacific region consists of more than fifty countries, making it necessary to observe biodiversity by country and by sub-region level. Major activities he suggested were a gap analysis for the AP-BON countries and evaluation of current status in activities, and networking of AP-BON by sub-region and by country. Also, they could have AP-BON reports by sub-region and by country, as well as a strategic action plan and roadmap and promotion of AP-BON activities based on these.

With that, he concluded his presentation, but followed it up with a short introduction to the purposed bylaws of AP-BON. The 5th AP-BON meeting in Los Banos in Philippines decided to draft the bylaws, where Mr. Shakya was given consent to prepare the draft. He said he wanted to propose two things: the venue of the 7th meeting, to be considered in Kathmandu along with other potential cities; and to let the 7th meeting of AP-BON be the place to thoroughly discuss and approve the bylaws of AP-BON. He would make a presentation there for a draft of the bylaws for the consensus and consent.

Dr. Vergara opened the floor to questions and comments. Dr. Kim clarified a bit more on his role in the trip to Nepal. He thought his role might be how to promote AP-BON and how to develop closer ties to the Korean government.

The next presentation was given by Dr. San Thwin, of the University of Forestry in Yezin, Myanmar, discussing the biodiversity concentration in Myanmar. The country was endowed with rich diversity of habitat types, and was 47% natural forces. It was highly interested in protecting and conserving its diverse biological resources on a sustainable basis and the resources of vital importance. He gave statistics on the vast number of species to be found in Myanmar. He highlighted selected new species recorded in the country since 2009, such as flowers, plants, and the snub-nosed monkey. Next, he gave statistics on their natural forest resources.

Their Forest Department carried out out forest inventory annually within its capacity to establish the forest database such as stand tables, stock stables, species composition and status of natural regeneration in the country's forest. The Forest Inventory Section and Computer Section of Planning and Statistics Division were responsible for conducting forest inventory and developing databases. The Forest Resource Assessment was undertaken mainly based on digital classification of Landsat AT data with a combination of various surveys.

Their fifth such survey in 2005 was compiled by updating the 2000 data with complete coverage of the border area. Dr. Thwin showed further statistics concerning forest cover status and land use, and how that had changed compared from 2001 to 2010. Next, he presented numbers regarding the change in forest cover from 1990-2010. The numbers showed clear loss from overexploitation, repeated logging in accessible areas, illegal logging, the fuel wood crisis, expansion of agricultural lands, urban expansion and infrastructure development, and shifting cultivation, and population increase.

Next, he discussed protected areas management. They had 36 wildlife sanctuaries and 7 parks, constitution about 6% of Myanmar's total land. They hoped to increase protected areas to be up to 10% of total land area. He also introduced ASEAN heritage sites, like the Alaungdaw Kathapa National Park, Hkakaborazi, Natmataung, Lampi Marine National Park, Inlay Lake wetland bird sanctuary, and more. He also introduced the wetlands of Myanmar, and national biodiversity strategies for conservation, management, and utilizing with sustainability regarding them. The conservation was conducted together with Norway, Germany, Japan, and others.

Dr. Thwin then focused on the Inlay lake conservation, and the conservation and rehabilitation activities taking place there: watershed conservation, maintaining stream flows, and preserving areas of opening water bodies. They also worked on preventing soil erosion and sedimentation, activities for extension, capacity building, and technical cooperation. They also performed activities to improve the socioeconomic status of local communities. Together with the UN-Habitat and Institute for Biological Development they were working to preserve the wetland environments and species; in particular, migratory bird species on the IUCN red list.

He listed next the various agreements for biodiversity conservation that Myanmar was party to, such as the Global Tiger Forum in 1994, the UN Convention on Biological Diversity in 1995, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1997, and in particular the Ramsar Convention in 2005.

Changes in Myanmar's marine and aquatic species were that marine fauna and flora were affected by habitat degradation, particularly in mangrove forests, coral reefs, and sea grasses. That was due to human activity but also because of climate change. Some of the depleted species moved to new habitats, such as freshwater fish. In particular was the Nga Tha Lauk fish, which was crucial to the livelihoods of many in Myanmar.

Threats to biodiversity included land use, soil erosion resulting from shifting cultivation, clearing natural forests for agricultural expansion, and more. For agro-biodiversity, since 1990 the Myanmar Seed Bank and international partners had conducted participatory field surveys, farmer visits, and focal group discussions to inventory cropland acres. That indicated that the distribution and extent of plant resources was growing. Next he introduced the plight of Myanmar sea turtles, which had severely diminished due to sale of sea turtle products and weak law enforcement, along with habitat encroachment. To save the turtles, they needed to urgently implement biodiversity conservation measures.

Dr. Thwin then described the plight of avian species on Mount Popa, which accounted for 177 species of birds. They needed encouragement for annual monitoring and investigation of the breeding and non0breeding population of the park to maintain stable populations, and having an annual monitoring programme would be crucial for understanding ecological information and developing conservation strategies throughout the country.

Their biodiversity conservation investment vision achieved an updated analysis of policy, socioeconomic and civil society contest for conservation efforts, a re-prioritization of threats, and more. Ongoing activities included biodiversity and forest ecosystem research, and many international cooperation projects for biodiversity conservation. They needed to implement monitoring, law enforcement, buffer zone management, water resource management, identify protected and rare species, and identify and register rare, endangered and threatened species. With that, Dr. Thwin concluded his presentation.

Dr. Vergara introduced the next speaker, Dr. Park Jongsun, who spoke on the current status of the K-BON project to create an integrated platform for a biodiversity observation network. Many people had made good

systems, but there were still limitations to fully utilize the data. Biodiversity data was really complex and vastly different, so there could be no unified data form. Last year, they developed software for Android smartphones so that ordinary citizens could contribute to K-BON, and making use of GPS data in recent digital devices, and weather sensors. They had to consider how to gather weather information like humidity, temperature, light, and wind. They tried to collect all that data to upload to their server farm. They also accumulated data from diverse sources (although most were not yet digitalized), and also information from GBIF. Once the data was amassed, they would develop an interactive web interface in order to support diverse research.

He briefly introduced the smartphone application. There were big limitations to identifying plant species, but it was still useful to have ordinary people taking pictures of plants to send to the database. Whenever the user connected to a Wi-Fi network, they could then smoothly upload their photos to the server. With weather information, they were grateful to have basic sensors, although they did not have all of the capabilities they wished it would have. Construction of a cheap sensor network for gathering weather information efficiently was their priority (for cost), providing for more data that was ready to be analyzed with other information, and they also sought out equipment with high durability and low power consumption. He demonstrated the current status of the K-BON database. Once they had the data, they could now plot it on the map.

The next step was to improve the quality of data, including species identification. A plant taxonomist could access the pictures by citizens and confirm the names of all the specimens that come in. They found it difficult since a simple picture was often not quite enough to tell, but something was better than nothing. They practiced the technique on Mt. Suri nearby Seoul, collecting data over eight trips. They plotted the data on a map, and began identifying species. They managed to list 141 species and 326 plants. He finished by showing a picture of the K-BON website, which displayed statistics and products. The picture browser was one of the tools available on the site. He also showed the website for the K-Bon Appathon.

Next he showed the integration of sequence for building the database: collecting photo information from smartphones or digital cameras, next taking a sample, then bringing the sample into a lab to make a herbarium, and finally registering the herbarium into another database. It was quite simple, but once the experts had the herbarium, they could track back the plant to its natural status before they took the sample. Sometimes they also needed to extract DNA and identify species. First they extracted the DNA, they sequenced the DNA, and deposited the sequences. Once that was finished, the data would be used for phylogenetics, population genetics, and phylogenomics, finally building novel relationships between observed data and sequence analysis results.

Future directions for the K-BON platform included an integrated platform, where data was naturally deposited and analyzed in the database. Data management would increase seriously, and the web interface would be made even more user-friendly. All of that would lead to more diverse research—and new innovations. Even though there were some shortcomings to the system, it was still necessary to promote regular sharing of information.

Dr. Vergara opened the floor for questions. Mr. Wang said that for data integration, the schema was very important, and asked what kind Dr. Park used. He said he used his own, designing his own schema of loose relationships between various types of data rather than a rigid one. Mr. Wang clarified that when starting a database, it was crucial to decide on a schema core like Darwin Core. Dr. Park said he didn’t bother with that, as he wanted to keep up the loose relationships and center on those.

Dr. Pereira added to that, as there were many standards already for making the data useable. Largely the only way to organize those was with standards. Otherwise it was very difficult to develop relationships between data, as the databases could not communicate with each other. Dr. Park admitted it was strange because he made his own schema, but the structure could change based on various needs. First, he wanted to develop a relatively tight table for preserving raw data, so as to avoid losing any data that might not be allocated for in a database like Darwin Core.

Dr. Kim thanked him for his hard work, and thought it was especially effective for involving ordinary citizens

in K-BON activities. He thought it was a good opportunity for Dr. Park to establish an international means of sharing data, and also that it was a good chance for him to demonstrate their technology to the other BONs. Dr. Park thanked him for his comment.

Mr. Freyhof commented that it seemed like they took available data, adapted it to suit their means, but did not provide any backflow. He encouraged them to seriously consider their data flow both ways, to make sure it was internationally accessible. His main point was what they would do if the Korean government suddenly came to ask about how its outputs were contributing to biodiversity initiatives. Dr. Park admitted he did not make a slide about data exporting, but he would definitely make an export function to share the data with the rest of the world. He would make sure to make sure it was an open system that could communicate with other platforms, as he was aware that as a closed system it could not survive. His hope was that he could discuss with Dr. Park Chanho to develop the database for further integration, and that it was the next step. Dr. Kim replied that they, the BONs were all asked the same question from their governments; they should firmly discuss how they could contribute to Aichi Targets and IPBES activities, and give suggestions to national BONs. Dr. Park agreed, saying that was part of why he applied to participate in the meeting.

Dr. Vergara brought the session to a close, commenting on how many activities were going on, but that they were still mostly Asia rather than Asia-Pacific, and that they needed to work on their organizational structure. She also thought they could discuss how to contribute to the CBD and come up with strategies to address those. Dr. Vergara thanked them for a fruitful morning of discussion, and broke for lunch.

The meeting resumed with a presentation by Dr. Ma Keping on infrastructure development for biodiversity conservation, from a national to regional scale. He was happy to have the opportunity to speak, and briefly introduced the Chinese Academy of Sciences.

He began with a map of the Chinese Forest Biodiversity Monitoring Network, CForBio, which monitored a vast array of trees in various climate zones throughout the country. It was part of the international network CTFS or ForestGEO, to which China contributed about 13 plots. They also had Sino-BON, which was meant to expand their forest network into a biodiversity network, trying to cover all sorts of ecosystems. The Academy committed to invest USD $30 million for the expansion, with about 40% already invested. They planned to purchase more sets of LiDARs for remote sensing data collection, and also servers for to manage and store data. They had various networks to cover observation of species, such as for mammals, birds, fish, insects, soil biodiversity, and so on; and planned to implement canopy cranes for studying biodiversity in canopy. So far, they had eighteen institutes involved in the initiative.

Next, Dr. Ma brought up species red listing in China. The Chinese Academy of Sciences and Ministry of Environment Protection of China officially released the national red list last year, with 12% of 34,000 species of higher plants in China being threatened. They were also part of the National Red List Alliance, and made sure to note that in their official statements. They also established the National Specimen Information Infrastructure, NSII, in which USD $20 million had been invested. More than 10 million specimens have been digitized. Two million species' names were included. They also put out the Catalogue of Life-China, which categorized nearly 70,000 species found in China, with a hard copy started last year. Additionally, they put out the Flora of China (Chinese version), with 80 volumes, 126 books; Flora of China (English version) with 50 volumes. They also had the Chinese Virtual Herbarium (CVH). Another NSII initiative was the Nature Museum (CFH), where photos were regularly uploaded to their website; just that day over 4,000 photos had been uploaded; so far, there were more than 5 million color photos in the system.

For regional initiatives, in 2010 they released the Asian Plant Conservation Report, and together with many colleagues from Asian countries launched the ABCDNet, Asia Biodiversity Conservation and Database Network. They always strived to create linkages with isolated data sources. They had collected about 500 websites associated with biodiversity that gathered information. They also developed a taxonomic tree tool to compare species checklists and improve visualization. That tool could be found on the Global Names website. Another priority project on ABCDNet was the Asia Red List, from which they had data from over 40 countries. For regional assessment with IPBES, they needed more data sets. Dr. Ma was part of an expert group for scoping conceptual framework and methodologies on valuation of biodiversity and ecosystem services, and

was involved in writing the guide to do so. It was very important to consider how to collect and clarify data of biodiversity in a region to provide support for global or regional assessment.

He described the first and second meetings of ABCDNet. Their current priorities were to integrate national red lists in Asia, integrate national species checklists, to improve communication and networking among Asian countries for biodiversity conservation, promoting Asian contribution to CBD and IPBES, and more. The way forward included promotion of networking and cooperation at a regional scale, capacity building through training courses, fellowships, and workshops, and mobilizing joint efforts in collecting and integrating baseline information from member countries and areas in Asia. With that, he concluded his presentation.

Dr. Pereira thanked him for his presentation, and had a concern about the direction of IPBES. He thought it was becoming an assessment of everything on the planet and was becoming too broad, as if it was going to solve all the problems of the world. In engaging with IPBES, he thought they had to bring it back to the basics of biodiversity and keeping biodiversity as its core. Dr. Ma agreed. He attended the 3d Expert Group twice, and noted that most participants in those were economists who valued ecosystems and human activities, rather than biodiversity.

Dr. Hosoya was surprised that they were also working on merging the red lists in Asia. That convinced him that his activities were not moving in the wrong direction, but thought they should avoid duplication of activities. He asked that when they were merging the lists, if they came across ensuring that the given name was truly the official taxonomic name, and asked how they overcame that. Dr. Ma responded that it was a true challenge to merge the red lists and taxonomies. They were in the pilot phase, selecting groups like bryophytes and birds as pilot projects. It was difficult to merge everything together.

Dr. Kim thought that his presentation was excellent, and commented on the development of Sino-BON. Additionally, with ABCDNet, he was grateful for that contribution, but was not sure if it had any close relationship with AP-BON at the moment. Dr. Ma's understanding was that the focus of ABCDNet was on biodiversity informatics, rather than monitoring any change. Dr. Kim also asked about how he could relate Sino-BON with answering the Aichi Targets. Dr. Ma thought that for national BONs, they might have had different missions rather than solely contributing to CBD or IPBES. For networking, the Chinese Academy of Sciences felt promotion of science was also an important mission. If they had the data, they would of course analyze it to try and be strategic, but they did not focus on a conventional agreement only.

Next was Dr. Perry Ong. He first thanked Dr. Yahara for the invitation, and the Ministry of the Environment of Japan for funding his trip. As there was no Philippines-BON, they used PhiLTERnet instead, which he headed. He started off with a picture of a degraded fresco, analogizing it to the state of biodiversity. Good intentions, he stressed, could lead to disastrous results. If we saw something that was not right, yet we did not complain, we have lost our right to complain when the result was not what we wanted.

With that introduction, he led into his work at the University of the Philippines. Just like the fresco, he noticed that there was no serious assessment, nor no serious baseline for biodiversity going on. Without a baseline, they could not tell if they were succeeded or not. At the time GEO BON went online, he wanted the Philippines to join, but they had no data to offer. Thus, he started the Research on Ecological Systems and Services to Protect, Enhance and Conserve Total Biodiversity (Respect Biodiversity) Project. The project was split into taxa-based and ecosystems-based fields. On the other side was Pro-active Research and Outreach to Test and Explore Cures and Treatments for Humanity (Protect Humanity), which focused on natural products research and biomedical research. The third part was DNA-barcoding Of Life-Philippine Network (DOLPhiN), which was a research and networking agenda to develop the capacity for database establishment and management, with a DNA library and more.

How did he intend to implement the project and get funding? He would promote science-based biodiversity conservation with partners. He focused on the private sector, convincing them of benefits to their company and to the world. Local benefits were that the data they generate could be fed back directly to the community, such as comprehensive land-use programs and capacity building of local universities. That would prevent 'parachute' biology, so that they did not just gather data and leave. National benefits would contribute to better

land use planning and long-term development goals, and global initiatives included greater ties to international networks and access to data.

Components of the genes to ecosystems data collection included DOLPhiN, with DNA barcoding and wildlife forensics; Flora Research Program; Wildlife Flagship Species Program; and Ecosystems Monitoring 100. Some of the wildlife forensics included confiscating specimens of illegal transport, such as 'dressed' Pangolins that were too far gone to save, and they were buried. When they exhumed the carcasses a year later, the vacuum-packed specimens were almost perfectly preserved.

For the flora of the Philippines, they were working with various institutions for biodiversity monitoring, which was complicated as there were only about 50 botanists nationwide. He introduced the Palanan Forest Dynamics Plot, and the study they completed which was published into a book. Within a single 16-hectare plot, they found 323 species of trees—nearly 10% of known species of Philippine trees.

Next, eight years after he began the program, the university was implementing terrestrial research at eight sites throughout the country. He compared statistics for four 2-hectare plots, comparing the various biodiversity variables between them. The state of the forest could be characterized comparing as tree size and basal area. Most of the plots are regenerating forests, as the most of the trees in the plants have small DBH (diameter at breast height), with very few trees contributing to the basal area of the forests. They were in the early stages of coastal and marine work. For Ecosystems Monitoring 100, they worked on capacity building, mentorship, partnership, collaboration, and hands-on work. They envisioned a network of field stations through establishing 100 permanent plots. Dr. Ong gave a list of the tasks that still had to be done, such as identifying and obtaining data holdings, making a database and analyzing it, validating their result, publishing gap analyses, initial discussions and monitoring protocols; and a list of tools they would need to accomplish that.

He discussed the ILTER EAP that was held in June, and the topics they discussed there. Their research programs had produced various field guides, which were not meant to be definite, but produced as soon as possible so that field staff could use the field guides to make assessments on the spot. In the field guides, they used both IUCN and Philippine classifications to understand the state of a plant in the country, also showing how a specimen looks in its natural environment. He introduced the LTER further, as a site-based research method with long records of baseline measurements. It was interdisciplinary with mechanisms of sharing information, and focused on ecosystem change. It had nine formal member networks and three associate ILTER sites, with 170 facilities and 3,000 scientists. The region expanded throughout Asia and the Pacific. He listed the international conferences since its establishment. Dr. Ong described how the 4th ILTER-EAP Information Management System training was organized and conducted, which was largely organized and discussed over the Internet beforehand, allowing for the smooth implementation of the training workshop.

Finally, he suggested that BONs coordinated with the government, as PhiLTERnet already exists, and had found it effective. Another problem they faced was the limited number of warm bodies who would continue the work, since some of their members are way past retirement age. Some of their activities were symposiums, training workshops, and participations in international conferences.

He stressed that they had to change their MAPS (mindsets, attitudes, and practices); and bridge their GAPS (goals, aspirations, and passion). The Asia-Pacific had many cultural and biological treasures, so they had to nurture nature, protect people, and sustain society. He suggested a societal framework where economics did not control their agenda, but it would be foolish to completely exclude those forces. Transforming that framework led to a vision of using science-based approaches and an empowered people living harmoniously with biodiversity for the present and future generations, whose outcomes were maintaining species and habitats, and improved quality of life. Strategies included protection, mitigation, development, management, capacity building, research, and communication. They had to take actions for conservation with programs, projects, and activities, and get many parties and organizations involved. They also had to have indicators of success to let them know whether they are attaining their visions and goals.

Finally, their work would not be complete without the 4Ps+++: those were patterns, processes, predictions,

and publications. That would lead to the pluses of change: practices, perspectives, and policies. That, in turn, should be strengthened by the 4Cs+++: coherence, consistency, continuity, and commitment; which would then lead to changes in cooperation, capacity building, and critical mass. His final message was to change MAPs, bridge GAPs, the 4Cs and 4Ps, and the NPS2. With that, he concluded his presentation.

Dr. Pereira thanked him for the lengthy talk, but wondered that from the monitoring programs they had in place, how many programs did they have for species and ecosystems, and how many were engaged in them. Dr. Ong replied there were very few. Of those that did exist, many had data that could not be analyzed, and part of their job was to convince them to follow a standard. With their programs, they attempted to make sure standards were met. They were getting closer to the point where they could make a coherent assessment, but were not there yet.

Dr. Darnaedi thanked him for his presentation, and added that Indonesia had the problem that many species' names were not unified, especially for flora, and asked if that was a problem in the Philippines. He noted it was a huge setback to their efforts to put out a red list, and that there was little unification between regional, national and local levels. Dr. Ong replied that they only had three senior botanists left, but they could not agree on what to do. His first idea was to get younger people involved and interested, but they were not as serious in his opinion. A company put a scholarship to sponsor a student to study their Ph.D. in somewhere like Harvard, but three years later there had been no takers. The funding was available, but no one had applied. Collecting specimens was also a difficult issue, though it could be done with planning. That had discouraged many plant taxonomists from other countries to come to the Philippines, unfortunately.

Dr. Kim first thanked and congratulated Dr. Ong for his success in hosting the meeting earlier this year. It could not have been easy to build up their initiatives, but Dr. Ong had done an impressive job, demonstrating important leadership with PhiLTERnet.

Mr. Shakya asked about a particular slide, concerning the confiscated pangolins, and Nepal's struggled in figuring out what to do with the corpses they found. He asked if that was also the case in the Philippines. Dr. Ong replied that their first impulse was to destroy the specimens, because they simply ran out of space to store them; but instead of throwing them away, he proposed that they use them for research so that they still had some value. The government agreed, but no follow-through would keep it as just a suggestion.

Mr. Freyhof wondered if there was a database of confiscated animals. Dr. Ong replied they did, but it was all analog. They could retrieve it with patience, but were still asking them to digitize the records. Mr. Freyhof also wondered about the future of taxonomy, and how to think about ways to monitor biodiversity without experts and without taking things from nature. Dr. Ong said that was a challenge to all, but thought that they should emphasize they were losing interest from the international community because of the restrictions on their samples. A team of researchers recently got charged for an infraction because they did not capture and release; they captured and dissected.

Dr. Vergara had two questions. Was training consistent with their format? And also, he asked if there was long-term research. Dr. Ong replied there was no long-term research, though he was looking into it. In regards to training, they adopted the Darwin Core, and an IMS system for biological information.

Session 4: Contribution to IPBES regional assessment

Next, Dr. Tohru Nakashizuka discussed networking observations of ecosystem services. His presentation was an introduction to observing ecosystem services, networking observations, and EVBs, essential variables for ecosystem services.

He first showed the procedure to monitoring ecosystem services based on biomass and productivity. First it should cover land cover, classification, and biomass change. Next were climactic condition, then ecosystem functions, then estimating ecosystem services and mapping/monitoring of ecosystems. There was less information about biodiversity, however. They gathered some data about SO2 and NO2 absorption in Chiba Prefecture, Japan, modeled with simple equations. What they wanted was to involve more biodiversity

information to estimate ecosystem services. What they were now doing was keeping the land cover classification change the same, but have a database on tree enumeration and a database on functional traits, to estimate ecosystem functions and ecosystem services. In case of abundance of key organisms, they build up a database there as well. The variables depended greatly on the landscape, and so they needed information about land cover. Using that information to estimate the abundance of key organisms, they estimate ecosystem functions.

They also began a database for tree species. They targeted 300 Japanese tree species, the most abundant; that meant they could acquire 90% of biomass. They only had 900 species for throughout Asia, however. The measuring traits included LMA, leaf area, leaf strength, leaf thickness, water content, wood density, leaf nitrogen, leaf carbon, and more. Literatures had 120 traits, however: those relating to defense, pollination, root system, or its utilization (lumber, food, medicine). They created a map of photosynthetic potential using their data, including data on species composition, a database of leaf traits, climactic data, and a statistical model. Additionally, they analyzed the probability of soil erosion, which allowed them to establish a statistical model of soil erosion.

In the second case, they used a local model of pollination services. First they made a model of the abundance of honeybees, and plotted the abundance of beetles, compared with the land cover. It was quite successful on a local scale. They expanded it to be nationwide, estimating the abundance of the honeybee, cross-referencing with land cover to understand the estimated potential of pollination services and evaluating their effectiveness. They also analyzed the abundance of trees for honey resources, examining the change in the 1980s with change in the 2000s.

Dr. Nakashizuka hoped that they could implement this outside Japan, attempting to have some kind of residential land cover maps for the Asian region. Besides CTFS sites, they probably had as much as 500 plots in Southeast Asia, from where they could create a database of functional traits. At the moment, they collected a data set of nearly 500 species in Thailand, and 400 or so in Malaysia. For land use, most of the maps they could use were potential vegetation maps, so they had to detect newly-disturbed forests.

For networking, they hoped to have data on physical environment, land-cover data, network of plot data, collaboration for functional traits database, a survey or analyses on ecosystem services and ecosystem conditions, identification of key organisms, analyses on abundance of key organisms, and compensation of insufficient information.

For essential variables, he thought it was probably effective to apply locally, so as to quantify ecosystem services. However, it could be difficult on a larger scale. The local combination of climate, topography, and biodiversity made the variables different; different species/taxa may play different essential roles in different areas, and it might depend on the abundance of information available. If they did not have sufficient information, the situation would be very different. To use essential variables, they should think about that kind of problem. With that, he concluded his presentation.

Dr. Park Jongsun asked about remote sensing, and how they could sense the configuration of a plot has changed just through a satellite image. Dr. Nakashizuka said that fundamentally, remote sensing alone could not accomplish that. Dr. Ishii added that they get more information from local organizations.

Next, Dr. Pereira complimented them on their approach. He had been pushing to use exactly that kind of approach, and hoped to discuss later on how to collaborate with him. He asked a question concerning the essential variables, wondering why essential variables could not work on both local and global scales. Dr. Nakashizuka replied that some biological controls depended on which organisms played important roles. For instance, honeybees were not as abundant in tropical areas. The procedure itself on a global scale was effective in some way, but he thought that local variables had a strong effect.

Dr. Ma had a question concerning trees, and wanted to know how they factored species distribution into their assessments. Dr. Nakashizuka replied that they sampled trees in several locations to assess the functions of trees and how they were improved or impaired. The data they would collect would be open to everyone

eventually, but for now was being kept for their research purposes.

Finally Dr. Yahara spoke on the scoping of IPBES regional assessment. The IPBES was launched with two plenary sessions, where they developed the conceptual framework. The first objective was to strengthen capacity and knowledge foundations of the science-policy interface to implement IPBES functions, to strengthen it as the sub-regional, regional and global levels; to strengthen thematic assessments; and eventually to contribute to policy. The first assessment was ongoing on pollination, with land degradation, alien species, and sustainable use starting soon; later on regional assessments, global assessment afterward, then thematic assessment, with a policy support to follow. They used existing literature to prepare drafts of pollination assessments. Last August they had a scoping meeting for regional assessment for the Asia-Pacific region based on the IPBES Conceptual Framework, assessing nature's benefit to mankind and more.

The unique feature of IPBES assessment was not only to assess nature and its benefits, but also to assess anthropological benefits and socio-politic, economic, technological, and cultural drivers, so as to contribute to a harmonious life with the planet. He related translating the concepts to the Rosetta Stone, such as translating concepts found in Asian languages to better understand the concepts in English—not only literally, but semantically. Dr. Yahara thought maybe they could publish a chapter in AP-BON book 3 about comparing these different semantic concepts.

The scoping meeting included a chapter outline of AP regional assessment. That was to first set the scene, then discuss nature's benefits to people and its impact on quality of life, the status and trends in biodiversity and ecosystems underpinning nature's benefits to people, direct and indirect drivers of change in the context of quality of life, integrated analysis of interactions of the natural world and human society, and options for decision-making across scales and sectors. He next shared the chapter outline as based on the IPBES framework, and stated they needed to figure out how to relate the chapters to each other; relating the states and changes of biodiversity to changes of ecosystem services or nature's gifts. They had many examples of that.

Next he showed a prototype figure, where institutions and governments were placed in the center, with nature's gifts, human wellbeing, and nature on the periphery. The first part of chapter five would focus on scenarios and models that provide insights into future trends, pathways to change, best practices and specific policies; as well as addressing key challenges for sustainability and what they were for the Asia-Pacific region. For instance, he brought up data regarding forest coverage in Asian countries, which was largely on the decline, and how they could discuss the different drivers in the various countries that contributed to that. That included the human development index, human population density, wood imports, and increases in crop imports, oil palm plantations, and forest coverage. He suggested the Kuznets curve to demonstrate the changes, and to show where the 'turning point' for increasing forest coverage could be.

He hoped to collaborate with the other members of AP-BON to write good assessment chapters. However, for that, they needed to publish ideas and evidence. His idea was to publish book three, so that they could cite their work in the future and for others to see their activities. With that, he concluded his presentation.

Dr. Tan asked a question, wondering if AP-BON would consider complementary copies of the book for those who were supporting their activities and conferences. Dr. Yahara replied that after the scoping process, they could do so, but they could not distribute widely to the public.

Dr. Kim said that most of the work seemed to be regional, but IPBES was mostly aimed at a global scale. He asked them to consider how they could contribute to a global scale, and that scoping was only part of the process. Many chapters had been drafted, with ten expert groups working on it. Thinking on IPBES activities, he thought it better to consider all of the work going on. Dr. Yahara responded that he had to read other documents at the scoping meeting, and that each group had to provide direction, and that his basic idea was being incorporated.

Dr. Darnaedi commented that the global assessments would finish before they completed their regional assessments, and he asked how GEO BON falls in the global assessment of IBPES, and if they had any plans

for assessment. Second, he asked about the rapid economic development of regions affecting forest cover, and population growth, wondering if it was specific to AP-BON but not the Asia-Pacific as a whole. He also mentioned that indigenous knowledge was closely related to ownership of the culture along the protected area, and would be very important to include. Dr. Yahara responded to the first that there was no formal relationship as far as he was aware. But in the process of regional assessment, at least for natural science, the participants at AP-BON were actively involved in those processes, and that their communication was crucial to develop it.

Dr. Vergara asked about chapter 4, on the drivers of biodiversity loss, and thought they might include sub-regional drivers in that as well. Dr. Ma then commented it was a good idea to relate AP-BON with IPBES, and asked if he had any further ideas about AP-BON trying to cover specific sub-regions. Dr. Yahara responded that they were mainly working in East Asia and Southeast Asia, with some participants from the Pacific Islands. As for West Asia, they had no relationship, so as for regional assessment in the Asia-Pacific region, they hoped they could develop relationships there.

Discussion began on the matters raised, the EBVs, regional red lists, and data papers. First he asked for comments on EBVs. Dr. Kim noted that at the meeting at the Philippines last November, he thought they should review the EBVs with AP-BON. He thought it was very good to see the variables created by GEO BON, and hoped that they could have some support from the Korean side to promote the list with AP-BON. He hoped to have a subcommittee working on the AP-BON side for a first evaluation and ways to apply.

Dr. Pereira added that from the GEO BON secretariat point of view, the point was to try to assign the development of specific EBVs to particular communities. They would now post again criteria until the end of the year for how the assignments could be made and how a community could develop a specific EBV, coming up with standard measurements and protocols in order to build data sets. He saw no reason they could not have multiple locations working on the same EBVs, as long as there was active communication with the secretariat to make sure AP-BON did not go in one direction and GBIF in another. Dr. Ma added that based on the presentations he saw, there might be information available on trees, and wondered if they could add ‘service’ to the ecosystem function variable. Dr. Pereira thought it was fine to add ecosystem services. There was a large discussion regarding that in the workshop. The comment that was the deciding factor was that for services, you required both supply and demand. You needed to have data that was not only for potential of service, but for demand; and that was why they limited data to a strictly biological framework. It was all right to add services with a similar methodology, but it would not be strictly biological.

Dr. Ma thought that maybe they should consider another strategy of setting up core variables, along with selected variables, as observations varied depending on scale. If they could come up with two sets of variables, and associate select variables to those. Dr. Pereira said they could develop another list, but that these should be core variables. The six examples could be measured at the scale of one square meter or on the global scale, which was the idea behind it; that they could be measured across scales. They had a full list of 23, available on their website. Some might be core, some might not be. He thought that was crucial to the discussion. For instance, they discussed the variance variable the week before, struggling to define it.

Mr. Park Jongsun thought that they could extract common variables from a population, like location, time, species, movement, and so on. In that way, they could list it in six big groups and detail the items for each group, and then for each item, try to define commonalities and a structure for the data they have to collect. Dr. Pereira suggested they did not move away from calling these essential variables. He gave an example where he believed there was already contribution. GBIF would soon produce a report with the extended Darwin Core that could now allow it to report on abundances and other variables in the EBVs. There was no single way of standardizing reporting measurements, so they had to come up with data standards and protocols for each of the EBVs, and start building data sets from local to national. But as much as possible, he thought they should constrain it to these terminology and those variables, else they risked being unable to harmonize concepts.

Next, Dr. Nakashizuka moved on to red list discussion. Dr. Ma offered a comment, because there were two issues; combining taxa from two different countries and how to promote countries and collaborate. Collaboration was key, he thought. Dr. Hosoya added that he was talking about how to share information together with Mr. Wang, and he said that they could utilize something like Google Drive. Mr. Wang added that

he created one Google Drive folder after a meeting in July, so the data was easily accessible and facilitated collaboration. He was not sure how feasible it was, but since GBIF has some data from different countries, countries that lacked a database could simply download data from GBIF and build off the taxa. Dr. Ito had to clarify that locality was not a variable in GBIF.

Dr. Tan wondered if they could get a country's checklist for red lists from GBIF. Dr. Yahara commented on their progress on making a national red list of trees, and that they were working especially on big family groups. To identify and edit red lists, they needed complete checklists of each group. Taxonomists usually took a lot of time to publish one graph, but with the need to access red lists, he suggested that one initiative of AP-BON could be to quickly publish their countries' red lists. Dr. Ito continued about local checklists, noting that they had initiatives for publishing local checklists for data papers. Mr. Freyhof reminded them that the very different approaches used for different countries' red lists were a good example of how interoperability would never be achieved, and at least they could stick to a IUCN standard and be compatible with the rest of the world.

In response, Dr. Ma said that it was a matter of collecting data and analyzing it. He said he found an example about one species on the red list in Korea, but not in China; from that case they could understand the difference in red lists between countries. He thought it was good for AP-BON to take red listing as a priority, and if they endorse that, in terms of expertise or training costs, they could have some viable policies on these issues. Dr. Thwin responded that Myanmar's red list needs to identify different kinds of species, and that was why they needed input for the red list. Dr. Nakashizuka suggested that AP-BON deliver assistance. Dr. Vergara agreed with Dr. Ma, that ASEAN member states would rather make red lists on their national level and gather data accordingly.

Dr. Nakashizuka moved the discussion on to data papers. Dr. Yahara first commented that they met several times to discuss writing data papers. One idea was a workshop on how to develop capacity for publishing the data. In Indonesia, they were actively working to integrate forest plot data, and they developed a semantic web system to publish those. That was one such activity. Japan had many similar examples too. By introducing the teams to each other, he thought they might be able to build on that experience and collaborate on papers. Dr. Ma added that they had several initiatives for publishing data papers and data journals, and that it had been really difficult to convince the majority of scientists to publish. Only a very small proportion could be convinced. He thought it was not only a technical issue, but also a cultural and environmental issue. To hold a training class was a good idea, he thought, emphasizing the success and opportunities that come with publishing.

Dr. Tan added his experience in making checklists—it was difficult to find a high-name journal to publish them. He prepared a list with Dr. Iwatsuki in Japan, and eventually had to publish in a Philippine journal. That was an issue they would have to think about. Mr. Wang added that they could have their own special issue on publishing. Dr. Ong suggested the online journal Checklists, which was an SCI journal. Mr. Wang added that he had a friend who tried that, but came across difficulty because the approval process took over a year.

Dr. Kim asked if they could discuss AP-BON promotion. He reminded them of the gaps in strategy, and they had to decide their core activities, vision, mission, and goals. Also they had to discuss gaps in understanding with identifies and interactions, such as with AP-BON itself, GEO BON, and national BONs. They also had gaps in focus, with internal network functions and external international interactions. Finally they had gaps in governance and bylaws. He brought up again the categories and criteria for establishing the success of individual networks. First was governance and infrastructure, second was sustainability of research, monitoring and science; and third was service to society. For governance, he thought they could create some committees and sub-committees to work on those. For sustainability, he thought they could work on science and protocol, as well as cyber infrastructure and protocol. Finally, for service, he thought they needed education, outreach, and capacity building, along with communication, demonstration, and extension. Dr. Nakashizuka thought they could discuss that in the steering committee meeting. He brought the discussion to a close and thanked them for their comments.

Dr. Yahara thanked Dr. Kim, Dr. Park Chanho, and his other Korean colleagues for hosting the meeting. He

directed the council members to a separate room for discussion and ended the 6th Asia-Pacific Biodiversity Observation Network Meeting.

[END]