New ideas for a new work plan of AP BON

Tetsukazu Yahara, Sheila Vergara and Eun-Shik Kim
CBD COP10 (2010, Aichi)

Life in harmony, into the future

United Nations Decade on Biodiversity
<table>
<thead>
<tr>
<th>Year</th>
<th>GEOSS AP Symposia</th>
<th>GEO BON</th>
<th>AP BON Meetings</th>
<th>National BONs</th>
<th>CBD COPs</th>
<th>IPBES</th>
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<tbody>
<tr>
<td>2009</td>
<td>3rd GEOSS AP (Kyoto, February)</td>
<td>GEO BON</td>
<td>1st AP BON (July, Japan) 2nd AP BON (December, Japan)</td>
<td>Japan BON (May)</td>
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<td>2010</td>
<td>4th GEOSS AP (a session, Bali, March)</td>
<td>GEO BON Meeting (February, USA)</td>
<td>3rd AP BON (CBD COP10 Preconference, March, Japan)</td>
<td>COP10 (Japan, Side-event)</td>
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<td>4th AP BON (December, Japan)</td>
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<td>5th GEOSS AP (Tokyo, April)</td>
<td>GEO BON Meeting (December, USA)</td>
<td>WCC of IUCN (September, Korea)</td>
<td>Korea BON, Nepal BON, Bangladesh BON</td>
<td>COP11 (India, Side-event)</td>
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<td>2013</td>
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<td>IC and AB (June, Germany)</td>
<td>5th AP BON (November, ACB, Philippines)</td>
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<td>2016</td>
<td>2016-2025 A New GEO Strategy Plan Initiated</td>
<td>All-Hands Meeting (July, Germany)</td>
<td>7th AP BON (ACB, Thailand) 8th AP BON (Taipei, Taiwan)</td>
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**New work plan to 2021**
Current scheme of AP BON

- GEOBON/
- CBD
- IPBES
- ILTER
- GBIF
- IUCN
- ATBC
- SDGs/
- Future Earth
- GEO

Networking/Fascillitating

APBON/ GEOSSAP/ AOGEOSS

ACB
- AP regional assessment
- EAP
- ILTER
- GBIF Asia
- IUCN Asia Office
- ATBC Asia Chapter
- Future Earth Asia Centre

Promoting and networking national/regional projects

J-BON
K-BON
China BON
Sino BON etc

Observing same sites (plots) repeatedly to assess not only states but also trends
A Next Step of AP BON

Drafting a work plan document

New Strategies to observe states and changes of biodiversity in the Asia-Pacific region

Tetsukazu Yahara, Sheila Vergara, Eun-Shik Kim, Hiroyuki Muraoka, Yayoi Takeuchi, Shin Nagai, ....

(list all the contributors as co-authors, including participants of the 10th AP-BON workshop)

This manuscript will be submitted to Ecological Research as a review paper including opinions.

See a related article already published on Ecological Research:


https://link.springer.com/article/10.1007/s11284-017-1523-7

https://docs.google.com/document/d/15382jyNtCRnXgJMVl8le1MjYcduMfjcW3KG1KeLr0dU/edit?ts=5b399a27#
Project 1A: Plant diversity assessment (2011-present)

145 plots in 42 locations
Network of plant diversity assessment

- **Cambodia**: Sokh Heng, Chhang Phourin, Ma Vuthy, Samreth Vanna (Forest Administration)
- **Vietnam**: Son Van Dang (ITB), Nguyen Van Ngoc, Hoang Thị Binh (Dalat University), Hoang Thanh Son (Vietnamese Academy of Forest Sciences)
- **Laos**: Phetlasy Souladeth (National University of Laos)
- **Thailand**: Somran Suddee, Sukid Rueangruea, Dokrak Ma (Forest Herbarium)
- **Myanmar**: Mu Mu Aung (Forest Research Institution)
- **Malaysia**: Saw Leng Guan, Lim Chung Lu, Yao Tze Leong, Sam Yen Yen (FRIM), Bibian Anak Michael Diway, Julia Anak Sang (FRC), Mohizah Bt. Mohamad (Sarawak Herbarium), Zedtee SDN, Kinabalu National Park
- **Burnei**: Ferry Slik (Universiti Brunei Darussalam)
- **Indonesia**: Dedy Darnaedi, Marlina Ardiyani, Arief Hidayat (LIPI), Anes Syamsuardi (Andalas University), Ibrahim Dberjadin, Ngakan Putu Oka (Hasanudin University)
- **Japanese fieldwork members**: Shuichiro Tagane (Kagoshima University), Hironori Toyama, Akiyo Naiki (Ryukyu University), Meng Zhang, Noriaki Okabe, Ai Nagahama (Kyushu University), Hidetoshi Nagamasu, Mamoru Kanzaki (Kyoto University), Eiji Suzuki (Kagoshima University), Shinji Fujii (University of Human Environments)
Project 1A: Plant diversity assessment (2011-present)

- to record all vascular plants within 100 x 5 m
- to record Height and DBH for trees above 4 m tall

(1) Collect plants and record data, (2) Taking photos, (3) Collect leaf pieces for DNA analysis and (4) Make voucher specimens.

(5) Identify the plant species based on herbarium specimens, literature and DNA barcoding

(6) Study on taxonomy, ecology, phylogeny and biogeography; Picture guide, Database, etc.
Fig. species richness observed in one transect line (500 m$^2$)

Plant diversity hotspots estimated from specimens in 7 families. Raes, Guan, Welzen, & Yahara (2013)
Pasoh Forest Reserve; July 18-27, 2018
MIG-seq and multiplexed DNA barcoding: an efficient combination for molecular phylogenetic analysis

Yoshihisa Suyama\textsuperscript{a*}, Ayumi Matsuoa, Shun Hirota\textsuperscript{a}, Chika Mitsuyukib, Tetsukazu Yahara\textsuperscript{b}
\textsuperscript{a} Tohoku University, \textsuperscript{b} Kyushu University

**MIG-seq:** Multiplexed ISSR Genotyping by sequencing

- A PCR-based procedure for SNP discovering and their genotyping using next-generation sequencing (NGS).

**Overview**
- PCR-based (multi ISSR-PCR)
  - applicable to low quantity DNA
- $\sim 1000<$ SNP discovery & typing
  - without prior genetic info.
- Applicable to a wide range of species
  - without any optimization

**Advantages**
- Quick: 3 days for 192 or more samples
- Simple: 2 PCRs for library construction
- Low cost: ca. 10 USD/sample

**Multiplexed DNA barcoding**

- A simple and economical protocol to detect sequences of ITS and several cpDNA regions together using one run of NGS.

**Overview**
- Multi PCR of $\sim 5$ or more regions
  - $\textit{psbA-trnH, rbcL, trnL}^{\text{UAA}}\text{intron, (matK)}, \text{and ITS1} & 2$
- $\sim 500$ bp sequences for each region
  - $\sim 250$ bp from both ends
- Applicable to a wide range of plant species
  - without any optimization

**Advantages**
- Quick: 3 days for 384 or more samples
- Simple: 2 PCRs for library construction
- Low cost: ca. 2 USD/sample
Scientific name: Fabaceae *Spatholobus gyrocarpus* (Willd.) Benth.

Local name: No. M542

Pasoh Forest Reserve, Malaysia
Outside (Alt. 148 m)
MIGseq: Malesian clade 1

1. **KAL1288** > S. auritus
2. **BRN0435** > S. dubius
3. **SWK0708** > S. ayamensis sp nov
4. **KAL1096**
5. **SWK0100** > S. affinis
6. **SWK049, SWK3565, SWK3578**
7. **SWK0226** > S. latibractea
8. **SWK2988** > S. latibractea
9. **SWK4131** > S. multiflorus
10. **BRN0227**
11. **KAL1092**
12. **KAL1117** > S. hirsutus
13. **BRN_0327** > S. albus
14. **SWK_1385** > S. tatauensis sp. nov.
S. cf. macropterus

S. aff. bracteolatus

S. batanaiensis sp. nov.

S. bankiraianus

S. cf. bracteolatus

MIGseq: Malesian clade 2

SWK0671 > S. bicolor
SWK0554 > S. bintuluensis
Scientific name: Fabaceae *Sphatholobus bicolor* sp. nov.
No. SWK671

Line 1: Watercatchment Camp Ayam
alt. 381 m
Scientific name: Fabaceae *Sphatholobus bintuluensis* sp. nov.
No. SWK554

Line 1_Watercatchment Camp Ayam
(alt. 389 m)
<table>
<thead>
<tr>
<th>Species</th>
<th>Lateral vein</th>
<th>Leaflet shape</th>
<th>Leaflet apex</th>
<th>Tertiary veins</th>
<th>Tertiary veins</th>
<th>Petiole</th>
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<tr>
<td>S. auritus</td>
<td>Curved just below margin, not boped with an upper one</td>
<td>elliptic</td>
<td>caudate</td>
<td>Asymmetric, lower half distinctly broader</td>
<td>Scalariform, undulate</td>
<td>Indistinct above</td>
</tr>
<tr>
<td>S. latractea</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Obovate to obtuse or cuspate</td>
<td>Only slightly asymmetric</td>
<td>Scalariform, undulate</td>
<td>Distinctly sunken above, raised below</td>
<td>Brownish hairy</td>
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<td>S. multiflorus</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Elliptic</td>
<td>Caudate</td>
<td>Only slightly asymmetric</td>
<td>Scalariform, undulate</td>
<td>Distinctly sunken above, raised below</td>
</tr>
<tr>
<td>S. affinis</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Obovate</td>
<td>Acuminate</td>
<td>Only slightly asymmetric</td>
<td>Scalariform–reticulate</td>
<td>Distinctly sunken above, raised below</td>
</tr>
<tr>
<td>S. tataiensis</td>
<td>Curved towards margin, not boped with an upper one</td>
<td>Narrowly elliptic</td>
<td>Attenuate</td>
<td>Only slightly asymmetric</td>
<td>Coarsely scalariform–reticulate</td>
<td>Distinctly sunken above, raised below</td>
</tr>
<tr>
<td>S. batanaensis</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Narrowly elliptic</td>
<td>Attenuate</td>
<td>Only slightly asymmetric</td>
<td>Coarsely scalariform–reticulate</td>
<td>Distinctly sunken above, raised below</td>
</tr>
<tr>
<td>S. bankianus</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Elliptic</td>
<td>Caudate</td>
<td>Only slightly asymmetric</td>
<td>Coarsely reticulate</td>
<td>Distinctly sunken above, raised below</td>
</tr>
<tr>
<td>S. hirsutus</td>
<td>Curved towards margin, not boped with an upper one</td>
<td>Obovate to obtuse or cuspate</td>
<td>Only slightly asymmetric</td>
<td>Scalariform–reticulate</td>
<td>Distinctly sunken above, raised below</td>
<td>Brownish hairy at base</td>
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<td>S. dubius</td>
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<td>Narrowly ovate</td>
<td>Acuminate</td>
<td>Only slightly asymmetric</td>
<td>Reticulate</td>
<td>Distinctly sunken above</td>
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<td>S. ayamensis</td>
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<td>Oval</td>
<td>Caudate</td>
<td>Only slightly asymmetric</td>
<td>Reticulate</td>
<td>Distinctly both above and below</td>
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<td>S. abus</td>
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<td>Lanceolate</td>
<td>Acuminate</td>
<td>Only slightly asymmetric</td>
<td>Scalariform–reticulate</td>
<td>Distinctly above, distinct but flat below</td>
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<tr>
<td>S. auricoma</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Obovate</td>
<td>Caudate</td>
<td>Asymmetric, lower half distinctly broader</td>
<td>Coarsely reticulate</td>
<td>Distinctly sunken above, raised below</td>
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<tr>
<td>S. bidens</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Narrowly elliptic</td>
<td>Attenuate</td>
<td>Only slightly asymmetric</td>
<td>Coarsely reticulate</td>
<td>Flat above, raised below</td>
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<td>Elliptic</td>
<td>Caudate</td>
<td>Only slightly asymmetric</td>
<td>Coarsely reticulate</td>
<td>Distinctly sunken above, raised below</td>
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<td>S. macropterus</td>
<td>Curved towards margin, boped with an upper one</td>
<td>Elliptic</td>
<td>Attenuate</td>
<td>Only slightly asymmetric</td>
<td>Coarsely scalariform, undulate</td>
<td>Distinctly sunken above, raised below</td>
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<tr>
<td>S. bracteolatus</td>
<td>Curved towards margin, boped with a tertiary vein branched from an upper lateral vein</td>
<td>Elliptic</td>
<td>Caudate</td>
<td>Only slightly asymmetric</td>
<td>Coarsely reticulate to scalariform</td>
<td>Distinctly sunken above, slightly raised below</td>
</tr>
<tr>
<td>S. bruneiensis</td>
<td>Curved towards margin, boped with a tertiary vein branched from an upper lateral vein</td>
<td>Elliptic</td>
<td>?</td>
<td>Only slightly asymmetric</td>
<td>Coarsely reticulate</td>
<td>Indistinct above, visible but flat below</td>
</tr>
</tbody>
</table>
Project 1B: Plant phenology observation

Flowering records in Pasoh, Malaysia (Chen, Satake, Sun et al. 2017)

(a) Non Mutica species
- Shorea sec. Mutica

(b) Flowering intensity
- S. macroptera
- S. lepidota
- S. parvifolia
- S. acuminata
- S. maxwelliana
- S. leprosula
Bi-Doup Nuiba National Park, Vietnam

Plant diversity is the highest in Indo-china

Phenology project started

Deo Khanh Le slope

Smithonian 25 ha plot
Project 1C: Trait diversity assessment

SPAD-502Plus
## Project 1C: Trait diversity assessment

<table>
<thead>
<tr>
<th>Species</th>
<th>DPL</th>
<th>Lweigh</th>
<th>NoLL</th>
<th>Thickn</th>
<th>SPAD</th>
<th>Wood</th>
<th>Area</th>
<th>Width</th>
<th>Length</th>
<th>Circula</th>
<th>AR</th>
<th>Round</th>
<th>Solidity</th>
<th>Llonge</th>
<th>SLA</th>
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<td>8.75</td>
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<td>0.23</td>
<td>44.71</td>
<td>0.56</td>
<td>21.90</td>
<td>4.05</td>
<td>8.09</td>
<td>0.58</td>
<td>1.91</td>
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<td>0.96</td>
<td>0.70</td>
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<td>0.54</td>
<td>0.95</td>
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<td>1.36</td>
<td>0.74</td>
<td>0.96</td>
<td>0.70</td>
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<td>Pueraulia</td>
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<td>0.92</td>
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<td>Euscaphis</td>
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<td>Vaccinium</td>
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<td>57.33</td>
<td>0.59</td>
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<td>0.30</td>
<td>53.17</td>
<td>0.43</td>
<td>23.84</td>
<td>3.69</td>
<td>9.71</td>
<td>0.52</td>
<td>2.44</td>
<td>0.41</td>
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<td>12.80</td>
<td>2.70</td>
<td>7.53</td>
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<td>2.55</td>
<td>0.40</td>
<td>0.93</td>
<td>2.00</td>
<td>66.99</td>
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<tr>
<td>Melia</td>
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<td>3.15</td>
<td>121.80</td>
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<td>60.90</td>
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<td>0.47</td>
<td>0.70</td>
<td>153.83</td>
<td>0.35</td>
</tr>
</tbody>
</table>
Project 1C: Trait diversity assessment

Leaf length

Shape uniqueness
**Project 1 in Thailand and Sarawak**

- **Project in Thailand**
  - Besides traditional biodiversity monitoring and forest dynamic studies, current activities emphasize on 1) the **visualization of observation information** to advice decision making and policy development for biodiversity conservation and for public awareness, and 2) **vulnerability and resilience to climate change**.

- **Project in Sarawak**
  - We found **rapid forest cover decline and livelihood change**; however, remnant forests which are managed by local communities still harbored high biodiversity including endangered species (Takeuchi et al 2017). We are also investigating the ecosystem services from those remnant forest to local people would be essential. However, as local use and perception has been changing, we need to assess **both social and biological consequences of biodiversity and ecosystem services** for effective conservation planning in those developing areas.
Project 2: Freshwater fish assessment

http://ffish.asia developed by Kano et al. (2013)
Threats of dam construction and global warming upon freshwater fish diversity in Mekong Basin (Kano et al. 2016, Plos One)

<table>
<thead>
<tr>
<th>Fish biodiversity index</th>
<th>Pristine</th>
<th>Current</th>
<th>Dam</th>
<th>Global warming</th>
<th>Combined</th>
<th>Synergistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean species richness</td>
<td>39.6</td>
<td>37.3</td>
<td>32.8</td>
<td>41.1</td>
<td>36.1</td>
<td>34.2</td>
</tr>
<tr>
<td>Mean range size (km²)</td>
<td>637,097</td>
<td>613,626</td>
<td>564,744</td>
<td>586,691</td>
<td>546,480</td>
<td>511,394</td>
</tr>
<tr>
<td>Threatened species</td>
<td>0.0%</td>
<td>4.7%</td>
<td>16.0%</td>
<td>35.0%</td>
<td>39.7%</td>
<td>40.5%</td>
</tr>
</tbody>
</table>
Examples of Agreements and Disagreements

◆ Turtle Islands Heritage Protected Area (Major nesting area of marine turtles)
◆ Island Unit of Mariana Trench Marine National Monument (High biodiversity of seamounts and hydrothermal vents)
◆ Savu Sea Marine Protected Area (Migration corridor for threatened species, high nutrient)
◆ Great Barrier Reef Marine Park (World largest coral reefs)

Sea area within Asia-Pacific region

<table>
<thead>
<tr>
<th>Sea area</th>
<th>Rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marine Protected Area (MPA)</td>
<td>1.1</td>
</tr>
<tr>
<td>MPA included among EBSA candidates</td>
<td>0.5</td>
</tr>
<tr>
<td>MPA not included among EBSA candidates</td>
<td>0.6</td>
</tr>
<tr>
<td>EBSA candidate not overlap with MPA</td>
<td>13.9</td>
</tr>
</tbody>
</table>

Total area of EBSAs became 14.4% of the study area.
Only 45% of MPAs overlapped with EBSA candidates.
Project 4: Networking observation sites

Candidate “master sites” in SE Asia

- Large plots surveyed
- Small plots surveyed
- Smithsonian large-scale plots to be visited
Tree species diversity along a latitudinal-gradient forest transect in Southwest China and the Indo-China Peninsula

Luxiang Lin 林露湘

Shenzhen, 2017/07/28

‘101°E’ forest transect from Southwest China to the Indo-China Peninsula
## Project 4: Networking observation sites

### Candidate “master sites” in SE Asia

<table>
<thead>
<tr>
<th>Country</th>
<th>UNESCO BR</th>
<th>Forest GEO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Yakushima</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>Jeju Island</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>Xishuangbanna</td>
<td>Xishuangbanna</td>
</tr>
<tr>
<td>Taiwan</td>
<td></td>
<td>Lienhuachih</td>
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<tr>
<td>Vietnam</td>
<td>Langbian</td>
<td>Bidoup</td>
</tr>
<tr>
<td>Laos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambodia</td>
<td>Tonle Sap</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>Mae Sa-Kog Ma</td>
<td>Doi Inthanon</td>
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<tr>
<td>Myanmar</td>
<td>Inlay Lake</td>
<td></td>
</tr>
<tr>
<td>Malaysia</td>
<td>Crocker Range</td>
<td>Pasoh, Lambir</td>
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<tr>
<td>Brunei</td>
<td></td>
<td>Kuala Belalong</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
<td>Bukit Timah</td>
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<tr>
<td>Indonesia</td>
<td>Cibodas</td>
<td></td>
</tr>
<tr>
<td>Phillipines</td>
<td>Pallawan</td>
<td>Palanan</td>
</tr>
</tbody>
</table>
Yakushima and Kuchinoerabu Jima

The Yakushima and Kuchinoerabu Jima Biosphere Reserve situated 60km south of the Island of Kyushu is known for the Yaku cedar primeval forest. It encompasses the area inscribed on the World Heritage List, also under the name of Yakushima, and now covers the entire island, as well as the island of Kuchinoerabu and the marine area surrounding both. It is famous for the Yaku cedar primeval forest, and it includes Yakushima World Natural Heritage site which was inscribed in 1993.

Designation date: 1980 (extended in 2016)


Surface area (terrestrial and marine): 78,196 ha
Core area(s): 12,359 ha
Buffer zone(s): 20,137 ha
Transition area(s): 45,700 ha

Location
Latitude: 30°12’30”N – 30°29’58”N
Longitude: 130°07’56”E – 130°41’33”E
Midpoint: 30°21’12”N – 130°24’30”E
Yakushima and Kuchinoerabu Jima

Kuchinoerabu Jima

National park

World Natural Heritage

Strictly protected area
Yakushika: *Cervus nippon yakushimae*
Yakushima: Vegetation loss by deer grazing
Analysis, visualization, and communication of datasets on biodiversity status and trends
Project 5 Developing Tailor-fit Indicators and Visualization Tools

Marine Indicators

-- Indicator from Ocean Health Index Science
Networking observations by citizen

Good success in Korea and Japan
Networking observations by citizen

Flora of Vietnam Facebook group

Son Hoangさんがアルバム「Gomphandra tetrandra (Wall.) Sleum」に写真9件を追加しました。
管理者・7月9日 17:18

Son Hoangさんがアルバム「Symplocos cambodiana (Pierre) hall.」に写真9件を追加しました。
管理者・7月9日 16:43
Capacity building

Development of biodiversity informatics cookbook and regional training workshop for Asia in 2016

Mao-Ning Tuanmu\textsuperscript{1} & Tsuyoshi Hosoya\textsuperscript{2}

\textsuperscript{1}Taiwan Biodiversity Information Facility (TaiBIF)
\textsuperscript{2}Japan Node of Global Biodiversity Information Facility (JBI\textsuperscript{F})

2017 GBIF Asia Regional Meeting
2017-06-13
Hanoi, Vietnam

https://assets.ctfassets.net/uo17ejk9rkwj/mZRkHybrrwcacKSucGa2c/8a688316ef1664e15c3bc62008987877/9_Development_of_biodiversity_informatics_cookbook_and_regional_training_workshop_for_Asia_in_2016.pdf
Publication of AP BON Book series

2012

The Biodiversity Observation Network in the Asia-Pacific Region
Toward Further Development of Monitoring

S. Nakano · T. Yahara
T. Nakashizuka Editors

2014

Asia-Pacific Biodiversity Observation Network
Integrative Observations and Assessments

S. Nakano · T. Yahara
T. Nakashizuka Editors

2016

Aquatic Biodiversity Conservation and Ecosystem Services

Shin-ichi Nakano · Tetsukazu Yahara
Tohru Nakashizuka Editors

Springer

Springer

Springer
Networking migratory birds observations

The case of black-faced spoonbill

Korea, Japan, China, Vietnam and Cambodia are connected
• 15:45-16:10 Keynote presentation and discussion (from forest)
  – “Networking of forest plots in Asian countries”
  – Chair (and 5 min. presentation): Kaoru Kitajima
• 16:10-16:35 Keynote presentation and discussion (from forest)
  – “Relationship among phenology, ecosystem process, and biodiversity”
  – Chair (and 5 min. presentation): Shin Nagai
• 16:35-16:50 Keynote presentation and discussion (from forest)
  – “Possible linkage with the UNESCO’s Man and Biosphere programme”
  – Chair: Yayoi Takeuchi
  – Dedy Darnaedi: UNESCO’s Man and Biosphere programme in Indonesia
• 16:50-17:15 Keynote presentation and discussion (from forest)
  – “Evaluation of ecosystem services and biodiversity in river basin scale”
  – Chair (and 5 min. presentation): Yongyut Trisurat
• 17:15-17:45 Keynote presentation and discussion (from fresh water)
  – “Threats and future of freshwater fish biodiversity in Southeast Asia”
  – Chair (and 5 min. presentation): Yuichi Kano
• 17:45-17:50 Activities in TERN Australia (Mark Grant)
• 17:50-18:00 Announcement and comments
Co-chairs and co-organizers

- **Co-chairs:**
  - Tetsukazu Yahara (Kyusyu University, Japan)
  - Sheila Vergara (ASEAN Centre of Biodiversity, Philippines)
  - Yongyut Trisurat (Kasetsart University, Thailand)

- **Session Co-organizers:**
  - Yayoi Takeuchi (National Institute for Environmental Studies, Japan)
  - Shin Nagai (JAMSTEC, Japan)
  - Takehisa Yamakita (JAMSTEC, Japan)
  - Yuichi Kano (Kyusyu University, Japan)
  - Kaoru Kitajima (Kyoto University, Japan)