TaiBON

Taiwan Biodiversity Observation Network

Taiwan Biodiversity Observation Network

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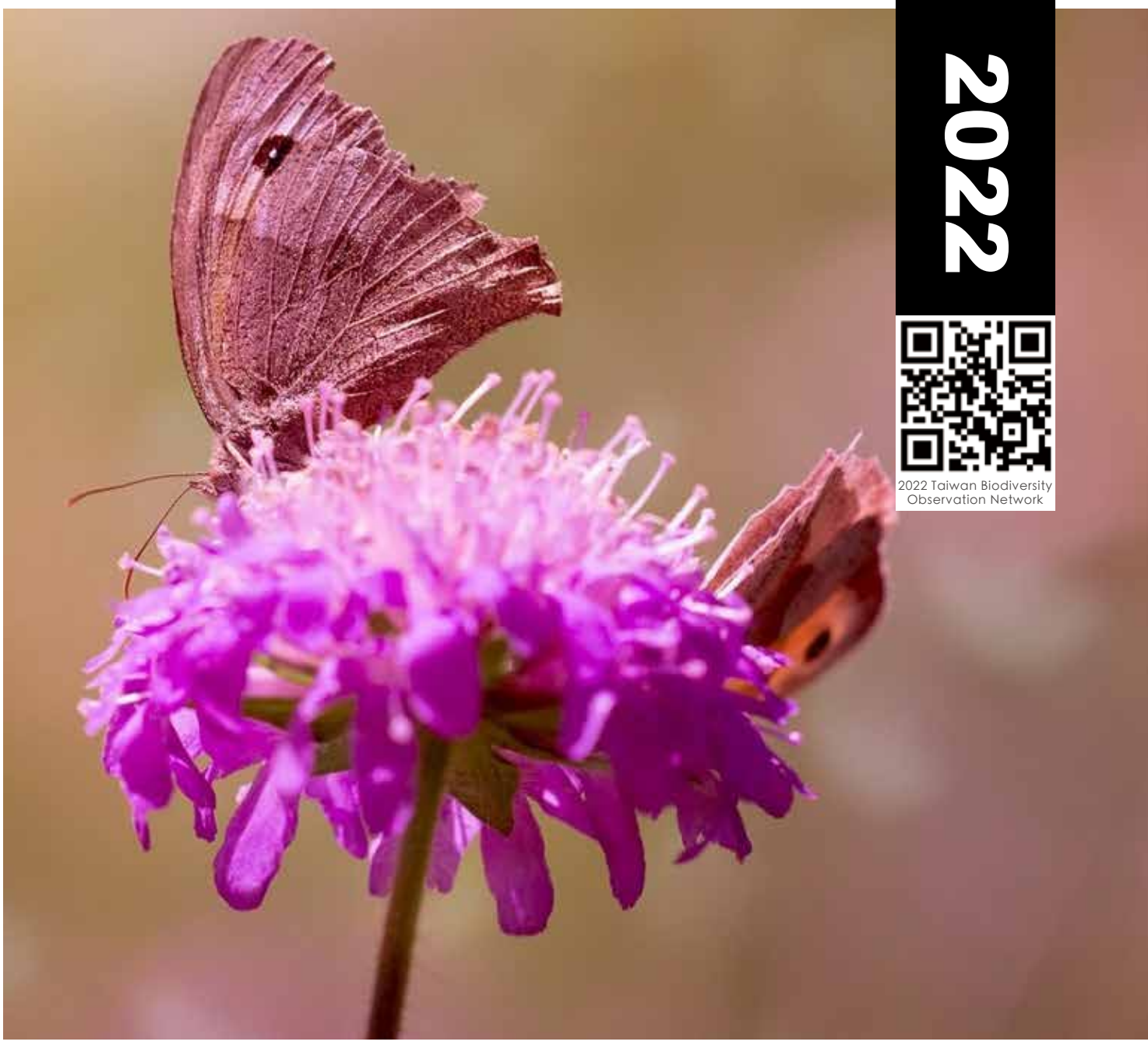
Annual Report



2022

2022 Taiwan Biodiversity Observation Network

Data

- PARCC data quality inspection system
- Efficiency upgrade of auditing management system

Indicators

- Monitoring of Changes in Categories of National Land-Use
- Number of people legally applying for entry into protected areas
- Carbon storage capacity of coastal blue carbon ecosystem

System

- Taiwan Biodiversity Observation Network Portal Visualization Upgrad
- Preparation of the Biodiversity National Reports

Editorial Office Report

Biodiversity research and surveys in Taiwan have been conducted for many years. However, in terms of biodiversity information at the ecosystem level, the quality and quantity of relevant research or survey results are relatively weak, and there is no strong integration system.

Most of the government-commissioned survey projects or departmental data are still fragmented, making it difficult to communicate, disclose, and share with users. This makes it difficult to achieve the strategic objective of the Aichi Target of the Convention on Biological Diversity that states "By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied." and to show the long-term trend of biodiversity change in the country.

In order to improve the integration and openness of domestic biodiversity monitoring information, it is necessary to develop an integration mechanism for national biodiversity observation and survey results to formulate important and representative indicators to grasp the current status and changing trends of biodiversity. In addition, Taiwan has also actively participated in building biodiversity databases and related organizations in recent years, by looking at international organizations such as: Global Biodiversity Information Facility (GBIF), Encyclopedia of Life (EOL), Barcode of Life (BOL), Biodiversity Observation Network (BONs), etc. Although some international organizations have not been able to formally sign contracts or participate in cooperation due to political issues, if Taiwan can have its own national biodiversity monitoring system and specific indicators to reflect its biodiversity status, it could be integrated in the international biodiversity observation network, such as: GEO BON, AP BON. Therefore, the Taiwan Biodiversity Observation Network (TaiBON) construction plan came into being.

The Convention on Biological Diversity (CBD) has formulated the Post-2020 Global Biodiversity Framework (GBF) as a guideline for the development and strategy of biodiversity issues for the decade 2020-2030. As a guideline for promotion, the Framework not only takes up the unfulfilled targets of the Aichi Targets for the previous decade, but also makes new adjustments for future trends. The new indicator concepts include a region-wide integrated planning approach to habitat conservation and use (Target 1), planning and measuring the effectiveness of habitat conservation through the establishment of protected areas and OECMs (Target 3), To adopt Nature Based Solutions to combat carbon emissions and other impacts of global environmental change (Target 8), to adopt sustainable use of wildlife resources (Target 9), to integrate biodiversity issues and concepts into public and private sector strategic concepts and business approaches (Target 14), and fully applying traditional and technological knowledge in policy areas such as national governance and public outreach (Target 20). The TaiBON’ s team is also actively updating its indicators whenever changes are made in the international community. Originally, there were eight issues in the TaiBON system, totaling 62 biodiversity indicators. This annual report will also provide an update on TaiBON's latest development from the perspective of how to respond to the international trend with 4 new trend indicators and 2 supporting work. In order to provide the most accurate and faithful information to reflect the trend, the quality of the data is checked by the PARCC process to facilitate readers' interpretation and tracking of the trend. Through the calculation results of various indicators, the public can understand the current status and trend of biodiversity in the country, enhance their awareness and knowledge of biodiversity protection, and help promote biodiversity conservation and related monitoring information management, so as to effectively implement the strategy of sustainable development of biodiversity.

In the future, TaiBON hopes to strengthen the cooperation between the government and the private sector to enrich the existing sources of biodiversity indicators, review the issues of indicators, evaluate the quality of data, and improve the accuracy of the indicators to reflect the biodiversity status in Taiwan, so as to adjust the policy plan and make the biodiversity development more in line with the international trend. At the same time, TaiBON strives to improve the system interface and visual communication of charts and graphs, hoping this way that the public will be able to read and interpret the information more easily, so as to promote the concept of biodiversity and its application, and eventually achieve the goal of mainstreaming biodiversity in the future.

note1 OECM: Other Effective Area-based Conservation Measures.

note2 PARCC: The five indicators of the data quality measurement tool: “Precision, Accuracy, Representative, Completeness, and Comparability.

Development timeline

In 1992, the United Nations adopted the Convention on Biological Diversity (CBD), which calls for the adoption of consistent biodiversity indicators and long-term monitoring mechanisms. In 2010, the Conference of the Parties of the CBD reestablished the more stringent Aichi biodiversity targets as the biodiversity targets for 2010-2020, and in 2015, the United Nations established the broader Sustainable Development Goals (SDGs), which include 17 core targets and 169 tracking indicators.

Although Taiwan is not a member of the CBD, it still wants to actively protect the ecological environment and the sustainable use of resources in the country. Therefore, from 2001 to 2003, the Council for Sustainable Development of the Executive Yuan implemented the Biodiversity Promotion Program, the Biodiversity Sustainable Development Action Plan, and the Taiwan Sustainable Development Indicator System, and in 2005, the Forestry Bureau proposed 14 biodiversity monitoring indicators. In 2012, the Sustainability Council reviewed and revised the original biodiversity action plan in accordance with the Aichi Targets.

In response to the international biodiversity and sustainability goals, the Forestry Bureau initiated the "National Biodiversity Monitoring and Reporting System Planning" project in 2015, working with Academia Sinica, National Taiwan University, National Chung Hsing University, and National Chiayi University to form a research team. The research team (here onwards referred to as the TaiBON's team) objectives are to compile an inventory of the biodiversity indicators used abroad, integrate the biodiversity research results of various domestic authorities, improve the quality of monitoring data, and develop representative biodiversity indicators and data integration mechanisms.

The establishment of TaiBON is expected to reflect the results of biodiversity implementation in Taiwan and provide a reference for future management and administration, as well as convergence with international databases.

Data

• PARCC data quality inspection system

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For the data collected into the TaiBON system, the quality assessment will be carried out in the first stage to present the characteristics of the data sets of different types, sources, and collection methods, so as to reflect the actual situation when judging the trend of the data. The quality assessment method used is the PARCC data quality inspection mechanism. The acronym PARCC stands for precision (P), accuracy (A), representativeness (R), completeness (C), and comparison (C).

The data quality assessment process is based on the five major characteristics of data as the evaluation benchmark. Understanding the characteristics and quality of the data will help support the analysis results; since the data collection process will experience different challenges and constraints, the purpose of evaluating the data quality is to indicate whether the data is long-term, periodical, extensive, and if it is a collection method that has passed a reasonable gatekeeping mechanism. If it is not the above mentioned collection method, it will show whether there is a concentration in a specific area, a specific period, or other specific collection methods to help judge the background and rationality of the trend.

• Efficiency upgrade of auditing management system

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Chun-I Chang | Product Manager, Taiwan Biodiversity Information Facility, Academia Sinica

In order to integrate the biodiversity research results and related data of various domestic agencies and improve the indicator observation mechanism, the TaiBON's team has started to build an online biodiversity reporting and auditing management system since 2015, in order to digitize paper-based operation; and at the same time, it also allows relevant personnel to systematically review and review the progress and performance of various tasks at the end of the year. This supporting work also helps to respond to Goal 14 of the Post-2020 GBF, "Integrate biodiversity values fully into policies, regulations, planning, development processes, poverty reduction strategies, accounting and environmental impact assessments at all levels, ensuring that all activities and Financial flows are all in line with the values of biodiversity" convenience and accessibility.

In 2017, the National Sustainable Development Committee (Sustainable Development Council) of the Executive Yuan formulated the "Taiwan Sustainable Development Goals", and the TaiBON's team began to assess whether the indicators on the auditing management system need to be adjusted accordingly. After several years of use, the system has accumulated many adjustment suggestions from users. The team redesigned and planned the user interface of the auditing management system in 2021, and is expected to release a new version of the system for testing by the end of this year. In addition to confirming whether the operation process is suitable for internal team members, it can also be used for cooperation discussions with the National Council for Sustainable Development. It is expected that the new version of the system will be officially launched in 2023.

The new version of the auditing management system will have three major features:

1.Connect the website with the existing database to reduce the manual filling of content by staff.

Since the research results and related data of each organization have different system requirements for the auditing management system (e.g., the Council for Sustainable Development also has corresponding requirements for filling in indicators), in order to avoid repetition in the system, a new system is being developed. The new version of the auditing management system will be connected to the databases of existing websites, such as the portal site of the Taiwan Biodiversity Information Coalition currently under development. This way, the information required for the indicators can be directly imported into the system from the database, and the filers will only need to add the information that is not automatically imported in the system, making them more willing to add their data.

2.Data quality assessment (PARCC) self-assessment design, quality check of the content of the indicators.

The new version of the system is designed to be compatible with the data quality assessment program established in this project. In addition to the content of the indicators, the filers also need to evaluate and fill in the information on the accuracy (P), precision (A), representativeness (R), completeness (C), and comparability (C) of each indicator in order to evaluate the quality of the data. The PARCC system can also be used to preliminarily judge some of the content from the system by using the connection between the databases, and the filers only needs to self-assess the content that cannot be obtained through the connection.

3.Improve the visualization process of filling in the content of past years to make the distinction of responsibilities on the website clearer.

The existing auditing management system has been designed to visually present the content of previous years' applications, however, some of the content of the indicators has not been quantified, the visualization is incomplete and not easy to understand. In the future, the TaiBON's team will not only continue to design the indicators of the new version of the auditing management system, but also put more emphasis on the collaboration with the TaiBON's portal website. After the data collected by the system is sent back to the TaiBON portal, the portal will produce visual charts. When the filers want to view the visual charts of each indicator directly from the auditing management system, the charts produced by the TaiBON portal are presented in a serial way, so that their respective positions on the website can be more clearly defined.

In addition to the TaiBON indicators in this project, the Sustainability Council has also begun to make more progress in its indicator filing planning, and the work for filers in each unit may become more complicated in the future. In order to reduce the burden of the filers, it is necessary to simplify the process of the reporting system. We hope that through the re-adjustment of the indicators in the system and the optimization of the system interface and process, we can make it easier for filers to report biodiversity research results and related information, and even attract volunteers to report, so that this information can have the opportunity to support the country's sustainable development strategy.

Note3 Auditing management system: In line with the objectives of international biodiversity and sustainability, the contractors of each national institution are required to fill in the performance indicators of the corresponding work items in this system so that the performance results can be collected systematically and the relevant council can understand whether the management measures are effective.

Indicator presentation

TaiBON currently has a total of 62 indicators for both marine and land environments. The indexes were established by the team after taking note of international and domestic indicators and working with experts to assess their potential in these four dimensions: responsiveness to issues, international relevance, long-term monitoring, and data validity. Each indicator is expected to reflect the pressure, state, benefit, and human response to biodiversity management. The indicators were collected from government, academic institutions or private organizations, and the quality of the data was evaluated by the team and the source of the data by scientific criteria They provide sources for discussion, and evaluate the quality classification of the data according to scientific research classification:

I.Result is consistent and the methodology is adequate;

II.Lack of either long-term data collection or of an adequate methodology;

III.he appropriate methodology has yet to be developed.

The following are four new indicators that have been established in recent years in the terrestrial and marine areas.

Themes	Indicators	Data	PSBR
Theme 5: Terrestrial protected areas	Ratio of Rivers Slightly Polluted/Unpolluted	I	P
	The area of Protected Areas	I	R
	Illegal hunting and havesting in the protection areas	I	P
	Species Diversity in national park	II-1	S
	Number of people legally applying for entry into protected areas	II-2	P
	The length ratio of the natural coast to the total coast in the coastal protection areas	II-2	S
	Estimation of forest cover in protected areas	III	S
	Carbon sequestration capacity of forest in protected areas	III	B
	Specified alien species in the protected areas	III	P
	The number and proportion of various protected areas with regular evaluations on management effectiveness	III	R
	Landscape Development Intensity Index (LDI) of Important National Wetlands	III	S
Theme 6: Population of selected taxa	Common Breeding Birds	I	S
	Common Frogs	I	S
	Population of Black-faced Spoonbill (Platalea minor)	I	S
	Ratio of Threatened Species in the Red List	II-1	P
	The Influence of Climate Change on Bird Populations	III	P
	The Influence of Climate Change on High Altitude Grassland Ecosystems	III	P
Theme 7: Invasive species	Fire Ants	I	P
	Spot-legged Tree Frog (Polypedates megacephalus)	I	P
	African Sacred Ibis	I	P
	Mikania micrantha	II-2	P
	The List of Evaluated and Classified Invasive Species	II-2	P
	Changes in the species number and population of native species affected by invasive alien species	III	P
Theme 8 : Sensitive habitats	Area of Taiwan's Wetlands of Importance	I	S
	The Length Ratio of Natural Coast to the Total Coast in Taiwan	I	R
	Carbon Sequestration Capacity of Forest	I	B
	onitoring of Changes in Categories of National Land-Use	I	R
	Length of Natural Riverbank in the Downstream of the Main stem	I	S
	Area Ratio of Significant Land Subsidence	I	P
	Estimation of Ecosystem Service Value	II-2	B
	Habitat diversity	III	S

議題	指標	品質	PSBR
Theme 1: Fishery resources	Fish Landings of Offshore and Inshore Fisheries	I	S
	Catch rate of Inshore/offshore fish species	III	S
	Variation trends of fish composition and abundance in the set net fishing grounds	I	S
	Mean Trophic Index	II-1	S
	Fishing-in-balance index	II-1	S
	Primary Productivity	II-1	S
	Funds Invested in Fishery Biological Researches and Fundamental Surveys	III	R
	Total Tonnage of Fishing Vessels and Reduced Tonnage Every Year	I	R
	The Total Number of Active Fishing Vessels, the Number of Vessels Reduced Yearly and the Number of Newly Constructed Vessels Yearly	I	R
	Reducing Subsidies That Are Not Conducive To Biodiversity	I	R
	Increase Subsidies That Are Conducive To Biodiversity	I	R
Theme 2: Marine protected areas	The Ratio Of Marine Protected Areas To The Sea Areas Adjacent To Taiwan	I	R
	Number and area of fishing exclusion zone and their percentages in Marine Protected Areas	II-1	R
	Community changes in marine biodiversity in protected areas	II-1	S
	Community changes in marine biodiversity in unprotected areas	II-2	S
	Proportion or mechanism of stakeholder or community participating in the management of marine protected areas	II-2	R
	Marine Protected Area Index	III	R
Theme 3: Marine pollution	Pass rate of data from environmental water quality monitoring reaching Class A and Class B standards	I	P
	Set up fixed water quality monitoring stations in the sea area to conduct regular and long-term monitoring of changes in water quality parameters	I	P
	Changes in parameters of beach water quality in testing items	I	P
	Number of research and monitoring projects and data on ocean acidification	III	P
	Marine Water Quality and Eutrophication Indicator	I	P
Theme 4: Abundance trends of selected taxa	Population Size of Indo-Pacific Humpback Dolphin (Sousa chinensis)	II-1	S
	Number of female green sea turtle	II-1	S
	Survey on the number of cetaceans caught in the inshore/offshore fisheries	II-1	S
	The frequency of offshore/inshore cetaceans seen	I	S

• Monitoring of Changes in Categories of National Land-Use PARCC level: I

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In response to target 1 of the Post-2020 Global Framework for Biodiversity
Ensure that all land and sea areas globally are under integrated biodiversity-inclusive spatial planning addressing land- and sea-use change, retaining existing intact and wilderness areas.

Definition and calculation method

Use satellite telemetry as a detection tool to conduct comprehensive and periodic land use change monitoring. After observing the images in different periods, computer automated interpretation and manual screening are used to screen out the variation points suspected of violations, and the local governments and the competent authorities of the target industry are notified to send personnel to the site for inspection and report the inspection results.

Indicator trend

According to the data on the website of the Land Use Monitoring Program, a total of 31,168 variation points were reported in 2020, of which 18,739 variants were verified as legal, 11,654 variants were illegal, and 775 variation points fell under other categories (including known works, natural changes, unidentifiable variants, unavailable for on-site inspection, and not under its jurisdiction). This represents an increase of 4,985 variance points compared to 2020.

Since 2014, the National Land Survey and Mapping Center has taken over the integration of the monitoring programs of the Construction Department, the Water Conservation Bureau, and the Water Resources Department, increasing the frequency of monitoring of each department to once every two months, and increasing the resolution of satellite images to between 1.5 and 2.5 meters. Compared to 2014 when the monitoring results were not integrated, the rate of detecting land use violations has increased significantly since the implementation of the monitoring integration.

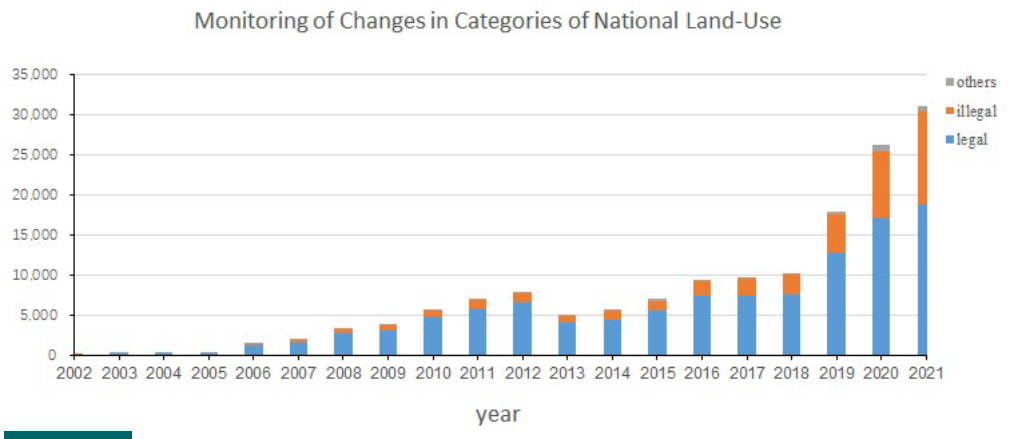

Figure 2 Land-Use Change Monitoring Report

Indicator quality improvement

Although the current monitoring system can show the amount of land used for either illegal or legal situations, it is suggested that the land use type attribute data of the variation points can still be added to the biodiversity monitoring work to better understand the status of ecological habitats.

Reference information

Data management/responsibility unit: Land Surveying and Mapping Center of the Ministry of the Interior

Source: National Land Use Monitoring Program website - monitoring reports report statistical results.

• Number of people legally applying for entry into protected areas PARCC level: I

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In response to target 3 of the Post-2020 Global Framework for Biodiversity
Ensure that at least 30% globally of land areas and of sea areas, especially areas of particular importance for biodiversity and its contributions to people, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Definition and calculation method

Count the number of people applying to enter the ecological protection area each year to represent the degree of human disturbance.

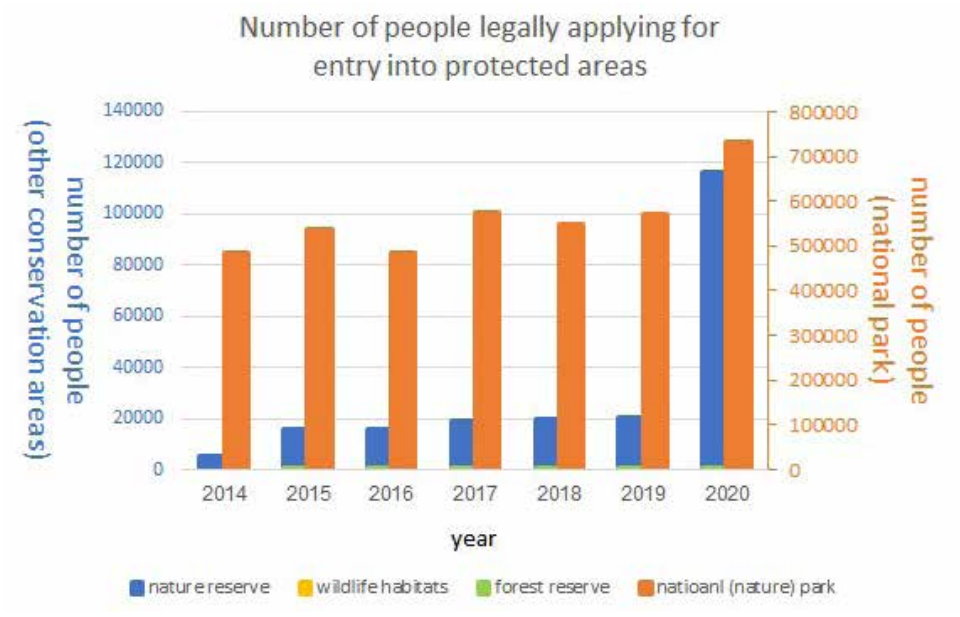

Figure 3 Number of entry by year to national conservation area

Indicator Trend

From January to December 2020, a total of 117,581 people applied to enter 30 wildlife habitats, national (nature) park, nature reserve and forest reserve area (hereinafter referred to as conservation areas) across Taiwan, and a total of 733,446 people applied to enter the nine national park ecological reserves. Although the main focus is on the protection of conservation areas, the mission of each type of protected area is not the same. For example, national parks are also responsible for promoting education and have areas with specific functions such as "recreation areas" within their boundaries. These sites are well-known and attractive to the general public. Due to their differences, the number of annual applications to enter these conservation areas is different for each type, as we can see in the figure below.
From 2015 to 2019, the number of approved entries to conservation areas was higher each year than in 2014 and remained relatively stable until 2020, when the number of approved entries to national parks and reserves increased significantly. It is speculated that one of the possible reasons is the impact of the COVID-19 epidemic which caused people to be moving outdoors to seek less crowded places. However, since the maximum number of applicants varies among national parks and reserves, and the purpose of the applications is not yet compiled, this indicator trend is still listed for reference only.

Indicator quality improvement

It is recommended to calculate the level of environmental stress by using the ratio of daily admissions to the daily limit as an indicator, and to include biological monitoring data to fully reflect the environmental stress. The complementary data items are as follows.
1.The total number of people entering different management areas (core area, etc.) of the reserve per day and the limit of the number of people entering the reserve.
2.Monitoring data (wildlife community surveys, etc.) reflecting changes in biodiversity in the reserve.

Reference information

Data Management/Authorities: Forestry Bureau, Council of Agriculture, Executive Yuan; National Parks Section, Department of Construction, Ministry of the Interior
Source: Forestry Bureau's statistics on applications for entry into protected areas and national parks' statistics on approved entry into ecological reserves

• Carbon storage capacity of coastal blue carbon ecosystem PARCC level: III

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In response to target 8 of the Post-2020 Global Framework for Biodiversity
Minimize the impact of climate change on biodiversity, contribute to mitigation and adaptation through ecosystem-based approaches, contributing at least 10 GtCO2e per year to global mitigation efforts, and ensure that all mitigation and adaptation efforts avoid negative impacts on biodiversity.
Climate change is regarded as one of the global environmental crises, and its impact will also affect the marine environment and ecology. Under the global "Net-zero carbon emissions" vision, Taiwan has also officially announced the "Taiwan 2050 Net-zero Emissions Pathway and Strategy General Description" in March 2022.In order to achieve the goal of net-zero emissions, in addition to gradually controlling and reducing greenhouse gas emissions, how to increase natural carbon sinks is the focus of future development.
In recent years, the ability of natural carbon sinks to sequester carbon has been increasingly emphasized, especially the blue carbon and green carbon ecosystems have received much attention; Blue Carbon refers to the carbon absorbed and stored by "marine organisms". The internationally recognized blue carbon ecosystems are comprised of mainly coastal mangroves, seagrass beds and salt marsh ecosystem.

Calculation Method

The TaiBON Sea Area Indicator refers to the "Carbon Storage (CS)" target in the Ocean Health Index (OHI) and adds a new indicator for "Carbon Storage Capacity of Coastal Blue Carbon Ecosystems" under the topic of "Marine Protected Areas" to assess the carbon storage status of coastal blue carbon ecosystems (mangroves, seagrass beds, and salt marshes).

By multiplying the area of mangrove, seagrass beds and salt marshes by the carbon storage rate of different types of habitats, the annual carbon storage capacity of coastal blue carbon ecosystems in China can be obtained.
At present, only the data from international literature are available for reference and calculation, and the data are also early estimates. In the future, after the data on the carbon storage rate of Taiwan's coastal blue carbon is established, it can be directly calculated by combining the area of mangrove forests, seagrass beds and salt marsh ecosystems obtained from the inventory in recent years.

Indicator Trends

The mangrove and seagrass bed area inventory data were obtained from the Marine Conservation Administration's "108th Annual Mangrove Ecosystem Survey Project" and "108th Annual Seagrass Bed Ecosystem Survey Project" respectively, while the salt marsh area inventory data were provided by the presenter of this project. The largest area of blue carbon ecosystem in Taiwan is the seagrass bed, with a total of 7,536.35 hectares, of which 7,500 hectares are located on Dongsha Island; the largest area of mangrove forest is on Taiwan's main island and the surrounding islands, with a total of 680.70 hectares. The salt marsh has a total area of 188.33 hectares after the inventory, and 49.80 hectares if we do not include the area covered by the salt marsh cordgrass. Although the plant is a salt marsh plant, it is a strong invasive species that has been expanding in recent years and has seriously affected the coastal intertidal beaches. The government often carry out removal operations, so it is not included in the calculation.
This new indicator is not yet available, and no trend map can be prepared. In the future, the competent authorities should conduct regular area inventories of mangrove forests, seagrass beds and salt marsh ecosystems to gradually understand the changes in carbon storage capacity of Taiwan's coastal blue carbon ecosystems.

Indicator quality improvement

After the habitat carbon storage rates of Taiwan's native mangroves, seagrass beds and salt marsh ecosystems are established, the authorities must regularly inventory the area of each type of habitat in order to calculate and evaluate the annual carbon storage of Taiwan's coastal blue carbon ecosystems.

reference information

Data management/responsibility unit: Marine Conservation Department of the Oceanic Commission
Source: 2018 Mangrove Ecosystem Survey Project (Lin Xingsuke, 2019), 2018 Seagrass Bed Ecosystem Survey Project (Lin Xingsuke, 2019), provided by the host of this project

• Different offshore fishing catch rate PARCC level: III

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In response to target 9 of the Post-2020 Global Framework for Biodiversity

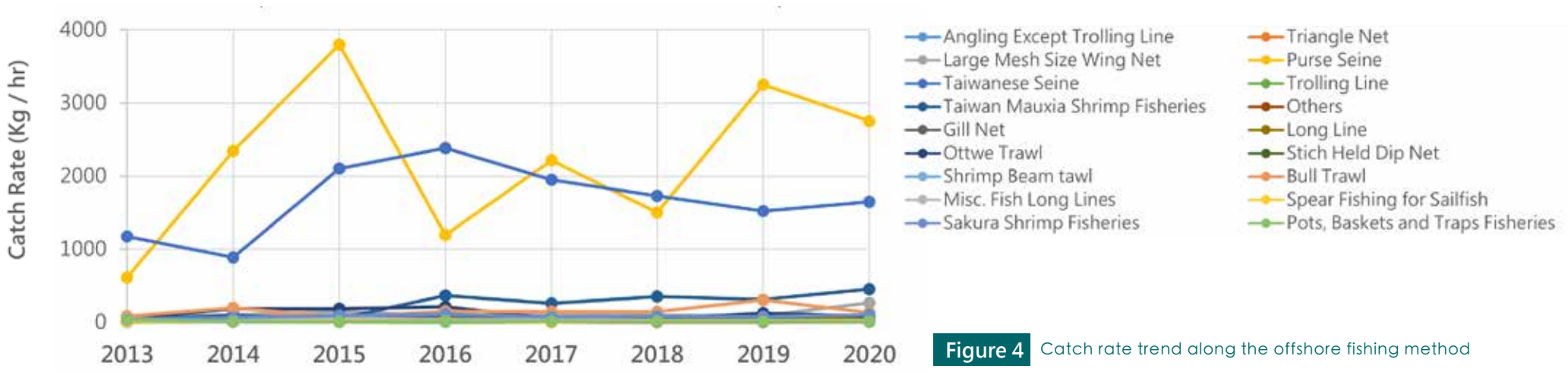

Figure 4 Catch rate trend along the offshore fishing method

Ensure benefits, including nutrition, food security, medicines, and livelihoods for people especially for the most vulnerable through sustainable management of wild terrestrial, freshwater and marine species and protecting customary sustainable use by indigenous peoples and local communities.

Calculation method

We continue to work on improving the quality of data for the indicators in the TaiBON waters, and through continuous communication with the authorities, we have been able to obtain usable data for important indicators for which no data were available. In 2021, we discussed with the Fisheries Department and changed the indicator to "catch rate of fishing methods along the coast", using the catch data of various fishing gears and fishing methods reported by ports and VDR data on fishing vessels (sailing time - sailing hours = operating time) to estimate the catch rate (kg) of different fishing methods per unit time. The catch rate per unit time (kg/hr) of different fishing methods was estimated by using the catch data of various fishing methods reported in each port and the VDR data on fishing vessels. The data will be obtained with the assistance of the Fisheries Department this year (2022) to fill the largest data gap in the TaiBON Sea Area Indicator since its development began in 2015.

Indicator Trend

The catch rate data along the offshore fishing method is calculated by adding up the catch rate (Kg /hr) of the same fishing method for each year and averaging it from 2013 to 2020. As can be seen from the trend graph, the highest catch rates per unit of time are for the two fishing methods of trawling and skimming, with almost all exceeding 1,000 Kg/hr; the catch rates of the other fishing methods are below 500 Kg/hr.

Indicator quality improvement

Currently, the data can only be provided with the assistance of the Fisheries Department, and no public statistics or reports are available. In the future, further clarification is needed on the selection of fishing vessels, ports, and reporting data for catch rate estimation to confirm the methodology of the data sources.

Reference information

Data management/authority: Agriculture Commission Fisheries Department
Source: Department of Fisheries, Council of Agriculture

System workings

• Taiwan Biodiversity Observation Network Portal Visualization Upgrade

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To help address Goal 20 of the Post-2020 Global Framework for Biodiversity, " Ensure that relevant knowledge, including the traditional knowledge, innovations and practices of indigenous and local communities with their free, prior, and informed consent, guides decision making for the effective management of biodiversity, enabling monitoring, and by promoting awareness, education and research," the Information Systems sub-team continues to continues to experiment with more efficient and user-friendly ways to present indicator status and trends. Visualization of indicator data is an important way of presenting various long-term survey/monitoring data. A good visual presentation can effectively communicate complex information to the public and facilitate the flow and exchange of academic results and research data.

The TaiBON portal site has been established since 2016 and is maintained and updated by the information system sub-team. One of the important purposes of the website is to display the past years of TaiBON indicators and provide information on the indicators collected and monitored over a long period of time, so that biodiversity-related organizations and the general public can understand the trends and changes of Taiwan's biodiversity indicators.

Since the data sources of the TaiBON website come from various units at different times, a more detailed operation is required for version control. For data management,

we use the gitHub data warehouse to store the metrics data and use the cleaned up open data address to interface with the frontend to present the metrics data visualization modules such as line graphs and bar graphs semi-automatically on the website. Since then, in order to respond to the increasing diversity of indicators and the need for more diversified chart presentation, the information system sub-team has adopted a new type of chart drawing system, adding different visual presentation methods such as overlapping long bar charts and map time, and developing the function of supporting multiple chart presentation for a single indicator. The main considerations for the new version of visual chart presentation include the universality of the development language, the convenience of data importing, and the diversity of chart presentation. According to the requirements of TaiBON website, there are two ways to consider, one is to use the more flexible plug-in package of plotly. The second is to embed the charts generated by Google data studio data tools. This will provide a variety of interactive charts with clearer and more aesthetically pleasing visual effects.

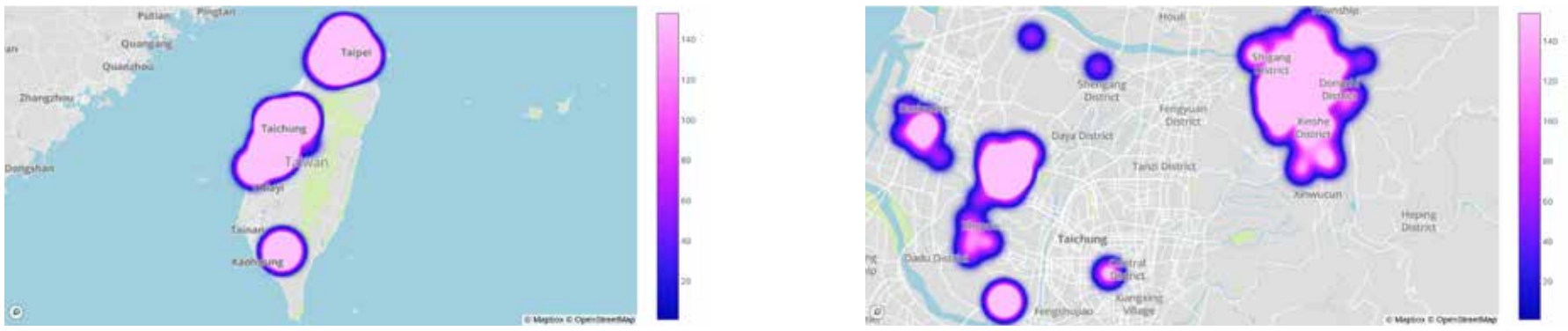

Figure 5 Plotly plug-in presenting the "Spotted-legged Tree Frog " interactive pointer visualization chart.

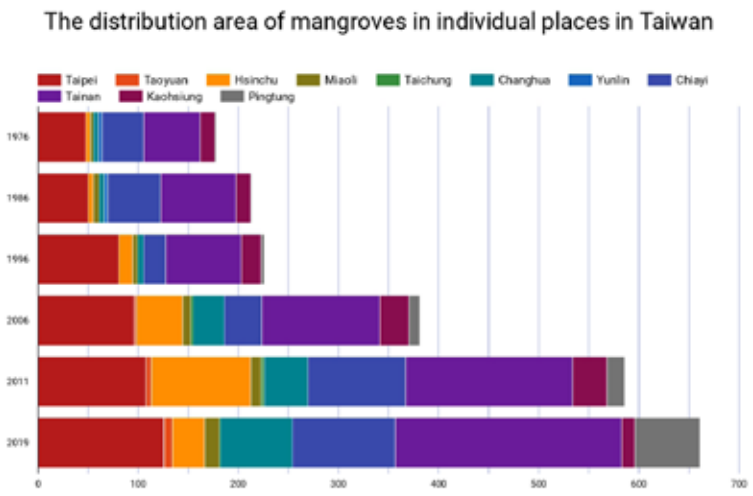

Figure 6 Looker Studio presents an interactive visual diagram of the "area of mangrove ecosystems in the surrounding waters of Taiwan ".

Currently, there are 38 indicators in the portal with visual graphical presentation, and 4 indicators with multiple graphical presentations due to content needs, including "offshore fishery catch", "subsidies to reduce adverse biodiversity", "area of the mangrove ecosystem in the surrounding waters of Taiwan", and "percentage of area of significant stratigraphic subsidence" .

Although the visualization charting function is sufficient to support the use of existing indicators, the information system sub-team will start to plan the visualization presentation upgrade tool as the indicators become more abundant and more different types of charts are expected to be needed in the future. Depending on the status of internal consultation and requirement definition, and the future direction of the indicators, the actual development tool for visualization upgrade of indicators will be determined to provide a better experience for the team and the users browsing the website.

Content management system (CMS, content management system) :

A management tool for any type of content information (such as text, images, documents, web pages, etc.). It allows you to track the history of content additions, deletions, and revisions thanks to its revision control function.

Drupal :

an open source content management system, sometimes considered a content management framework. It was adopted by the team as the TaiBON web system due to its high security and customizability.

Plotly :

A database of visual diagrams, Plotly can be used for drawing, to display reports, and even to create interactive diagrams on the web. It is open-source and supports a large number of interactive graph types.

Looker studio :

(formerly Google Data Studio) Is a service launched by Google to produce customizable and up-to-date reports by linking to google sheets, or imported csv, xlsx, etc. The service provides a simple and elegant layout and makes it easy to link, display and even share data.

Note5 Demonstration for the distribution and abundance of exotic species - Spot-legged tree frogs: https://taibon.tw/zh-hant/indicator/aizhi/140

Note6 The area of mangrove ecosystem in Taiwan's surrounding waters: https://taibon.tw/zh-hant/indicator/aizhi/214

• Preparation of the Biodiversity National Reports

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Essential Biodiverstiy Variables and Inidcators for Post-2020 Global Biodiversity Framework

n order to provide baseline data for trend analysis of biodiversity monitoring data, the TaiBON Team would adopt the Essential Biodiversity Variables (EBVs) proposed by GEO BON , to measure and monitor the biodiversity information at different scales. The EBVs can be measured in six dimensions from microscopic to macroscopic scales: genetic composition, species populations, species traits, community composition, ecosystem structure and ecosystem functioning , which together describe the state of biodiversity in an environment. When combined with trends that use the same data over a long term, trends in the state of biodiversity can be identified and tracked. For example, by using the results of citizen science, the unified methodology is used to record the number of species populations in different environments within a country each year, and these data can be used to describe fluctuations in the number of populations in various environments over long periods of time. In Taiwan, the large-scale Taiwan Breeding Bird Survey and the Amphibian Resources Survey have provided continuing and stable records of local EBVs.

The six dimensions can also be regarded as the basic unit of record for biological surveys or long-term monitoring. With the starting baseline information, the biodiversity fluctuations and long-term trends can then be calculated and measured, providing decision makers with scientific evidence to address biodiversity-related issues. For example, by mapping the long-term records in species population, its habitat range we can obtain the Species-Habitat Index. This index, which uses the EBVs of species

population size and ecosystem structure, is used to measure the intactness of habitat and the adequacy of the habitat to support the needs of the population growth. The pecies-habitat index of different countries in the world are available on the UN Biodiversity Lab. The CBD encourages national authorities to use such indicators and the maps based on them as evidence in environment-related policy legistating and for the further develop planning.

The TaiBON Team, as the supporter of the editing of the Biodiversity National Report, follows international criteria and intend to adopt the same set of indicators used by CBD parties to assess our national biodiversity status. This also for the concern of comparing and evaluating the biodiversity status at the same standard with other countries in the future. When the Aichi Target (2011-2020) was due, the new 2021-2030 criteria for the Post-2020 Global Biodiversity Framework (Post-2020 GBF) would be designated in the end of 2022. Under this framework, the new set of indicators will be used to track changes in global biodiversity during the next decade, and many of these indicators will require the EBVs data as the basis for calculation. Therefore, prior to the preparation of the national report, it is one of the essential tasks to collect and record the relevant EBVs in Taiwan and maintain them in a long-term database.

The following three examples are to illustrate the potential presentation and calculation methods of EBVs in Taiwan at three scales: species, community, and ecosystem levels respectively.

Species population: species richness and species distribution

At this scale, one can choose to present the population fluctuation of single target or key species, or to show the richness or distribution information of the specific group of species from the superimposition mapping.The first example is from the "Taiwan Breeding Bird Survey" from 2009 to 2019 , in this case the data is adpoted to explain the avian species richness in each 10-km square range, and their fluctuation in distribution over a decade (Figure 7).

The middle and high altitude mountain areas are the areas with higher overall bird abundance, and are stable in trend of such high species richness during the survey period. On the other hand, from 2012 to 2014, it can be seen that the number of light-colored squares representing lower species richness at lower elevations and along the western coastal areas have slightly increased, although some dark-colored squares do have increased in recent years.

Since the western and southern coastal areas of Taiwan are an agricultural intensive area, and the change in the abundanceof farmland birds is one of the important signal in the overall planning of agricultural environment. This map presents the preliminary trend of bird species abundance, and with the addition of other supporting data, decision makers can make more in-depth exploration and planning. There is also further species distribution and abundance information and examples presented internationally, please refer to the GEO BON website and the Map of Life website.

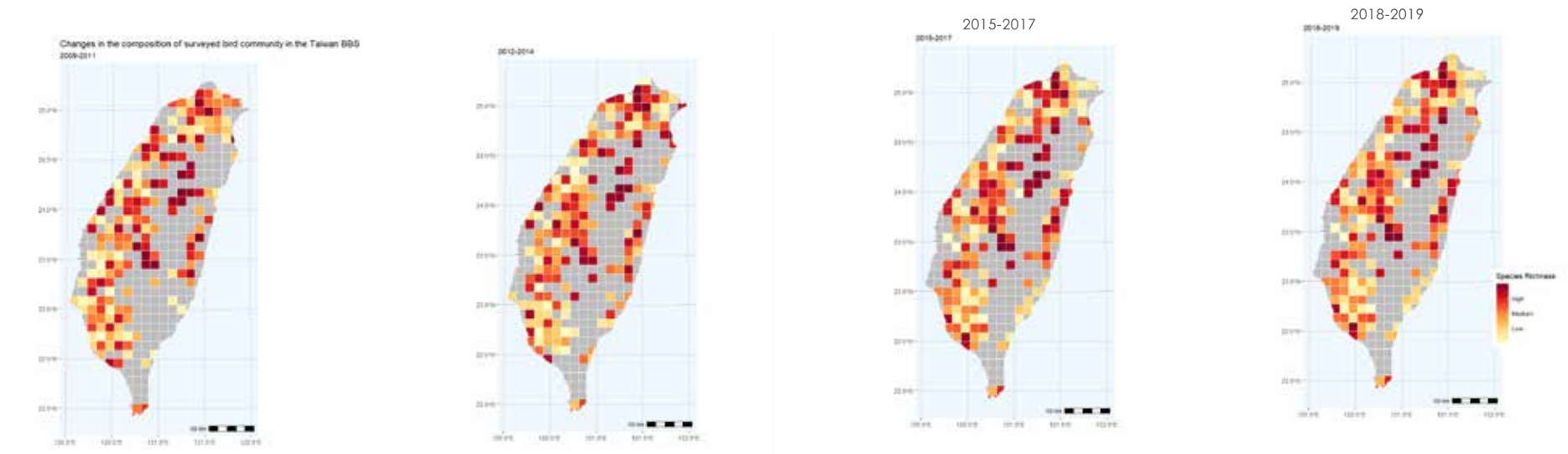

Figure 7 Changes in the composition of surveyed bird community from 2009 to 2019 in the "Taiwan Breeding Bird Survey", the darker the color scale, the higher the abundance.

Community compostion

At the community level, the Amphibian Resources Survey from 2013 to 2016 is taken as an example. Figure 8 shows the increase (in black fond) or decrease (in red fond) in the number of different species of different traits (in here we present the status of species inhabits in different elevations and the exotic ones). The purple bars show the number of exotic frogs surveyed, e.g., the spotted-legged tree frog was not surveyed in 2014, but doubled in 2015 compared to the number surveyed in the previous year, and then decreased slightly in 2016. This method uses wind rose charts to present information on the colony structure and the number of species, as well as the changes in their growth and decline.

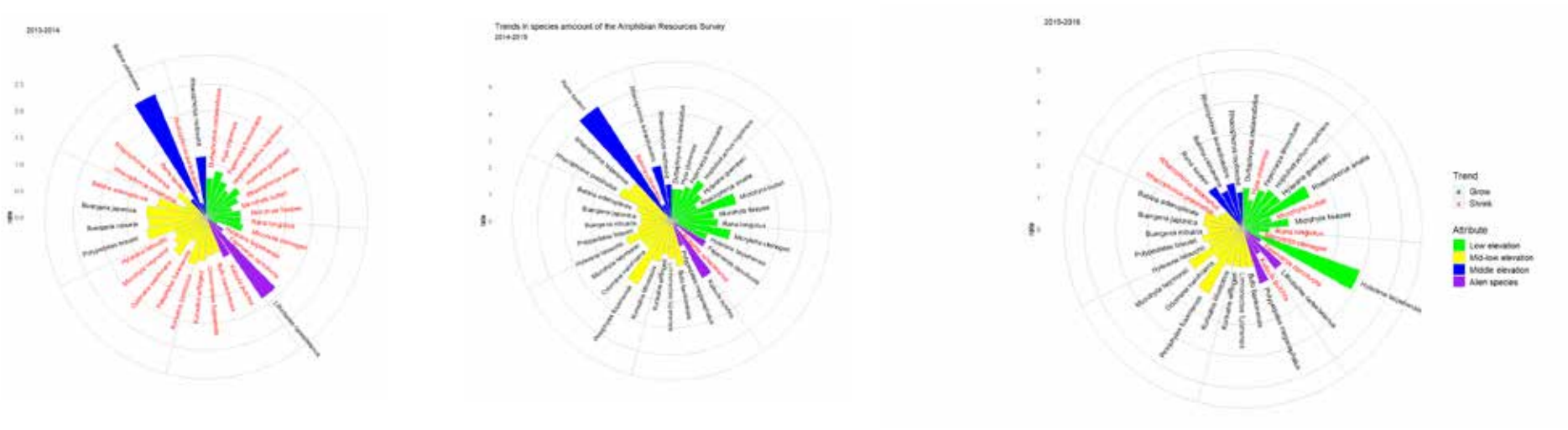

Figure 8 Trends in species amoount of survey result from 2013 to 2016 in the "Amphibian Resources Survey".

Note7 GEO BON: Group on Earth Observations - Biodiversity Observation Network

Note8 For more information, please refer to the official website of GEO BON: https://geobon.org/ebvs/what-are-ebvs/

Note9 CBD: Convention on Biological Diversity, the official body of the United Nations that hosts international conferences on biodiversity

Note10 The Presence-Absence data were first combined every three years from 2009 to 2019 to avoid the possibility of pseudo-negativity in the survey. In addition to the number of species, the abundance data were weighted by the frequency of species occurrence and the spatial distribution of restricted species. The detailed calculation method is described in Reference 1.

Note11 For more details, see the GEO BON website at https://portal.geobon.org/home

Note12 Life Map: https://mol.org/, see Reference 2 for more details

Ecosystem structure

Ecosystem structure records the composition of habitats and blocks that make up an ecosystem, as well as their possible effects on organisms living on them. In Taiwan, there are already potential data that can be used as a basis for representing main ecosystem structure, such as the "Map of Existing Natural Vegetation in Taiwan", "Map of Taiwan Ecological Network Areas", "National Importance Wetlands", and other supporting information related to habitat composition and land use (Figure 9). An important task in the future will be to analyze the importance and influence of ecosystems based on these base maps, and compile them into a national-scale ecosystem classification standard. These ecosystem structures information will be an important reference for the subsequent planning of biodiversity strategies.

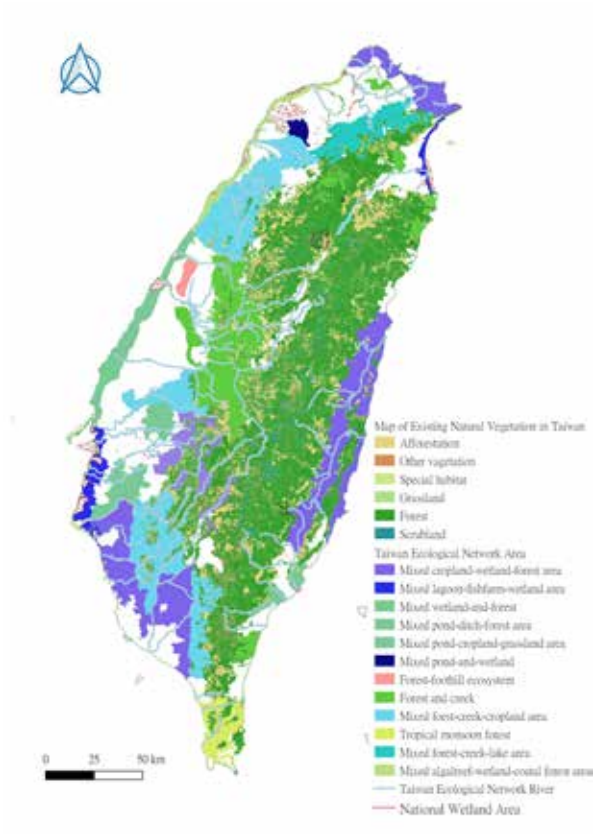

Figure 9 Schematic diagram of the potential components of Taiwan's ecosystem structure

Reference

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Conclusion

In recent years, biodiversity has become increasingly important at the national, industrial, and individual levels. Organisms and the ecosystems they inhabit provide tangible and intangible services to people, therefore, the integrity and stability of biodiversity and ecosystems are related to the health and quality of life of all human beings. In order to safeguard biodiversity, the establishment, optimization, and continuous monitoring of indicator systems are an urgent priority for all countries in the world.

In the future, the TaiBON program is expected to align its indicators with international trends and the Post-2020 Global Biodiversity Framework, while the domestic component will be linked to sustainable development goals and climate change adaptation actions, and will further strengthen the interface with national reports, for example, by assessing the possibility of including indicators for national reporting in the TaiBON indicators.

In terms of the system, the TaiBON's team is not only updating the index data of the portal website, but also building the English version of the content. At the same time, it is optimizing the website interface according to the statistical analysis of the network traffic, and designing the corresponding operation mechanism with the goal of making it automatic or semi-automatic, so that the visual chart can be clearer and give the users a better experience. Additionally,

for the management system, the team strives to integrate the data quality assessment and work unit performance indicators into the same platform, and the same rolling update interface design and interface mechanism with the TaiBON website. This way not only can the biodiversity indicators be updated automatically, but it will also facilitate the tracking of management performance and adjust the update according to the user needs, which not only simplifies the backend workflow, but also enhances the efficiency of indicator establishment, analysis, update and maintenance.

In addition to analyzing the trend of indicator data and explaining its meaning, we also hope to visit data providers and hold expert consultation meetings to discuss the scope and content of data provision; while maintaining the regular update and revision of existing indicator data, we also propose specific recommendations for improvement of indicators that still need to be optimized.

The TaiBON's team will continue to work hard to update the indicators and platforms in line with international trends and technologies. We hope that the government, enterprises, the private sector, and academia can work together to establish a better indicator system and access to information, so that the Taiwanese society together, could care about the biodiversity of our home in the future.

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