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# The Development of Inventory, Monitoring and Information Networks System of Faunal Diversity in South Sumatra

Indra Yustian<sup>1</sup>, Arum Setiawan<sup>1</sup>, Doni Setiawan<sup>1</sup>, Laila Hanum<sup>1</sup>, Zulkifli Dahlan<sup>1</sup>

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Received on 05<sup>th</sup> October 2017 and Accepted on 29<sup>th</sup> November 2017

**Abstract**—Despite high attention and commitment of Indonesia in biodiversity conservation and its habitat, however, loss of biodiversity and habitat deforestation is also still high. Deforestation rate in Indonesia between period of 2000-2012 reach up 6.02 million ha, and approximately onethird of which is in Sumatra Island. As the fulfillment of CBD and Aichi targets, and in line with the mandate of the Law on the Conservation of Natural Resources and Ecosystems and IBSAP (Indonesian Biodiversity Strategy & Action Plan 2015-2020), we try to support the requires data as well as information on the current state of biodiversity. The aims are to develop an inventory system of biodiversity needed to establish baseline data on biodiversity including its conservation status in South Sumatra, develop a biodiversity monitoring system with qualitative parameters that can be used in the determination and monitoring of degradation rates of biodiversity, and the establishment of data management system and information network of fauna biodiversity in South Sumatera so that it can be utilized in monitoring and reporting of biodiversity at regional, national and international level at the international level. We conduct a comprehensive review of methods and techniques of inventory and monitoring of fauna biodiversity, especially those that have been done in the area of South Sumatra Province. We also analysis of data needs and information network of fauna biodiversity in South Sumatra. The results is shows in the web-application database, called the South Sumatran Biodiversity Information Networks, or SSBIN, and could preview at <http://ssbin.unsri.ac.id/>.

**Index Terms**—south sumatra, biodiversity, information, networks, SSBIN.

## Introduction

Despite of high commitment to biodiversity, Indonesia still loses its biodiversity and habitat. Indonesia's deforestation in the period of 2000-2012 amounted to 6.02 million hectare, approximately onethird of the deforestation part occurred on the island of Sumatra [1]. Deforestation of natural forests in Sumatra during this period is estimated at 233 thousand hectare per year.

Efforts to protect habitat loss and biodiversity have been formulated in the form of the stakeholders' strategic goals in the Convention on Biological Diversity (CBD) to protect the ecosystem until 2020, formulated at the 10th COP of the CBD in Nagoya, Japan. The strategic objective is called Aichi Target, which contains 20 targets, from five strategic objectives: (a) Mainstreaming biodiversity in government and community institutions as an effort to reduce biodiversity loss, (b) Reducing pressures on biodiversity and promoting sustainable use, (c) Enhancing biodiversity status by protecting ecosystems, species and genetic diversity, (d) increasing biodiversity and service benefits and (e) improving implementation through participatory planning and capacity building.

The fulfillment of the CBD targets (Aichi Target) in line with the Indonnesia's mandate of the Law on the Conservation of Natural Resources & Ecosystem, Forestry Law, Spatial Planning Law and the implementation of REDD + security framework, will require data support as well as information on the current state of biodiversity. A framework for developing a set of biodiversity indicators and parameters for multipurpose monitoring systems in South Sumatra Province has been developed [2]. Nevertheless, these biodiversity indicators and parameters cannot yet be composed due to the large number of "scattered" data and information that are not in the integrated inventory or monitoring system.

For example, the concept of developing an essential area of wildlife corridor in the area around the Dangku Wildlife Sanctuary of South Sumatra Province has been developed and provided considerable data on land cover change in South Sumatera [3]. Local universities are also has various researches of biodiversity inventory in South Sumatra. Several non-governmental organizations have also tried to establish biodiversity monitoring systems. The SMART (Spatial Monitoring and Reporting Tool) built by ZSL (Zoological Society of London), LIPI Biology Research Center tried to develop the Indonesian Biodiversity Information System (IBIS), a biodiversity database that currently contains information on botanical specimens and some zoologists. LIPI Biology is also trying to develop the Indonesian Biodiversity Information Facility (InaBIF).

In addition, there are quite a number of approaches that have been tried to implement biodiversity monitoring. Biodiversity monitoring at various ecological levels through the identification of monitoring questions derived from regional, provincial and watershed studies has been attempt to approached [4]. A hierarchical approach to setting indicators for monitoring biodiversity has also been proposed [5] and the general-direct approach (common-ground approach) has been reapplied [6]. Last but not least, an important variables of biodiversity that need to be identified and supported by consensus and stakeholder capabilities has been proposed [7].



The large number of existing data and systems on biodiversity are still in great need of development, especially when faced with regional and local conditions and problems such as in South Sumatera Province. Specific varieties of biodiversity variations that may be specific to the South Sumatra region are required specific inventory, monitoring and information network system. This research will try to answer the problem by developing inventory system, monitoring and information network of biodiversity, especially faunal diversity in certain ecosystems in South Sumatra. In addition, the study will also support the national biodiversity management policy framework as embodied in the 2015-2020 IBSAP (Indonesian Biodiversity and Action Plan) document which locates biodiversity data, research and documentation as one of the priorities of the national action plans.

The aims of study are to develop an inventory system of biodiversity needed to establish baseline data on biodiversity including its conservation status in South Sumatra, develop a biodiversity monitoring system with qualitative parameters that can be used in the determination and monitoring of degradation rates of biodiversity, and the establishment of data management system and information network of fauna biodiversity in South Sumatra so that it can be utilized in monitoring and reporting of biodiversity at regional, national and international level at the international level.

## **Methods**

### *A. Review of Inventory and Monitoring of Fauna Diversity Methods and Techniques and Analysis of Data and Information Network Needed*

We conduct a comprehensive review on methods and techniques of inventory and monitoring of fauna biodiversity, especially those that have been done in the area of South Sumatra Province. Sources from various studies that had been done or reported previously by NGO's and/or local Universities. We also analysis of data needs and information network of fauna biodiversity in South Sumatra.

### *B. Establishment of a Diversity Inventory Baseline*

Field work is necessary for data collection. The main objectives of the inventory are to collect a representative sample of the species within a specific forest ecosystem or habitat type. A rapid survey of faunal diversity can be carried out using a variety of methods, depending on the species or taxa observed and the location or type of habitat that is the location of the observation. In some cases, different methods may be equally suitable for use in obtaining biodiversity data required. In principle, the survey method to be used is determined by each researcher. Some common methods commonly used for surveying fauna diversity include: line transect method, point count, river survey, mist net and interview [8, 9, 10, 11, 12].

## **Results and Discussion**

In Indonesia several biodiversity information systems have been established that collect and distribute data. Most of these systems are websites that are accessible via the world wide web. They have many names, including biodiversity information platform, biodiversity information network, or biodiversity facility. For example: Indonesian National Biodiversity Information Network (NBIN) [13], Indonesian Biodiversity Information System (IBIS)[14], Indonesian Biodiversity Information Facility (InaBIF) [15] and Indonesian-German Biodiversity Network [16].

Most of these systems facilitate the collection and distribution of biodiversity information and data in Indonesia. Many of them are limited in scope (e.g., bird, insects, or plant species only), some do not provide data at all and/or only link to other resources, some provide species list(s), others provide various kinds of datasets, and some are access restricted whilst other are open to the public.

Access to data and information is not only a prerequisite for CBD reporting but also for wise decision making at the national and regional/local level. Information and data need to be reliable and of reasonable quality. Biodiversity information systems and knowledge sharing platforms are also an integral part of the CBD Parties that ratified the CBD are encouraged to establish knowledge sharing and information exchange services at the national level. The SSBIN, stands for **South Sumatra Biodiversity Information Network**, was designed to fulfill these requirements. In the future, the SSBIN would like to provide biodiversity data and support national biodiversity information system through Indonesian Biodiversity Information Facility (InaBIF).

The development of SSBIN was started at 2016. During this year, team from University of Sriwijaya conducted some focus group discussion and field surveys in order to collect data of biodiversity at different types

of habitat and/or ecosystems in South Sumatra. The SSBIN as a web-database, consist of at least two main components, information about biodiversity with all the international/national/regional contents and resources component. Each main component could has several sub-components, which are again subdivided into lower level sub-components.

### *C. Information about Biodiversity*

This component provides information about biodiversity in general and information about biodiversity in Indonesia and South Sumatra. Information about the CBD, Protocols (such as Cartagena and Nagoya) under the CBD, and Aichi Targets should be provided in this component. The Aichi Targets are closely linked to the National Biodiversity Strategy and Action Plan (NBSAP), which is again linked to national (and sub-national) reporting.

Information about the National Biodiversity Strategy and Action Plan (NBSAP) which contain information about the Indonesian Biodiversity Strategy and Action Plan (IBSAP) should also be provided. Information of the proposed South Sumatran Biodiversity Strategy and Action Plan will be also provided under this sub-component.

Whenever possible, a hyperlink will be made to relevant web resources. Otherwise, should be made available for download in a PDF file format. The main goal of the component “Biodiversity” is to inform the potential user about status, trends, strategies and actions related to biodiversity in Indonesia in general and biodiversity in South Sumatra in particular.

### *D. Resource Component of the Biodiversity Information System*

The Resources component consist of a number of sub-components. This includes: (i) a fauna and flora species list for SouthSumatra, (ii) a sub-component “Available datasets”, that lists all available datasets that are available on the biodiversity information system, (iii) guidelines on how to handle and analyze (biodiversity) data, (iv) an interactive map of protected areas in South Sumatra, and (v) a list of documents and links.

### *E. Species List for South Sumatra*

The Species list is a list of animal species that have been detected in South Sumatra. For each species several attributes are provided. These attributes include:

- A unique ID (one ID for each species).
- The taxonomic class, family, genus and species name (four columns in a database table). Higher classes may be included (e.g., order, phylum, kingdom).
- The local (also vernacular or common) name. Sometimes more than one common name is used for a species. This issue has to be considered when designing the database table.
- Date detected (the date when the species have been detected): month and year (two columns). The separation into year and month would allow to filter by year (or month). Alternatively standard data formats may be used such as YYYYMM (-DD), from which the year and month (and day) can easily be extracted.
- IUCN, CITES, and Indonesian status (three columns). These values may change over time for a given species.
- Date entered (when was the species entered into the database?). As e.g., the status of a species may change over time the date when the species was entered into the database (list) is important. If a user sees that the species was entered a long time ago, he or she might be able to check him- or herself if the status have changed since the date the species was entered into the database.
- Data source (who detected the species?). Whenever possible, a reference to a reliable data source (e.g., scientific article) should be provided.

#### Optional:

- Location (coordinates, or name of a district, regency, and alike). If coordinates are provided they should be given in decimal degrees (and not in latitude/longitude). Information about the coordinate reference system (CRS) needs to be provided.
- Additional information: in this column additional information about the species can be added.
- Images. Images of the species may be provided. These image files need to be stored in the remote file system.



The database table needs to link to these files. The users should be able to add detections to the species list. However, entries should only be made visible to all users if the detection has been verified by an expert. The content of the species list, i.e., the different variables and their values, should be separated from its appearance on the website.

Not all of the species attributes have to be displayed in the list (or table) view. Modern websites (and most Content Management System (CMS)) provide the probability to extract only a subset of attributes for display. What and how a species is displayed can easily be changed if content and display are separated. Access to all attribute values should be made available when a user “clicks” on a single species.

The SBBIN website [17] already provides a species list that holds information on all the attributes listed above (see Figure 1). So far the list includes animal species only (i.e., fauna list). A second list may be created that contains all plant (flora) species that have been detected in South Sumatra. Alternatively, both lists (i.e., fauna and flora) may be combined into a single list by adding another column that indicates whether the species belongs to the fauna or flora realm. Currently, the SBBIN provide 701 data of fauna in South Sumatra, consist of 332 data of Aves, 143 data of Mammals, 41 data of Reptiles, 33 data of Amphibians, and 152 data of Lepidopterans.

Figure 1: The website of South Sumatera Biodiversity Information Network <http://ssbin.unsri.ac.id>.

## Conclusion

The SBBIN, **South Sumatra Biodiversity Information Network**, was designed to fulfill the requirements for access to data and information at the national and regional/local level which reliable and of reasonable quality. Incomplete information in SBBIN will soon be completed because SBBIN is designed as a live web.

## Acknowledgment

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# The Development of Inventory, Monitoring and Information Networks System of Faunal Diversity in South Sumatra

*By Arum Setiawan*

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### Introduction

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In addition, there are quite a number of approaches that have been tried to implement biodiversity monitoring. Biodiversity monitoring at various ecological levels through the identification of monitoring questions derived from regional, provincial and watershed studies has been attempt to approached [4]. A hierarchical approach to setting indicators for monitoring biodiversity has also been proposed [5] and the general-direct approach (common-ground approach) has been reapplied [6]. Last but not least, an important variables of biodiversity that need to be identified and supported by consensus and stakeholder capabilities has been proposed [7].

The large number of existing data and systems on biodiversity are still in great need of development, especially when faced with regional and local conditions and problems such as in South Sumatera Province. Specific varieties of biodiversity variations that may be specific to the South Sumatera region are required specific inventory, monitoring and information network system. This research will try to answer the problem by developing inventory system, monitoring and information network of biodiversity, especially faunal diversity in certain ecosystems in South Sumatera. In addition, the study will also support the national biodiversity management policy framework as embodied in the 2015-2020 IBSAP (Indonesian Biodiversity and Action Plan) document which locates biodiversity data, research and documentation as one of the priorities of the national action plans.

The aims of study are to develop an inventory system of biodiversity needed to establish baseline data on biodiversity including its conservation status in South Sumatera, develop a biodiversity monitoring system with qualitative parameters that can be used in the determination and monitoring of degradation rates of biodiversity, and the establishment of data management system and information network of fauna biodiversity in South Sumatera so that it can be utilized in monitoring and reporting of biodiversity at regional, national and international level at the international level.

## Methods

### *A. Review of Inventory and Monitoring of Fauna Diversity Methods and Techniques and Analysis of Data and Information Network Needed*

We conduct a comprehensive review on methods and techniques of inventory and monitoring of fauna biodiversity, especially those that have been done in the area of South Sumatera Province. Sources from various studies that had been done or reported previously by NGO's and/or local Universities. We also analysis of data needs and information network of fauna biodiversity in South Sumatera.

### *B. Establishment of a Diversity Inventory Baseline*

Field work is necessary for data collection. The main objectives of the inventory are to collect a representative sample of the species within a specific forest ecosystem or habitat type. A rapid survey of faunal diversity can be carried out using a variety of methods, depending on the species or taxa observed and the location or type of habitat that is the location of the observation. In some cases, different methods may be equally suitable for use in obtaining biodiversity data required. In principle, the survey method to be used is determined by each researcher. Some common methods commonly used for surveying fauna diversity include: line transect method, point count, river survey, mist net and interview [8, 9, 10, 11, 12].

## Results and Discussion

In Indonesia several biodiversity information systems have been established that collect and distribute data. Most of these systems are websites that are accessible via the world wide web. They have many names, including biodiversity information platform, biodiversity information network, or biodiversity facility. For example: Indonesian National Biodiversity Information Network (NBIN) [13], Indonesian Biodiversity Information System (IBIS)[14], Indonesian Biodiversity Information Facility (InaBIF) [15] and Indonesian-German Biodiversity Network [16].

Most of these systems facilitate the collection and distribution of biodiversity information and data in Indonesia. Many of them are limited in scope (e.g., bird, insects, or plant species only), some do not provide data at all and/or only link to other resources, some provide species list(s), others provide various kinds of datasets, and some are access restricted whilst other are open to the public.

Access to data and information is not only a prerequisite for CBD reporting but also for wise decision making at the national and regional/local level. Information and data need to be reliable and of reasonable quality. Biodiversity information systems and knowledge sharing platforms are also an integral part of the CBD Parties that ratified the CBD are encouraged to establish knowledge sharing and information exchange services at the national level. The SSBIN, stands for **South Sumatera Biodiversity Information Network**, was designed to fulfill these requirements. In the future, the SSBIN would like to provide biodiversity data and support national biodiversity information system through Indonesian Biodiversity Information Facility (InaBIF).

The development of SSBIN was started at 2016. During this year, team from University of Sriwijaya conducted some focus group discussion and field surveys in order to collect data of biodiversity at different types



of habitat and/or ecosystems in South Sumatra. The SSBIN as a web-database, consist of at least two main components, information about biodiversity with all the international/national/regional contents and resources component. Each main component could has several sub-components, which are again subdivided into lower level sub-components.

### C. Information about Biodiversity

This component provides information about biodiversity in general and information about biodiversity in Indonesia and South Sumatra. Information about the CBD, Protocols (such as Cartagena and Nagoya) under the CBD, and Aichi Targets should be provided in this component. The Aichi Targets are closely linked to the National Biodiversity Strategy and Action Plan (NBSAP), which is again linked to national (and sub-national) reporting.

Information about the National Biodiversity Strategy and Action Plan (NBSAP) which contain information about the Indonesian Biodiversity Strategy and Action Plan (IBSAP) should also be provided. Information of the proposed South Sumatran Biodiversity Strategy and Action Plan will be also provided under this sub-component.

Whenever possible, a hyperlink will be made to relevant web resources. Otherwise, should be made available for download in a PDF file format. The main goal of the component "Biodiversity" is to inform the potential user about status, trends, strategies and actions related to biodiversity in Indonesia in general and biodiversity in South Sumatra in particular.

### D. Resource Component of the Biodiversity Information System

The Resources component consist of a number of sub-components. This includes: (i) a fauna and flora species list for South Sumatra, (ii) a sub-component "Available datasets", that lists all available datasets that are available on the biodiversity information system, (iii) guidelines on how to handle and analyze (biodiversity) data, (iv) an interactive map of protected areas in South Sumatra, and (v) a list of documents and links.

### E. Species List for South Sumatra

The Species list is a list of animal species that have been detected in South Sumatra. For each species several attributes are provided. These attributes include:

- A unique ID (one ID for each species).
- The taxonomic class, family, genus and species name (four columns in a database table). Higher classes may be included (e.g., order, phylum, kingdom).
- The local (also vernacular or common) name. Sometimes more than one common name is used for a species. This issue has to be considered when designing the database table.
- Date detected (the date when the species have been detected): month and year (two columns). The separation into year and month would allow to filter by year (or month). Alternatively standard data formats may be used such as YYYYMM (-DD), from which the year and month (and day) can easily be extracted.
- IUCN, CITES, and Indonesian status (three columns). These values may change over time for a given species.
- Date entered (when was the species entered into the database?). As e.g., the status of a species may change over time the date when the species was entered into the database (list) is important. If a user sees that the species was entered a long time ago, he or she might be able to check him- or herself if the status have changed since the date the species was entered into the database.
- Data source (who detected the species?). Whenever possible, a reference to a reliable data source (e.g., scientific article) should be provided.

#### Optional:

- Location (coordinates, or name of a district, regency, and alike). If coordinates are provided they should be given in decimal degrees (and not in latitude/longitude). Information about the coordinate reference system (CRS) needs to be provided.
- Additional information: in this column additional information about the species can be added.
- Images. Images of the species may be provided. These image files need to be stored in the remote file system.



The database table needs to link to these files. The users should be able to add detections to the species list. However, entries should only be made visible to all users if the detection has been verified by an expert. The content of the species list, i.e., the different variables and their values, should be separated from its appearance on the website.

Not all of the species attributes have to be displayed in the list (or table) view. Modern websites (and most Content Management System (CMS)) provide the probability to extract only a subset of attributes for display. What and how a species is displayed can easily be changed if content and display are separated. Access to all attribute values should be made available when a user "clicks" on a single species.

The SBBIN website [17] already provides a species list that holds information on all the attributes listed above (see Figure 1). So far the list includes animal species only (i.e., fauna list). A second list may be created that contains all plant (flora) species that have been detected in South Sumatra. Alternatively, both lists (i.e., fauna and flora) may be combined into a single list by adding another column that indicates whether the species belongs to the fauna or flora realm. Currently, the SBBIN provide 701 data of fauna in South Sumatra, consist of 332 data of Aves, 143 data of Mammals, 41 data of Reptiles, 33 data of Amphibians, and 152 data of Lepidopterans.

Figure 1: The website of South Sumatera Biodiversity Information Network <http://ssbin.unsri.ac.id>.

## Conclusion

The SBBIN, **South Sumatera Biodiversity Information Network**, was designed to fulfill the requirements for access to data and information at the national and regional/local level which reliable and of reasonable quality. Incomplete information in SBBIN will soon be completed because SBBIN is designed as a live web.

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# The Development of Inventory, Monitoring and Information Networks System of Faunal Diversity in South Sumatra

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• Kelengkapan dan Kesesuaian Unsur:	Paper terkait inventarisasi, monitoring dan sistem jaringan informasi diversitas fauna di Sumatera Selatan. Isi paper sudah memenuhi kaidah-kaidah karya ilmiah, dan sudah sesuai dengan bidang biologi konservasi.
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