

## Biodiversity monitoring using eDNA metabarcoding : A Snapshot of Pelagic microbiomes in Savu Sea, Indonesia

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**Programme:**BIFA  
**Project ID:** BIFA6\_021  
**Project lead organization:**YAYASAN BIODIVERSITAS INDONESIA  
**Project implementation period:** 1/9/2021 - 28/2/2023  
**Report approved:** 4/7/2023

### Narrative Final report

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#### Executive Summary

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The project has achieved its designated goal of conducting Biodiversity monitoring using eDNA metabarcoding across areas with untapped biodiversity Savu Sea, Indonesia. The team has usefully collected 20 sample and identified more than 2000 microbial taxa. The research efforts was probably the first that has been done in the areas with ability of accumulating microbial taxa information important for biodiversity to manage and inform the local manager and government institution. Few highlights from the project are following

1. Sample condition and quality determines the success of laboratory works and therefore also impact taxa being produced during the bioinformatic process. In this regards, this is the main reason why the project has change its focus from building shark database into microbial community focus project.
2. Insufficient exposure to Metabarcoding and bioinformatic pipeline has impeded eDNA application in Indonesia. This is also compounded with high cost associated with lab work and sample sequencing in eDNA method
3. Poor exposure to GBIF as an alternative platform to store biodiversity data is the main reason why not many data is deposited from Indonesia. Many Indonesian researcher don't also have a good habit of proper data management therefore are reluctant to store biodiversity data in online platform.
4. Registering data to GBIF platform is challenging for first timers, however once this becomes a repetitive habit, the practice becomes easier.
5. Funding disbursement regulation that restrict lab works, sequencing and field work might disadvantage contribution of eDNA related biodiversity data to GBIF platform.
6. The team realized that more efforts need to be done to popularize GBIF, encouraging more data to be stored in the platform.

#### Progress against milestones

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**Has your project completed all planned activities?: Yes**

**Has your project produced all deliverables?: Yes**

#### Report on Activities

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##### Activity implementation summary

The presented implementation summary is the continuation of activities performed during the first phase of the project. Therefor only activities done following completion of mid term report are reported.

- **Project Dissemination and Data Analysis (Phase 2):**Data Analysis for the second batch of the samples have been completed, and data are currently uploaded through GBIF platform. However, this process are currently pending by the system. Although the team is considering to publish the data through research article, the team is considering to add more samples before publishing the results. The current data is insufficient to provide robust conclusion on how microbial diversity is distributed across the areas of sampling.

- Related to activities number one, the team has also written data analysis and sampling protocol (draft version and written in Bahasa Indonesia) that will help other researchers to perform eDNA metabarcoding research in marine field. This will allow data and sampling efforts to be comparable across research and could provide meaningful comparative study in marine biodiversity research.

- **Workshop :** A Seminar that engaged more than 70 participants have also been done to expose the importance of eDNA metabarcoding and data management for biodiversity research. The seminar focused on explaining the challenges with eDNA research and potential for the solution. Prof. Ryan Kelly for University of Washington gave 30 minute exposure to explain what eDNA is, the on going research in his lab and potential future collaboration between his lab and international collaborators. GBIF representative Chijen Ko highlight the needs of managing research and biodiversity data and the importance of incorporating data management into research cycle. He also expose the benefits of using GBIF as biodiversity and data management platform.

- **Evaluation Meeting.** Evaluation meeting with Dr. Sapto, the project supporter form University of Brawijaya, Malang occurred around Mid February 2023. We discussed challenges during project implementation and plan for future research project and how GBIF can be used as an alternative for biodiversity data management.

- **Field Training and Workshop :** We have also conducted a field training and workshop in two different institution as a way to expose early researcher to eDNA metabarcoding. The activity was

done in MERO foundation located in Bali and in University Diponegoro in Semarang, Central Java. The activities engaged 40 people in total ranging from students and early researcher from diverse institution

#### Completed activities

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##### Activity name: eDNA Data Analysis

**Description:** This activity encompass all procedure done from DNA extraction, quantification, sequencing and bioinformatic analysis needed for the project to generate biodiversity data

**Start Date - End Date:** 1/12/2022 - 15/2/2023

**Verification Sources:** - Draft of field hand guide to collect eDNA sample  
- Draft of Bioinformatic methods to analyze eDNA data

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##### Activity name: eDNA data submission to GBIF platform

**Description:** Second batch data submission to GBIF platform

**Start Date - End Date:** 5/2/2023 - 11/3/2023

**Verification Sources:** Raw data in CSV file for the second batch

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##### Activity name: eDNA and GBIF expose to Indonesian Researcher

**Description:** Online seminar that engaged more than 70 participants. The seminar focused on eDNA and

**Start Date - End Date:** 21/1/2023 - 21/1/2023

**Verification Sources:** Photo of the participants, Youtube link and presentation from the speaker

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##### Activity name: Evaluation Meeting

**Description:** Discussion on how to solve challenges and how to move forward with GBIF and biodiversity inventory research

**Start Date - End Date:** 2/1/2023 - 2/1/2023

**Verification Sources:** Meeting's photo

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##### Activity name: eDNA sample collection Field Training

**Description:** Field training focused on eDNA sampling collection using filtration and sterivex methods

**Start Date - End Date:** 4/12/2022 - 10/12/2022

**Verification Sources:** Field photo from field activities located in MERO Foundation'Bali and in Semarang, Central Java

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#### Report on Deliverables

##### Production of Deliverables - Summary

All the proposed deliverables have been completed successfully. We have processed around 20 samples and generated around 2000 microbial Operational taxonomic units diversity important for marine conservation. We have also engaged and exposed around 70 students, researchers to GBIF and eDNA, this activity is expected to increase data curation and uploads from Indonesia to GBIF.

Our work was also the first to record microbial diversity from the areas, and therefore providing a baseline data for the next conservation agenda in the Savu Seas. Many marine taxa are heavily dependent on microbial composition in their food chain and therefore our data provides information that will be useful for marine conservation in general particularly how the marine species is distributed related to microbial composition.

The seminar components of the project were not specifically listed in the deliverable, however we think that the activities are important to expose the project and how to popularize eDNA to Indonesia researcher. We targeted early researcher for this activity to nurture the growth of marine biodiversity research and researcher from many different institution in Indonesia.

Numbers of people trained :

As shown by the uploaded documents we successfully trained around around 40 students in two different areas Central Java and Bali.

Details of completion of deliverables described in the project proposal.

Sampling Collection Event and Species list Data :

This deliverables have been submitted through GBIF IPT portal and CSV file for this will also be uploaded in reports attachment.

eDNA field guide sampling book:

The two documents related with the project are still pending for further edits and comments, this is to facilitate comments from other researchers and experts in the areas. Final draft is expected to be issued within next two months

##### Production of deliverables

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##### Title: Sampling Collection Event and Species list Data

**Type:** Dataset

**Status update:** Uploaded

**Dataset scope:** Coral Reef Region in Eastern Indonesia}

**Expected number of records:** 2000

**Data holder:** Bionesia

**Data host institution:** Blonesia

**Sampling method:** eDNA-Metabarcoding through water sampling  
**% complete:** 70  
**DOI:** <https://doi.org/10.15468/hyxfc6>  
**Expected date of publication:**

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**Title: eDNA sampling methods : A field guide**

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**Type:** Other

**Description:** A field guide to assist researchers collecting eDNA samples from marine and water environment

**Sources of verification:** eDNA\_Protocol\_Indo\_draft.pdf, Modul analysis\_draft.pdf

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**Title: Field Training on eDNA sampling techniques**

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**Type:** Other

**Description:** Field training aims to assist researcher to collect eDNA samples using water filtering techniques

**Sources of verification:** eDNA sampling field training in Bandengan.docx Field Training and Workshop eDNA\_BAli

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**Title: Online Seminar**

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**Type:** Other

**Description:** Online Seminar aims to expose GBIF eDNA technique

**Sources of verification:** Data Management in eDNA Research Webinar.docx

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**Impact of COVID-19 pandemic on project implementation**

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There is no direct impact of covid during the last quarter of project duration. However, except for eDNA sampling exercise, all seminar activities and meeting activities were held online. This particularly done as precautionary measure against the impact of the covid while still engaging more participant Indonesian wide.

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**Events**

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**eDNA-GBIF Expose**

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**Dates:** 2023-01-21 - 2023-01-21

**Organizing institution:** Bionesia

**Country:** Indonesia

**Number of participants:** 70

**Comments:** Photo to the event and slide deck during the seminar

, [https://gbifs-my.sharepoint.com/personal/cko\\_gbif\\_org/\\_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fcko%5Fgbif%5Forg%2FDocuments%2FProj%5FGBIF%2FEvents%2F20230121%20Bionesia%20eDNA%2F20230121%20b](https://gbifs-my.sharepoint.com/personal/cko_gbif_org/_layouts/15/onedrive.aspx?id=%2Fpersonal%2Fcko%5Fgbif%5Forg%2FDocuments%2FProj%5FGBIF%2FEvents%2F20230121%20Bionesia%20eDNA%2F20230121%20b)

**Website or sources of verification:** <https://www.youtube.com/watch?v=-UA5mnfV9o>

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**Events**

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**eDNA sampling exercise**

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**Dates:** 2023-01-19 - 2023-01-20

**Organizing institution:** Bionesia

**Country:** Indonesia

**Number of participants:** 40

**Comments:** Event is located in Bali, collaborate with MERO foundation. Image related with the activities will be uploaded

**Website or sources of verification:**

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**Events**

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**eDNA sampling training**

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**Dates:** 2022-07-16 - 2022-07-16

**Organizing institution:** University of Diponegoro

**Country:** Indonesia

**Number of participants:** 10

**Comments:** Event is located in Semarang, Central Java and images related with Thea activities will be uploaded

**Website or sources of verification:**

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**Communications and visibility**

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We will continuously expose the research result to larger research community Indonesian wide. At the same we will also showcase GBIF as an alternative to database management platform in Indonesia. The protocol will also be made available through bionesia website <http://bionesia.org>. As the next step of the project, the research staff managing the research will expand the research effort, continuously seek for funding support to future planning and explore for international and local collaboration.

The YouTube page <https://youtu.be/-UA5mnfV9o> for the eDNA and GBIF exposure by GBIF representative will also be made continuously available. Aji and Dita who curly manage the project plan for future extension is also an active member of DNA collaborative network managed by university of Washington <https://www.ednacollab.org/>

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**Monitoring and evaluation**

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### Final Evaluation

The project in general have been crucial for the development of eDNA research and biodiversity inventory efforts in Indonesia. GBIF in this case have also been a crucial component for project management and as a to to show case the importance of data management in biodiversity research. Existing network made by GBIF and continues weekly meeting has also been crucial to answer variety of problems occurred during project implementation. All in all team involved in the project have been impressed by how the project is managed and is expecting future support by GBIF to expand the current research project.

### Best Practices and Lessons Learned

Few Lesson learned related with GBIF and biodiversity inventory research :

1. Exposure with Networking within GBIF is good to be expanded. Particularly to nurture the growth of data deposition from rich biodiversity country like Indonesia
2. Time constraint for project implementation, as problems might arise during the data collection and data processing, Speciallly for genetic related project
3. Plug in development that will ease data submission will be helpful for new GBIF adopter

### Post Project Activity(ies)

The planned activities for project extension are as follows

1. Expand the existing project and areas for sampling location. Perform comparative study and upload more data to GBIF or other platforms
2. Refine existing research questions, particularly that aims to elucidate biodiversity pattern in shark and ray diversity. Choose genetic markers that are easier to amplify and develop collaboration with local and international researcher with more experience in shark biodiversity research

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### Sustainability plans

1. A regular monthly talk is planned following the completion of this project. This will facilitate the new eDNA users to elaborate challenges while the existing eDNA user can proposed potential solutions. We will also invite international collaborators to explore and develop collaboration and initiate interesting research question for future research project.
2. Exposure to existing international funding needs to be increased for local Indonesia resaercher, therefore increasing the chance of doing Biodiversity inventory research in Indonesia. We have initiated the eDNA collaborative program with University of Washington to implement this
3. There is idea of building a sustain and long collaboration platform lead by Bionesia. However this is still pending for further discussion

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GBIF leads the Biodiversity Information Fund for Asia (BIFA), a programme funded by the Ministry of the Environment, Government of Japan. The programme provides supplementary support for activities addressing the needs of regional researchers and policymakers through mobilization and use of biodiversity data.

