

# Assessment and update of GBIF marine macroalgae databases (Rhodophyta, Ochrophyta and Chlorophyta) from Haiti and Dominican Republic (Hispaniola)

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**Programme:** BID

**Project ID:** BID-CA2020-012-INS

**Project lead organization:** Programa EcoMar, Inc.

**Project implementation period:** 1/7/2021 - 30/9/2022

**Report approved:** 25/10/2022

## Final Narrative Report

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### Executive Summary

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Among the key achievements of the implementation of this project are: a) An updated database of marine benthic macroalgae from Hispaniola with 1633 new records published in GBIF. In addition, we informed GBIF about 1043 registers, from ten north American and two European museums, that has not yet been incorporated into their databases. The contribution of the project to GBIF reaches a total number of 2675 registers. b) Publication of the second inventory of the marine benthic macroalgae from Hispaniola, with a broader coverage of the historical and current literature, a greater presence of national and international museums and updated following the fifth revision of benthic marine algae of the tropical and subtropical Western Atlantic (Wynne, 2022). c) Involvement of key biodiversity actors with information about the GBIF and our project results, through a national workshop with representatives of the main institutions, with the support of the Dominican Environmental Consortium and the Ministry of Environment and Natural Resources. The context and approach for the project final evaluation was based on the analysis of the project objective and the fulfillment of the proposed activities. Both the objective of the project and its activities were fulfilled. The most important conclusion is that the project allowed us to visualize that the GBIF projects constitute the best way to mobilize the vast information on Hispaniola's biodiversity that is not available in any international database. The lessons learned are related to the opportunity offered by GBIF tools to achieve a more comprehensive analysis of biodiversity data. Among the best practices identified are those for georeferencing biological data, how to extract and express information from publications to complete the DwC matrix and publication of data through the GBIF IPT. Parallel to the project activities, steps are being taken to encourage the Ministry of Environment to officially join the GBIF as a country.

### 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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#### Summary of the implementation of the project activities

A search and review of taxonomic, biological, ecological, biogeographic or genetic papers, as well as collections of national and international museums, was done; all relevant data were compiled, the taxonomic information was updated by WoRMS and Wynne (2022) and the second inventory of benthic marine macroalgae species from Hispaniola was elaborated. A Darwin Core matrix was elaborated and uploaded in the IPT as <https://doi.org/10.15468/8pys84>

A GBIF occurrence download (with Rhodophyta, Ochrophyta, Chlorophyta, Haiti and Dominican

Republic as key words) were done at the beginning of the project. The information between GBIF and Hispabiota Marina databases were compared. As a result of such comparison it was found that there were nine north American museums in the Macroalgal Herbarium Consortium Portal and two European museum whose information has not yet been incorporated into the GBIF databases The number of records from these museums (1,043) plus the 1,633 records in our Darwin Core matrix was account for 2,675 records, more than the approximate number of records of 2,500 indicated in the project proposal.

A paper: "Second taxonomic inventory of marine macroalgae benthic (Ochrophyta, Rhodophyta and Chlorophyta) from the island of Hispaniola" and a book chapter: "Marine macroalgae research in Hispaniola (Dominican Republic and Haiti)" were done.

A workshop on the implementation of "Global Biodiversity Information Infrastructure (GBIF) projects as a strategy for biodiversity conservation in the Dominican Republic" was held at the National Museum of Natural History "Prof. Eugenio de Jesús Marcano" in Santo Domingo, on August 29, 2022 with the participation of more than 20 institutions from the biodiversity sector and the support of the Dominican Environmental Consortium and the Ministry of Environment.

New activity. The results of the second taxonomic inventory of marine macroalgae benthic from the island of Hispaniola were taken as the basis for preparing a particular inventory for Haiti that was published in French as: Premier inventaire taxonomique des macroalgues marines benthiques (Ochrophyta, Rhodophyta et Chlorophyta) d'Haïti.  
URL: <https://www.programaecomar.com/2022RIPE02.pdf>

### Completed activities

#### **Activity: Update the inventory of the marine macroalgae species in Hispabiota Marina databases**

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**Description:** 1. Review and update the inventory from 2001: "Algas marinas bentónicas (Rhodophyta, Phaeophyta y Chlorophyta) conocidas para Hispaniola" published in Moscosoa, the scientific journal of the

National Botanic Garden of Dominican Republic.

**Start Date - End Date:** 1/7/2021 - 31/10/2021

**Verification Sources:** Publication: Second taxonomic inventory of marine macroalgae benthic (Ochrophyta, Rhodophyta and Chlorophyta) from the island of Hispaniola (Report Attachment 1) URL: <https://www.programaecomar.com/2022RIPE01.pdf>

#### **Activity: Update the inventory of the marine macroalgae species in Hispabiota Marina databases**

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**Description:** 2. Search and review taxonomic, biological, ecological, biogeographic or genetic studies in the Atlantic and Caribbean region that include valid reports of marine macroalgae species for Haiti and the Dominican Republic, within the limits of their exclusive economic zones.

**Start Date - End Date:** 1/7/2021 - 10/10/2021

**Verification Sources:** Publication: Second taxonomic inventory of marine macroalgae benthic (Ochrophyta, Rhodophyta and Chlorophyta) from the island of Hispaniola (Report Attachment 1) URL: <https://www.programaecomar.com/2022RIPE01.pdf>

#### **Activity: Update the inventory of the marine macroalgae species in Hispabiota Marina databases**

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**Description:** 3. Review the information on marine macroalgae species from Dominican Republic or Haiti hosted in the collections of national and international museums.

**Start Date - End Date:** 1/7/2021 - 31/10/2021

**Verification Sources:** Publication: Second taxonomic inventory of marine macroalgae benthic (Ochrophyta, Rhodophyta and Chlorophyta) from the island of Hispaniola (Report Attachment 1) URL: <https://www.programaecomar.com/2022RIPE01.pdf>

#### **Activity: Update the inventory of the marine macroalgae species in Hispabiota Marina databases**

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**Description:** 4. Taxonomically update the list of species following the criteria of the World Register of Marine Species: WoRMS

**Start Date - End Date:** 1/7/2021 - 31/10/2021

**Verification Sources:** Publication: Second inventory of benthic marine macroalgae species (Ochrophyta, Rhodophyta and Chlorophyta) from Hispaniola (Report Attachment 1)

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**Activity: Update the inventory of the marine macroalgae species in Hispabiota Marina databases**

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**Description:** 5. Prepare the Darwin Core matrix with the information obtained.

**Start Date - End Date:** 1/7/2021 - 31/10/2021

**Verification Sources:** Final Darwin Core matrix uploaded in the IPT <https://doi.org/10.15468/8pys84>

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**Activity: Review and collate the marine macroalgae databases of GBIF and Hispabiota Marina, detect and correct possible inaccuracies, add missing species and assign coordinates to some non-georeferenced occurrences, based on best collection georeferencing practices**

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**Description:** 1. Search the occurrences content of the GBIF marine macroalgae database using the key words: Rhodophyta, Ochrophyta (Phaeophyceae) and Chlorophyta as scientific names; and Haiti and

Dominican Republic, as countries

**Start Date - End Date:** 1/11/2021 - 31/10/2022

**Verification Sources:** Download report: GBIF.org (30 July 2021) GBIF Occurrence Download <https://doi.org/10.15468/dl.bmggjb> (3,323 occurrences downloaded) (Report Attachment 2)

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**Activity: Review and collate the marine macroalgae databases of GBIF and Hispabiota Marina, detect and correct possible inaccuracies, add missing species and assign coordinates to some non-georeferenced occurrences, based on best collection georeferencing practices**

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**Description:** 2. Compare the information between GBIF and Hispabiota Marina project databases.

**Start Date - End Date:** 1/11/2021 - 28/2/2022

**Verification Sources:** Report of the comparison of the GBIF and HISPABIOTA MARINA macroalgae (Ochrophyta, Rhodophyta and Chlorophyta) databases (Report Attachment 3). Missing museums Excel matrix (Report Attachment 4). Coordinate Excel matrix (Report Attachment 5)

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**Activity: Review and collate the marine macroalgae databases of GBIF and Hispabiota Marina, detect and correct possible inaccuracies, add missing species and assign coordinates to some non-georeferenced occurrences, based on best collection georeferencing practices**

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**Description:** 3. Detect and solve possible inaccuracies in the Haitian and Dominican information (e.g. wrong geographical coordinates or species needing taxonomic updates)

**Start Date - End Date:** 1/11/2021 - 28/2/2022

**Verification Sources:** Report of the comparison of the GBIF and HISPABIOTA MARINA macroalgae (Ochrophyta, Rhodophyta and Chlorophyta) databases (Report Attachment 3). Missing museums Excel matrix (Report Attachment 4). Coordinate Excel matrix (Report Attachment 5)

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**Activity: Review and collate the marine macroalgae databases of GBIF and Hispabiota Marina, detect and correct possible inaccuracies, add missing species and assign coordinates to some non-georeferenced occurrences, based on best collection georeferencing practices**

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**Description:** 4. Collate both databases.

**Start Date - End Date:** 1/11/2021 - 28/2/2022

**Verification Sources:** Report of the comparison of the GBIF and HISPABIOTA MARINA macroalgae (Ochrophyta, Rhodophyta and Chlorophyta) databases (Report Attachment 3). Missing museums Excel matrix (Report Attachment 4). Coordinate Excel matrix (Report Attachment 5)

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**Activity: Review and collate the marine macroalgae databases of GBIF and Hispabiota Marina, detect and correct possible inaccuracies, add missing species and assign coordinates to some non-georeferenced occurrences, based on best collection georeferencing practices**

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**Description:** 5. Complete the final Darwin Core matrix and elaborate the new distribution maps.

**Start Date - End Date:** 1/11/2021 - 28/2/2022

**Verification Sources:** Final Darwin Core matrix uploaded in the IPT. <https://doi.org/10.15468/8pys84>  
New distribution maps in the publication: Second inventory of benthic marine macroalgae species (Ochrophyta, Rhodophyta and Chlorophyta) from Hispaniola (Report Attachment 1)

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**Activity: Prepare and publish two technical documents about marine macroalgae from Hispaniola to share project findings and results.**

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**Description:** 1. Produce the scientific paper: "Inventario actualizado de las macroalgas marinas de la

Hispaniola (República Dominicana y Haití)" to be published in Moscosoa, the scientific journal of the National Botanic Garden of Dominican Republic, as an update of our first list.

**Start Date - End Date:** 1/3/2022 - 15/9/2022

**Verification Sources:** Publication: Second taxonomic inventory of marine macroalgae benthic (Ochrophyta, Rhodophyta and Chlorophyta) from the island of Hispaniola (Report Attachment 1) URL: <https://www.programaecomar.com/2022RIPE01.pdf>

**Activity: Prepare and publish two technical documents about marine macroalgae from Hispaniola to share project findings and results.**

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**Description:** 2. Elaborate the chapter "Marine macroalgae research in Hispaniola (Dominican Republic and Haiti)" to be published in the book Marine macroalgae of Latin-America and the Caribbean by Springer Publishing in 2022 (Programa EcoMar has been formally invited by the Editorial Committee of the Latin American and Caribbean Phycological Society for this contribution).

**Start Date - End Date:** 1/3/2022 - 15/9/2022

**Verification Sources:** Chapter book: "Marine macroalgae research in Hispaniola (Dominican Republic and Haiti)" (Report Attachment 6)

**Activity: Inform biodiversity stakeholders about an update inventory of marine macroalgae from Haiti and Dominican Republic and the main steps involved in the mobilization and process of this biodiversity data.**

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**Description:** 1. Publicize the project through the Programa Ecomar website.

**Start Date - End Date:** 1/3/2022 - 30/9/2022

**Verification Sources:** Programa EcoMar webpage: <https://www.programaecomar.com/ProjectBID-CA2020-012-INS.htm>

**Activity: Inform biodiversity stakeholders about an update inventory of marine macroalgae from Haiti and Dominican Republic and the main steps involved in the mobilization and process of this biodiversity data.**

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**Description:** 2. Organize a workshop to present and distribute the results among binational stakeholders on biodiversity issues, including the working session: "Guidelines for the management of marine biodiversity data from Hispaniola Island: marine macroalgae".

**Start Date - End Date:** 1/8/2022 - 30/9/2022

**Verification Sources:** Workshop report (Report Attachment 7). PP introductory presentation about GBIF (Report Attachment 8). PP presentation about Hispaniola Biodiversity Guidelines. URL: <https://www.programaecomar.com/proecomarGBIFworkshop.htm>  
URL: <https://ojala.do/medioambiente/promueven-taller-sobre-proyectos-de-infraestructura-en-biodiversidad>

**Activity: Inform biodiversity stakeholders about an update inventory of marine macroalgae from Haiti and Dominican Republic and the main steps involved in the mobilization and process of this biodiversity data.**

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**Description:** 3. To provide the authorities of the Ministries of Environment of Dominican Republic and Haiti with the results corresponding to each country for inclusion in the national biodiversity reports to the Convention on Biological Diversity.

**Start Date - End Date:** 1/8/2022 - 30/9/2022

**Verification Sources:** Workshop report (Report Attachment 7) sent to the Haitian authorities (Report Attachment 9)

**Activity: Inform biodiversity stakeholders about an update inventory of marine macroalgae from Haiti and Dominican Republic and the main steps involved in the mobilization and process of this biodiversity data.**

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**Description:** 4. Upload results online through the Programa Ecomar website.

**Start Date - End Date:** 1/8/2022 - 30/9/2022

**Verification Sources:** Programa EcoMar website: <https://www.programaecomar.com/ProjectBID-CA2020-012-INS.htm>

## Report on Deliverables

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### Deliverables - Summary

Deliverable 1. Inventory of the marine macroalgae species updated in Hispabiota Marina databases. Scientific publication: Second taxonomic inventory of marine macroalgae benthic (Ochrophyta, Rhodophyta and Chlorophyta) from the island of Hispaniola. The present paper updates, from an insular perspective and with a historical approach, the knowledge of the species taxonomic richness of the benthic marine macroalgae of Hispaniola Island. Here, 393 infrageneric taxa are documented: 375

species, 1 subspecies, 6 forms and 11 varieties distribute in 5 classes, 27 orders and 61 families; with 41 taxa in Ochrophyta, 221 in Rhodophyta y 131 in Chlorophyta. For Dominican Republic 294 taxa are compiled and 284 for Haiti (with 185 shared). Fourteen taxa have type localities on the island: 5 Dominican and 9 Haitian. A list of institutions that house material collected in Hispaniola and the distribution map with the collection locations, are offered. In the context of the Greater Antilles ecoregion, the knowledge of marine macroalgae from Hispaniola shows some progress, but new research is needed to raise our inventories to the figures for Cuba and Puerto Rico.

**Deliverable 2. Inventory of the marine macroalgae species updated in Hispabiota Marina databases.** Scientific publication: "Marine macroalgae research in Hispaniola". This paper will be sent to the Editorial Committee of the Latin American and Caribbean Phycological Society to be published as a chapter of the book Marine macroalgae of Latin America and the Caribbean by Springer Publishing in 2022. This chapter will be integrated with chapters from others Latin America and the Caribbean countries to offer an updated overview of the situation of the group in the region as a basis for future research.

**Deliverable 3. Final workshop report with biodiversity stakeholders.** The workshop on the implementation of "Global Biodiversity Information Infrastructure (GBIF) projects as a strategy for biodiversity conservation in the Dominican Republic" was held at the National Museum of Natural History "Prof. Eugenio de Jesús Marciano" in Santo Domingo, on August 29, 2022 in the morning hours. The workshop was attended by 67 participants from 19 institutions. The involvement of key biodiversity actors with information about the GBIF and our and others GBIF projects, with the support of the CAD and the Ministry of Environment and Natural Resources was an important achievement of this workshop.

**Deliverable 4. GBIF algae database reviewed and updated.** A Darwin Core matrix with 1633 records was elaborated and uploaded in the IPT as <https://doi.org/10.15468/8pys84>. The comparison of GBIF and Hispabiota Marina databases revealed 1,043 records from museums not present in the former. The number of records from these museums plus the 1,633 records in our Darwin Core matrix was account for 2,675 records, more than the approximate number of records of 2,500 indicated in the project proposal.

#### Deliverables produced by the project

##### Dataset deliverables

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#### **Deliverable 4. GBIF algae database reviewed and updated.**

**Dataset type:** Occurrences

**Dataset scope:** New records of benthic marine macroalgal species from Dominican Republic and Haiti (Hispaniola Island) based in a review of scientific literature from 1924 to 2001 and the collection of the National Herbarium of the Botanical Garden of Santo Domingo (HNJBSD).

**Number of records:** 1,633

**Data holder:** GBIF Secretariat

**Data host institution:** GBIF Secretariat

**% complete:** 100%

**Status update:** A Darwin Core matrix with 1633 records was elaborated and uploaded in the IPT GBIF.

**DOI:** <https://doi.org/10.15468/8pys84>

**Expected date of publication:** 2022-09-20

##### Other deliverables

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#### **Deliverable 1. Inventory of the marine macroalgae species updated in Hispabiota Marina databases.**

**Description:** Scientific publication: Segundo inventario taxonómico de las macroalgas marinas bentónicas (Ochrophyta, Rhodophyta y Chlorophyta) de la isla Hispaniola.

**% complete:** 100%

**Status update:** The present paper updates, from an insular perspective and with a historical approach, the knowledge of the species taxonomic richness of the benthic marine macroalgae of Hispaniola Island. Here, 390 infrageneric taxa are documented: 372 species, 1 subspecies, 6 forms and 11 varieties distribute in 5 classes, 27 orders and 61 families; with 41 taxa in Ochrophyta, 220 in Rhodophyta y 129 in Chlorophyta. For Dominican Republic 293 taxa are compiled and 281 for Haiti (with 184 shared). Fourteen taxa have type localities on the island: 5 Dominican and 9 Haitian. A list of institutions that house material collected in Hispaniola and the distribution map with the collection locations, are offered. In the context of the Greater Antilles ecoregion, the knowledge of the marine macroalgae of Hispaniola can be considered quite advanced.

**Sources of verification:** Report Attachment 1

#### **Deliverable 2. Inventory of the marine macroalgae species updated in Hispabiota Marina databases.**

**Description:** Scientific publication: "Marine macroalgae research in Hispaniola".

**% complete:** 100%

**Status update:** This paper will be sent to the Editorial Committee of the Latin American and Caribbean Phycological Society to be published as a chapter of the book Marine macroalgae of Latin America and the Caribbean by Springer Publishing in 2022. This chapter will be integrated with chapters from others Latin America and the Caribbean countries to offer an updated overview of the situation of the group in the region as a basis for future research.

**Sources of verification:** Report Attachment 6

### **Deliverable 3. Final workshop report with biodiversity stakeholders.**

**Description:** The workshop on the implementation of "Global Biodiversity Information Infrastructure (GBIF) projects as a strategy for biodiversity conservation in the Dominican Republic" was held at the National Museum of Natural History "Prof. Eugenio de Jesús Marcano" in Santo Domingo, on August 29, 2022 in the morning hours.

**% complete:** 100%

**Status update:** The workshop was attended by 67 participants from 19 institutions. The involvement of key biodiversity actors with information about the GBIF and our and others GBIF projects, with the support of the CAD and the Ministry of Environment and Natural Resources was an important achievement of this workshop.

**Sources of verification:** Report Attachment 7.

## **Events**

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### **Workshop: "Global Biodiversity Information Infrastructure (GBIF) projects as a strategy for biodiversity conservation in the Dominican Republic"**

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**Dates:** 2022-08-29 - 2022-08-29

**Organizing institution:** Programa EcoMar

**Country:** Dominican Republic

**Number of participants:** 67

**Comments:** The work was held at the National Museum of Natural History "Prof. Eugenio de Jesús Marcano" in Santo Domingo, attended by 19 institutions. The involvement of key biodiversity actors with information about the GBIF and our and others GBIF projects, with the support of the CAD and the Ministry of Environment and Natural Resources was an important achievement of this workshop (Report Attachment 7).

**Website or sources of verification:** <https://www.programaecomar.com/proecomarGBIFworkshop.htm>

## **Communications and visibility**

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During the project implementation we maintain the communication with GBIF Secretariat when necessary and specially with the GBIF technician Leonardo Buitrago, whose participation was essential for the success of the project

Links to all project results were added to the website of Programa EcoMar:

<https://www.programaecomar.com/ProjectBID-CA2020-012-INS.htm>

The paper "Second taxonomic inventory of marine macroalgae

benthic (Ochrophyta, Rhodophyta and Chlorophyta) from the island of Hispaniola" was published in the Programa EcoMar journal (ISSN 2737-6605) with the following reference: Betancourt, L. y Herrera-Moreno, A. (2022). Segundo inventario taxonómico de las macroalgas marinas bentónicas (Ochrophyta, Rhodophyta y Chlorophyta) de la isla Hispaniola. Reporte de Investigación del Programa EcoMar, ISSN 2737-6605, 22(1): 1-40. (Report Attachment 1)

A draft of the chapter of the book was finished and will be submitted to the Editorial Committee of the book Marine Macroalgae of Latin-America and the Caribbean when they requested it. (Report Attachment 6)

The implementation of the project workshop allowed the promotion and final communication of all the results of the project. The workshop was announced to the various personalities, institutions and associations of the biodiversity sector personally, by email and through different social (Facebook) and professional networks (Linkedin, Plagiodontia), reaching all institutions of the biodiversity sector. It was also uploaded and promoted in the local press and through our website using the mentioned online invitation. The National Museum of Natural History "Prof. Eugenio de Jesús Marcano" and the Dominican Environmental Consortium, assisted in the announcement (Report Attachment 7).

## **Monitoring and evaluation**

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### **Final Evaluation**

During the implementation of the project, constant communication was maintained for the exchange of literature and consultation of taxonomic issues with several specialists, among them: Dr. Ana María



Suarez and Dr. Beatriz Martínez-Daranas from Cuban marine science institutions, Dr. Fabio Nauer from the Sao Paulo Institute of Botany, Dr. Robert S. Steneck from the University of Maine, and Dr. Chantale Begin from the University of South Florida. At the University of Michigan, we received from Dr. Michael Wynne -the highest phycological authority in the region- a large literature on the algae of Haiti as well as taxonomic advices for our work. In fact, his fifth review of the benthic marine algae of the tropical and subtropical Western Atlantic, that has just been published, was the guide to our inventory. He also attended and corrected some errors in the scientific names that we found and reported to the Michigan University Museum during the search and review steps of this project. Since the beginning of the project the Viceminister of Biodiversity and Protected Areas (Ministry of Environment) as well as other technicians of his staff, were informed about the implementation of the project. They attended the project workshop and receive all project documentation.

### Best Practices and Lessons learned

Among the best practices identified are those for georeferencing biological data, how to extract and express information from publications to complete the DwC matrix and publication of data through the GBIF IPT. The lessons learned are related to the opportunity offered by GBIF tools to achieve a more comprehensive analysis of biodiversity data. The most important lesson was to visualize that the GBIF projects constitute the best way to mobilize the vast information on Hispaniola's biodiversity that is not available in any international database. The national workshop demonstrates that the key biodiversity actors can be involved in a national movement of data mobilization through GBIF project results.

### Post Project activities

Parallel to the project activities, steps are being taken to encourage the Ministry of Environment to officially join the GBIF as a country.

## Sustainability

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### Sustainability Plans

All publications and technical materials produced in the project will be available online for the national and international scientific community and other specialized databases, for example Algaebase. Following the workshop, the National Botanic Garden is considering initiating data mobilization projects from various botanical groups through GBIF. The results of our project support the other GBIF projects in the Dominican Republic that are still being implemented. The successful implementation of this project by the Programa EcoMar prepares the institution to apply for future GBIF projects in other Hispaniolan taxonomic groups that are absent or underrepresented in their databases. It is expected that the Ministry of Environment officially join the GBIF as a country.

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

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Covid-19 did not affect the project activities.

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**GBIF leads the Biodiversity Information for Development (BID), a programme funded by the European Union. The programme provides supplementary support for activities addressing the needs of regional researchers and policymakers through mobilization and use of biodiversity data.**

