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Contribution of Hispabiota Marina Project to the Biogeographic Information System of the Oceans OBIS: I. Echinoderms from Hispaniola

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ABSTRACT. The database of echinoderms of the Project Hispabiota Marina was analyzed in order to find species with appropriate data to be incorporated in the Biogeographic Information System of the Oceans (OBIS). For Haiti, 79 species of echinoderms are known but only 24 are present in OBIS. The present paper proposes the addition of 30 species, increasing to 54 the number of echinoderms Haitian species on the basis of OBIS. For Dominican Republic, 122 species of echinoderms are known but only 63 are present in OBIS. The number of Dominican echinoderms on the basis of OBIS increases to 72 with the addition of 9 species in the present paper. These new reports increase the insular species richness in OBIS and extend the range of distribution of the echinofauna with new locations, highlighting the potential of Hispabiota Marina to enrich the bases of OBIS with new data from Hispaniola Island. The dissemination of these inventories through OBIS will provide key information for the National Strategies of Biodiversity in Dominican Republic and Haiti to the Convention of Biological Diversity, and will offer to the scientific community updated marine biodiversity information for future taxonomic, ecological and zoogeographical researches.

Key words: OBIS, Hispabiota Marina, echinoderms, Hispaniola

INTRODUCTION

Hispabiota Marina is a long term project implemented by Programa EcoMar in order to create the first inventory of the marine biodiversity of the Hispaniola Island (Dominican Republic and Haiti). More than 2,500 species from different taxonomic groups of flora (Betancourt and Herrera-Moreno, 2001) and fauna (Herrera-Moreno and Betancourt, 2005), representative of all ecosystems and coastal and marine environments - pelagic and benthic - from the shore to about 3,000 m deep, have been compiled and organized in several databases (PROECOMAR, 2014).

To spread this knowledge, Programa EcoMar has begun the Project *Contribution to Hispabiota Marina to the Biogeographic Information System of the Oceans* (OBIS), whose objective is the analysis of databases from all taxonomic groups to select appropriate data to be included in OBIS databases. The present report analyzes the database of echinoderms, created by the Hispabiota Marina Project for the preparation of the chapter *Recent echinoderms from Hispaniola Island* (Herrera-Moreno and Betancourt, 2012), published recently in the regional book *Echinoderms research and diversity in Latin American* (Alvarado and Solís-Marín, 2012).

MATERIALS AND METHODS

The analysis of the information on echinoderms from Hispaniola, to be included in the databases of the OBIS, followed these basic steps:

1. Search for data in the OBIS using the keyword "Echinodermata" in the species section and the EEZ of Haiti and the Dominican Republic, in the region.
2. Download the results and distribution maps of the OBIS search.
3. Comparison of records of echinoderms obtained in the OBIS search with those present in the echinoderm databases of Hispabiota Marina Project from Herrera-Moreno and Betancourt (2012).
4. Recognition and separation of Hispabiota Marina species not present in OBIS, by direct inspection in the matrix data and overlapping the distribution maps from both sources.
5. Species-specific analysis to verify that they satisfy the requirements for OBIS, as well as its authenticity and scientific validity.
6. Review of taxonomic aspects with the assistance of different specialized sources: World Register of Marine Species WORMS (Appeltans *et al.,* 2014) and in the global databases of Ophiuroidea (Stöhr and O'Hara, 2014), Echinoidea (Kroh and Mooi, 2011) and Asteroidea (Mah, 2014).
7. Preparation of the final array of data according to OBIS requirements (Darwin Core).
8. Construction of the final distribution map.

RESULTS AND DISCUSSION

Data from Haiti

There are 39 echinoderms records for the EEZ of Haiti at OBIS database: one at the level of family (Pterasteridae), four at the level of genera (Caymanostella, Litonotaster, Pourtalesia and Tamaria) and 34 at a specific level. Only 24 species, of the 79 known for Haiti, are represented. In the present analysis we found 30 species in the Hispabiota Marina Project database that meet the requirements to be incorporated into OBIS (Table 1). Data come from the works of A. H. Clark (1939) during the Smithsonian-Hartford Expedition in Turtle Island and Cap-Haïtien, Meyer *et al.* (1978) in Navassa Island, Wilcox *et al.* (1989) in Les Arcadins, as well as reports from the United States National Museum (USNM) for the Gulf of Gonâve and Turtle Island, and the Zoological Museum of Berlin for Port-au-Prince.

Table 1. Comparison of the known number of species of echinoderms for the EEZ of Haiti in Hispabiota Marina and OBIS databases, with new species proposal.

Class	Herrera-Moreno and Betancourt (2012)	OBIS	Proposed to be included in OBIS	Total in OBIS
Crinoidea	8	6	1	7
Asteroidea	18	9	2	11
Ophiuroidea	21	0	14	14
Echinoidea	21	9	9	18
Holothuroidea	11	0	4	4
Total	79	24	30	54

Eight species of crinoids are known to the EEZ of Haiti. For this region there are six species in OBIS. This review proposes the addition of the comatulid *Comactinia meridionalis meridionalis*. Meyer *et al.* (1978), in their zoogeography of the crinoids of the Tropical West Atlantic, included a specimen collected at West of Navassa Island (Station 1187) during the RV Pillsbury Expedition. For the same Haitian locality, Meyer *et al.* (1978) described four species of crinoids (*Comactinia echinoptera, Democrinus conifer, Trichometra cubensis* and *Zenometra columnaris*) which are in OBIS. The only difference is that these four species have specimens at the USNM, while *C. meridionalis meridionalis*, which is missing in OBIS, does not.

Nine species of starfishes, from the 18 known for Haiti, are at the base of OBIS. There are two species that do not appear in OBIS and could be incorporated from the Hispabiota Marina Project database: *Linckia guildingi* and *Oreaster reticulatus*. The data belongs to the works of A. H. Clark (1939) and Wilcox *et al.* (1989), respectively.

Ophiuroids do not have any records in the EEZ of Haiti in the base of OBIS. Twenty-one species are known for Haiti. In the database of Hispabiota Marina Project there are 14 species that can be added to OBIS. The data correspond to the works of A. H. Clark (1939) and Wilcox *et al.* (1989), and a report from the Berlin Zoological Museum.

Twenty-one species of echinoids are known for Haiti. The base of OBIS has 9 reports to the specific level. From the database of Hispabiota Marina Project, 9 species of sea urchins are proposed to be included in OBIS. The data belongs to the works of A. H. Clark (1939) and Wilcox *et al.* (1989), and material from the USNM.

At the base of OBIS there are no records of holothurians for the EEZ of Haiti, where 11 species are known. From the database of the Hispabiota Marina we propose the incorporation of 4 species, collected by A. H. Clark (1939) and Wilcox *et al.* (1989).

Data for Dominican Republic

At the base of OBIS there are 149 records of echinoderms for the EEZ of Dominican Republic, 8 at the level of genera (Brissopsis, Cidaris, Clypeaster, Henricia, Holothuria, Mesothuria, Pentamera and Pseudarchaster) and 141 to specific level. Sixty-three species[1], of the 122 reported for Dominican Republic are represented. In the present analysis only 9 species in the Hispabiota Marina Project databases meet the requirements to be incorporated into the OBIS (Table 2). The data correspond to the collections of the RV Crawford in May 1979 in three Dominican localities: Saona and Catalina Islands and La Caleta (Williams *et al.,* 1983); and reports from the United States National Museum (USNM) from the collections of the Norcross-Bartlett Expedition in July 1931 at the SW of Santo Domingo, and the collections of RV Pillsbury in July 1970, out of Ocoa Bay and Cabo Falso.

[1] We have not considered here the OBIS records of the holothuroid *Cherbonniera utriculus* and the ophiuroid *Amphiophiura bullata* which seems to be outside their distribution range and deserve reviewed.

Table 2. Comparison of the known number of species of echinoderms for the EEZ of Dominican Republic in Hispabiota Marina and OBIS databases, with new species proposal.

Class	Herrera-Moreno and Betancourt (2012)	OBIS	Proposed to be included in OBIS	Total in OBIS
Crinoidea	18	15	1	16
Asteroidea	21	11	3	14
Ophiuroidea	24	5	3	8
Echinoidea	41	30	0	30
Holothuroidea	18	2	2	2
Total	122	63	9	72

Eighteen species of crinoids are known for the Dominican Republic EEZ and 15 species are in OBIS. This review proposes the addition of *Poliometra prolixa* deposited at the United States National Museum (USNM E5192), after the collections of the Norcross-Bartlett Expedition at SW of Santo Domingo.

Eleven species of starfishes, of the 21 known for Dominican Republic, are mentioned in the base of OBIS. In the Hispabiota Marina Project database there are 3 species that can be incorporated. All have specimens in the USNM from the collections of RV Pillsbury: *Luidia clathrata* (USNM E17600) and *Echinaster guyanensis* (USNM E32717), collected outside the Ocoa Bay in 35 m depth; and *Ceramaster grenadensis grenadensis* (USNM E 19090) collected at W of Cabo Falso, between 1893 and 3109 m depth.

Ophiuroids have 5 records for the EEZ of Dominican Republic at OBIS database. Twenty-four species are known for Dominican Republic. In the database of the Hispabiota Marina Project there are 3 species that can be added to OBIS: *Astrophyton muricatum, Ophiotrix suensonii* and *Ophiolepis impressa*. The data comes from the collections of the RV Crawford (Williams *et al.,* 1983). At the base of OBIS 30 species of echinoids are mentioned; 41 species are known for Dominican Republic. We did not find in our databases any echinoid species meeting all requirements for OBIS.

In the case of holothurians, 18 species are known for the EEZ of Dominican Republic and only 2 records are in OBIS. From our databases 2 species can be incorporated: *Astichopus multifidus* and *Holothuria mexicana*, collected in the reefs of La Caleta and Catalina Island, respectively, during the Expedition of the RV Crawford (Williams *et al.,* 1983). Most of the data for echinoids and sea cucumbers in the database of the Hispabiota Marina Project corresponds to specimens deposited at the National Museum of Natural History in Santo Domingo (MNHNSD), collected in various Dominican localities, between 1983 and 1986, but they don't have geographic coordinates, essential information for OBIS bases.

CONCLUSIONS

The review of the echinoderms database of the Project Hispabiota Marina showed 37 species (with 185 records) that may be incorporated to the bases of OBIS (see Appendix 1), increasing the known species richness of Hispaniola Island and extending the range of distribution of the echinofauna to new localities (Figure 1). These first results demonstrate the potential of Hispabiota Marina to enrich the bases of OBIS.

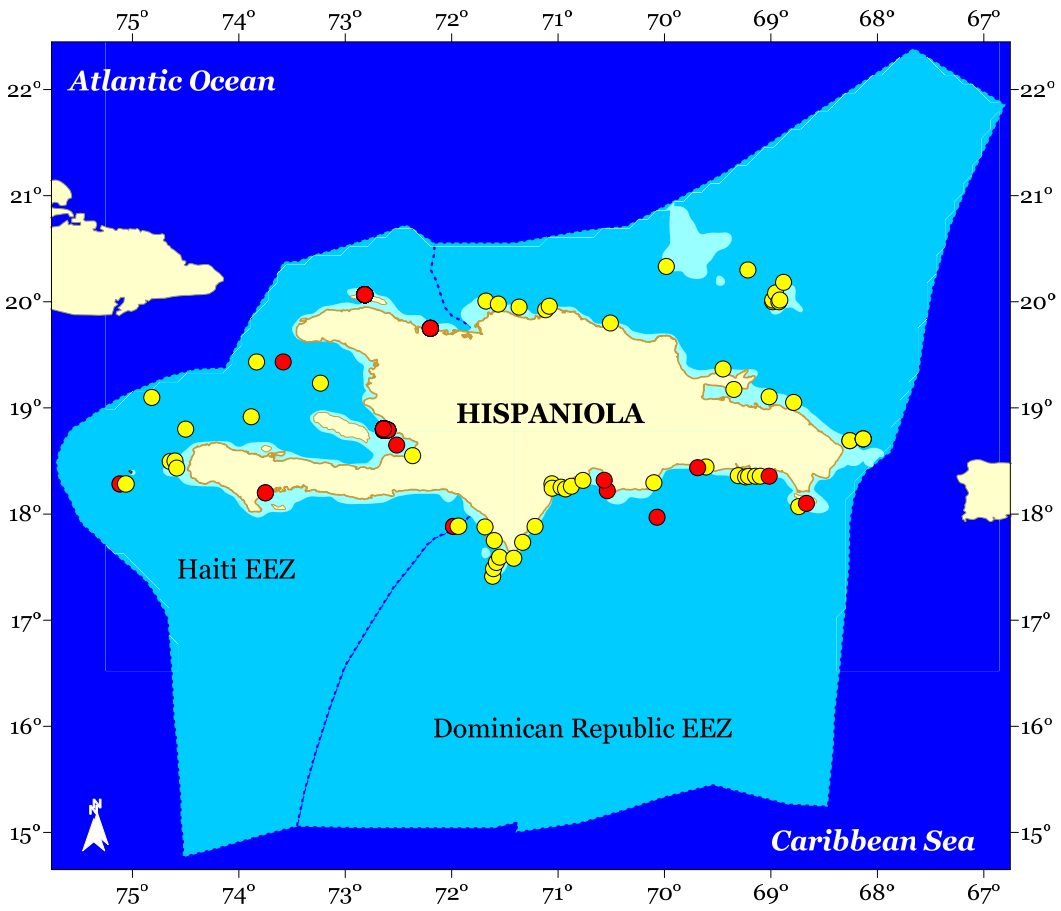

Figure 1. Map of Hispaniola Island indicating the Exclusive Economic Zones (EEZ) of Haiti and Dominican Republic. Records of different taxonomic categories of echinoderms are indicated for OBIS (yellow circles) and additions of the Hispabiota Marina Project (red circles).

In contrast to the other islands of the Greater Antilles (Jamaica, Puerto Rico, and especially Cuba), Hispaniola Island has never been the subject of a marine biota inventory. The causes of this apparent carelessness rest on the particularity that its territory is divided and occupied by two different countries: Dominican Republic on the Eastern and Haiti on the Western. Although both nations have common historical roots they have developed as very different cultures. The essential notion that they are sharing an insular area, geopolitically divided but ecologically unique and indivisible, is not totally assumed. Hence, the national marine researches - virtually non-existent in Haiti and with certain institutional tradition in Dominican - have been mainly confined to the territories of their coasts and the marine platforms.

Some investigations of foreign institutions have contributed to visualize the insular context as the basis of knowledge of marine biodiversity but these contributions have remained scattered in journals and collections of international museums, until Programa EcoMar endorsed the responsibility of its compilation and taxonomic update through Hispabiota Marina Project (PROECOMAR, 2014).

The dissemination of these inventories through OBIS is essential to provide key information for the National Strategies of Biodiversity in Dominican Republic and Haiti to the Convention of Biological Diversity, as well as to offer to the scientific community updated marine biodiversity information from Hispaniola Island valuable for future taxonomic, ecological and zoogeographical researches.

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Appendix 1. List of echinoderm species from Hispaniola (in alphabetical order) proposed to be introduced in the bases of OBIS. Numbers of reports are indicated for each species.

Scientific name	Haiti	Dominican Republic
Astichopus multifidus (Sluiter, 1910)		1
Astrophyton muricatum (Lamarck, 1816)	2	1
Ceramaster grenadensis grenadensis (Perrier, 1881)		1
Comactinia meridionalis meridionalis (Agassiz, 1865)	1	
Diadema antillarum (Phillipi, 1845)	17	
Echinaster (*Othilia*) *guyanensis* (A. M. Clark, 1987)		1
Echinometra lucunter lucunter (Linnaeus, 1758)	15	
Echinometra viridis A. Agassiz, 1863	3	
Echinoneus cyclostomus Leske, 1778	1	
Eucidaris tribuloides (Lamarck, 1816)	11	
Holothuria (*Halodeima*) *mexicana* Ludwig, 1875	4	1
Holothuria (*Selenkothuria*) *glaberrima* Selenka, 1867	1	
Holothuria (*Thymiosycia*) *thomasi* Pawson y Caycedo, 1980	1	
Linckia guildingi Gray, 1840	7	
Luidia clathrata (Say, 1825)		1
Lytechinus variegatus variegatus (Lamarck, 1816)	8	
Lytechinus williamsi Chesher, 1968	2	
Ophiactis ljungmani Marktanner-Turneretscher 1887	1	
Ophiocoma echinata (Lamarck, 1816)	18	
Ophiocoma pumila Lutken, 1859	34	
Ophiocoma wendtii Müller y Troschel, 1842	3	
Ophioderma appressa (Say, 1825)	1	
Ophioderma brevicauda Lütken, 1856	4	
Ophiolepis impressa Lütken, 1859		1
Ophiolepis paucispina (Say, 1825)	1	
Ophiomyxa flaccida (Say, 1825)	1	
Ophionereis reticulata (Say, 1825)	2	
Ophionereis squamulosa Koehler, 1914	3	
Ophiopsila riisei Lütken, 1859	6	
Ophiothrix (*Ophiothrix*) *angulata* (Say, 1825)	4	
Ophiothrix (*Ophiothrix*) *oerstedii* Lütken, 1856	1	
Ophiotrix suensonii Lütken, 1856		3
Oreaster reticulatus (Linnaeus, 1753)	2	
Phormosoma placenta sigsbei (A. Agassiz, 1880)	1	
Poliometra prolixa (Sladen, 1881)		1
Thyone cognata (Lampert, 1885)	1	
Tripneustes ventricosus (Lamarck, 1816)	18	
Total	174	11