



Echinoderms of the Seaflower Biosphere Reserve: State of Knowledge and New Findings

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BACKGROUND

Echinoderms are a charismatic marine invertebrate group that stand out for their beauty and color, but also for several attributes. Their morphological and biological characteristics represent innovations and particularities in animal evolution. Several species have proven to be key in the functioning of ecosystems and therefore in their conservation. Besides, some sea cucumbers and sea urchins are used for human consumption, being currently highly commercially important. In this paper we summarize the list of echinoderms in the Seaflower Biosphere Reserve (SFBR) and their distribution patterns, including shallow and deep species. The SFBR was declared in November 2000 by UNESCO, and covers the extension of the department of Colombia “Archipiélago de San Andrés, Providencia y Santa Catalina,” which has an approximate area of 180,000 km² of which <1% is emerged (CORALINA-INVEMAR, 2012). Within the SFBR is the Marine Protected Area Seaflower with 65,018 km², declared in 2005 and divided in three sections: a northern section (37,522 km²) that includes Quitasueño, Serrana and Roncador as well as multiple deep submerged banks; a central section (12,716 km²) that includes Providencia and Santa Catalina; and a southern section (14,780 km²) encompassing San Andrés, Bolívar and Albuquerque among other banks (Figure 1). Although the sections share similar environments dominated by corals, transparent waters and oceanic features, each one has particular dynamics of fishing exploitation, which make them to require specific management actions (CORALINA-INVEMAR, 2012). To compile the data presented in this study we reviewed literature, specimen’s records from museums, open access databases, and the species collected during recent samplings made in 2011 by Universidad Nacional de Colombia-Sede Caribe and the Seaflower Expeditions 2016 and 2017. This dataset provides a baseline for echinoderm species composition and geographic distribution, thus expanding the knowledge on biodiversity within the SFBR as part of the current Seaflower Expeditions. It is essential to continue efforts to access these remote areas at SFBR, implement the use of new tools to evaluate their biodiversity (such as DNA barcoding) and define priority research topics for the conservation of marine biodiversity in this strategically located reserve.

DATA DESCRIPTION

Data Collection

We report here the dataset entitled “Echinoderms from the Seaflower Biosphere Reserve” which updates the checklist presented by Borrero-Pérez et al. (2016) including new records from unpublished results of samplings conducted in 2011 by Universidad Nacional de Colombia-Sede Caribe, the Seaflower Expeditions 2016 and 2017, and open-access databases.

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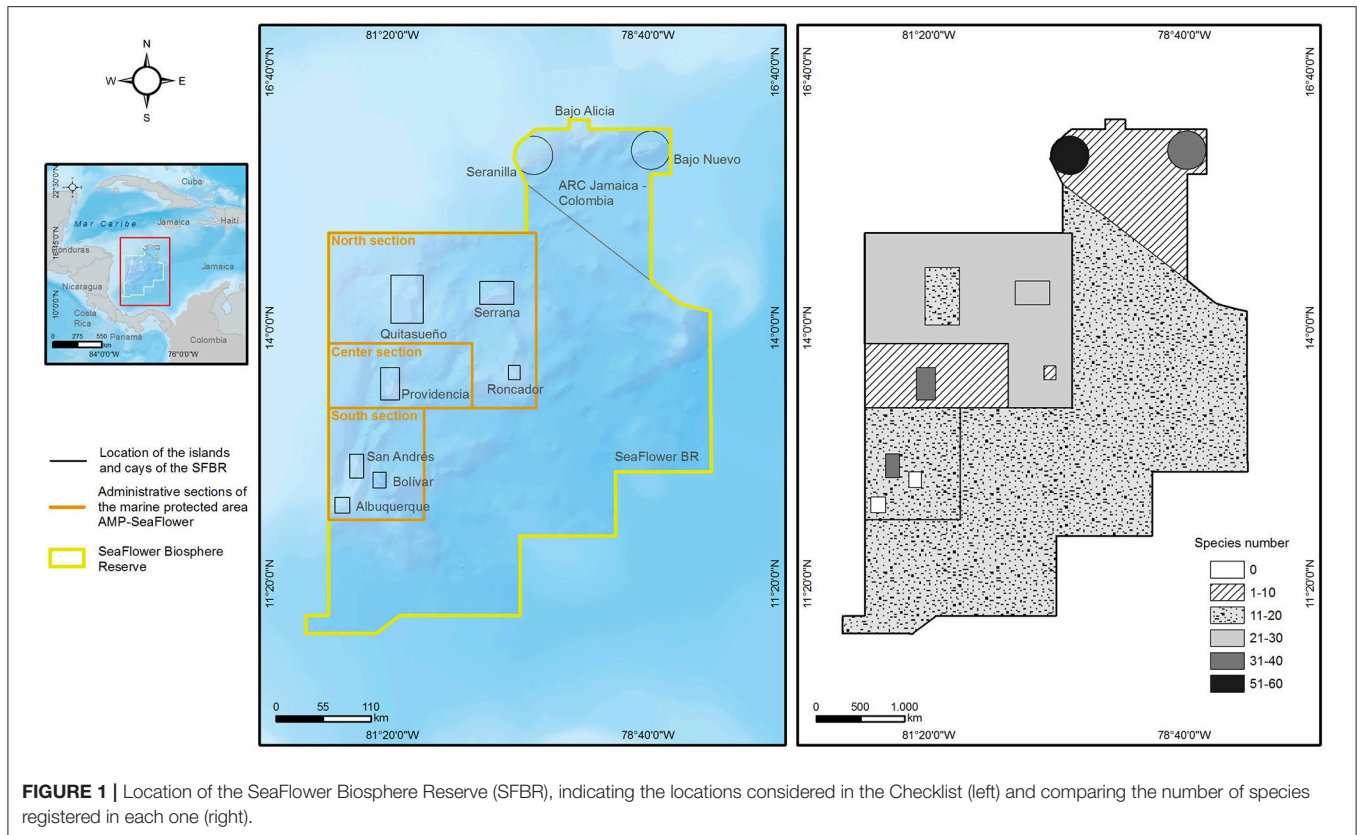
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A descriptive analysis of species richness and spatial distribution patterns was made and some outcomes are presented.

This dataset compiles the lists of echinoderm species recorded within the SFBR and derived from: (i) Peer reviewed papers or published reports of several investigations, most of them supported by voucher specimens deposited at Museo de Historia Natural Marina de Colombia (MHNMC-INVEMAR), available through the Sistema de Información sobre Biodiversidad Marina (SIBM), and at the National Museum of Natural History (NMNH) (Clark, 1939; Quiñones, 1981; Clark and Downey, 1992; CORALINA, 2001; Diaz et al., 2003; García et al., 2003; Vélez, 2003; García-Hanse and Álvarez-León, 2007; Lasso, 2007a,b; Mejía-Ladino et al., 2008; Benavides-Serrato et al., 2011, 2013; Abril-Howard et al., 2012; Borrero-Pérez et al., 2012; INVEMAR-ANH, 2012; Vega-Sequeda et al., 2015; INVEMAR-SIBM a¹, b², c³; NMNH⁴); (ii) The Ocean Biogeographic Information System (OBIS) data base; (iii) The

Global Biodiversity of Information Facility (GBIF) data base; (iv) Biological records available at SIB Colombia reporting the unpublished results of samplings made in 2011 and the results of several projects developed during the Seaflower Expeditions 2016 and 2017 (UNAL (Universidad Nacional de Colombia), 2016; Benavides-Serrato et al., 2018a,b; Borrero-Pérez, 2018). The search at GBIF database was conducted using two polygons including the SFBR: Polygon 1 (−80 W 11.8 N, −78 W 11.8 N, −78 W 16.2 N, −80 W 16.2 N, −80 W 11.8 N), Polygon 2 (−82 W 11 N, −80 W 11 N, −80 W 15 N, −82 W 15 N, −82 W 11 N). Using this search criteria we recovered new information formerly recorded as present in Nicaragua. The following nine fields are presented per species in this dataset:

taxonID and scientificNameID: These fields include a unique and stable-through-time alphanumeric identifier (taxonomic identifier) AphiaID provided by World Register of Marine Species (WoRMS).

locality: Specific localities where the species have been recorded in the SFBR are presented in this field. Fourteen localities were defined (Figure 1) considering the largest islands San Andrés (1), and Providencia and Santa Catalina (2); the Cay Islands Serranilla (3), Bajo Nuevo (4), Quitasueño (5), Serrana (6), Roncador (7), Albuquerque (8) and Bolívar (9); the Joint Regime Area Jamaica-Colombia (ARC Jamaica-Colombia, in Spanish) (10); the administrative sections of the SeaFlower marine protected area: North section (11), Central section (12) and South section (13) (CORALINA-INVEMAR, 2012), that were used to locate

¹INVEMAR -SIBM a. *Acceso en línea en*. Available online at: <http://siam.invemar.org.co/sibm-busqueda-avanzada>. Ecorregión SAN. Consultado en: 29-06-2015

²INVEMAR-SIBM b. *Acceso en línea en*. Available online at: <http://siam.invemar.org.co/sibm-busqueda-avanzada>. Proyecto Expedición Providencia I. Consultado en: 19-09-2018.

³INVEMAR-SIBM c. *Acceso en línea en*. Available online at: <http://siam.invemar.org.co/sibm-busqueda-avanzada>. Proyecto ANH ARC Jamaica. Consultado en: 17-07-2018

⁴NMNH. *National Museum of Natural History*. *Acceso en línea en*. Available online at: <http://collections.nmnh.si.edu/search/iz/>. Consultado en: 23-06-2015

the species not recorded in the area near the islands or cays; and finally, the locality Seaflower BR (14), where all the recorded species outside of the previously mentioned localities and sections were located.

locationID and coordinates: Fields based on the Marine regions Gazetteer (<http://www.marineregions.org/gazetteer.php>).

catalogNumber and collectionCode: These fields list cataloged lots available for each species, indicating the museums where they are deposited.

basisOfRecord: This field indicates PreservedSpecimens and HumanObservations, which includes records from literature.

bibliographicCitation: This field includes the reference that explicitly mentions the species in the RBSF, usually with voucher specimens.

References: This field includes references that have compiled echinoderm species records in the SFBR or in the Colombian Caribbean Sea.

institutionCode: This field includes the name (or acronym) in use by the institution having custody of the object(s) or information referred to in the record.

eventDate: This field includes the date of collection of the specimens recorded. Wherever the exact collection date is unknown, a comment appears in the field **eventRemarks**.

Echinoderms Species and Distribution Patterns

A total of 148 echinoderm species were found within the SFBR. Ophiuroidea was the most species-rich class (44 species), followed by Asteroidea (38), Echinoidea (31), Holothuroidea (26) and finally Crinoidea (9). Considering the revision by Borrero-Pérez et al. (2016) as a baseline, there are 23 new records for the SFBR; eight of them are shallow water species based on unpublished results of samplings made in 2011 by UNAL and SeaFlower Expeditions 2016, 2017 at Quitasueño, Roncador, Serrana and Serranilla (Benavides-Serrato et al., 2018a,b; Borrero-Pérez, 2018); and 15 are deep water species located mostly in SeaFlower BR (13 species) and in the North section (2) localities, recorded from GBIF data base. As these deep species were assigned to Nicaragua, they were not considered in previous publications. The majority of these deep water specimens were collected by research vessels Alaminos and Gyre during the 1960's and 1970's (Prestridge, 2016). On a smaller scale, the importance of the expeditions carried out recently is reflected, considering that the increase in the number of species for Quitasueño and Serrana was 80%, Serranilla 25%, and Roncador was 100% (Table 1).

The echinoderms recorded for the first time in the SFBR are the shallow water species: *Astropecten duplicatus*, *Copidaster lymani*, *Ophioderma cinerea*, *Ophiolepis impressa*, *Ophiolepis paucispina*, *Arbacia punctulata*, *Mellita quinquiesperforata*, *Brissus unicolor*; and the deep water species: *Plinthaster dentatus*, *Zoroaster fulgens*, *Hymenaster modestus*, *Litonotaster intermedius*, *Dytaster insignis*, *Benthopecten simplex*,

Calyptroaster personatus, *Ophiothrix pallida*, *Deima validum validum*, *Mesothuria verrilli*, *Mesothuria maroccana*, *Molpadia cubana*, *Psychropotes depressa*, *Benthoctes typica*, and *Benthoctes lingua* (Table 1). Ten of these species (in bold), are also first records for the Colombian Caribbean Sea.

The highest number of species were recorded in shallow waters near San Andrés (36 species), and Providencia and Santa Catalina islands (37), which is expected given their accessibility and the greatest sampling effort in those islands. However, Serranilla which is the farthest locality from Colombian continent coast, is currently the richest with 54 species. This locality has been sampled several times and this number of species includes shallow and deep environments. Some of the Serranilla records came from research cruises previous to 1970's; from expeditions carried out by INVEMAR in 2011 to characterize shallow and deep ecosystems (INVEMAR-ANH, 2012; Vega-Sequeda et al., 2015); and from the recent Seaflower Expedition in 2017 (Benavides-Serrato et al., 2018b; Borrero-Pérez, 2018). Albuquerque and Bolivar, located nearest to San Andres, showed no echinoderm records (Figure 1; Table 1).

Although deep environments have been relatively less studied in the SFBR, except by the research project focused on ARC Jamaica-Colombia (INVEMAR-ANH, 2012), 48% of the species currently recorded in the SFBR are distributed only or mainly below 200 m in depth. These species records are the result of some sampling stations of research cruises like the R/V Albatross (1884), Presidential Cruise (1938), R/V Oregon (1957, 1964), R/V Pillsbury (1971), R/V Alaminos, and R/V Gyre during the 1960's and 1970's. The samples of these cruises are deposited mostly in the Smithsonian NMNH and most of them were included in the catalogs of the echinoderms of Colombia and other publications (Clark, 1939; Clark and Downey, 1992; Benavides-Serrato et al., 2011; Borrero-Pérez et al., 2012; Prestridge, 2016). Given that samples from R/V Gyre during the 1960's and 1970's were assigned to Nicaragua they had not been considered in previous publications (Orrell and Hollowell, 2018).

Most of the deep water species (75%) have a single record in the reserve, which is expected considering that samplings at deep water are restricted to some of the deep banks in the SFBR, such as those sampled around Serranilla and Bajo Nuevo by INVEMAR-ANH (2012); or restricted to some stations during the research cruises previously mentioned. In the case of shallow water species, 42% (32 species) have a single record (one locality), 42% (32 species) 2 to 4, and 16% (13 species) 5 to 10 records. Among them only 17 species (22%) are distributed throughout the reserve, recorded in several localities or at least in Serranilla and/or Bajo Nuevo (the northernmost localities) and in one locality of the South section. These species are the sea star *Oreaster reticulatus* (reported in 4 localities), the brittle stars *Ophiocoma echinata* (7), *Ophiothrix oerstedii* (6), *Ophioderma appressa* (6) and *O. rubicunda* (4); the sea urchins *Diadema antillarum* (8), *Eucidaris tribuloides* (7), *Echinometra lucunter lucunter* (7), *E. viridis* (6), *Tripneustes*

TABLE 1 | Species of echinoderms of the SeaFlower Biosphere Reserve.

Species	South section	San Andrés	Bolivar	Albuquerque	Central section	Providencia and Santa Catalina	North section	Quitassueño	Serrana	Roncador	Bajo Nuevo	Serranilla	ARC Jamaica-Colombia	SeaFlower Biosphere Reserve
<i>Caryomeia atlantidis</i>											X			
<i>Trichomeira cubensis</i>							X				X			
<i>Davidaster discoideus</i>	X													
<i>Davidaster rubiginosus</i>	X				X									
<i>Crinomeira brevipinna</i>											X			
<i>Stylomeira spinifera</i>											X			
<i>Endoxocrinus (Endoxocrinus) parrae parrae</i>											X			
<i>Democrius conifer</i>							X							
<i>Democrius rawsonii</i>							X							
<i>Luidia alternata</i>												X		
<i>Luidia barbadensis</i>							X							
<i>Luidia clathrata</i>												X		
<i>Luidia senegalensis</i>												X		
<i>Astropecten americanus</i>							X							
<i>Astropecten antillensis</i>												X		
<i>Astropecten articulatus</i>												X		
<i>Astropecten cingulatus</i>							X							
<i>Astropecten duplicatus*</i>														
<i>Astropecten nitidus</i>							X							
Dytaster insignis*														R
<i>Persephonaster echinulatus</i>					X									
<i>Pseudarchaster gracilis gracilis</i>					X									
Benthopecten simplex*														R
<i>Cheiraster (Barbadosaster) echinulatus</i>							X							
<i>Cheiraster (Christopheraster) mirabilis</i>					X									
<i>Asterinides folium</i>	X													

(Continued)

TABLE 1 | Continued

Species	South section	San Andrés	Bolívar	Albuquerque	Central section	Providencia and Santa Catalina	North section	Quituesuño	Serrana	Roncador	Bajo Nuevo	Serranilla	ARC Jamaica-Colombia	SeaFlower Biosphere Reserve
<i>Stegnaster wesselii</i>	X													
<i>Marginaster pectinatus</i>							X				X			
<i>Anthenoides paircei</i>											X			
<i>Apollonaster yucatanensis</i>														X
<i>Circeaster americanus</i>				X			X							
<i>Nymphaster arenatus</i>				X			X							
<i>Rosaster alexandri</i>							X							
<i>Linckia bouvieri</i>								X						
<i>Linckia guildingi</i>						X						R		
<i>Ophidiaster guildingi</i>						X			R					
<i>Tamaria halperni</i>								X	X			X		
<i>Oreaster reticulatus</i>			X			X			R			X		
Copidaster lymani *														
<i>Plinthaster dentatus</i> *							R							R
<i>Litonotaster intermedius</i> *														R
<i>Calyptroaster personatus</i> *														R
Hymenaster modestus *														R
<i>Pteraster militarioides militarioides</i>					X									
<i>Echinaster (Othilia) brasiliensis</i>									X					
<i>Henricia antillarum</i>							X						X	
<i>Zoroaster fulgens</i> *														R
<i>Astrophyton muricatum</i>						X						X		
<i>Ophiomyxa flaccida</i>						X								
<i>Ophiacantha bidentata</i>											X		X	
<i>Ophiocamax hystrix</i>											X			
<i>Ophiomitra valida</i>											X		X	
<i>Ophiopristis hirsuta</i>											X		X	
<i>Ophiotreta cf. sertata</i>											X		X	
<i>Ophiocoma echinata</i>			X			X		R	R	R				
<i>Ophiocoma pumila</i>								R	R			X		
<i>Ophiocoma wendtii</i>						X		R	R			R		

(Continued)

TABLE 1 | Continued

Species	South section	San Andrés	Bolívar	Albuquerque	Central section	Providencia and Santa Catalina	North section	Quitassueño	Serrana	Roncador	Bajo Nuevo	Serranilla	ARC Jamaica-Colombia	SeaFlower Biosphere Reserve
<i>Bathypectinura heros</i>											X			
<i>Ophioderma appressa</i>	X	X				X		R	R			R		
<i>Ophioderma brevicauda</i>		X												
<i>Ophioderma brevispina</i>												X		
<i>Ophioderma cinerea*</i>									R			R		
<i>Ophioderma rubicunda</i>		X					R	R				R		
<i>Ophiopaepale goesiana</i>											X			
<i>Ophiomyces frutescens</i>											X			
<i>Amphiodia pulchella</i>		X				X								
<i>Amphiodia trychna</i>		X												
<i>Amphipholis gracillima</i>		X				X								
<i>Amphipholis januarii</i>		X				X								
<i>Amphipholis squamata</i>		X				X								
<i>Amphiura stimpsonii</i>		X												
<i>Microphipholis atra</i>														X
<i>Ophionephthys limicola</i>		X				X								
<i>Ophiophragmus pulcher</i>		X				X								
<i>Ophiosigma isocanthum</i>		X				X								
<i>Ophiosigma siva</i>		X				X								
<i>Ophiolithrix (Ophiolithrix) angulata</i>		X				X								
<i>Ophiolithrix lineata</i>														X
<i>Ophiolithrix (Ophiolithrix) oerstedii</i>	X								R		X	X		
<i>Ophiolithrix pallida*</i>							R							
<i>Ophiolithrix (Acanthophiothrix) suensoni</i>						X				R	X	X		
<i>Ophiactis savignyi</i>		X												
<i>Ophionereis reticulata</i>						X			R		X			R
<i>Ophiolapis elegans</i>		X												
<i>Ophiolapis impressa*</i>								R						R
<i>Ophiolapis paucispina*</i>														R

(Continued)

TABLE 1 | Continued

Species	South section	San Andrés	Bolívar	Albuquerque	Central section	Providencia and Santa Catalina	North section	Quitasueño	Serrana	Roncador	Bajo Nuevo	Serranilla	ARC Jamaica-Colombia	SeaFlower Biosphere Reserve
<i>Ophiathyreus goesi</i>							X							
<i>Ophiomusium aculeferum</i>											X		X	
<i>Ophiomusium eburneum</i>											X			
<i>Ophiomusium testudo</i>											X			
<i>Ophiomusium validum</i>											X			
<i>Eucidaris tribuloides</i>		X				X			R		X		X	
<i>Stylocidaris affinis</i>							X							
<i>Stylocidaris lineata</i>							X							
<i>Areosoma belli</i>														
<i>Aspidodiadema jacobyi</i>														
<i>Diadema antillarum</i>	X		X			X		R	R		X	X	X	
<i>Bathysalania goesiana</i>								R			X	X		
<i>Arbacia punctulata*</i>								R						
<i>Coelopleurus floridanus</i>										X				
<i>Trigonocidaris albida</i>			X			X					X		X	
<i>Lytechinus variegatus variegatus</i>														
<i>Lytechinus williamsi</i>			X											
<i>Tripneustes ventricosus</i>	X		X			X		R	R			X		
<i>Echinometra lucunter lucunter</i>	X		X			X		R	R		X	X		
<i>Echinometra viridis</i>		X				X		R	R		X			
<i>Echinoneus cyobostomus</i>		X												
<i>Clypeaster lamprus</i>							X							
<i>Clypeaster rosaceus</i>		X				X								
<i>Clypeaster subdepressus</i>		X												
<i>Echinocyamus grandiporus</i>						X					X			
<i>Encope emarginata</i>														
<i>Leodia sexiesperforata</i>	X					X						X	R	
<i>Mellita quinquesperforata*</i>														
<i>Conolampas sigsbei</i>							X				X			

(Continued)

TABLE 1 | Continued

Species	South section	San Andrés	Bolívar	Albuquerque	Central section	Providencia and Santa Catalina	North section	Quitasueño	Serrana	Roncador	Bajo Nuevo	Serranilla	ARC Jamaica-Colombia	SeaFlower Biosphere Reserve
<i>Brissus unicolor*</i>												R		
<i>Meoma ventricosa ventricosa</i>						X			R			X		
<i>Plagiobrissus grandis</i>		X									X			
<i>Palaeobrissus hilgardi</i>							X							
<i>Linopneustes longispinus</i>														
<i>Agasszia excentrica</i>											X			
<i>Heterobrissus hystrix</i>							X							
<i>Ocnus suspectus</i>														
<i>Thyonella sabanillaensis</i>												X		
<i>Pentamera pulcherima</i>												X		
<i>Lissothuria brazilensis</i>												X		
<i>Astichopus multifidus</i>												X		
<i>Isostichopus badionotus</i>		X				X		R				X		
<i>Deima validum validum*</i>														R
<i>Actinopyga agassizii</i>						X								R
<i>Holothuria (Cystipus) cubana</i>						X								
<i>Holothuria (Halodeima) floridana</i>						X								
<i>Holothuria (Halodeima) grisea</i>														X
<i>Holothuria (Halodeima) mexicana</i>		X				X		R		R	X			
<i>Holothuria (Platyperona) parvula</i>	X													R
<i>Holothuria (Selenkothuria) glaberrima</i>	X													X
<i>Holothuria (Thymiosycia) arenicola</i>														X
<i>Holothuria (Thymiosycia) impatiens</i>						X								

(Continued)

TABLE 1 | Continued

Species	South section	San Andrés	Bolívar	Albuquerque	Central section	Providencia and Santa Catalina	North section	Quitasueño	Serrana	Roncador	Bajo Nuevo	Serranilla	ARC Jamaica-Colombia	SeaFlower Biosphere Reserve
<i>Holothuria (Thymiosycia) thomasi</i>					X			R						
<i>Holothuria (Vaneyothuria) lentiginosa</i>								X						
<i>Mesothuria venilli*</i>														R
<i>Mesothuria maroccana*</i>														R
<i>Euapta lappa</i>												X		
<i>Synaptula hydriformis</i>		X				X								
<i>Molpadia cubana*</i>														R
<i>Psychropotes depressa*</i>														R
<i>Benthoodytes typica*</i>														R
<i>Benthoodytes lingua*</i>														R
Total species by Borrero-Pérez et al. (2016)	11	36	0	0	6	37	20	4	5	0	34	40	10	0
Total first records per locality							2	14	22	4		14		13
Total	11	36	0	0	6	37	22	18	27	4	34	54	10	13

X indicates presence of the species accounted by Borrero-Pérez et al. (2016); R indicates first records for a locality; asterisk (*) in the species column indicates new records for SeaFlower Biosphere Reserve, and bold letter denote new records for Colombian Caribbean Sea.

ventricosus (6), *Clypeaster rosaceus* (3), *Leodia sexiesperforata* (3) and *Lytechinus variegatus variegatus* (3); and the sea cucumbers *Holothuria mexicana* (7), *Isostichopus badionotus* (6), *H. parvula* (2), and *H. glaberrima* (2). Most of these species are also the most frequent, being recorded in more than 4 localities, and some of them occur in large densities. However, little is known about the local population densities and distribution of some species (e.g., *Diadema antillarum*) that have proven to be key in the functioning of reef ecosystems (Lessios, 2016) and *I. badionotus* and *H. mexicana* currently considered the most commercially important sea cucumbers in the Caribbean Sea (Guzman and Guevara, 2002; Toral-Granda, 2008). The high percentage of species records only in one locality likely are related with sampling effort. For example the widely-distributed and common family Amphiuroidae is almost restricted to San Andres and Providencia and Santa Catalina Islands localities. Most amphiuroids live buried in soft bottoms or hidden in different structures, extending their arms toward the surface to feed (Hendler et al., 1995). The records of this family in the SFBR come from a single study focused on this group using a specific sampling technique. More samplings are needed to complete the inventory and to better understand the spatial pattern of echinoderm diversity, including localities where the species composition is practically unknown, such as Albuquerque and Bolivar cays, and focusing on different habitats.

Knowledge on the geographic distribution of Echinoderm species throughout the SFBR is a prerequisite to understand the spatial patterns of larval connectivity and the role of SFBR in the Caribbean-wide Echinoderm population dynamics. Based on this knowledge it will be possible to define priority research topics for the conservation of marine biodiversity in this strategically located reserve for the Caribbean Sea. Currently, only the 53% of the species previously registered in the Colombian Caribbean (Benavides-Serrato et al., 2013), and 27% of the species from the Caribbean Sea and the Gulf of Mexico (Alvarado-Barrientos and Solís-Marín, 2013) are recorded in the SFBR.

Finally, most of the species (88%) included in this study have vouchers deposited in several biological collections, mostly in the Museo de Historia Natural Marina de Colombia (MHNMC-INVEMAR), the National Museum of Natural History-Smithsonian (NMNH-Smithsonian), and others, making a more reliable inventory. Physical evidence of each species is fundamental in taxonomy because it allows to unify criteria for the identification, especially of species or groups with variable characteristics, and dubious identifications.

Re-Use Potential

The checklist presented here provides an updated inventory of echinoderm species from the SFBR including published and unpublished records obtained through a comprehensive literature, museum collections, open-access databases records and recent samplings in the reserve. Future taxonomic

and biogeographic studies will greatly benefit from this baseline of echinoderms species of these remote areas, which despite their strategic location have generally been included in inventories of countries or larger regions. The dataset presents the catalog numbers of the voucher for each species, facilitating any taxonomic revision that could be needed.

DATA AVAILABILITY

The dataset Echinoderms from the SeaFlower Biosphere Reserve that includes the complete list of species was assembled using the Darwin Core standard (DwC) and is available through the Integrated Publishing Tool of the OBIS and GBIF Colombian nodes (SIBM-SIB Colombia) (<http://ipt.biodiversidad.co/sibm/>.) Future updates of the list will be published in the latter repository. Changes incorporated to each new version of the list will be summarized in the respective metadata section of the electronic resource.

AUTHOR CONTRIBUTIONS

GHB-P, MB-S, NC, EG-G, BG, JM, and AA-H collected and identified echinoderm samples during the last expeditions to Quitasueño, Roncador, Serrana and Serranilla (2011, 2016 and 2017). GHB-P and MB-S collected and processed the information for the biological records and the checklist dataset. GHB-P compile the complete checklist dataset, performed the descriptive analyses and wrote the manuscript. GHB-P, MB-S, NC, EG-G, BG, JM, and AA-H reviewed and approved the manuscript.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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