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Ruber Rodriguez-Barreras
University of Puerto Rico - Rio Piedras

Charles G. Messing
Nova Southeastern University, messingc@nova.edu

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A new list of Cuban crinoids (Echinodermata: Crinoidea)

RUBER RODRÍGUEZ-BARRERAS¹ AND CHARLES G. MESSING²

¹University of Puerto Rico-Rio Piedras campus, PO Box 23360 San Juan PR 00931-3360

²Oceanographic Center, Nova Southeastern University, 8000 N Ocean Dr., Dania Beach, FL, 33004 USA

ruber.rodriguez@outlook.com; messingc@nova.edu

ABSTRACT: This review is based on the most recent taxonomic classification of extant Cuban Crinoidea. Existing material in natural history collections in Cuba was analyzed in detail and accurately reflects species presence. The crinoid literature was also reviewed. Several previously unpublished observations of species found in waters off Cuba have also been included. This paper provides the most up to date description of the Cuban crinoid fauna. Habitat, distribution, depth range and localities in Cuba are reported for each species. Collection codes for available specimens are included when known. The work describes a total of 33 species (plus two subspecies) in 20 genera and 10 families representing three of the four living orders of the Class Crinoidea.

KEYWORDS: echinoderms, crinoids, sea lily, taxonomy, Cuba.

INTRODUCTION

The crinoids are the basal group among extant members of the phylum Echinodermata. They include the only living stalked taxa and are sister to the remaining four classes, collectively treated as Eleutherozoa. Their earliest undisputed fossils are from the Early Ordovician Period, about 479-488 million years ago (Simms 1999). All post-Paleozoic crinoids are currently assigned to the Articulata, which arose from now otherwise extinct cladid crinoids sometime during the Late Paleozoic, although their precise origins remain unresolved (Hess and Messing 2011). Extant crinoids are currently placed in four major groups, although their phylogenetic relationships are imperfectly understood: Isocrinida includes about 23 species in seven genera; the stalk consists of series of internodal columnals separated at intervals by nodal columnals bearing hooklike cirri that anchor the stalk to hard substrates. At least some living species can detach and crawl with their arms. They occur chiefly in 300-1000 m but are found in as little as 100 m off Japan, the shallowest of any living crinoid that retains the stalk. Hyocrinida, which includes ~25 species in 10 genera; have a thin-walled, box-like calyx, usually five unbranched rays, a long slender stalk composed of numerous disk-like columnals

cemented to hard substrates via a terminal attachment plate, and occur chiefly below 1000 m (to over 5,000 m). Living Cyrtocrinida include 8 species in four genera; they are a small group of highly modified, sometimes barnacle-like forms that cement to hard substrates either via a short stalk or directly via a short broad calyx. They occur chiefly on vertical or overhanging rock surfaces in ~275-500 m. The great majority of living crinoids, over 586 species in 159 genera, belong to Comatulida, most are feather stars, which lose the stalk following an attached postlarval stage. They have a reduced calyx and retain the uppermost stalk segment (centrodorsal) with anchoring cirri. Feather stars are the only living crinoids found in shallow water, although they also reach abyssal depths. Recent research (Rouse et al. 2013, Hemery et al. 2013) has submerged most members of a former fifth group, Bourgueticrinina, ~46 species in 13 genera, retain a stalk characterized chiefly by synarthrial articulations; and they anchor either to hard substrates via a terminal attachment plate or in sediments via a branched rootlike radix. Arms, numbering five or ten, arise from a conical to cylindrical calyx. They occur in as little as 300 m to over 9,000 m in depth.

The first crinoid known from Cuban waters was briefly described and illustrated as “Palma animal” by Parra (1787). Gervais (in

Guérin, 1835, Pl. 147, fig.1) translated Parra's description, reproduced his figure, and applied to it the Latin binomen *Encrinus parrae* (now *Endoxocrinus parrae*) (A.H. Clark, 1908; David et al. 2006). Almost a century after Parra, Pourtalès (1868) described the first comatulid from Cuban waters, *Antedon* (now *Crinometra*) *brevipinna*, collected during the first deep-sea dredging efforts in the western hemisphere (see also Arango & Molina, 1878). Subsequent operations carried out chiefly by U. S. Coast Survey Steamers in 1867-69 (Pourtalès, 1869, 1878a; Agassiz, 1878), the U.S. Fisheries Commission steamer Albatross in 1884 -1885, University of Iowa Bahamas Expedition (H.L. Clark, 1918), and the joint University of Havana-Harvard Atlantis Expeditions (1938-1939) (H. L. Clark, 1941) added 27 more species to the fauna (treated in detail in A.H. Clark 1931, 1940, 1947 & 1950; A.H. Clark & A.M. Clark. 1967). Since then, several catalogues of Cuban echinoderms including crinoids have been published (Suarez, 1974) and updated (Abreu, 1990, 1997; Abreu et al., 2000). Of two newer catalogues on the echinoderms of Cuba (Abreu et al. 2005; Del Valle et al. 2005), only the latter mentions shallow-water crinoids.

Crinoids as a group remain understudied in Cuban waters. However, substantial research has been carried out in adjacent areas, particularly in the Bahamas and Jamaica, that can be applied to the same taxa found in Cuban waters, e.g., Macurda & Meyer, (1974), Baumiller et al. (1997, 2008), Baumiller & Messing (2007), David et al. (1998), Featherstone et al. (1998), Llewellyn & Messing (1993), Messing (2003, 2004), Messing et al. (1990, 2007) on the ecology, growth, feeding, distribution and taphonomy of isocrinids; Meyer (1973a, b), Macurda (1973, 1975), Meyer & Macurda (1976), Macurda & Meyer (1977), on the ecology of shallow reef-dwelling comatulids, and observations on deep-water comatulids and stalked crinoids in the Bahamas (C.G. Messing, unpublished). As a result, this work creates a new, taxonomically updated list of all crinoids known from the Cuban Archipelago, incorporating current biological and ecological

data on included species, as well as information about the distribution, and bathymetric ranges where species are found in Cuban waters.

METHODOLOGY

Taxonomy has been updated following Messing (2001); Messing & White (2001); Roux et al. (2002) and David et al. (2006). We use the higher classification of Hess and Messing (2011). Marine collections in Cuba at the Marine Research Center (C.I.M), National Aquarium of Cuba (A.N.C), and the "Felipe Poey" Museum at the University of Havana (U.H), were checked for crinoid specimens. Acronyms are in Spanish because they are part of the catalogue codes. Species found in these collections are reported in the Remarks sections with their appropriate code. For species lacking any habitat information, station data for specimens in the collections of the Invertebrate Zoology Department, National Museum of Natural History, Smithsonian Institution, Washington, DC (abbreviated NMNH), were searched for co-occurring, habitat-forming invertebrates, particularly corals (i.e., Scleractinia, Stylasteridae and Octocorallia). The criterion for shallow vs. deep water was set at 60 m depth.

RESULTS

Of the approximately 50 currently recognized crinoid species from the tropical western Atlantic Ocean, 33 species (plus two subspecies) belonging to 20 genera in 11 families are currently known from Cuban waters. Ten species occur in shallow and the rest in deep waters.

List

Class CRINOIDEA Miller, 1821

Order ISOCRINIDA Sieverts-Doreck, 1952

Note: The genera and species in this order described below all have been placed in recent publications in the families Isocrinidae or Pentacrinitidae (e.g., Rasmussen & Sieverts-Doreck, 1978; David et al. 2006; Hemery et al. 2013). Here, we follow the classification of Hess

and Messing (2011).

Suborder ISOCRININA Sieverts-Doreck, 1953
 Family ISOCRINIDAE Gray, 1842
 Genus *Neocrinus* Thomson, 1864
Neocrinus decorus (Thomson, 1864)

References: Agassiz (1888); A.H Clark (1908); H.L Clark (1941); Suárez (1974); Meyer et al. (1978); Llewellyn & Messing (1993); Baumiller et al (1995); Messing (2004); Messing et al. (2007); Pawson et al. (2009).

Habitat: On hard substrates, sometimes within sediment settings, ranging from low-relief carbonate pavements to high-relief mounds, or rubble (Llewellyn & Messing 1993; Messing (2004); Messing et al. 2007; Pawson et al. (2009); has been observed crawling on sediment-veneered hard bottom (Baumiller and Messing 2007).

Distribution: Bahamas, Turks and Caicos Is., Antillean Arc from Cuba to Barbados, including Jamaica; Yucatán Channel and Providencia Island northeast of Venezuela.

Bathymetry: 154-1220 m (Meyer et al. 1978); direct observations from submersibles in the northern Bahamas recorded this species in 236-480 m with two isolated records in 518 and 536 m (Messing, unpublished).

Cuban localities: North coast of Havana off Baracoa beach, Matanzas' Bay in the North of Matanzas, and Cochinos Bay on the south coast of Matanzas (H.L Clark, 1941).

Neocrinus blakei (Carpenter, 1884)

References: Agassiz (1888); A.H Clark (1908); H.L Clark (1941); Suárez (1974); Meyer et al. (1978); Baumiller et al (1995); Pawson et al. (2009).

Habitat: Usually occurs on hard substrate, rubble (Pawson et al. 2009), but also in areas with a "soft sediment veneer" (Baumiller et al., 1995). Direct observations from submersibles found this species chiefly on low-relief pavements and

rubble between carbonate mounds (Messing et al., 1990).

Distribution: Bahamas, Antillean Arc from Cuba to Barbados, and Yucatán Channel.

Bathymetry: 220-650 m (Meyer et al., 1978), extended to 1200 m in Pawson et al. (2009).

Cuban localities: Coast of Cienfuegos and Northeast of Camagüey.

Family ISSELICRINIDAE Kikushin, 1977
 Subfamily DIPLOCROCRININAE Roux, 1981
 Genus *Cenocrinus* Thomson, 1864
Cenocrinus asterius (Linnaeus, 1767)

References: Arango & Molina (1878); Agassiz (1888); Hyman (1955); Suárez (1974); Macurda & Meyer (1974); Meyer et al. (1978); Pawson et al. (2009).

Habitat: On hard substrates including pavements (often sediment-veneered), mounds, ridges, Steep slopes and boulders (Meyer et al. 1978; Pawson et al. 2009; Messing, unpublished).

Distribution: Bahamas, Antillean Arc from Cuba to Barbados, including Jamaica and Grand Cayman Island; Roatán, Honduras (Meyer et al. 1978; Messing, unpublished).

Bathymetry: 140-585 m, common between 183-244 m (Meyer et al. 1978; Messing, unpublished).

Cuban localities: North coast of Havana (Arango & Molina, 1878).

Genus *Endoxocrinus* A.H Clark, 1908
Endoxocrinus parrae parrae [Gervais (in Guérin, 1835)]

References: Pourtalès (1869); Arango & Molina (1878); Agassiz (1888); A.H Clark (1908); H.L Clark (1941); Suárez (1974); Meyer et al. (1978); David et al. (2006); Pawson et al. (2009); Benavides-Serrato et al. (2011).

Habitat: Often in large numbers on low-relief (often-sediment-veneered) pavements, carbonate ridges, boulders and mounds (David et al. 2006; Messing et al. 2007; Pawson et al. 2009); has been observed crawling on sediment (Messing et al. 1988).

Distribution: Bahamas, Antillean Arc from Cuba to Barbados, including Jamaica; coast of Central and South America from the Yucatán Channel to San Luis, Brazil (David et al. 2006; Benavides-Serrato et al. 2011); records from Florida have never been substantiated.

Bathymetry: 154-518 m (David et al. 2006). This subspecies generally occurs in shallower water than *E. parrae prionodes* in the same geographic area.

Cuban localities: North coast of Havana (Pourtales, 1869, cited by Arango & Molina 1878; Agassiz, 1878). Maria la Gorda beach in the South of Pinar del Rio, Matanzas's Bay in the North coast of Matanzas and for the Northeast of Villa Clara (David et al. 2006).

Remarks: A.N.C-10.5.001 y 10.5.004; U.H-collection without any number or code.

Endoxocrinus parrae prionodes (H.L Clark, 1941)

References: H.L Clark (1941); Suárez (1974); David et al. (2006).

Note: A third subspecies, *E. parrae carolinae* (A.H. Clark, 1934) and an additional closely related species, *E. maclearanus* (Thomson, 1878), have not yet been recorded from Cuban waters but likely occur there given their wider Bahamas-to-Caribbean Sea distributions.

Habitat: On low-relief (often-sediment-veneered) pavements, carbonate ridges, boulders and mounds (Messing et al. 1990; David et al. 2006).

Distribution: Bahamas to the East of Hispaniola (David et al. 2006).

Bathymetry: 402-832 m (David, 1998 cited by

David et al. 2006). This subspecies generally occurs in deeper water than *E. parrae parrae* in the same geographic area.

Cuban localities: North coast of Villa Clara, Cochinos's Bay, Maria la Gorda beach in the South of Pinar del Rio, Baracoa Beach and Caibarien (H.L Clark.1941). But, taking into account that it is consider a subspecies, we can assume that was reported for the North coast of Havana by Pourtales (1869) cited by Arango & Molina (1878).

Remarks: A.N.C-10.5.005

ORDER COMATULIDA A.H Clark, 1908
Superfamily ATELECRINOIDEA Bather, 1899
Family ATELECRINIDAE Bather, 1898
Genus *Atelecrinus* Carpenter, 1881
Atelecrinus balanoides Carpenter, 1881

References: Agassiz (1888), A.H Clark (1908, 1954); A.H. Clark & A.M. Clark (1967); H.L Clark (1941); Suárez (1974); Meyer et al. (1978); Messing & Dearborn (1990); Pawson et al. (2009); Benavides-Serrato et al. 2011).

Habitat: On both sediment (foraminiferal ooze to rubble) and hard substrates (A.H. Clark & A.M. Clark. 1967; Messing & Dearborn. 1990; Pawson et al. 2009). NMNH collection data indicate that this species has been trawled with the mound-forming azooxanthellate scleractinian corals *Lophelia pertusa*, *Enallopsammia profunda* and *Madrepora oculata*, stylasterids, and diverse octocorals (Isididae, Chrysogorgiidae), although it may have been taken on adjacent sediment.

Distribution: Gulf of Mexico and Strait of Florida to Colombia and Venezuela, including the West Indies, but unknown from the Caribbean coast of Central America (Messing 2013).

Bathymetry: 512-838 m, but varying regionally; chiefly shallower than 700 m in the Gulf of Mexico, Strait of Florida and Bahamas, but chiefly deeper than 700 m in the Lesser Antilles.

Cuban localities: Nicholas Channel north of Sagua la Grande (Messing 2013).

Superfamily COMASTEROIDEA A.H Clark, 1908

Family COMASTERIDAE A.H Clark, 1908

Subfamily CAPILLASTERINAE A.H Clark, 1908

Genus *Davidaster* Hoggett and Rowe 1986

Davidaster discoideus (Carpenter, 1888)

References: A.H Clark (1931); Meyer (1973a, b); Macurda (1973, 1975); Suárez (1974); Meyer & Macurda (1976); Macurda & Meyer (1977); Meyer et al. (1978); Hendler et al. (1995); Del Valle et al. (2005); Pawson et al. (2009).

Habitat: Extends arms in a multidirectional posture with pinnules arranged in tetrads from crevices and under ledges chiefly on deeper portions of reefs, including the wall or among rubble (Hendler et al. 1995; Pawson et al. 2009).

Distribution: Gulf of Mexico, southeastern Florida, Bahamas, Turks and Caicos Is., Antillean Arc from Cuba to Barbados, including Grand Cayman, Jamaica, Curaçao, Bonaire; Central and South American coast from Yucatán to Colombia (Meyer et al. 1978).

Bathymetry: 0.6-100(?) m, common between 15-45 m (Macurda & Meyer, 1977; Hendler et al. 1995); generally deeper than *D. rubiginosus* where the two occur together, although their depth ranges overlap. Records from substantially deeper water (e.g., 355 m) are probably errors.

Cuban localities: off Havana province (A.H Clark, 1931).

Davidaster rubiginosus (Pourtalès, 1869)

References: H.L Clark (1901); Meyer (1973a, b); Macurda (1973, 1975); Meyer & Macurda (1976); Macurda & Meyer (1977); Espinosa et al. (1997); Del Valle et al. (2005); Pawson et al. (2009).

Habitat: Extends arms in a multidirectional posture with pinnules arranged in tetrads from crevices and under ledges on reefs, rubble and rocky substrates; more exposed in deeper water (Macurda & Meyer, 1977; Hendler et al. 1995;

Pawson et al. 2009).

Distribution: Southeastern Florida from Dry Tortugas to at least Fort Lauderdale, Bahamas, Turks and Caicos Is., western Gulf of Mexico; Antillean Arc from Cuba to Barbados and the Grenadines including Grand Cayman and Jamaica; coast of Central and South America from Belize to Bahia, Brazil (H.L. Clark, 1901; Meyer et al. 1978; Messing, unpublished observations).

Bathymetry: Common between 6-25 m; occasionally in as little as 1-3 m (Macurda & Meyer, 1977; Hendler et al. 1995); generally shallower than *D. discoideus*(?) where the two occur together, although their depth ranges overlap. The few records from substantially deeper water (e.g., 334 m) are probably errors.

Cuban localities: Gulf of Batabanó and west of Havana (H.L Clark, 1901; Espinosa et al. 1997).

Subfamily PHANOGENIINAE White et al. 2001

Genus *Neocomatella* A.H Clark, 1909

Neocomatella alata (Pourtalès, 1878a)

References: A.H Clark (1915), A.H Clark (1931); Suárez (1974).

Note: It is not certain whether *N. alata* and the following species, *N. pulchella*, both represent valid species, as some apparently intermediate specimens exist (Messing, unpublished).

Habitat: Clings to arborescent anthozoans such as the azooxanthellate scleractinian coral, *Madrepora carolina* (Messing, unpublished)..

Distribution: Bahamas, and from southern Cuba to Grenada (A.H Clark, 1931).

Bathymetry: 60-510 m (A.H Clark, 1931).

Cuban localities: North of Havana and south of Cuba (A.H Clark 1915, 1931)

Neocomatella pulchella (Pourtalès, 1878a)

References: A.H Clark (1908, 1931); Boone (1933); H.L Clark (1941); Suárez (1974); Meyer

et al. (1978); Del Valle et al. (2005); Pawson et al. (2009).

Habitat: Clings to arborescent anthozoans such as the azooxanthellate scleractinian coral, *Madrepora carolina* (Messing, unpublished).

Distribution: Southeastern Gulf de Mexico, Bahamas, Turks and Caicos Is.; Antillean Arc from north of Cuba to Grenada and Barbados; coast of Central America from Yucatán to Guanabara, Brazil (Meyer et al. 1978).

Bathymetry: 10-567 m (possibly as deep as 695 m) (Meyer et al., 1978).

Cuban localities: North of Havana (A.H. Clark, 1931; Boone, 1933). Cochinós Bay, Baracoa Beach and Matanzas Bay in the North-Oriental Zone (H.L. Clark, 1941).

Subfamily **insertae sedis**

Genus *Comactinia* A.H Clark, 1909

Comactinia echinoptera (Müller, 1840)

References: A.H Clark (1908, 1931); Suárez (1974); Messing (1978); Meyer et al. (1978); Hendler et al. (1995); Pawson et al. (2009).

Habitat: Cryptic during the day on coral reefs, with calcareous algae, and in rocky crevices; extends arms with pinnules arranged in a single plane from crevices at night (Hendler et al. 1995; Pawson et al. 2009).

Distribution: Southeastern Florida, Bahamas; Caribbean Sea and South America as far south as Cabo Frio, Brazil (Meyer et al. 1978).

Bathymetry: 2-92 m (Messing & Dearborn, 1990).

Cuban localities: North of Havana (A.H Clark, 1931).

Comactinia meridionalis hartlaubi Messing, 1978

References: Messing (1978); Meyer et al. (1978); Pawson et al. (2009).

Habitat: Clings to hard substrates, often with calyx hidden in a crevice, and with pinnules

arranged in a single plane on each arm (Pawson et al. 2009; Messing, unpublished).

Distribution: Gulf de Mexico, Bahamas, Lesser Antilles, Central America and Colombian Caribbean coast (Meyer et al. 1978).

Bathymetry: 58-373 m (possibly 46-549 m) (Meyer et al., 1978).

Cuban localities: North of Cuba (Meyer et al. 1978).

Comactinia meridionalis meridionalis (Agassiz, 1865)

References: A.H Clark (1931); Messing (1978); Meyer et al. (1978); Pawson et al. (2009).

Habitat: Coral reefs, associated with crevices, among calcareous algae or rubbles (Hendler et al. 1995; Pawson et al. 2009).

Distribution: Gulf of Mexico, Bahamas, Lesser Antilles, Central America and Colombian Caribbean coast (Meyer et al. 1978).

Bathymetry: 3-190 m (possibly to 508 m); apparently no shallower than 50 m in the Strait of Florida (Meyer et al. 1978).

Cuban localities: North of Cuba (Meyer et al. 1978).

Genus *Comissia* A.H Clark, 1909

Comissia venustus A.H Clark, 1909

References: A.H Clark (1931); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Note: Formerly known as *Leptonemaster venustus*.

Habitat: Rocky substrates; white, yellow and quartz sands, also between coral fragments, shells and rubble (A.H Clark, 1931; Pawson et al. 2009).

Distribution: Southeastern Gulf of Mexico, Bahamas, Caribbean Sea from the north coast of Cuba to Barbados and Grenada, including Jamaica, and Central America and Colombian Caribbean coast from Honduras to Trinidad and

Tobago (A.H Clark 1931, 1954; Meyer et al., 1978).

Bathymetry: 24-236 m (possibly to 549 m); deeper than 100 m in the Strait of Florida; shallower off northern South America and Panamá (Meyer et al. 1978).

Cuban localities: Off Havana (A.H Clark 1931; H.L Clark, 1941; Meyer et al. 1978).

SuperFamily MARIAMETROIDEA A.H Clark, 1909

Family COLOBOMETRIDAE A.H Clark, 1909

Genus *Analcidometra* A.H Clark, 1909

Analcidometra armata (Pourtalès, 1869)

References: A.H Clark (1908, 1947); Suárez (1974); Pawson et al. (2009).

Habitat: Typically clings to octocorals with narrow branches (e.g., Pseudopterogorgia species) (occasionally macroalgae) most commonly on coral reefs, in areas with moderate, steady currents on slope breaks and edges of forereef escarpments (Macurda & Meyer, 1977; Hendler et al. 1995; Pawson et al. 2009).

Distribution: Gulf of Mexico, Dry Tortugas, Bahamas, and throughout the Caribbean Sea including the Central American coast from Honduras to Guyana (A.H Clark 1947 & 1954; Meyer et al. 1978).

Bathymetry: 3-153 m, but relatively abundant between 50-70 m (Hendler et al. 1995).

Cuban localities: Both coasts of Cuba (A.H Clark, 1908).

Super Family TROPIOMETROIDEA A.H Clark, 1908

Family CHARITROMETRIDAE A.H Clark, 1911

Genus *Crinometra* A.H Clark, 1909

Crinometra brevipinna (Portalès, 1867)

References: Portalès (1869); A.H Clark (1908, 1909, 1950, 1954); H.L Clark (1941); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Note: *Crinometra brevipinna* is a widely variable species that includes 19 sculptural varieties, nine of which were originally described as separate species. Seven have been recorded from Cuba: *C. b. brevipinna*, *C. b. concinna*, *C. b. diadema*, *C. b. granulifera*, *C. b. insculpta*, *C. b. margaritacea*, *C. b. pulchra* and *C. b. gemmatafs*. All 19 are formally treated as subspecies under the International Code of Zoological Nomenclature, but because their identities and boundaries remain unclear, they are not distinguished here.

Habitat: On hard substrates and epifaunal on sponges and corals (Pawson et al. 2009; Messing, unpublished).

Distribution: Northern and eastern Gulf of Mexico, southeastern Florida, Bahamas, throughout the Caribbean Sea from Cuba to Barbados and Grenada, and Central and South American coasts to Rio Grande do Sul, Brazil (Meyer et al. 1978).

Bathymetry: 95-731 m (possibly 69-1097 m); chiefly in 500-600 m in the Strait of Florida (Meyer et al., 1978).

Cuban localities: North of Havana (Portalès, 1869); also off Baracoa Beach, Matanzas Bay, off Varadero Beach, north of Villa Clara, Gulf of Batabanó, East of Tanamo Port, Cienfuegos and Cochinos Bay (H.L Clark, 1941).

Remarks: A.N.C-10.5.002 and 10.5.003.

Family THALASSOMETRIDAE A.H Clark, 1908

Genus *Horaeometra* A.H Clark, 1918

Horaeometra duplex (Carpenter, 1888)

References: A.H Clark (1908, 1950); H.L Clark (1941); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Habitat: Epibenthic (Pawson et al. 2009).

Distribution: Bahamas; Antillean Arc from the north coast of Cuba to Grenada (Meyer et al. 1978).

Bathymetry: 159-567 m (possibly 159-575 m) (Meyer et al. 1978).

Cuban localities: North coast of Havana, Caibarien and Matanzas Bay (H.L. Clark, 1941).

Genus *Stylometra* A.H. Clark, 1908

Stylometra spinifera (Carpenter, 1881)

References: Agassiz (1888); Boone (1928); A.H. Clark (1908, 1950, 1954); H.L. Clark (1941); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Habitat: Arranges its arms in a parabolic filtration fan similar to those of co-occurring isocrinids, and clings to arborescent anthozoans such as the azooxanthellate scleractinian coral, *Madrepora carolina*, and the stalks of the isocrinid *Neocrinus decorus* (Messing, unpublished).

Distribution: Gulf of Mexico, Bahamas, Cuba, Dominican Republic, Jamaica, and the coast of Central and South America from Belize to Cabo Cordera, Venezuela (Meyer et al. 1978).

Bathymetry: 102-439 m; shallower records (55-58.5 m off Cape Canaveral, Florida, and a few substantially deeper dredging records (≥ 475 m) are likely errors; the great majority of records fall between 150 and 384 m (A.H. Clark, 1950; Meyer et al., 1978).

Cuban localities: North coast of Havana (H.L. Clark, 1918 cited by A.H. Clark 1950) and Matanzas's Bay (H.L. Clark, 1941).

Superfamily ANTEDONOIDEA Norman, 1865

Family ANTEDONIDAE Norman, 1865

Subfamily ANTEDONINAE A.H. Clark, 1909

Genus *Antedon* Fremenville, 1811

Antedon nuttingi (A.H. Clark, 1936)

References: Agassiz (1888); A.H. Clark (1908, 1910, 1940, 1954); H.L. Clark (1941); A.H. Clark & A.M. Clark (1967); Hyman (1955); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Habitat: On hard substrates (Pawson et al. 2009).

Distribution: North of Cuba and Barbados (Meyer et al. 1978).

Bathymetry: 364-429 m (Meyer et al. 1978).

Cuban localities: Punta Alegre on the North coast of Camagüey (H.L. Clark, 1941) and north coast of Havana (A.H. Clark & A.M. Clark, 1967).

Subfamily BATHYMETRINAE A.H. Clark, 1908

Genus *Trichometra* A.H. Clark, 1908

Trichometra cubensis (Pourtalès, 1869)

References: Arango & Molina (1878); A.H. Clark (1908, 1941, 1954); A.H. Clark & A.M. Clark (1967); H.L. Clark (1941); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Habitat: Clinging to arborescent cnidarians or hard substrates (Messing & Dearborn, 1990; Pawson et al. 2009).

Distribution: Northeastern Gulf of Mexico, Bahamas, Antillean Arc from the north coast of Cuba to Saint Vincent, Central and South American coasts from the Yucatán Channel to Colombia. North Atlantic records from Nova Scotia, Davis Strait, south of Iceland and West of the Faeroe Islands probably represent a separate species (Meyer et al. 1978; Messing & Dearborn, 1990; Messing, unpublished).

Bathymetry: 210-1162 m (possibly 177-1200 m); deeper records (to 2193 m) are from the North Atlantic (Meyer et al. 1978).

Cuban localities: North coast of Havana (Pourtalès, 1869 cited by Arango & Molina, 1878; Agassiz, 1878).

A.H. Clark & A.M. Clark

Subfamily PEROMETRINAE A.H. Clark, 1909

Genus *Hypalometra* A.H. Clark, 1908

Hypalometra defecta (Carpenter, 1888)

References: A.H. Clark (1908, 1940); A.H. Clark & A.M. Clark (1967); Suárez (1974); Meyer et al. (1978).

Habitat: A.H. Clark & A.M. Clark (1967)

indicate that most Albatross specimens from off Havana were collected with "coral". Co-occurring habitat-forming invertebrates (in the NMNH collection) that *H. defecta* might cling to include the scleractinian coral *Madrepora carolina*, the stylasterids *Distichopora* spp. and *Stylaster* spp., and a variety of chiefly plexaurid octocorals.

Distribution: Bahamas, Cuba, southeast of Hispaniola, Central and South American coast from Yucatán Channel to French Guiana (Meyer et al. 1978).

Bathymetry: 60-386 m; southern Caribbean records are chiefly < 100 m (Meyer et al. 1978)

Cuban localities: North coast of Havana (A.H. Clark. 1908).

Subfamily THYSANOMETRINAE A.H. Clark, 1909

Genus *Coccometra* A.H. Clark, 1900

Coccometra guttata A.H. Clark, 1918

References: A.H. Clark & A.M. Clark (1967); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009); Benavides-Serrato et al. (2011).

Habitat: On hard substrates (Pawson et al. 2009).

Distribution: Southeastern coast of Cuba, U.S. Virgin Is., Grenadines, and Caribbean coast of Colombia (A.H. Clark & A.M. Clark 1967; Benavides-Serrato et al. 2011).

Bathymetry: 288-480 m (Meyer et al. 1978).

Cuban localities: Off Santiago de Cuba (A.H. Clark & A.M. Clark, 1967).

Coccometra hagenii (Pourtalès, 1867)

References: Agassiz (1888); A.H. Clark (1908, 1954); H.L. Clark (1933); A.H. Clark & A.M. Clark (1967); Suárez (1974); Meyer et al. (1978).

Habitat: On rocky substrates (Messing & Dearborn, 1990).

Distribution: North Carolina, south of the

Florida Keys, north coast of Cuba, Yucatan and Campeche Bank; abundant on the Pourtalès Terrace south of the Florida Keys (A.H. Clark & A.M. Clark, 1967).

Bathymetry: 14-1046 m; chiefly in 150-250 m off Florida; 323-442 m off Cuba; the two deepest records (805 and 1046 m) are from the Blake Plateau (A.H. Clark & A.M. Clark, 1967; Meyer et al. 1978).

Cuban localities: North coast of Havana (Agassiz, 1888, Meyer et al. 1978; Agassiz 1868 cited by A.H. Clark & A.M. Clark, 1967).

Coccometra nigrolineata A.H. Clark, 1908

References: A.H. Clark (1908, 1954); A.H. Clark & A.M. Clark (1967); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Habitat: On hard substrates (A.H. Clark & A.M. Clark, 1967; Pawson et al. 2009). Common co-occurring habitat-forming invertebrates associated with *C. nigrolineata* (based on NMNH collections) include the scleractinian coral *Madrepora carolina*, the stylasterids *Distichopora* spp. and *Stylaster* spp., and a variety of chiefly plexaurid and primnoid octocorals.

Distribution: Bahamas, North coast of Cuba, Jamaica, Puerto Rico, and Yucatán Channel (Meyer et al. 1978; Messing, unpublished).

Bathymetry: 165-373 m. A record from 987 m off Cuba and one from 42 m off Jamaica are both based on fragmentary material and likely erroneous. Two records from Arrowsmith Bank on the Mexican side of the Yucatán Channel (40-165 m and 210-293 m) reflect the shoaling of isotherms from east to west across the Yucatán Current (A.H. Clark & A.M. Clark. 1967; Meyer et al. 1978; Messing, unpublished).

Cuban localities: Cojimar, north coast of Havana (A.H. Clark & A.M. Clark, 1967).

Subfamily incertae sedis

Genus *Caryometra* A.H. Clark, 1936

Caryometra alope A.H. Clark, 1940

References: A.H. Clark (1940, 1954); A.H. Clark & A.M. Clark (1967); H.L. Clark (1941); Suárez (1974); Pawson et al. (2009).

Habitat: On hard substrates (Pawson et al. 2009).

Distribution: Only known from the north coast of Cuba (A.H. Clark & A.M. Clark, 1967).

Bathymetry: 338-777 m (A.H. Clark & A.M. Clark, 1967)

Cuban localities: North of Camagüey, Ciego de Ávila, Santis Spíritus, Villa Clara, Matanzas Bay and Cochinos Bay (H.L. Clark, 1941).

Caryometra atlantidis A.H. Clark, 1940

References: A.H. Clark (1940, 1954); A.H. Clark & A.M. Clark (1967); H.L. Clark (1941) Suárez (1974); Benavides-Serrato et al. (2011).

Habitat: The delicate cirri, which taper to a point without an opposing spine, suggest that this species may occur on sediment bottoms as well as hard substrates, as does *Atelecrinus*, which has similarly tapered cirri.

Distribution: Bahamas, north coast of Cuba, Arrowsmith bank in the Yucatán Channel, Colombia (A.H. Clark & A.M. Clark, 1967; Benavidades-Serrato et al. 2011).

Bathymetry: 366-530 m A.H. Clark & A.M. Clark, 1967).

Cuban localities: Cochinos Bay, Punta Alegre, Caibarién and Santaren Channel in Villa Clara and the north coast of Camagüey (A.H. Clark & A.M. Clark, 1967).

Caryometra lisa A.H. Clark, 1940

References: A.H. Clark (1940, 1954); H.L. Clark (1941); A.H. Clark & A.M. Clark (1967); Suárez (1974); Pawson et al. (2009).

Habitat: On hard substrates (Pawson et al. 2009). The only other organism collected at the single station from which this species is known is a hydroid, *Aglaophenia octocarpa* Nutting.

Distribution: Only reported for Cuba.

Bathymetry: 713 m.

Cuban localities: One locality, close to the Port of Puerto Sagua la Grande, Nicholas Channel, in Villa Clara (A.H. Clark & A.M. Clark, 1967).

Caryometra monilicirra A.H. Clark, 1940

References: A.H. Clark (1940, 1954); A.H. Clark & A.M. Clark (1967); H.L. Clark (1941); Suárez (1974).

Habitat: Probably on hard substrates considering morphological similarities of the genus.

Distribution: Only known from Cuba (A.H. Clark & A.M. Clark, 1967).

Bathymetry: 446 m (A.H. Clark & A.M. Clark, 1967).

Cuban localities: Off Caibarién (H.L. Clark, 1941) in Villa Clara and also in Los Canarreos (Lalana et al. 2004).

Caryometra spinosa A.H. Clark, 1940

References: A.H. Clark (1940, 1954); A.H. Clark & A.M. Clark (1967); H.L. Clark (1941); Suárez (1974).

Habitat: Probably on hard substrates considering morphological similarities of the genus.

Distribution: Only collected in Cochinos Bay, province of Matanzas, South coast of Cuba.

Bathymetry: 338-484 m (A.H. Clark & A.M. Clark, 1967).

Caryometra tenuipes (A.H. Clark, 1936)

References: A.H. Clark (1908, 1940, 1954); A.H. Clark & A.M. Clark (1967); H.L. Clark (1941); Suárez (1974); Pawson et al. (2009).

Habitat: On hard substrates (A.H. Clark & A.M. Clark, 1967; Pawson et al. 2009). NMNH collection data indicates that *C. tenuipes* was collected with the scleractinian coral *Madrepora*

carolina.

Distribution: Caribbean Sea from the north coast of Cuba to Puerto Rico (A.H. Clark & A.M. Clark, 1967).

Bathymetry: 386-914 m; possibly as shallow as 165 m (A.H. Clark & A.M. Clark, 1967).

Cuban localities: North coast of Havana (A.H. Clark & A.M. Clark, 1967).

Suborder BOURGETICRININA Sieverts-Doreck, 1953

Family BATHYCRINIDAE Bather, 1899

Genus *Monachocrinus* A.H. Clark, 1917

Monachocrinus caribbeus (A.H. Clark, 1908)

References: A.H. Clark (1908, 1910, 1954); H.L. Clark (1941); Suárez (1974); Pawson et al. (2009).

Habitat: Attached to rock pavements and slopes (Messing, unpublished); recorded as hard substrate in mud by Pawson et al. (2009).

Distribution: Gulf of Mexico, Bahamas, Antillean Arc from Cuba to Barbados, Bonaire, Curaçao; coast of Central and South America from Yucatán to Colombia (Meyer et al. 1978; unpublished NMNH records).

Bathymetry: 641-1857 m (possibly as shallow as 421 m) (Meyer et al. 1978; unpublished NMNH records).

Cuban localities: Punta Lucrecia in the South coast of the Oriental zone (H.L. Clark, 1941).

Family BOURGUETICRINIDAE Loriol, 1882

Genus *Democrinus* Perrier, 1883

Democrinus rawsonii (Pourtalès, 1874)

References: Agassiz (1888); A.H. Clark (1909, 1954); H.L. Clark (1941); Suárez (1974); Messing (2004).

Habitat: Anchors via rootlike radix on carbonate sediment; radix sometimes expanded as a holdfast suitable for attachment to hard substrates (Messing, 2004).

Distribution: Bahamas, Antillean Arc from Cuba to Barbados; coast of Central and South America from the Yucatán Bank to Panamá and Guyana (Meyer et al. 1978).

Bathymetry: 66-652 m (Meyer et al. 1978). The record from 66 m may be an error; most records are from between 100 and 200 m (Meyer et al. 1978; Messing, unpublished).

Cuban localities: North coast of Havana (Agassiz, 1878) and Cochino's Bays, in the South of Matanzas (H.L. Clark, 1941).

Democrinus conifer (A.H. Clark, 1909)

References: A.H. Clark (1909); H.L. Clark (1941); Tommasi (1969); Suárez (1974); Meyer et al. (1978); Pawson et al. (2009).

Note: It is likely that this species and *Democrinus brevis* (A.H. Clark, 1909) are synonyms; the ranges given here include both (Meyer et al., 1978).

Habitat: Anchors via rootlike radix on sediment (Messing & Dearborn, 1990) Pawson et al. (2009) list it as hard substrates in mud.

Distribution: Blake Plateau, Gulf of Mexico, Bahamas, Antillean Arc from Cuba to Grenada, including Jamaica; coast of Central and South America from Honduras to San Luis, Brazil (Meyer et al. 1978).

Bathymetry: 170-1750 m (possibly as shallow as 119 m); most records are shallower than 1000 m (Meyer et al., 1978; Messing & Dearborn, 1990).

Cuban localities: Nicholas Channel, in the western part of the Sabana-Camaguey archipelago (H.L. Clark, 1941).

Order CYRTOCRINIDA Sieverts-Doreck, 1952

Suborder HOLOPODINA, Arendt, 1974

Family HOLOPODIDAE Zittel, 1879

Genus *Cyathidium* Steenstrup, 1847

Cyathidium pourtalesi Améziane,

Bourseau, Heinzeller, Roux, 1999

References: Pourtalès, 1878b; Améziane et

al.1999).

Note: This species was originally described as the young of another cyrtocrinid, *Holopus rangii* d'Orbigny, 1837, which occurs in both the Bahamas and Caribbean Sea, although it has not yet been recorded from Cuban waters.

Habitat: On vertical and overhanging rock walls, boulders and escarpments protected from sediment deposition (Messing, unpublished).

Distribution: Bahamas, north coast of Cuba off Bahía Honda, Jamaica, NE of the Dominican Republic (Améziane et al. 1999).

Bathymetry: 171-249 m (Améziane et al. 1999).

Cuban localities: Bahía Honda, off the north coast of Pinar del Río (Pourtalès, 1878b; Améziane et al. 1999).

DISCUSSION

This work reviews the Cuban crinoid fauna in order to update current information available for the region. A lack of specialists in this relatively poorly-studied group has left a gap of information for future researchers which we here attempt to rectify. Here we report locations of the specimens in the marine collections of the country in order to facilitate future work. Most specimens have been collected from waters off the northern coast; substantial work remains to be carried out along the southern coast and in shallow waters around the entire island before a better understanding of the Cuban crinoid fauna can be reached. Such work will also increase the availability of crinoids in local marine collections.

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Cincinnati.

RESUMEN

Teniéndose en cuenta la clasificación taxonómica más contemporánea y la necesidad de actualización del tema, presentamos el catálogo de los crinoideos de Cuba, grupo de equinodermos conocidos como lirios y plumas de mar. Se revisó el material existente en las colecciones marinas cubanas y la literatura referente al tema. Para cada una de las especies, se ofrecen el tipo de hábitat, la distribución y batimétrica, así como las localidades en Cuba donde estas han sido reportadas. Se registran un total de 33 especies (25 comatúlidos y 8 pedunculados) distribuidas en cuatro de los cinco órdenes vivientes que conforman la Clase Crinoidea. De éstas, solo diez habitan en la zona nerítico-bentónica de la plataforma cubana, todas pertenecientes al grupo de los comatúlidos, y las restantes habitan por debajo de los 60 metros de profundidad.

Palabras clave: equinodermos, crinoideos, lirios de mar, sistemática, Cuba

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