A literature review of the Ophiuroidea (Echinodermata) from the Pacific coast of Mexico

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Received 30-V-2014. Corrected 03-X-2014. Accepted 17-XI-2014.

Abstract: Despite the important effort of knowing the Ophiuroidea diversity in the Mexican Pacific, some mistakes in the taxonomic nomenclature have pervaded through time. In order to clarify the latter, a checklist based on literature review of brittle stars from the Mexican Pacific is provided. We reviewed a total of 105 references that in total summarized 125 species of brittle stars from the Mexican Pacific (112) and the Gulf of California (97), belonging to two orders, 16 families and 50 genera. These records are higher than those reported on previous studies carried out in the area. México is the country with the highest number of brittle stars reported in the Tropical Eastern Pacific; this may be due to its exceptional oceanographic conditions, location and coastline extension. However, a total of 27 species reported in the literature were considered doubtful due to their general distributions and were not included in the checklist. Of the reported species, 35 have their type locality in the Mexican Pacific, corroborating the importance of the country in the Tropical Eastern Pacific in terms of Echinodermata diversity. Rev. Biol. Trop. 63 (Suppl. 2): 37-47. Epub 2015 June 01.

Key words: Brittle stars, bibliographic references, checklist, distribution, valid names.

The Mexican Pacific coast comprises the Gulf of California and a total of 11 States distributed in a coast line of approximately 8 000 km (Instituto Nacional de Estadística y Geografía, 2012). The area is very complex, it can present a great range of depths (up to 5 000 m), high values of productivity, and a large number of ecosystems such as submarine canyons, islands, rocky and sandy coast, coast lagoons, estuaries, coral reefs and mangroves, therefore the zone holds a high marine biodiversity (Wilkinson et al., 2009).

The study of the Ophiuroidea in the Mexican Pacific coast started during the nineteenth century when Lyman (1860) reported for the first time ophiuroids (*Ophiocoma alexandri*, *Ophioderma teres*, *Ophionereis annulata*) from the Mexican Pacific waters. During this century, the first expedition, the *Albatross* (1891) was conducted in some areas from the Mexican Pacific (Gulf of California, Marías Islands, Acapulco), and produced the important work of Lütken and Mortensen (1899), who described a large number of new brittle stars unknown to science. Following the former work, several other pioneering studies were conducted during this century, special mention deserve the works of Lyman (1865, 1882), Verrill (1867a, 1867b,

1867c, 1868, 1869, 1871a, 1871b), and Ives (1889a, 1889b).

The twentieth century was by far, the most productive in terms of published works and expeditions. In 1911 the expedition *Albatross* was carried out in the Gulf of California (mostly in San Francisquito Bay), a total of 34 species of brittle stars were collected and later reported in Clark (1913, 1923). The second oceanographic expedition of the *Pawnee* (1926) took place in the Gulf of California (Boone, 1926). In the 1930´s, several expeditions were carried out: *Zaca* in the Gulf of California and Clarion Island (1936; Ziesenhenne, 1937), *Zaca* in Baja California, Jalisco, Guerrero and Oaxaca (1937-1938; H.L. Clark, 1940), the Presidential Cruise in the Gulf of California (1938; A.H. Clark, 1939), and *Velero III* in the Gulf of California, Baja California, Jalisco, Guerrero and Oaxaca (1934-1939; Ziesenhenne, 1940). In 1940, an expedition of the *Western Flyer* in the Gulf of California was carried out (Steinbeck & Ricketts, 1941). By the end of the century, studies conducted by national scientific begun to increase, thus contributing largely to the knowledge of Ophiuroidea in the area (*i.e.* Caso 1951, 1962, 1979, 1983, 1986a, 1986b, 1992; Pacheco-Ruíz & Aguilar-Rosas, 1982; Salcedo-Martínez et al., 1988; Buitrón-Sánchez & Solís-Marín, 1993; Caso et al., 1996; Solís-Marín et al., 1997; Cintra-Buenrostro et al., 1998).

As opposed to the XX century, the current one is characterized by major contributions of Mexican scientist regarding a wide variety of topics such as ecology (Benítez-Villalobos, 2001; Zamorano & Leyte, 2005; Gonzáles-Medina et al., 2006), inventories of species (Solís-Marín et al., 2005; Honey-Escandón et al., 2008; Ríos-Jara et al., 2008a, 2008b, 2013; López-Uriarte et al., 2009; Hendrickx, 2012; Granja-Fernández et al., 2014), new distribution records (Frontana-Uribe et al., 2000; Hernández-Herrejón et al., 2010; Granja-Fernández & López-Pérez, 2011; Herrero-Pérezrul et al., 2014), potential distribution (Ayala-Bocos et al., 2011), symbiosis (Granja-Fernández et al., 2013), and reproduction (Benítez-Villalobos et al., 2012).

The major effort of knowing the biodiversity of brittle stars in the Mexican Pacific has provided a large amount of information (*i.e*. substrata, depths, distribution records), and remarkable contributions have summarized the information about ophiuroids from the Mexican Pacific (Buitrón-Sánchez & Solís-Marín, 1993; Solís-Marín et al., 2005; Honey-Escandón et al., 2008; Hendrickx, 2012; Solís-Marín et al., 2013). Despite the valuable effort, differences in nomenclature have persisted over time thus hampering the knowledge of the brittle stars in the Mexican Pacific. Therefore, the main goal of the present contribution is to provide an up to date checklist of the valid names of brittle stars and their distribution in the Mexican Pacific, based on literature review.

MATERIALS AND METHODS

Species names of Ophiuroidea recorded in scientific publications concerning the Mexican Pacific region were compiled. Species names were assigned to any of the following areas: the Gulf of California (GF), Baja California (Pacific coast) (BC), Baja California Sur (Pacific coast) (BCS), Nayarit (NAY), Marías Islands (MAR), Isabel Island (ISA), Jalisco (JAL), Colima (COL), Revillagigedo Islands (REV), Michoacán (MICH), Guerrero (GRO), Oaxaca (OAX) and Chiapas (CHIS). When the literature did not mention a specific geographic site for a species, we assigned the record to the Mexican Pacific (MP).

The complete list of consulted literature includes about 105 references (1860-2014). Among the most relevant references are Lütken and Mortensen (1899), Clark (1913, 1915, 1940), Ziesenhenne (1937, 1940), Caso (1951, 1962, 1979, 1986a, 1986b, 1992), Downey (1969), Buitrón-Sánchez and Solís-Marín (1993), Maluf and Brusca (2005), Solís-Marín et al. (2005), Honey-Escandón et al. (2008), Hendrickx (2012), Solís-Marín et al. (2013) and Granja-Fernández et al. (2014). The checklist is

based solely on data reported in the literature and no specimens were examined.

The checklist represents a list of species currently considered as valid. Systematics arrangements follow the criteria of Smith et al. (1995) and Okanishi and Fujita (2013). Meanwhile, valid names agree with Stöhr et al. (2014).

RESULTS

Table 1 shows the list of the valid names of brittle stars and their distribution in the Mexican Pacific. For this area, the checklist contains 125 species belonging to two orders, 16 families and 50 genera. The families with the highest number of species were Amphiuridae (37), Ophiacanthidae (18), and Ophiuridae (14), but the families Asteroschematidae, Ophiomyxidae, Hemieuryalidae, Amphilepididae and Ophiochitonidae were represented by one species.

The Gulf of California was the zone with the highest number of species (97), followed by the Pacific coast of Baja California Sur (57), the Pacific coast of Baja California (48),

TABLE 1
List of valid species and geographical distribution of the Ophiuroidea from the Mexican Pacific, based on literature review

Phylum Echinodermata Brugiére, 1791
Class Ophiuroidea Gray, 1840
Order Euryalida Lamarck, 1816
- Family Asteroschematidae Verrill, 1899
  - ***Asteroschema sublaeve*** Lütken & Mortensen, 1899 **GC, MAR**
- Family Asteronychidae Verrill, 1899
  - ***Asteronyx excavata*** Lütken & Mortensen, 1899 **GC, BC, BCS, MAR**
  - ***Asteronyx longifissus*** Döderlein, 1927 **BCS, GRO**
  - ***Asteronyx loveni*** Müller & Troschel, 1842 **GC, BC, BCS**
- Family Gorgonocephalidae Ljungman, 1867
  - ***Astrocaneum spinosum*** (Lyman, 1875) **GC, BCS, MAR**
  - ***Astrodictyum panamense*** (Verrill, 1867) **GC, BCS, REV**
  - ***Gorgonocephalus eucnemis*** (Müller & Troschel, 1842) **BC**

Order Ophiurida Müller & Troschel, 1840
- Family Ophiomyxidae Ljungman, 1867
  - ***Ophiomyxa panamensis*** Lütken & Mortensen, 1899 **GC, BC, BCS, REV, GRO**
- Family Ophiacanthidae Ljungman, 1867
  - ***Ophiacantha bathybia*** H.L. Clark, 1911 **BC**
  - ***Ophiacantha cosmica*** Lyman, 1878 **GC**
  - ***Ophiacantha costata*** Lütken & Mortensen, 1899 **GC, MAR**
  - ***Ophiacantha diplasia*** H.L. Clark, 1911 **GC, BC, REV**
  - ***Ophiacantha eurypoma*** H.L. Clark, 1911 **MP**
  - ***Ophiacantha hirta*** Lütken & Mortensen, 1899 **GC, MAR**
  - ***Ophiacantha moniliformis*** Lütken & Mortensen, 1899 **GC, BCS, MAR, REV, GRO**
  - ***Ophiacantha normani*** Lyman, 1879 **GC, BC, BCS**
  - ***Ophiacantha pacifica*** Lütken & Mortensen, 1899 **PM**
  - ***Ophiacantha phragma*** Ziesenhenne, 1940 **GC, BC**
  - ***Ophiacantha pyriformis*** Ziesenhenne, 1937 **REV**
  - ***Ophiacantha quadrispina*** H.L. Clark, 1917 **GC**
  - ***Ophiacantha rhachophora*** H.L. Clark, 1911 **GC, BCS**
  - ***Ophiacantha sentosa*** Lyman, 1878 **GC, PM**
  - ***Ophiolimna bairdi*** (Lyman, 1883) **GC, BC**
  - ***Ophiomitra granifera*** Lütken & Mortensen, 1899 **GC, BC, MAR**
  - ***Ophiomitra partita*** Lütken & Mortensen, 1899 **GC, MAR**
  - ***Ophiotreta valenciennesi*** (Lyman, 1879) **GC**
- Family Hemieuryalidae Verrill, 1899
  - ***Amphigyptis perplexa*** Nielsen, 1932 **GC**

Family Ophiuridae Müller & Troschel, 1840
Amphiophiura oligopora (H.L. Clark, 1913) **GC**
Amphiophiura superba (Lütken & Mortensen, 1899) **GC, BCS, GRO**
Gymnophiura mollis Lütken & Mortensen, 1899 **GC, MAR**
Ophiernus adspersus annectens Lütken & Mortensen, 1899 **GC, BCS, MAR, GRO**
Ophiocten hastatum Lyman, 1878 **BC, BCS**
Ophiomisidium leurum Ziesenhenne, 1940 **OAX**
Ophiura bathybia H.L. Clark, 1911 **BC, BCS**
Ophiura flagellata (Lyman, 1878) **GC, BCS**
Ophiura leptoctenia H.L. Clark, 1911 **BC**
Ophiura luetkenii (Lyman, 1860) **GC, BC**
Ophiura sarsii Lütken, 1855 **MP**
Ophiura (Ophiura) scutellata (Lütken & Mortensen, 1899) **GC, MAR**
Ophiura (Ophiuroglypha) irrorata irrorata (Lyman, 1878) **GC, BCS, MAR, OAX**
Stegophiura ponderosa (Lyman, 1878) **GC, OAX**
Family Amphilepididae Matsumoto, 1915
Amphilepis patens Lyman, 1879 **GC, BC, BCS**
Family Amphiuridae Ljungman, 1867
Amphichondrius granulatus (Lütken & Mortensen, 1899) **GC, BC, GRO, OAX**
Amphichondrius laevis Ziesenhenne, 1940 **GC, BC, BCS, JAL, OAX**
Amphiodia assimilis (Lütken & Mortensen, 1899) **MAR**
Amphiodia occidentalis (Lyman, 1860) **GC, BC, NAY**
Amphiodia periercta H.L. Clark, 1911 **MP**
Amphiodia platyspina Nielsen, 1932 **GC, NAY, GRO**
Amphiodia psara H.L. Clark, 1935 **GC, GRO**
Amphiodia sculptilis Ziesenhenne, 1940 **GC, JAL, GRO, OAX**
Amphiodia tabogae Nielsen, 1932 **GC, GRO**
Amphiodia violacea (Lütken, 1856) **GC, NAY**
Amphiodia (Amphispina) digitata Nielsen, 1932 **GC, BC, NAY**
Amphiodia (Amphispina) urtica (Lyman, 1860) **GC, BC, NAY, MAR, OAX**
Amphioplus (Amphioplus) strongyloplax (H.L. Clark, 1911) **GC, BC**
Amphioplus (Unioplus) daleus Lyman, 1879 **BC, BCS**
Amphipholis elevata Nielsen, 1932 **GC, MAR**
Amphipholis pugetana (Lyman, 1860) **GC, BC, BCS, NAY**
Amphipholis squamata (Delle Chiaje, 1828) **GC, BC, BCS, GRO, OAX**
Amphiura arcystata H.L. Clark, 1911 **GC, BC, GRO**
Amphiura carchara H.L. Clark, 1911 **BC**
Amphiura otteri Ljungman, 1872 **GC, BC, BCS**
Amphiura seminuda Lütken & Mortensen, 1899 **GC, BC, BCS, REV, OAX**
Amphiura serpentina Lütken & Mortensen, 1899 **GC, BCS, MAR, GRO**
Amphiura (Amphiura) diomedeae Lütken & Mortensen, 1899 **GC**
Dougaloplus amphacanthus (McClendon, 1909) **GC, MP**
Dougaloplus gastracanthus (Lütken & Mortensen, 1899) **GRO**
Dougaloplus notacanthus (Lütken & Mortensen, 1899) **GC, MAR**
Microphiopholis geminata (Le Conte, 1851) **GC**
Microphiopholis platydisca (Nielsen, 1932) **GC, BCS, NAY**
Microphiopholis puntarenae (Lütken, 1856) **GC, BCS, MAR**
Ophiocnida californica Ziesenhenne, 1940 **GC, BC, BCS**
Ophiocnida hispida (Le Conte, 1851) **GC, BCS, MAR, JAL, GRO, OAX**
Ophiophragmus lonchophorus Ziesenhenne, 1940 **JAL**
Ophiophragmus marginatus (Lütken, 1856) **GC, NAY, JAL, OAX**
Ophiophragmus papillatus Ziesenhenne, 1940 **GRO, OAX**
Ophiophragmus paucispinus Nielsen, 1932 **GC**
Ophiophragmus tabogensis Nielsen, 1932 **GC, BCS**
Ophiostigma tenue Lütken, 1856 **BCS, ISA**
Family Ophiotrichidae Ljungman, 1867
Ophiothela gracilis Nielsen, 1932 **MP**

Ophiothela mirabilis Verrill, 1867 **GC, BCS, NAY, ISA, JAL, MICH, GRO**
Ophiothrix galapagensis Lütken & Mortensen, 1899 **GC, BCS, MAR, REV**
Ophiothrix (Ophiothrix) rudis Lyman, 1874 **GC, BCS, NAY, MAR, REV, MICH, GRO, OAX**
Ophiothrix (Ophiothrix) spiculata Le Conte, 1851 **GC, BC, BCS, NAY, MAR, ISA, JAL, COL, REV, MICH, GRO, OAX**

Family Ophiactidae Matsumoto, 1915
Hemipholis gracilis Verrill, 1867 **GC, BCS, JAL**
Histampica duplicata (Lyman, 1875) **GC**
Ophiactis savignyi (Müller & Troschel, 1842) **GC, BC, BCS, NAY, MAR, JAL, COL, REV, MICH, GRO, OAX**
Ophiactis simplex (Le Conte, 1851) **GC, BC, BCS, NAY, MAR, ISA, JAL, COL, REV, MICH, GRO, OAX**
Ophiopholis aculeata (Linnaeus, 1767) **MP**
Ophiopholis bakeri McClendon, 1909 **GC, BC, BCS, REV**
Ophiopholis kennerlyi Lyman, 1860 **MP**
Ophiopholis longispina H.L. Clark, 1911 **GC, BCS**

Family Ophionereididae Ljungman, 1867
Ophionereis albomaculata E.A. Smith, 1877 **GC, MAR, ISA**
Ophionereis amphilogus (Ziesenhenne, 1940) **BC**
Ophionereis annulata (Le Conte, 1851) **GC, BC, BCS, NAY, ISA, JAL, COL, REV, MICH, GRO, OAX**
Ophionereis eurybrachiplax H.L. Clark, 1911 **GC, BC**
Ophionereis perplexa Ziesenhenne, 1940 **GC, BCS, GRO**

Family Ophiocomidae Ljungman, 1867
Ophiocoma aethiops Lütken, 1859 **GC, BC, BCS, NAY, MAR, ISA, JAL, COL, REV, MICH, GRO, OAX**
Ophiocoma alexandri Lyman, 1860 **GC, BC, BCS, NAY, MAR, ISA, JAL, COL, REV, MICH, GRO, OAX**
Ophiocomella schmitti A.H. Clark, 1939 **COL, REV**
Ophiocomella sexradia (Duncan, 1887) **GC, MAR, REV**
Ophiopsila californica A.H. Clark, 1921 **GC, BC, BCS**
Ophiopteris papillosa (Lyman, 1875) **BC, BCS**

Family Ophiochitonidae Matsumoto, 1915
Ophiochiton fastigatus Lyman, 1878 **GC**

Family Ophiodermatidae Ljungman, 1867
Diopederma daniana (Verrill, 1867) **GC, BC, BCS, JAL, MICH, GRO, OAX, CHIS**
Ophioderma panamensis Lütken, 1859 **GC, BC, BCS, MAR, ISA, JAL, REV, GRO, OAX**
Ophioderma pentacantha H.L. Clark, 1917 **GC**
Ophioderma sodipallaresi Caso, 1986 **GC**
Ophioderma sp. **GRO, OAX**
Ophioderma teres (Lyman, 1860) **GC, BC, BCS, NAY, MAR, JAL, GRO, OAX**
Ophioderma vansyoci Hendler, 1996 **GC, BCS**
Ophioderma variegata Lütken, 1856 **GC, BC, BCS, NAY, MAR, JAL, REV, GRO, OAX**
Ophioncus granulosus Ives, 1889 **GC**
Ophiopaepale diplax (Nielsen, 1932) **GC, BCS**
Ophiuroconis bispinosa Ziesenhenne, 1937 **GC, BCS, REV**

Family Ophiolepididae Ljungman, 1867
Ophiolepis crassa Nielsen, 1932 **GC, BC, BCS, MAR**
Ophiolepis fulva H.L. Clark, 1940 **OAX**
Ophiolepis pacifica Lütken, 1856 **GC, NAY, MAR, JAL, GRO, OAX**
Ophiolepis plateia Ziesenhenne, 1940 **JAL**
Ophiolepis variegata Lütken, 1856 **GC, BCS, NAY, MAR, JAL, COL, GRO, OAX**
Ophiomusium glabrum Lütken & Mortensen, 1899 **GC, BC, BCS, OAX**
Ophiomusium lymani Wyville-Thomson, 1873 **GC, BC, BCS, MAR**
Ophiomusium variabile Lütken & Mortensen, 1899 **GC, MAR, JAL, REV, GRO**
Ophiosphalma jolliense (McClendon, 1909) **GC, BCS**
Ophioplocus esmarki Lyman, 1874 **GC, BC, BCS**

Gulf of California (GF), Baja California (Pacific coast) (BC), Baja California Sur (Pacific coast) (BCS), Nayarit (NAY), Marías Islands (MAR), Isabel Island (ISA), Jalisco (JAL), Colima (COL), Revillagigedo Islands (REV), Michoacán (MICH), Guerrero (GRO), Oaxaca (OAX), Chiapas (CHIS), Mexican Pacific (MP).

Marías Islands (36), Guerrero (33), Oaxaca (29), Jalisco (21), Revillagigedo Islands (21) and Nayarit (20). The States of Chiapas (1), Colima (8), Michoacán (9) and Isabel Island (9) were the zones with the lowest number of reported brittle stars.

The brittle stars *Ophiothrix (Ophiothrix) spiculata*, *Ophiactis simplex, Ophiocoma aethiops* and *Ophiocoma alexandri* were the most widespread species in the Mexican Pacific, inhabiting all the zones except the State of Chiapas. Other species with wide distribution were *Ophiactis savignyi*, *Ophionereis annulata*, *Ophioderma panamensis* and *Ophioderma variegata*. It is important to note that 30 species were reported in just one zone, most of them in the Northern part of the Mexican Pacific such as the Gulf of California, or the Pacific coast of Baja California Sur and Baja California (Table 1). Specifically, in the Mexican Pacific, the species *Ophiacantha cosmica*, *Ophiacantha quadrispina*, *Ophiotreta valenciennesi*, *Amphigyptis perplexa*, *Amphiophiura oligopora*, *Amphiura (Amphiura) diomedeae*, *Microphiopholis gemminata*, *Ophiophragmus paucispinus*, *Histampica duplicata*, *Ophiochiton fastigatus*, *Ophioderma pentacantha*, *Ophioderma sodipallaresi* and *Ophioncus granulosus* were confined to the Gulf of California. On the other hand, since the distribution records of 27 species reported in the literature were considered doubtful, they were not included in the checklist.

DISCUSSION

This updated compilation of brittle stars of the Mexican Pacific includes more taxa than the reported in any of the previous reviews for this area (Buitrón-Sánchez & Solís-Marín, 1993; Solís-Marín et al., 2005; Honey-Escandón et al., 2008; Hendrickx, 2012; Solís-Marín et al., 2013). We reported a total of 97 species in the Gulf of California and 112 in the Mexican Pacific. Previously, 41-71 species were recorded in the Gulf of California (Buitrón-Sánchez & Solís-Marín, 1993; Solís-Marín et al., 2005; Solís-Marín et al., 2013), and 63 - 84 species were listed for the Mexican Pacific (Buitrón-Sánchez & Solís-Marín, 1993; Honey-Escandón et al., 2008; Hendrickx, 2012). Differences in diversity among studies are related to differences in methodology, but also to the addition of new records in the area. Honey-Escandón et al. (2008), for example, only reported brittle stars deposited in the National Museum of Natural History (Smithsonian Institution) and the Colección Nacional de Equinodermos "Dra. Ma. Elena Caso" (Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México), while our checklist was draw after literature search. Meanwhile, the recent addition of new species records in the region such as *Gorgonocephalus eucnemis* in Guadalupe Island, Baja California (Herrero-Pérezrul et al., 2014), *Ophioderma* sp. in the verge of description and recently discovered in Guerrero and Oaxaca (Granja-Fernández et al. 2014), and *Ophiacantha pacifica* collected in the Mexican Pacific (Hendrickx, 2012) added to the difference among this and previous studies.

Specifically, the current list of species increases the number of known brittle stars reported by Honey-Escandón et al. (2008) for some areas of the Mexican Pacific coasts: Baja California (23), Baja California Sur (36), Marías Islands (11), Jalisco (14), Colima (5), Revillagigedo Islands (13), Guerrero (28) and Oaxaca (10), thus for this area, the current checklist increment the total number of species in a 30 to 85 %. We also found the same number of brittle stars for Michoacán (9) and Chiapas (1) as Honey-Escandón et al. (2008), which suggest that there have been no new reports for these States during the last five years.

Regarding other countries of the Tropical Eastern Pacific, México is the country with the highest number of species in the area (125), followed by Panamá (75; Coppard & Alvarado, 2013), Perú (42; Hooker et al., 2013), Costa Rica (38; Alvarado et al., 2013), Colombia (30; Benavides-Serrato et al. 2013), Ecuador (21; Sonnenholzner et al., 2013), El Salvador (17; Alvarado et al., 2013), Nicaragua (12; Alvarado et al., 2013), Guatemala (7; Alvarado et al., 2013), and Honduras (3; Alvarado et al.,

2013). It is relevant that the Gulf of California by itself possesses more species (98) than any other country in the Tropical Eastern Pacific, this can be explained by its geographical location and conformation (Lluch-Cota et al., 2007), as well as a major coastline compared to other countries. Similarly, Marías Islands possess more species (36) than comparable size island as Cocos Island (30; Alvarado et al., 2013) but less than the Galápagos archipelago (82; Sonnenholzner et al., 2013).

According to the literature research, we realized that the distribution record of some of the reported species is doubtful. The species *Ophiocoma (Breviturma) brevipes* (Stiansky & Groenewegen, 1929), *Amphiodia guillermosoberoni*, *Astrocaneum herrerai*, *Ophiocoma echinata*, *Ophiocoma pumila*, *Ophiocoma wendtii*, *Ophioderma appressa*, *Ophioderma cinerea*, *Ophiophragmus wurdemani*, *Ophiopsila riisei*, *Ophiopyren longispinus*, *Ophiothrix (Ophiothrix) angulata*, *Ophiothrix (Ophiothrix) oerstedii*, *Ophiothrix (Acanthophiothrix) suensoni*, *Ophiura acervata*, *Ophiura ljungmani* (Buitrón-Sánchez & Solís-Marín, 1993), *Hemipholis elongata* (Solís-Marín et al., 2005), *Amphioplus coniortodes*, *Ophiocomella ophiactoides* (Honey-Escandón et al., 2008), *Hemipholis cordifera* and *Ophiacantha pentacrinus* (Solís-Marín et al., 2013) previously reported in the Gulf of California and the Mexican Pacific, have their distribution in the Western Atlantic, the Caribbean Sea and the Gulf of México (Hendler et al., 1995; Stöhr et al., 2014), while *Amphiura koreae* (Luke, 1982) and *Ophiacantha adiaphora* (Buitrón-Sánchez & Solís-Marín, 1993; Hendrickx, 2012) have been only reported to inhabit in the Western Pacific and the Bering Sea (Stöhr et al., 2014). It is important to emphasize that all the above records are the only ones in the entire Eastern Pacific therefore the presence of the species in the area should be taken with caution.

The species *Ophiernus adspersus adspersus* currently inhabiting the Western Atlantic, the Caribbean Sea and the Gulf of México (Stöhr et al., 2014), was recorded in Baja California Sur, Marías Islands and Guerrero by Honey-Escandón et al. (2008) after material deposited in the National Museum of Natural History (Smithsonian Institution). We consulted these records in the available online database of the Smithsonian Institution (http://collections.nmnh.si.edu/search/iz/) and detected that the records correspond to the species *Ophiernus polyporum*, a synonym of the valid species *Ophiernus adspersus annectens*, therefore this report corresponds to the latter and not to *O. adsperus adspersus*. On this regard, we did not include *O. adspersus adspersus* in the current checklist.

The reported brittle stars *Ophiopholis kennerlyi* (Ives, 1889b; Hendrickx, 2012), *Ophiopholis aculeata* (Buitrón-Sánchez & Solís-Marín, 1993), *Amphiodia periercta*, *Ophiacantha eurypoma* and *Ophiura sarsii* (Hendrickx, 2012) in Mexican Pacific waters needs to be confirmed since their distributions occur in the North Pacific Ocean (from California to Artic Ocean) and there is no other record of these species in lower latitudes. Finally, *Amphioplus (Unioplus) daleus*, *Ophiacantha cosmica*, *Ophiernus seminudus*, *Ophiotoma paucispina* and *Ophiura plana*, have been mentioned in localities called "off México", "590 km south of Puerto Angel, Oaxaca" and "Gulf of Tehuantepec, Oaxaca" corresponding to the *Albatross* Station 3414 (Lütken & Mortensen, 1899; Turner & Hallan, 2011; Granja-Fernández & López-Pérez, 2012; Hendrickx, 2012); we corroborated the geographic coordinates of the station (10°14′ N - 96°29′ W; Lütken & Mortensen, 1899), and found that it is off Mexican waters, therefore the records of these species in Oaxacan territory are incorrect and were removed for the State in the current list.

A total of 35 species of brittle stars collected in Mexican Pacific waters bear some type status, of these, 20 are holotype (*Amphichondrius laevis*, *Amphiodia sculptilis*, *Amphiophiura oligopora*, *Dougaloplus gastracanthus*, *Dougaloplus notacanthus*, *Amphiura seminuda*, *Ophiura (Ophiura) scutellata*, *Ophiacantha phragma*, *Ophiacantha pyriformis*, *Ophiocnida californica*, *Ophiocoma alexandri*, *Ophioderma sodipallaresi*, *Ophioderma*

vansyoci, *Ophionereis amphilogus*, *Ophiolepis fulva*, *Ophiolepis plateia*, *Ophiophragmus lonchophorus*, *Ophiophragmus papillatus*, *Ophiomitra partita*, *Ophiuroconis bispinosa*). The large number of species recorded in the area as well as the importance of the type material, highlights the relevance of the Mexican Pacific waters to the taxonomy and diversity of ophiuroids in the Tropical Eastern Pacific. Regardless the high number of records of Ophiuroidea in the Mexican Pacific, large stretches of Colima, Michoacán and Chiapas remain unexplored therefore systematic effort in poor known areas surely should increase the biodiversity in the area. Also, we suggest realizing more studies involving literature review in other marine taxa since these allow to determinate with more precision an inventory of the regional fauna and provide baseline data for future taxonomical, ecological and biogeographic works.

ACKNOWLEDGMENTS

We thank Alicia Durán-González, Francisco Solís-Marín, Héctor Reyes-Bonilla, Emerson Martínez-Zavala, Paola Cervantes-Aguilar, Gordon Hendler and Sabine Stöhr for providing valuable information. This work was funded by CONABIO (JF047). While this work was done, RGF was supported by a scholarship from CONACYT (336853). We thank the reviewers and editor for commenting and improving the manuscript.

RESUMEN

Revisión de literatura de Ophiuroidea (Echinodermata) de las costas del Pacífico de México. A pesar del importante esfuerzo en el conocimiento de la diversidad de ofiuroideos del Pacífico mexicano, algunos errores en la nomenclatura taxonómica han perseverado a través del tiempo. Con el objetivo de clarificar lo anterior, se provee una lista de especies de ofiuroideos del Pacífico Mexicano, basada en la revisión de literatura. Se revisó un total de 105 referencias que en total suman 125 especies pertenecientes a dos órdenes, 16 familias y 50 géneros de ofiuros del Pacífico Mexicano (112) y el Golfo de California (97). Estos reportes son mayores que otros estudios llevados a cabo en el área. México es el país con el mayor número de ofiuros reportados en el Pacífico Oriental Tropical; esto puede deberse a su excepcional condición oceanográfica, ubicación y extensión de línea de costa. Un total de 27 de las especies reportadas en la literatura fueron consideradas dudosas de acuerdo distribución geográfica por lo que no fueron incluidas en la lista. 35 especies poseen su localidad tipo en el Pacífico Mexicano, corroborando la importancia de México en el Pacífico Oriental Tropical en términos de diversidad de equinodermos.

Palabras clave: estrellas quebradizas, referencias bibliográficas, listado, distribución, nombres válidos.

REFERENCES

Alvarado, J. J., Barraza, E., & Sancho-Mejías, T. I. (2013). Central America Echinoderms: diversity, ecology and future perspectives. In J. J. Alvarado-Barrientos & F. A. Solís-Marín (Eds.), *Echinoderm research and diversity in Latin America* (pp. 67-106). Berlin, Germany: Springer-Verlag.

Ayala-Bocos, A., Reyes-Bonilla, H., Herrero-Pérezrul, M. D., Walther-Mendoza, M., & Castañeda-Fernández de Lara, V. (2011). New records and range extensions of *Astrodictyum panamense* (Ophiuriodea: Gorgonocephalidae) in the eastern Pacific Ocean. *Marine Biodiversity Records, 4*, 1-3.

Benavides-Serrato, M., Borrero-Pérez G. H., Cantera, J. R., Cohen-Rengifo, M., & Neira, R. (2013). Echinoderms of Colombia. In J. J. Alvarado-Barrientos & F. A. Solís-Marín (Eds.), *Echinoderm research and diversity in Latin America* (pp. 145-182). Berlin, Germany: Springer-Verlag.

Benítez-Villalobos, F. (2001). Comparación de la comunidad de equinodermos asociada a arrecifes en dos localidades de las Bahías de Huatulco, Oaxaca, México. *Ciencia y Mar, 5*(13), 31-36.

Benítez-Villalobos, F., Aguilar-Duarte, C., & Ávila-Poveda, O. H. (2012). Reproductive biology of *Ophiocoma aethiops* and *O. alexandri* (Echinodermata: Ophiuroidea) from Estacahuite Bay, Oaxaca, Mexico. *Aquatic Biology, 17*, 119-128.

Boone, L. (1926). Scientific results of the first oceanographic expedition of the "Pawnee", 1926. Echinoderms from the Gulf of California and the Perlas Islands. *Bulletin of the Bingham Oceanographic Collection, 2*(6), 1-14.

Buitrón-Sánchez, B. E. & Solís-Marín, F. A. (1993). La biodiversidad en los equinodermos fósiles y recientes de México. *Revista de la Sociedad Mexicana de Historia Natural*, *64,* 209-231.

Caso, M. E. (1951). Contribución al conocimiento de los ofiuroideos de México. I. Algunas especies de ofiuroideos litorales. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, 22*, 219-312.

Caso, M. E. (1962). Estudios sobre equinodermos de México. Contribución al conocimiento de los equinodermos de las islas Revillagigedo. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, 33*, 293-330.

Caso, M. E. (1979). Los equinodermos de la Bahía de Mazatlán, Sinaloa. *Anales del Centro de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, Publicación especial, 6*, 197-368.

Caso, M. E. (1983). Especies del género *Amphichondrius* de la costa del Pacífico Americano. Descripción de una nueva especie del género *Amphichondrius*. *Amphichondrius unamexici* sp. nov. (Ophiuroidea). *Anales del Centro de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, 10*, 209-230.

Caso, M. E. (1986a). Los Equinodermos del Golfo de California colectados en las campañas SIPCO I-II-III a bordo del B/O "El Puma". *Anales del Centro de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, 13*, 91-184.

Caso, M. E. (1986b). Descripción de una nueva especie de ofiuroideo de la Bahía de Mazatlán, Sin. *Ophioderma sodipallaresi* sp. nov. y comparación con *Ophioderma variegatum* Lütken. *Anales del Centro de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, 13*, 223-248.

Caso, M. E. (1992). Los Equinodermos (Asteroideos, Ofiuroideos y Equinoideos de la Bahía de Mazatlán, Sinaloa. *Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, Publicaciones Especiales, 11*, 1-214.

Caso, M. E., Laguarda-Figueras, A., Solís-Marín, F. A., Ortega-Salas, A., & Durán-González, A. L. (1996). Contribución al conocimiento de la ecología de las comunidades de equinodermos de la Bahía de Mazatlán, Sinaloa, México. *Anales del Centro de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, 22*, 101-119.

Cintra-Buenrostro, C. E., Reyes Bonilla, H., & Arizpe-Covarrubias, O. (1998). Los equinodermos (Echinodermata) del arrecife de Cabo Pulmo, Pacífico de México. *Revista de Biología Tropical, 46*, 341-344.

Clark, A. H. (1939). Echinoderms (other than Holothuroidea) collected on the Presidential Cruise of 1938. *Smithsonian Miscellaneous Collections, 98*, 1-18.

Clark, H. L. (1913). Echinoderms from Lower California, with descriptions of new species. *Bulletin of the American Museum of Natural History, 32*, 185-236.

Clark, H. L. (1915). Catalogue of recent ophiurans: based on the collection of the Museum of Comparative Zoölogy. *Memoirs of the Museum of Comparative Zoölogy, 25*, 164-376.

Clark, H. L. (1923). Echinoderms from Lower California with descriptions of new species: supplementary report. *Bulletin of the American Museum of Natural History, 48*, 147-163.

Clark, H .L. (1940). Notes on Echinoderms from the West Coast of Central America. Eastern Pacific Expeditions of the New York Zoological Society. *Zoologica, 25*, 331-352.

Coppard, S. E., & Alvarado, J. J. (2013). Echinoderm diversity in Panama: 144 years of research across the Isthmus. In J. J. Alvarado-Barrientos & F. A. Solís-Marín (Eds.), *Echinoderm research and diversity in Latin America* (pp. 107-144). Berlin, Germany: Springer-Verlag.

Downey, M. E. (1969). Catalog of recent ophiuroid type specimens in major collections in the United States. *United States National Museum Bulletin, 293*, 1-239.

Frontana-Uribe, S. C., Hernández-Alcántara, P., & Solís-Weiss, V. (2000). *Ophiocomella schmitti* (Echinodermata: Ophiuroidea) from Socorro Island, Mexican Pacific. *Revista Biología Tropical, 49*, 766.

González-Medina, F. J., Holguín-Quiñones, O. E., & De la Cruz-Agüero, G. (2006). Variación espaciotemporal de algunos macroinvertebrados (Gastropoda, Bivalvia y Echinodermata) de fondos someros del Archipiélago Espíritu Santo, Baja California, Sur, México. *Ciencias Marinas, 32*, 33-44.

Granja-Fernández, M.R., & López-Pérez, R.A. (2011). Nuevos registros de ofiuroideos (Echinodermata: Ophiuroidea) para localidades de Zihuatanejo (Guerrero) y Puerto Escondido (Oaxaca), Pacífico Mexicano. *Revista Mexicana de Biodiversidad, 82*, 1320-1323.

Granja-Fernández, M. R. & López-Pérez, R. A. (2012). Biodiversidad de ofiuroideos (Echinodermata: Ophiuroidea) de Oaxaca y Chiapas. In A. J. Sánchez, X. Chiappa-Carrara, & R. Brito-Pérez (Eds.), *Recursos Costeros del Sureste: tendencias actuales en investigación y estado del arte* (pp. 357-370). Mérida, México: CONCITEY, FOMIX, SIIDETEY, UNAM, CONACYT, ECOSUR, PROMEP, RECORECOS, UNACAR, UJAT.

Granja-Fernández, R., Hernández-Moreno, P., & Bastida-Zavala, R. (2013). First record of the association between *Malmgreniella cf. variegata* (Polychaeta, Polynoidae) and *Ophionereis annulata* (Echinodermata, Ophionereididae) in the Mexican Pacific. *Symbiosis, 60*, 85-90.

Granja-Fernández, R., Herrero-Pérezrul, M. D., López-Pérez, R. A., Hernández, L., Rodríguez-Zaragoza, F. A., Jones, R. W., & Pineda-López, R. (2014). Ophiuroidea (Echinodermata) from coral reefs in the Mexican Pacific. *ZooKeys,* 406: 101-145.

Hendler, G., Miller, J. E., Pawson, D. L., & Kier, P. M. (1995). *Sea stars, sea urchins, and allies.*

Echinoderms of Florida and the Caribbean. Washington: Smithsonian Institution.

Hendrickx, M. E. (2012). Listado sistemático de los equinodermos de aguas profundas del Pacífico mexicano. In P. Zamorano, M. E. Hendrickx, & M. Caso (Eds.), *Biodiversidad y comunidades del talud continental del Pacífico mexicano* (pp. 373-395). *México*, D.F.: SEMARNAT, INE.

Hooker, Y., Prieto-Rios E., & Solís-Marín, F. A. (2013). Echinoderms of Peru. In J. J. Alvarado-Barrientos & F. A. Solís-Marín (Eds.), *Echinoderm research and diversity in Latin America* (pp. 277-299). Berlin, Germany: Springer-Verlag.

Hernández-Herrejón L. A., Solís-Marín, F. A., Laguarda-Figueras, A., & Pineda-Enríquez, T. (2010). First record of *Ophioderma vansyoci* (Echinodermata: Ophiuroidea) in the Gulf of California. *Marine Biodiversity Records,* 3, e114.

Herrero-Pérezrul, M. D., Granja-Fernández, R., Hoyos-Padilla, M., & Reyes-Bonilla, H. (2014). New record of the basket star *Gorgonocephalus eucnemis* (Ophiuroidea: Gorgonocephalidae) at the Pacific coast of Mexico. *Marine Biodiversity Records,* 7.

Honey-Escandón, M., Solís-Marín, F. A., & Laguarda-Figueras, A. (2008). Equinodermos (Echinodermata) del Pacífico Mexicano. *Revista de Biología Tropical, 56*(Supl. 3), 57-73.

Instituto Nacional de Estadística y Geografía (INEGI). (2012). *Anuario Estadístico de los Estados Unidos Mexicanos. Edición 2012*. México: Instituto Nacional de Estadística y Geografía.

Ives, J. E. (1889a). Variation in *Ophiura panamensis* and *Ophiura teres*. *Proceedings of the Academy of Natural Sciences of Philadelphia, 41*, 76-77.

Ives, J. E. (1889b). Catalogue of the Asteroidea and Ophiuroidea in the Collection of the Academy of Natural Sciences of Philadelphia. *Proceedings of the Academy of Natural Sciences of Philadelphia, 41*, 169-179.

Lluch-Cota, S. E., Aragón-Noriega, E. A., Arreguín-Sánchez, F., Aurioles-Gamboa, D., Bautista-Romero, J. J., Brusca, R. C., … Sierra-Beltrán, A. P. (2007). The Gulf of California: Review of ecosystem status and sustainability challenges. *Progress in Oceanography, 73*, 1-26.

López-Uriarte, E., Ríos-Jara, E., Galván-Villa, C. M., Juárez-Carrillo, E., Enciso-Padilla, I., Robles-Jarero, E. G., & Pérez-Peña, M. (2009). Macroinvertebrados bénticos del litoral somero de Punta La Rosada, Bahía Chamela, Jalisco. *Scientia-CUCBA, 11*, 57-68.

Luke, S. R. (1982). *Catalog of benthic invertebrate collections*. San Diego, California, USA: University of California.

Lütken, C. F., & Mortensen, T. (1899). The Ophiuridae. *Memoirs of the Museum of Comparative Zoology, 23*, 93-208.

Lyman, T. (1860). Descriptions of new Ophiuridae, belonging to the Smithsonian Institution and to the Museum of Comparative Zoology at Cambridge. *Proceedings of the Boston Society of Natural History, 7*, 193-204, 252-262.

Lyman, T. (1865). Ophiuridae and Astrophytidae. *Illustrated Catalogue of the Museum of Comparative Zoölogy, at Harvard College, 1*, 1-200.

Lyman, T. (1882). Report on the Ophiuroidea dredged by H.M.S. "Challenger" during the years 1873-1876. *Report of the Scientific Results of the Voyage of H.M.S. "Challenger" 1873-1876, 5*, 1-386.

Maluf, L. I., & Brusca, R. C. (2005). Echinodermata. Chapter 18. In M. E. Hendrickx, R. C. Brusca, & L. T. Findley (Eds.). *A Distributional checklist of the macrofauna of the Gulf of California, Mexico. Part I. Invertebrates* (pp. 327-343). Tucson, Arizona: Sonora Desert Museum.

Okanishi, M., & Fujita, T. (2013). Molecular phylogeny based on increased number of species and genes revealed more robust family-level systematics of the order Euryalida (Echinodermata: Ophiuroidea). *Molecular Phylogenetics and Evolution, 69,* 566-580.

Pacheco-Ruiz, I. & Aguilar-Rosas, L. E. (1982). Equinodermos de aguas profundas de la Bahía Todos Santos, Baja California. *Ciencias Marinas, 8*, 337-348.

Ríos-Jara, E., Galván-Villa, C. M., & Solís-Marín, F. A. (2008a). Equinodermos del Parque Nacional Isla Isabel, Nayarit, México. *Revista Mexicana de Biodiversidad, 79*, 131-141.

Ríos-Jara, E., López-Uriarte, E., Pérez-Peña, M., Enciso-Padilla, I., Arreola-Robles, J. L., Hermosillo-González, A., & Galván-Villa, C. M. (2008b). *Listados taxonómicos de la biota marina del Parque Nacional Isla Isabel (invertebrados, peces y macroalgas)*. Jalisco, Mexico: Universidad de Guadalajara.

Ríos-Jara, E., Galván-Villa, C. M., Rodríguez-Zaragoza, F. A., López-Uriarte, E., Bastida-Izaguirre, D., & Solís-Marín, F. A. (2013). Los equinodermos (Echinodermata) de bahía Chamela, Jalisco, México. *Revista Mexicana de Biodiversidad, 84*, 263-279.

Salcedo-Martínez, S., Green, G., Gamboa-Contreras, A., & Gómez, P. (1988). Inventario de macroalgas y macroinvertenbrados bénticos presentes en áreas rocosas de la región de Zihuatanejo, Guerrero, México. *Anales del Instituto de Ciencias del Mar y Limnología, Universidad Nacional Autónoma de México, 15*, 73-95.

Smith, A. B., Paterson, G .L .J., & Lafay, B. (1995). Ophiuroid phylogeny and higher taxonomy: morphological, molecular and palaeontological perspectives.

Zoological Journal of the Linnean Society, 114, 213-243.

Solís-Marín, F. A., Reyes-Bonilla, H., Herrero-Pérezrul, M. D., Arizpe-Covarrubias, O., & Laguarda-Figueras, A. (1997). Sistemática y distribución de los equinodermos de la bahía de La Paz. *Ciencias Marinas, 23*, 249-263.

Solís-Marín, F. A., Laguarda-Figueras, A., Durán-González, A., Ahearn, C. G., & Torres-Vega, J. (2005). Equinodermos (Echinodermata) del Golfo de California, México. *Revista de Biología Tropical, 53*, 123-137.

Solís-Marín, F. A., Alvarado, J. J., Abreu-Pérez, M., Aguilera, O., Alió, J., Bacallado-Aránega, J.J., … Williams, S. M. (2013). Appendix. In J. J. Alvarado-Barrientos & F. A. Solís-Marín (Eds.), *Echinoderm research and diversity in Latin America* (pp. 543-658). Berlin, Germany: Springer-Verlag.

Sonnenholzner J., Brandt, M., Francisco, V., Hearn, A., Luzuriaga, M., Guarderas, P., & Navarro, J. C. (2013). Echinoderms of Ecuador. In J. J. Alvarado-Barrientos & F. A. Solís-Marín (Eds.), *Echinoderm research and diversity in Latin America* (pp. 183-233). Berlin, Germany: Springer-Verlag.

Steinbeck, J., & Ricketts, E. F. (1941). *Sea of Cortez. A leisurely journal of travel and research*. New York, USA: Viking Press.

Stiasny, V. G., & Groenewegen, A. W. Jr. (1929). Verzeichnis der Ophiuriden-Sammlung des Naturhistorischen Reichmuseums in Leiden. *Zoologische Mededeelingen, 12*, 176-194.

Stöhr, S., O´Hara, T., & Thuy, B. (2014). *World Ophiuroidea database.* Retrieved from http://www.marinespecies.org/ophiuroidea

Turner, R. L., & Hallan, J. K. (2011). *Triplodia*, replacement name for *Triodia* A. M. Clark, 1970 (Ophiuroidea: Amphiuridae), *non* Hübner, 1820 (Lepidoptera: Hepialidae). *Proceedings of the Biological Society of Washington, 124*, 7-8.

Verrill, A. E. (1867a). Notes on the Echinoderms of Panama and West Coast of America, with descriptions of new genera and species. *Transactions of the Connecticut Academy of Arts and Sciences, 1*, 251-322.

Verrill, A. E. (1867b). On the geographical distribution of the Echinoderms of the West Coast of America. *Transactions of the Connecticut Academy of Arts and Sciences, 1*, 323-338.

Verrill, A. E. (1867c). On the echinoderm-fauna of the Gulf of California and Cape St. Lucas. *Transactions of the Connecticut Academy of Arts and Sciences, 1*, 593-596.

Verrill, A. E. (1868). Notice of a collection of echinoderms from La Paz, Lower California, with descriptions of a new genus. *Transactions of the Connecticut Academy of Arts and Sciences, 1*, 371-375.

Verrill, A. E. (1869). On new and imperfectly know echinoderms and corals. *Proceedings of the Boston Society of Natural History, 12*, 381-396.

Verrill, A. E. (1871a). Additional observations on echinoderms, chiefly from the Pacific coast of America. *Transactions of the Connecticut Academy of Arts and Sciences*, *1*, 568-593.

Verrill, A. E. (1871b). On the echinoderm fauna of the Gulf of California and Cape San Lucas. *Transactions of the Connecticut Academy of Arts and Sciences, 1*, 593-596.

Wilkinson, T., Wiken, E., Bezaury-Creel, J., Hourigan, T., Agardy, T., Herrmann, … Padilla, M. (2009). *Ecorregiones marinas de América del Norte*. Montreal, Canadá: Comisión para la Cooperación Ambiental.

Zamorano, P. & Leyte-Morales, G. E. (2005). Cambios en la diversidad de equinodermos asociados al arrecife coralino en La Entrega, Oaxaca, México. *Ciencia y Mar, 9*, 19-28.

Ziesenhenne, F. C. (1937). Echinoderms from the West Coast of Lower California, the Gulf of California and Clarion Island. *Zoologica,* 22, 209-239.

Ziesenhenne, F. C. (1940). New Ophiurans of the Allan Hancock Pacific Expeditions. *Allan Hancock Pacific Expeditions, 8*, 9-52.