

## An annotated checklist of ophiuroids (Echinodermata) from Guam

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**Abstract**—Forty-seven ophiuroid species are recorded from the island of Guam. One species, *Ophiarthum pictum*, is known only from the literature. Ophiuroids identified as *Ophiolepis* cf. *cincta* may represent an undescribed species. Specimens of *Ophiocoma* cf. *erinaceus* and *Ophionereis* cf. *fusca*, respectively, display previously unrecorded structural and color characters. *Amphiura duncani* was found only in Apra Harbor and may be introduced.

### Introduction

The earliest collection of ophiuroids from Guam appears to be three specimens collected by Hornbostel in 1923 and 1924. They are housed at the B.P. Bishop Museum in Hawaii and are identified as two specimens of *Ophiocoma erinaceus* and an *Ophiothrix* sp. A. H. Clark (1954) provided the first published records for four species from the island: *Ophiocoma scolopendrina*, *Ophiarthum pictum*, *Ophiarachnella gorgonia*, and *Ophiarachnella infernalis*. Devaney (1978) published a record of *Ophiomastix caryophyllata* from Apra Harbor.

Few of the numerous ecological surveys published by the University of Guam Marine Laboratory (UOGML) as technical reports mention ophiuroids. Chernin et al. (1977) list *Ophiocoma erinaceus* and *O. pica* from Agat. A survey of “pristine marine communities” recorded only five ophiuroid from eleven marine habitats surveyed (Stojkovich 1977): *Ophiocoma erinaceus* (Double Reef, Cocos Lagoon, Ajayan Bay), *Ophiocoma* sp. (Double Reef), *Ophiothrix* sp. (Cetti Bay) and *Macrophiothrix longipeda* (Cocos Lagoon). Randall (1978) lists two *Ophiocoma* sp. and one *Ophioderma* sp. from Tumon Bay and an *Ophiocoma* sp. from Agana and Agat Bays. Eldredge (1979) lists *Macrophiothrix longipeda* and *Ophiocoma erinaceus* from Cocos and Agat and *Ophiarthum elegans* and *Ophiocoma pica* from Agat.

There is little reason to question most of the above identifications, as they are among the commonest of Guam’s brittle star species. However, I did not find any *Ophioderma* sp. during the course of this study. It is likely that the low diversity of ophiuroids recorded by these surveys was a result of the survey methodology employed, rather than the absence of the animals in a given area. Standard

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ecological surveys are generally conducted during the day and overlook cryptic or infaunal animals (J. Starmer, pers. obs.).

The first summary of the ophiuroid fauna of Guam is in an anonymous (1981) echinoderm checklist. The list appears to have been compiled from literature records and specimens available in the collections of the UOGML. It recorded 18 species with 15 new records for a total of 20 species. It mentioned, but did not include, the specimens of *Ophiarthum pictum* and *Ophiarachnella infernalis* that were collected by Clark (1954).

### Materials and Methods

I examined all the specimens in the UOGML systematic collection at the start of my survey. I later examined additional specimens from Guam located at the US National Museum of Natural History (USNM). Over a three-year period, from 1995 to 1998, I was able to search a wide range of marine habitats around Guam. These included fore reef slopes, reef flats, a sheltered harbor and lagoon patch reefs. The majority of my collecting took place on the western (leeward) side of the island. Pago Bay and the West Cocos Barrier Reef were the two windward sites where I collected ophiuroids. Although additional sites were searched, no other specimens were found. Apra Harbor is dominated by *Porites rus* (Forsskål, 1775) formations. Gab Gab, Western Shoals, Glass Breakwater, and Sponge Mound are all sites within the harbor. Much of the leeward side of the island has a fringing reef with a diverse, coral covered fore reef slope. Anae Is., Adelup Pt., Piti Bay, Tanguisson, Tumon Bay, Gun Beach, Haputo Pt., Sharks Hole, Double Reef and Ritidian are typical sites. Several leeward points have cliffs that meet a rubble slope or underwater terrace: Orote Pt., Hospital Pt. and Facpi Pt. The leeward south-central part of the island has a well-developed fringing reef that meets a very gradually sloping, mixed hard and sandy bottom. Oca Pt., Agat Bay, Asan, Neye Is., and Taogan Pt. are examples.

Collections were made during both day and night. An effort was made to locate cryptic species by searching under rocks, in sponges and on octocorals. Animals were collected by hand using SCUBA, snorkeling or wading. The animals were placed in water-filled plastic bags and returned to the laboratory. Representatives of most species were photographed to provide a record of live coloration. The brittle stars were then placed in shallow tubs with seawater and a 7.5% magnesium chloride solution was added to produce a ~1:9 (v:v) solution. The tubs were placed in a refrigerator overnight. The animals were then placed directly into 70% ethanol for preservation and storage or fixed in a 10% formalin solution, soaked in water to remove excess formalin and dried. Specimens were then deposited in the UOGML systematic collection.

The identifications in this checklist are based on the keys in Clark & Rowe (1971). The genus *Ophiocoma* was identified using Devaney (1970). Devaney (1978) was used for identifications of the genus *Ophiomastix*. Identifications of the species in the genus *Macrophiothrix* were made with additional reference to

Hoggett (1991). Rowe & Gates (1995) provided synonyms for some species found in Clark & Rowe (1971).

### Species List with Annotations

In this list, specific collection sites are listed, followed by the range of depths covered by all the sites. When known, I have indicated color of live specimens. I also note when preserved specimens differ markedly from the appearance of live specimens. In cases where only the live coloration is described, the specimens retain their coloration when preserved. However, color in even well preserved specimens tends to fade somewhat when compared to that of the living animals. When structural characters allow differentiation between species in a genus or represent unique attributes of a species, they are noted. These characters are not to be considered a substitute for a proper taxonomic identification, and should only be considered reliable for the limited suite of species recorded from Guam. In the following list, species not found by the author but present in the collections of the USNM are indicated by an asterisk (\*).

#### Amphiuridae

##### *Amphiura duncani* Lyman, 1882

**Habitat:** A single specimen was collected in Apra Harbor. Apra Harbor (Gab Gab Reef); 30 m

**Behavior and Ecology:** It was found extending its arms from a rock at night.

**Coloration:** Unknown. The specimen appears bleached.

##### *Amphiura sexradiata* Koehler, 1930

**Habitat:** A single collection has been made of this species on the shallow fore reef. Pago Bay; 1-3 m

**Coloration:** Not known. Dried specimens are cream colored with arm banded cream and blue-green.

##### *Amphiura velox* Koehler, 1910

**Habitat:** Associated with an unidentified sponge. Cocos Lagoon; 3 m

**Coloration:** Reddish brown disc with arms banded reddish brown and tan.

##### *Amphipholis squamata* (Delle Chiaje, 1828)

**Habitat:** A single collection was made of this species on a reef flat from the sponge *Dysidea* aff. *herbacea* (Keller, 1889). Pago Bay; 1 m

**Coloration:** Uniformly cream colored.

## Gorgonocephalidae

*Astroboa* sp.

**Habitat:** A single specimen was hauled up while clinging to a fishing trap. Haputo Pt., 118-137 m

## Gorgonocephalidae sp. 1

**Habitat:** Oca (Hospital) Pt.; 36-39 m

**Comments:** One partial specimen was collected in shallow water, but it is unidentifiable to genus because the entire disc is missing; however, the pattern of arm spines is sufficiently different from those of the other recorded specimen to consider it as separate species record.

## Ophiactidae

*Ophiactis savignyi* (Müller & Troschel, 1842)

**Habitat:** It has been found associated with a number of sponges on Guam. A preferred habitat in Apra Harbor is *Melophlus sarasinorum* Thiele, 1899. This species was also found associated with sponges on commercial ship mooring buoys. Cocos Lagoon, Piti Bay, Apra Harbor; 2-23m

**Behavior and Ecology:** Generally hidden during the day, but it will extend arms from the host sponge's oscules at night, presumably to filter feed. It is a small six-armed ophiuroid that is frequently found with 3 smaller arms regenerating as a result of fissiparous reproduction.

**Coloration:** Arms are banded white and green.

## Ophiocomidae

*Ophiarthum elegans* Peters, 1851

**Habitat:** Under rocks and loose rubble. Piti, Agat Bay (Neye Is.), Orote Pt., Facpi Pt., Sharks Hole; 1-13 m

**Behavior and Ecology:** Often found buried in sand and silt with only one or two arms exposed and presumably feeding.

**Coloration:** White arms with red aboral blotches and short but noticeable spines. Dark brown to black disc often with white markings, usually edged with white. Oral side is entirely white though the disk may be tinged with gray.

*Ophiarthum pictum* (Müller & Troschel, 1842)

**Habitat:** Oca (Hospital) Pt.

**Comments:** This species is only known from the literature (A.H. Clark 1954). I was unable to locate the specimen at the USNM or on Guam.

*\*Ophiocoma anaglyptica* Ely, 1944

**Habitat:** Fore reef. Outer Glass Breakwater, Agat Bay

**Behavior and Ecology:** See *Ophiocoma erinaceus*.

**Coloration:** See *Ophiocoma erinaceus*.

*Ophiocoma brevipes* Peters, 1851

**Habitat:** Found under rocks on shallow fore reef slopes. Shark's Hole, Tanguisson; 9-10 m

*Ophiocoma dentata* Müller & Troschel, 1842

**Habitat:** Found from back reef to shallow fore reef under loose rubble. Agat Bay (Neye Is.), Tumon Bay, Pago Bay, Piti Bay, Apra Harbor (Gab Gab Beach); 1-4 m

**Field characteristics:** Disc is quite variable may be uniform dark color, light brown with dark dots, light brown with reticulations, or blotched with white flecks. Arms generally have a dark band every 4-6 arm segments. See *O. scolopendrina* below.

*Ophiocoma doederleini* de Loriol, 1899

**Habitat:** The only specimen collected on Guam was found on the fore reef slope among an unspecified species of alga. Pago Bay; 8 m

*Ophiocoma erinaceus* Müller & Troschel, 1842

**Habitat:** Found under loose coral rubble on reef flats and shallow fore reefs. Pago Bay, Piti Bay, Agat Bay (Neye Is.), Apra Harbor; <1-19 m

**Behavior and Ecology:** This species is often locally abundant. It can be found under rocks or among live or dead coral.

**Coloration:** Aboral side a uniform dark brown to black color, oral side may be slightly lighter. Some individuals have a red tinge to the ventral arm plates and have brilliant red tube feet and tentacles. *Ophiocoma anaglyptica* is probably impossible to distinguish from *O. erinaceus* in the field. The coloration is very similar, though *O. anaglyptica* does not appear to exhibit the reddish coloration found in some *O. erinaceus*.

**Comments:** Fairly large, blunt arm spines. On the whole, its arm spines tend to be shorter in *O. anaglyptica*.

*Ophiocoma cf. erinaceus* Müller & Troschel, 1842

**Habitat:** Found under loose coral rubble. Pago Bay; 1-3 m

**Coloration:** Aboral side is a uniform dark brown to black color, oral side may be slightly lighter.

**Comments:** This animal is unusual in having inflated sacs on the tips of the long aboral spines. Dried specimens can be differentiated from the typical *O. erinaceus* by the presence of a dark mark on the tips of the long aboral spines. The mark is formed by the tissue that forms a bulbous sac in live animals. Evidence of this sac should be detectable in alcohol preserved specimens and forms a dark spot on dried specimens.

*Ophiocoma pica* Müller & Troschel, 1842

**Habitat:** Found on fore reef slopes and reef flats, often associated with live coral. Agat Bay (Neye Is.), Piti Bay, Asan; <1m-20 m

**Coloration:** Resembles *O. erinaceus* in form, its color is distinctive. It has a narrow, bright yellow lines radiating from the center of the aboral side of the disc. Arms have narrow black and yellow bands along their length.

*Ophiocoma scolopendrina* (Lamarck, 1816)

**Habitat:** This species seems restricted to reef flats, as has been previously noted (H. L. Clark, 1921), where it can be found in high densities. Oca (Hospital Pt., Pago Bay, Asan Reef, Pelagi; 0-1 m

**Behavior and Ecology:** In contrast to most of the ophiuroids observed in this study, it is often found exposed with its arms extended from holes during the day. It is not, however, only active during the day. H. L. Clark (1921) noted that these brittle stars become active when the water just covers them on an incoming tide. In Guam, they appear to keep two or three arms exposed as long as they are covered with water.

**Coloration:** The irregular color pattern is similar to that of *O. dentata*, however the overall color tends to be darker and shades of gray predominate. I have not seen this animal with the regular spotted or reticulated disc patterns sometimes seen in *O. dentata*. It can easily be separated from *O. dentata* in the field by noting that in *O. scolopendrina*, the tips of the arms have light spots on the edge of each aboral arm plate.

*Ophiocomella sexradia* (Duncan, 1887)

**Habitat:** Fore reef slope. Adelup Pt.; 10 m

*Ophiomastix caryophyllata* Lütken, 1869

**Habitat:** Ranges from shallow fore reef to deep lagoon. Lives in holes in the reef and under loose rubble. Apra Harbor, Piti Bay, Gun Beach, Tanguisson; 1-27 m

**Behavior and Ecology:** Generally only arms from a hole or from under rubble. This species is active during the day, but generally only in low light environments.

**Coloration:** Readily distinguished from Guam's *Macrophiothrix* species in that its arms are finely banded with black and white. The disc, when visible, is also uniformly spotted with black and covered with fine spines.

**Comments:** See *Ophionereis cf. fusca*.

*Ophiomastix mixta* Lütken, 1869

**Habitat:** Reef flat to fore reef, generally under rocks. Ana'e Is., Tanguisson, S. Orote Pt., Taogan Pt., Piti Bay, Double Reef; 2-35 m

**Coloration:** Dark red with narrow white bands on arms, some individuals may lack white markings. Preserved specimens invariably lose their color, regardless of the method used to fix them, and fade to a uniform white. This tendency has been previously remarked upon (H. L. Clark 1921).

*Ophiomastix palaoensis* Murakami, 1943

**Habitat:** Typically found under rocks on the shallow fore reef to deep lagoon. Apra Harbor (Sponge Mound, Gab-Gab reef); 2-23 m

**Coloration:** Uniform brown disc, arms banded light and dark brown.

**Comments:** Club shaped dorsal arm spines.

*Ophiomastix variabilis* Koehler, 1905

**Habitat:** Shallow fore reef. Taogan Pt., Piti Bay; 1-3 m

**Coloration:** Black with long, thin arms with thin, white band every 8-10 segments. May have sparse white markings on aboral side of disc.

**Comments:** Conspicuously club-shaped dorsal spines every 4-5 segments.

Ophiodermatidae

*Distichophis clarki* Ely, 1942

**Comments:** No additional collection information. Guam

*Ophiarachna robillardi* de Loriol, 1893

**Habitat:** Found among dead coral and under rubble on reef flats. Piti Bay; 1-2 m

**Coloration:** Fairly large ophiuroid with a finely mottled gray disc. Arm spines are uniformly and finely banded. Arms have white bands with gray speckles every 3-5 segments.

*Ophiarachnella gorgonia* Müller & Troschel, 1842

**Habitat:** Reef flat to fore reef, generally concealed under rock. Piti Bay, Agat Bay (Neye Is.), Asan Bay, Orote Pt., Shark's Hole, Tanguisson; 5-33 m

**Coloration:** Fairly smooth in overall appearance. Colored in shades of pink and green. Arms banded and the aboral disc surface often has a circular or star shaped mark. Bands on arms have dark edges that blend into a paler shade toward the center.

*\*Ophiarachnella infernalis* (Müller & Troschel, 1842)

**Habitat:** . Oca (Hospital) Pt.

**Comments:** No additional information

*Ophiarachnella parvispina* H.L. Clark, 1925

**Habitat:** A single specimen has been collected on the fore reef under a rock. Luminao Reef; 20 m

*Ophiarachnella* sp.

**Habitat:** A single specimen has been collected on the fore reef under a rock. Orote Pt.; 20-60 m

**Coloration:** Not known. Preserved specimen is pink with white bands every 3-4 arm segments.

*Ophiochaeta hirsuta* Lütken, 1869

**Habitat:** Shallow fore reef under rocks. Sharks Hole, Agat Bay (Neye Is.), Pago Bay, Luminao Reef, Piti Bay; 2-30 m

**Coloration:** Tan disc with arms banded brown, tan, and cream.

*Ophiopeza spinosa* Ljungman, 1867

**Habitat:** Fore reef rubble field. West Cocos barrier reef; 10-15 m

## Ophiomyxidae

*Ophiomyxa australis* Lütken, 1869

**Habitat:** Found in shallow lagoon and shallow to mid fore reef under rocks embedded in sand. Orote Peninsula, Piti Bay, Apra Harbor (Glass Breakwater), Agat Bay, Facpi Pt., Tanguisson; 1-20 m

**Coloration:** Red arms with wide pink bands, short spines. Aboral disc is generally red with darker red spots. A couple of specimens with yellowish coloration were also collected. The disc is very soft and inflated when alive.

Preserved specimens may retain some color if well preserved, but often fades to a translucent grayish-yellow.

#### Ophionereidae

##### *Ophionereis degeneri* A. H. Clark, 1949

**Habitat:** Found on the fore reef and in Apra Harbor under rocks. Apra Harbor (Glass Breakwater), Double Reef; 1-30 m

**Coloration:** Dark brown with short, erect arm spines. Entire aboral surface is covered with fine white speckles. The marks form rows across each of the arm plates, but are irregularly spaced on the disc.

##### *Ophionereis dubia* (Müller & Troschel, 1842)

**Habitat:** Reef moat and fore reef under rocks. S. of Orote Pt., Double Reef; 3-33 m

##### *Ophionereis cf. fusca* Brock, 1888

**Habitat:** Gun Beach, Apra Harbor (Western Shoals); 5-20 m

**Coloration:** White with black markings on disc and black banding on long, thin arms. Spines are much sparser, shorter, and thicker than those of *Ophiomastix caryophyllata*. The banding on the arms is also quite unlike any other ophiuroid found on Guam.

##### *Ophionereis porrecta* Lyman, 1860

**Habitat:** Under rubble. Cocos Is., Tanguisson, Piti Bay, S. of Orote Pt., Luminao; 1-30 m

**Coloration:** The disc is pale gray-brown aborally, lighter underneath. Entire disc covered with irregular thick dark markings and white flecks. Arms banded tan and brown.

**Comments:** Short, erect arm spines.

#### Ophiotrichidae

##### *Macrophiothrix* sp.

**Habitat:** A single specimen has been collected on the reef flat. Pago Bay; 1 m

##### *Macrophiothrix galateae* (Lütken, 1872)

**Habitat:** Found in sand under rubble on reef flats and lagoons. Piti bay, Double Reef, Facpi Pt., Cocos Lagoon; 1-15 m

**Behavior and Ecology:** This *Macrophiothrix*'s long arms are generally extended from underneath some concealing rubble.

**Comments:** Though the arms are characteristic in being very long, 20-25 cm, it is difficult to identify the members of this genus to species in the field. See *Ophiomastix caryophyllata*.

*Macrophiothrix longipeda* (Lamarck, 1816)

**Habitat:** Reef flat to fore reef, generally under rocks or in holes. Orote Pt., Cocos Lagoon; <1-41m

**Behavior and Ecology:** This *Macrophiothrix*'s long arms are generally extended from underneath some concealing rubble.

**Comments:** Though the arms are characteristic in being very long, 20-25 cm, it is difficult to identify the members of this genus to species in the field. See *Ophiomastix caryophyllata*.

\**Macrophiothrix robillardi* (De Loriol, 1893)

**Habitat:** Tumon Bay; No additional collection information given.

*Ophiothrix (Acanthophiothrix) purpurea* von Martens, 1867

**Habitat:** On soft corals and gorgonians on the fore reef. Facpi Pt., Hospital Pt., Shark's Hole; 5-25 m

*Ophiothrix (Ophiothrix) trilineata* Lütken, 1869

**Habitat:** The single specimen collected was associated with the hard coral *Seriatopora hystrix* Dana, 1846 on a fore reef wall. Hospital Pt.; 40-43 m

*Ophiothrix* sp.

**Habitat:** Lives in rock crevices on the fore reef. Tanguisson, Gun Beach; 1-10 m

**Behavior and Ecology:** Extends arms to filter feed at night.

Ophiuridae

*Ophiolepis* cf. *cincta* Müller & Troschel, 1842

**Habitat:** Under loose rubble and sand on reef flats and fore reefs. Agat Bay (Neye Is.), Double Reef, Gun Beach, Piti Bay, Cocos Lagoon, Tumon Bay; 1-20 m

**Coloration:** A uniform tan color, oral side is lighter.

**Comments:** Has fairly rigid arms with spines that are held pressed along the sides, giving them a very smooth appearance. See discussion.

*Ophiolepis superba* H. L. Clark, 1915

**Habitat:** Found under loose, sandy rubble on reef flats and fore reefs. Piti Bay, Orote Pt., Gun Beach, Luminao Reef, Double Reef; <1-7m

**Coloration:** A fairly robust brittle star with striking brown and tan markings. Banded arms, brown star on aboral side of disc, oral side lighter in color.

**Comments:** Spines are held pressed along the sides of the arms, giving them a very smooth appearance. See *Ophioplocus imbricatus* below.

*Ophioplocus imbricatus* Müller & Troschel, 1842

**Habitat:** Reef flats, under rocks. Ritidian, Tumon Bay; <1 m

**Coloration:** Brown with diffuse dark brown bands on arms and dark brown splotches on aboral side of disc. Short, erect spines give arms a ridged appearance. Specimens from other locations may have patterning similar to that of *Ophiolepis superba* (Chao et al., 1991) but none have been found in the Marianas.

*Ophioteichus multispinum* H. L. Clark, 1938

**Habitat:** A single specimen has been collected among rubble on the fore reef slope. Orote Pt.; 20-33 m

*Ophiotylos leucus* Murakami, 1943

**Habitat:** Reef flat, shallow to mid fore reef. Gun Beach, Piti Bay, Orote Pt.; 1-33 m

## Discussion

The records documented in this study increase the number of species found around the island of Guam from twenty to forty-seven (Table 1). While there are certainly more ophiuroid species remaining to be discovered, it is likely that the majority of large (d.d. >5mm) ophiuroids have been found. However, four large species (*Macrophiothrix robillardi*, *Ophiarachnella infernalis*, *Ophiarthum pictum* and *Ophiocoma anaglyptica*) were not recollected during the course of this study. Additional species of Ophiotrichidae may well exist around the island as specimens of this group of brittle stars were difficult to collect intact. Smaller species (d.d. <5mm) were not intensively targeted and additional collecting effort is likely to add new records.

Brittle stars identified as *Ophiocoma erinaceus* may represent a species complex. I distinguished three color-morphs: all black, black with gray oral surface, and black with red tube feet. Some specimens among these color morphs had inflatable sacs on their aboral spines. Despite these variable characters, all

Table 1. Ophiuroid species recorded from Guam

Voucher: voucher specimens in: USNM: BPBM: Bernice P. Bishop Museum; UGI: University of Guam Invertebrate collections; US National Museum of Natural History

Ref: Literature records from Guam: 1) Anonymous 1981; 2) Clark 1954

ID: Identifier: A) A.H. Clark; C) C.M. Clark; D) J. Doty; E) D. Devaney; H) A. Hoggett; S) J. Starmer; T) T. Coffey

Species	Voucher	Ref	ID
<b>AMPHIURIDAE</b>			
<i>Amphiura duncani</i> Lyman, 1882	UGI 6654		S
<i>Amphiura sexradiata</i> Koehler, 1930	UGI 2066	1	D
<i>Amphiura velox</i> Koehler, 1910	UGI 6651		S
<i>Amphipholis squamata</i> (Delle Chiaje, 1829)	UGI 2068	1	D
<b>GORGONOCEPHALIDAE</b>			
<i>Astroboa</i> sp. 1	UGI uncat		S
Gorgonocephalidae sp. 1	UGI uncat		S
<b>OPHIACTIDAE</b>			
<i>Ophiactis savignyi</i> (Müller & Troschel, 1842)	UGI 6653; USNM E31627		S
<b>OPHIOCOMIDAE</b>			
<i>Ophiarthrum elegans</i> Peters, 1851	UGI 2077	1	C
** <i>Ophiarthrum pictum</i> (Müller & Troschel, 1842)		2	A
* <i>Ophiocoma anaglyptica</i> Ely, 1944	USNM E24321		T
<i>Ophiocoma brevipes</i> Peters, 1851	UGI 6146		S
<i>Ophiocoma dentata</i> Müller & Troschel, 1842	UGI 2078, USNM E24322	1	C
<i>Ophiocoma doderleini</i> de Loriol, 1899	UGI 2088	1	C
<i>Ophiocoma erinaceus</i> Müller & Troschel, 1842	UGI 6659, USNM E24325	1	S
<i>Ophiocoma</i> cf. <i>erinaceus</i> Müller & Troschel, 1842	UGI uncat		S
<i>Ophiocoma pica</i> Müller & Troschel, 1842	UGI 2083, USNM E31630	1	C
<i>Ophiocoma scolopendrina</i> (Lamarck, 1816)	UGI 2097, USNM E7717	1	C
<i>Ophiocomella sexradia</i> (Duncan, 1887)	UGI 2901, USNM E31629	1	T
<i>Ophiomastix caryophyllata</i> Lütken, 1869	UGI 5874, BPBM-W 516	1	S
<i>Ophiomastix mixta</i> Lütken, 1869	UGI 6643	1	C
<i>Ophiomastix palaoensis</i> Murakami, 1943	UGI 6036		S
<i>Ophiomastix variabilis</i> Koehler, 1905	UGI 6650		S
<b>OPHIODERMATIDAE</b>			
<i>Distichophis clarki</i> Ely, 1942	UGI 6715		S
<i>Ophiarachna robillardi</i> de Loriol, 1893	UGI 6714		S
<i>Ophiarachnella gorgonia</i> (Müller & Troschel, 1842)	UGI 2084, USNM E7724	1	C
* <i>Ophiarachnella infernalis</i> (Müller & Troschel, 1842)	USNM E7721	2	A
<i>Ophiarachnella parvispina</i> H.L. Clark, 1925	UGI 6722		S
<i>Ophiarachnella</i> sp.	UGI 6713		S
<i>Ophiochaeta hirsuta</i> Lütken, 1869	UGI 6716, USNM E8439		S
<i>Ophiopeza spinosa</i> Ljungman, 1867	UGI uncat		S
<b>OPHIOMYXIDAE</b>			
<i>Ophiomyxa australis</i> Lütken, 1869	UGI 6638, USNM E24326		S
<b>OPHIONEREIDAE</b>			
<i>Ophionereis degeneri</i> A.H. Clark, 1949	UGI 6648		S
<i>Ophionereis dubia</i> (Müller & Troschel, 1842)	UGI 6717		S
<i>Ophionereis</i> cf. <i>fusca</i> Brock, 1888	UGI 2074	1	S
<i>Ophionereis porrecta</i> Lyman, 1860	UGI 2091	1	C
<b>OPHIOTRICHIDAE</b>			
<i>Macrophiothrix</i> sp.	UGI 2090	1	C

Table 1. Ophiuroid species recorded from Guam / (continued)

Species	Voucher	Ref	ID
<i>Macrophiothrix galateae</i> (Lütken, 1872)	UGI 6072		S
<i>Macrophiothrix longipeda</i> (Lamarck, 1816)	UGI 5864, USNM E30109	1	S
* <i>Macrophiothrix robillardi</i> (de Loriol, 1893)	USNM E34503		H
<i>Ophiothrix purpurea</i> von Martens, 1867	UGI 6646		S
<i>Ophiothrix trilineata</i> Lütken, 1869	UGI 6642		E
<i>Ophiothrix</i> sp.	UGI 6656		S
OPHIURIDAE			
<i>Ophiolepis cf. cincta</i> Müller & Troschel, 1842	UGI 2092	1	S
<i>Ophiolepis superba</i> H. L. Clark, 1915	UGI 6712		S
<i>Ophioplocus imbricatus</i> (Müller & Troschel, 1842)	UGI 6660		S
<i>Ophioleichus multispinum</i> H. L. Clark, 1938	UGI uncat		S
<i>Ophiotylos leucus</i> Murakami, 1943	UGI uncat		S

\* Species not found by the author but present in the collections of the USNM.

\*\* Species known from a literature record only.

forms keyed out as *Ophiocoma erinaceus* when using Clark & Rowe (1971). I have differentiated the specimens with spine sacs as *Ophiocoma cf. erinaceus* in the checklist as I have not seen any mention of this character in the literature. I have included all the color morphs in the checklist as *Ophiocoma erinaceus*.

Both reticulated and ocellated spot patterns were found in *O. doederleini*. This species also invariably had banded arm spines. The color of *O. doederleini* tends to range from white to dark gray. Color pattern differences between *Ophiocoma dentata* and *Ophiocoma doederleini* from Guam agree with those discussed by Devaney (1970).

Three color patterns were found in large (>1.5 cm) *O. dentata* on Guam: uniform dark spots, reticulated, irregular small, white flecks. Smaller specimens could exhibit these color patterns, but often were irregularly marked with brown and white flecks and patches. Intermediates between these color patterns were noted in some mid-sized specimens and it appears that the patterning of this species may change as it grows. *Ophiocoma dentata* generally has a suite of colors ranging from pale tan to dark brown.

The specimens of *Ophiolepis cf. cincta* found around Guam are all a uniform, pale gray-brown. This species is recorded to exhibit variation in disc coloration, banding on the arms and morphology, which may represent specific or subspecific differences (Sloan et al. 1979). I examined specimens identified as *O. cincta* with three color patterns in the collections of the USNM. Uniformly colored pale specimens are primarily from the Pacific: Moorea, Okinawa, Ifalik and Katelu Benjo (Carolines), Rongerik (Marshalls), and Saipan (Marianas). Pale mottled specimens in the collection were from the Western Pacific and Indian Oceans: Yap (Carolines), Indonesia, Sunda, Thailand, Eniwetok (Marshalls), Tonga, Cebu, Okinawa, Fiji, and Ashmore (Western Australia). I have also found mottled specimens in Palau (Carolines), a mottled specimen from New Caledonia is illustrated in Guille et al. (1986). Deeply colored specimens were from Aldabra

and the Seychelles (with strong patterning) and Mounimeri (Comoros, dark brown).

The coloration of the dark specimens was distinct from that of the other two forms as it often continued to the oral side of the disc and a brown tinge was present on the oral side of the arms on all of the dark specimens. Also, the "banding" on the specimens from Aldabra and Seychelles is probably better described as a broad interrupted stripe, as a thin stripe runs along either side of the arm above the arm spines. The pattern on the disc was made up of pale splotches on a dark reddish-brown background. In contrast the pale mottled specimens were evenly colored with small patches of shades of gray and the arms are evenly banded along their entire length. The pale gray specimens varied in color from gray to gray-brown and all were uniformly pale tan on the oral side.

The pale mottled specimens can be distinguished from the uniformly colored and deeply colored specimens based on differences in the disc plate patterning on the oral side of the disc. Mottled specimens have an alternating, paired row of inter-radial plates. This row is distinct from the more closely spaced plates on either side that produce a regular fish scale pattern. There is also a mass of small scales where the arms insert into the disc on the oral side. The disc plate pattern is fairly uniform over the entire disc surface of both other color forms.

All three color forms also have different relative arm lengths. Six uniformly colored specimens from Saipan, Moorea, Okinawa, Katelu Benjo, Ifalik, and Rongerik have a mean ratio of arm length (a.l.) to disc diameter (d.d.) = 4.1 : 1. The darkly colored specimens, five from Seychelles and one from Aldabra, have a mean a.l. : d.d = 2.8 : 1. Six pale mottled specimens from Okinawa, Fiji (2), Yap, Irian Jaya, and Ashmore Island have a mean a.l. : d.d = 3.2 : 1. These ratios are all slightly less than those of 5.5 : 1 (drab specimens) and 3.6 : 1 (strongly patterned) reported by Sloan et al. (1979) for dried specimens.

Sloan et al. (1979) identified the drab form on Aldabra as *Ophiolepis cincta garretti* and the strongly patterned as *O. cincta cincta*. Sloan et al. (1979) note that the type specimen of *O. cincta* from the Red Sea is patterned. It would appear that *Ophiolepis cincta* is represented by the strongly patterned form and is restricted to the Western Indian Ocean. Due to the differences in distribution and relative arm length, the uniformly colored, pale form probably represents yet another *Ophiolepis* species. However, I have left its identification as *Ophiolepis cf. cincta*. The lightly mottled form with banded arms is clearly not *Ophiolepis cincta*. Its distinct pattern of aboral disc plates, coloration, and relative arm length all serve to distinguish it from the other two forms.

The color pattern of *Ophionereis cf. fusca* differs from *Ophionereis fusca* found in other areas in the Pacific. The animals collected in Guam and other Mariana Islands all exhibit a boldly patterned disc and broadly banded black and white arms. I examined the single specimen of *O. fusca* at the NMNH, which has a fine reticulated pattern covering both arms and disc. This is very unlike the specimens from the Marianas. Another specimen of *O. fusca* illustrated in Guille et al. (1986) also exhibits a fine brown pattern that is very distinct from that of

the specimens from the Mariana Islands. Although all specimens that I examined keyed out as *O. fusca* using Clark & Rowe (1971), the differences in color pattern led me to identify this species with reservations.

*Amphiura duncani* is known only from Apra Harbor. Clark & Rowe (1971) list *Amphiura duncani* (as *A. luetkeni* Duncan, 1879) as recorded from North Australia. Its discovery on Guam represents an unusually large range extension and may indicate that this species was introduced.

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