

QUALITATIVE ASSESSMENT OF THE ASTEROIDS, ECHINOIDS
AND HOLOTHURIANS IN YAP LAGOON¹

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INTRODUCTION

A limited amount of work has been done on the echinoderm population of Yap. Two previous technical reports (Amesbury et al., 1976, 1977) list 16 echinoderms observed in two localized areas: one at the Donitsch Island sewer outfall site and the other at a proposed dock site in Colonia, Yap.

The only other observations of this group relate to the asteroids. Earlier reports (Hayashi, 1938a, 1938b) mention only Culcita novaeguineae and Fromia monilis as being identified from Yap. Clark (1954) recorded Protoreaster nodosus as also being found there.

During the period of time when Acanthaster planci infestations were a concern throughout the western and central Pacific, several separate surveys were made on Yap. Beginning in July of 1969, Cheshier (1969) observed no large populations of A. planci. By late 1970 (Tsuda et al., 1970) two small populations (one consisting of 100 - 150 individuals and another of about 50 starfish) were identified outside of the barrier reef. A subsequent survey in 1971 (Marsh and Tsuda, 1973) noted an apparent increase in A. planci, but they were widely scattered with no obvious major concentrations.

This particular paper provides a qualitative assessment of the asteroid, echinoid, and holothurian populations in the Yap Lagoon, with particular reference to the latter.

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METHOD

The observations made here were done during the course of a general reef survey, conducted during July 9-20, 1977, which covered a major portion of the reef flat in the Yap Lagoon. Most observations were made as a result of towing the observer from a small boat in a zigzag pattern from the seagrass beds near shore to the barrier reef margin. When unusually conspicuous populations of echinoderms (particularly holothurians) were noted, a closer examination was made by snorkeling in the area. Periodically, more detailed observations of randomly chosen areas were made in order to note less conspicuous species.

Two 30-m transects were run in a Thalassia hemprichii bed just east of Bik Island in Tomil Harbor. In this case, all echinoderms 0.5 m on either side of a 30 m-long transect line were enumerated.

RESULTS AND DISCUSSION

Four zonal habitats (seagrass, seagrass-live coral, live coral, and coral pavement) characterize the reef flats in the Yap Lagoon.

The seagrass zone is characterized by thick beds of Thalassia and Enhalus adjacent to shore, becoming patchy and interspersed with live coral heads (predominately Porites) as one progresses out toward the reef margin. This transitional zone is referred to as the seagrass-live coral zone in this paper. As the seagrass becomes less dominant other corals (notably Acropora) along with the Porites form a live coral zone. Near the reef margin, the live corals become replaced by coral pavement. Table 1 lists the various echinoderms found in these four habitats, as well as those found on patch reefs, holes, and channel.

The densest populations of echinoderms on the reef flat occur in the seagrass beds adjacent to land, though not all of the seagrass beds surveyed exhibited obvious numbers of echinoderms. Holothurians in the seagrass beds were either absent, rare (1-2 seen per hour of snorkeling), or unusually abundant.

Table 2 presents the results of the two 30-m long transects (1 m wide) run in the Thalassia bed. Transect A was located adjacent to Tomil Harbor channel and southeast of Bik Island. Transect B was situated just east of the island. The major components in both cases were the echinoid Mespilia globulus and the holothurian Actinopyga echinites. The unusually large numbers of M. globulus present had covered themselves with seagrass detritus. Examination of the stomach contents of 25 M. globulus and four Tripneustes gratilla that were also present, revealed that Thalassia was the only food item ingested. Actinopyga echinites seemed to be feeding primarily on the detritus. In some cases, A. echinites could be seen feeding on the detritus that was attached to

Table 1. Checklist of asteroids, echinoids, and holothurians observed in various reef flat zones and other habitats in Yap Lagoon. (1. seagrass zone, 2. seagrass-live coral zone, 3. live coral zone, 4. coral pavement zone, 5. patch reefs in Tomil, Mil, and Gofenu Harbors, 6. holes in reef flat, 7. Tomil Harbor Channel).

SPECIES	Reef Flat Zones				Other Habitats		
	1	2	3	4	5	6	7
Class Asteroidea							
<u>Acanthaster planci</u> (Linnaeus)					X		
<u>Culcita novaeguineae</u> Müller & Troschel		X		X	X	X	
<u>Echinaster luzonicus</u> (Gray)			X	X			
<u>Fromia milleporella</u> (Lamarck)						X	
<u>Linckia laevigata</u> (Linnaeus)				X			
<u>Linckia multifora</u> (Lamarck)			X				
<u>Protoreaster nodosus</u> (Linnaeus)	X						
Class Echinoidea							
<u>Diadema setosum</u> (Michelin)			X		X	X	
<u>Echinothrix calamaris</u> (Pallas)				X			
<u>Heterocentrotus mammillatus</u> (Linnaeus)				X			
<u>Mespilia globulus</u> (Linnaeus)	X					X	
<u>Tripneustes gratilla</u> (Linnaeus)	X						
Class Holothuroidea							
<u>Actinopyga echinites</u> (Jaeger)	X						
<u>Bohadschia argus</u> Jaeger					X		X
<u>Bohadschia</u> sp.	X						
<u>Holothuria atra</u> Jaeger	X	X		X	X		
<u>Holothuria axiloga</u> Clark							X
<u>Holothuria edulis</u> Lesson	X	X			X	X	
<u>Holothuria hilla</u> Lesson	X						
<u>Holothuria flavomaculata</u> Semper	X	X	X		X	X	
<u>Holothuria leucospilota</u> Brandt		X	X		X	X	
<u>Holothuria nobilis</u> (Selenka)		X					
<u>Stichopus chloronotus</u> Brandt	X	X			X	X	
<u>Stichopus variegatus</u> Semper	X				X		
<u>Thelenota ananas</u> (Jaeger)							X
Unidentified synaptid	X						

M. globulus. Actinopyga echinites exhibited the clumped distribution referred to by Amesbury et al. (1976), being found often in "piles" of five or more in close association. One small dark red holothurian, which the author could not identify, was observed in Transect A.

Table 2. Density of echinoderms along two 30-m long transects (1 m wide) in a Thalassia bed off Bik Island, Tomil Harbor, Yap.

SPECIES	A	B
<u>Actinopyga echinites</u>	164	450
<u>Mespilia globulus</u>	34	245
<u>Holothuria edulis</u>	11	3
<u>Protoreaster nodosus</u>	9	4
<u>Holothuria atra</u>	4	2
<u>Stichopus chloronotus</u>	2	4
<u>Holothuria hilla</u>	1	1
Unidentified holothurian	1	-
<u>Holothuria flavomaculata</u>	-	4
<u>Tripneustes gratilla</u>	-	1

In another Thalassia bed off Pekel Island in Tomil Harbor, Actinopyga echinites was also abundant, exhibiting the same tendency toward clumping that was observed earlier. Also present but not as abundant were Stichopus variegatus and S. chloronotus and a variety of occasionally observed holothurians such as Holothuria hilla, H. atra, and the asteroid Protoreaster nodosus, along with the scyphozoan medusa Cassiopeia sp. Large population densities of H. atra were also noted in an Enteromorpha bed west of Thilimad Island, near the northern tip of Map Island. Only one synaptid was observed during the entire survey, in a seagrass bed off the northeast corner of Map.

As one progresses out toward the reef margin into the seagrass-live coral zone, Holothuria edulis replaces Actinopyga echinites as the predominant holothurian species. Stichopus chloronotus was usually present in this zone, but, as in the seagrass zone, was not particularly common. It was seen mostly in sandy areas between coral beds. Holothuria leucospilota was occasionally seen with the anterior part of its body extended out from under the Porites heads. Other holothurians observed in the seagrass-live coral zone were an occasional Holothuria atra, H. nobilis, and H. flavomaculata. The "cushion starfish" Culcuta novaeguineae was also seen.

In the live coral zone, the asteroids Linckia multifora, Fromia milleporella, and Echinaster luzonicus, along with the echinoid Diadema setosum, were common in among the Acropora, and under Porites heads.

Holothuria leucospilota was seen, as in the seagrass-live coral zone, extending out from under Porites heads, whereas H. flavomaculata was common in close association with stands of Acropora.

In the coral pavement zone out near the reef margin, only an occasional Holothuria atra represented the holothurians. The only other obvious echinoderms were Linckia laevigata and Culcita novaeguineae. The majority of the echinoderms in this zone were found in coral rubble and under rocks. These include an unidentified ophiuroid, Echinaster luzonicus, Echinothrix calamaris, and Heterocentrotus mammillatus.

Besides the general zonation across the reef flat, there exist distinct echinoderm populations in the deep holes that occur on the reef flat, and on patch reefs in the various harbor entrances. The holes are surrounded by a Porites-Acropora type community and the echinoderm fauna corresponds thusly. As the sides of the holes slope downward to a sandy bottom, those holothurians which prefer sandy substrate are seen, e.g., Holothuria edulis and Bohadschia argus.

Patch reefs in the three major harbors (Tomil, Mil, Gofenu) provide a diverse environment for a variety of echinoderms. Sandy areas with some seagrass are interspersed between areas of high coral density. The sandy areas of these reefs include the holothurians Holothuria edulis, H. atra, Stichopus chloronotus, S. variegatus, and Bohadschia argus. The holothurians H. flavomaculata and H. leucospilota were found associated with the corals Acropora and Porites, respectively. The echinoid Diadema setosum and the asteroid Fromia milleporella were found in the coral while Culcita novaeguineae was often observed in sandy patches between corals. On the downward slope of these patch reefs and along channels, the larger detritus-feeding holothurians, i.e., Thelenota ananas, Bohadschia argus, and Holothuria axiologa, were located.

While holothurians of major economic importance were identified within the reef flat (Thelenota ananas, Bohadschia argus, Holothuria nobilis), they were not observed to be present in such quantities that would make their export profitable. The Yapese, themselves, are not overly fond of the delicacy, but the Palauan community of Yap does occasionally utilize the above-mentioned species as a food source as well as Actinopyga echinites which is found in considerable abundance in some of the seagrass areas. Since the Palauan community is situated in the Colonia area, only edible holothurians in the Tomil Harbor area are likely to be harvested because of the strict reef tenure on Yap where the various villages have exclusive fishing rights on designated areas of the reef.

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