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Holothuroid Species in Talikud Island, Island Garden City of Samal IGACOS)

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ABSTRACT

This study entitled "Holothuroid Species in Talikud Island, Island Garden City of Samal (IGaCoS)", was conducted to identify the different holothuroid species present in the study area with the use of ossicle- based taxonomic key and determine their presence in 10 stations with due consideration of the environmental condition prevailing in the areas. A descriptive study was used to obtain the taxonomic account and distribution of the holothuroid species in ten selected areas of Talikud Island namely Dadatan, Baybay, Maniksik, Linosutan, Tastas, Mansod, Cogon, Dapia, Bagacay and Kamaonan. Fifteen species were identified belonging to three families namely: Synaptidae (Synapta maculata, Polyplectana kefersteini, Opheodesoma sp.); Stichopodidae (Thelenota sp., Stichopus sp., Stichopus horrens); Holothuriidae (Pearsonothuria graeffei, Holothuria hilla, Holothuria pulla, Holothuria sp 1, Holothuria sp. 2, Holothuria sp. 3, Holothuria sp. 4, Holothuria sp. 5 and Holothuria sp. 6. Human activities in some areas resulted to lower variation and number of holothuroids.

Keywords: Holothuroids, ossicles

INTRODUCTION

Sea cucumbers are echinoderms belonging to the Class *Holothuroidea* (Holothurians). Sea cucumbers are widely distributed in marine environments throughout the world, from intertidal zones to the deep-sea, with the highest diversity in the Indian and Western Pacific oceans. There are about 100 species of sea cucumbers in the Philippines but only 25 are commercially valuable (Schoppe, 2000). The commonly fished species are found in the families *Holothuriidae* and *Stichopodidae*.

Talikud Island of IGaCoS , harbors a rich marine flora and fauna. The earliest report on local holothurians was made by Alojado *et al.* (1995). Fifteen species were identified in the two sampling areas namely Dapia and Tastas, Talikud Island, Garden City of Samal. Classification was based on ossicles and significant morphological features. To date, there is scarcity of available literature of holothurians in Davap Gulf, Talikud Island in particular. Very little is known about the taxonomy of the holothurian fauna of the island. The earliest report on Philippine holothurians was made by Dr. Carl Semper in 1869 and this was published in "Reisen in Archipel der Philippinen". The species described were collected mostly from the deeper waters of Bohol. Seale in 1911

listed down 66 species of local holothurians. In 1917, in his account of "trepang" industry of Mindanao and Sulu, he described 16 principal varieties and 47 commercial grades. The first Filipino to publish work on the Class *Holothuroidea* was Jose S. Domantay whose taxonomic accounts of the holothurians of Puerto Galera. Zamboanga, Hundred Islands, Turtle Islands and others were published in several papers from 1933 to 1960. These reports were followed many years later by Geronimo (1976), Santiago (1979) and Tan Tiu (1981) who adopted the latest revision of Rowe in 1969 of the Family *Holothuriidae* (Leonardo, 1984).

A study of the intertidal holothurian fauna of Mactan and the neighboring islands carried out by Tan Tiu (1981), dealt with the systematics of intertidal sea cucumbers of Mactan, Sulpa, Olango, Hilutangan, Camungi, Panganan, Caohagan and Lassuan Islands. A total of twenty seven (27) species in eight genera belonging to the Families *Synaptidae*, *Stichopodidae* and *Holothuriidae* were included in the study. It was shown in the study that Family *Holothuriidae* is the most common having 20 species. Three new species were found namely *Actinopyga caroliniana*, *Holothuria (Selenkothuria) mactanensis* and *Holothuria canaliculata*. It was found out that out of the twenty seven species, twenty six were reported from the areas for the first time. Baluat in 2000, reported 35 species found in 4 stations of Lianga Bay, Surigao del Sur. The 35 species belong to 3 holothuroid families namely *Synaptidae*, *Holothuriidae* and *Stichopodidae*. A total of 13 species representing the families *Holothuriidae*, *Stichopodidae* and *Synaptidae* were found in the marine station of San Pedro College at Dasag, Babak, Island Garden City of Samal, Davao del Norte. Of the 13 species, 9 are known to be edible which are either used for home consumption or find their way into the market places (Madrid, 2001).

Over 900 species are contained in three subclasses, six orders and 25 families. They are found throughout all seas, reach their diversity in shallow tropical waters but often dominate the overall biomass of deep ocean trenches. Given the flexibility of the holothurian body wall, changes due to preservation are often gross, making detailed descriptions of external morphology difficult. However, careful observations and measurements of live animals are very useful and color photos can be of great assistance (Arnold *et al.*, 1989). Sea cucumbers are morphologically simple and this presents significant taxonomic challenges. There is scarcity of available characters to mark breaks between species due to its morphological simplicity. Cryptic species, for example, are not easily recognized by differences in morphology. This makes the endodermal ossicles of this group an essential diagnostic tool for taxonomy. The various shapes, size and fine details of ossicles are of paramount importance as systematic characters for holothuroids. As such, the use of ossicles as a taxonomic tool in the study can help confirm the identity of holothuroids.

It is therefore the purpose of this study to use endodermal ossicles as a major tool in the diagnosis and classification of holothuroids from the family down to the species level. The study aimed to provide a taxonomic account and distribution of sea cucumbers in Talikud Island, Island Garden City of Samal.

MATERIALS AND METHODS

Talikud Island, the study area, is located in the Island Garden City of Samal which is a 5th class city in the province of Davao del Norte. The name often abbreviated into IGaCoS. Island Garden City of Samal is politically subdivided into 46 barangays. The Island Garden City of Samal (IGaCoS) covers a total of 30,130 hectares of land area located 06° 56' 02'' N, 125° 41' 58''E. IGaCoS embraces about a quarter of the municipal waters of the entire Davao Gulf as shown in Figures 1 and 2. A Magellan GPS 310™ was used to locate the global positions of the ten sampling areas. Talikud Island is composed of four barangays namely Sta. Cruz, Dadatan, Linosutan and Cogon.

Figure 1. Map of Talikud Island, Island Garden City of Samal, Davao del Norte

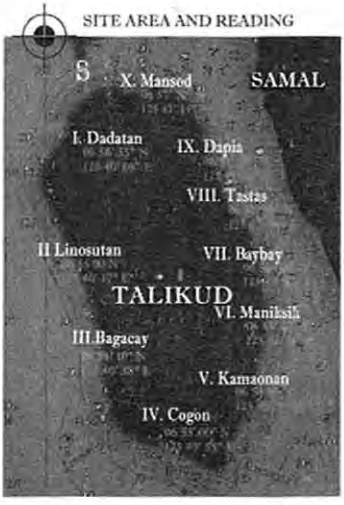

Figure 2. Map showing the location of the 10 sampling areas in Talikud Island

Specimen Collection

Samples were collected from 10 selected sites found in Talikud Island. Data collection was conducted from November 2005 to February 2006. Field sampling was done on a weekly basis. Specimens were collected by scuba diving and by hand in the

intertidal zone. A slate was used to note the needed data collected in this study. Data included morphological characteristics and important features of the holothuriod species. The time, depth and the substratum type were also note. Coding was done to facilitate collection. The samples were placed in seawater until they were fully extended. Small amounts of magnesium sulfate were added from time to time. Two sets of each species were collected for preservation. One was preserved in 10% formalin for documentation and the other set was preserved in 70% alcohol for the taxonomic work in the laboratory. The formalin and alcohol were replaced after 24 hours.

Taxonomic Description

The external features were identified and observed using a stereomicroscope. The overall shape, body wall and tentacles were observed. The body length was measured. Important features such as color, number and structure of the tentacles, color of the specimen, spots and designs, size and texture were considered. Every specimen was photographed. For preparation of ossicles, pieces of sea cucumber skin were removed from six different sites of the body of the sea cucumber namely anterior dorsal, posterior dorsal, mid dorsal, anterior ventral, posterior ventral and mid ventral. The skin was treated in 20% KOH that reduced the dermal tissues, leaving behind the ossicles. Ossicles were separated from the digested tissue by diluting the KOH with distilled water and decanting the upper half of the digesting solution after allowing the ossicles to settle. This was repeated to really cleanse the ossicles which were finally stored in 70% ETOH. Dermal ossicles were conveniently mounted on slides.

Identification of Samples

Morphological characteristics were used in the initial classification. A taxonomic key based on ossicles was developed. The book entitled, "A guide to common shallow water sea stars, brittle stars, sea urchins, sea cucumbers and feather stars (Echinoderms) of the Philippines" by Sabine Schoppe (2000) and Shallow-water holothurians of Calatagan, Batangas, Philippines by Lydia R. Leonardo and Marti Ellen Cowan (1984) were used in the identification. The intertidal holothurian fauna (Echinodermata: Holothuroidea) of Mactan and the neighboring islands, Central Philippines (1981) by Tan Tiu was also used in the taxonomic work and identification as well.

RESULTS AND DISCUSSION

The survey conducted in Talikud Island, Island Garden City of Samal (IGaCoS), resulted to a total of fifteen holothuroid species. The species represented three families namely *Synaptidae*, *Stichopodidae Holothuriidae* including nine species that were identified up to the generic level. There were twelve ossicle types identified from the fifteen holothuroid species are shown in Figure 3 and described in the presentation of the holothuroids.

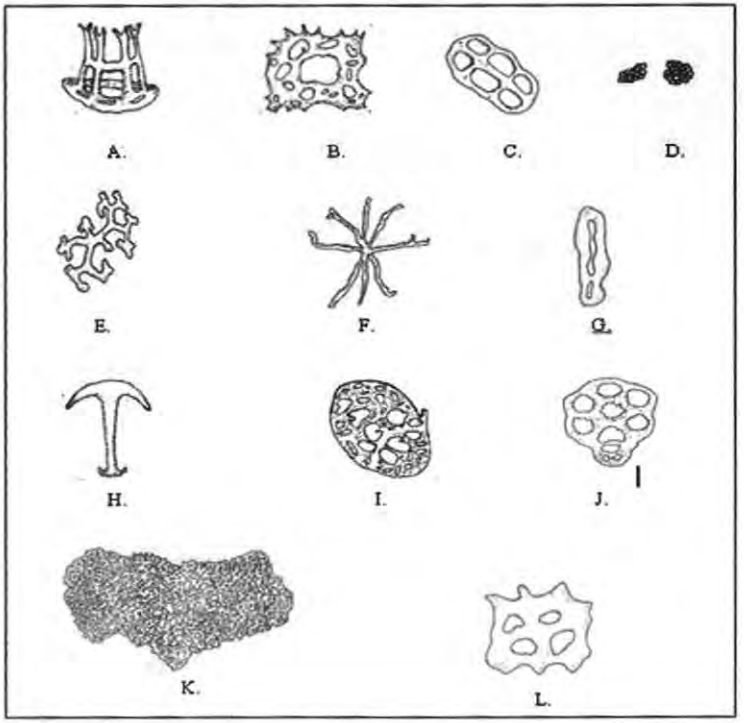

Fig. 3. Ossicles from the collected samples. **A.** table, **B.** disc view of table, **C.** smooth with three pairs of holes, **D.** miliary granules, **E.** branched rod with lobed branches, **F.** branched rod with spinose branches, **G.** unbranched rod, **H.** anchor, **I.** anchor plate with handle not abruptly contracted, **J.** anchor plate with handle abruptly contracted, **K.** perforated plate (with many holes), **L.** perforated plate (with only four holes

The three most dominant species are presented to provide a glimpse of the classification process. Only *Synapta maculata*, *Holothuria pulla* and *Opheodesoma* sp. were consistently found at the 10 different stations.

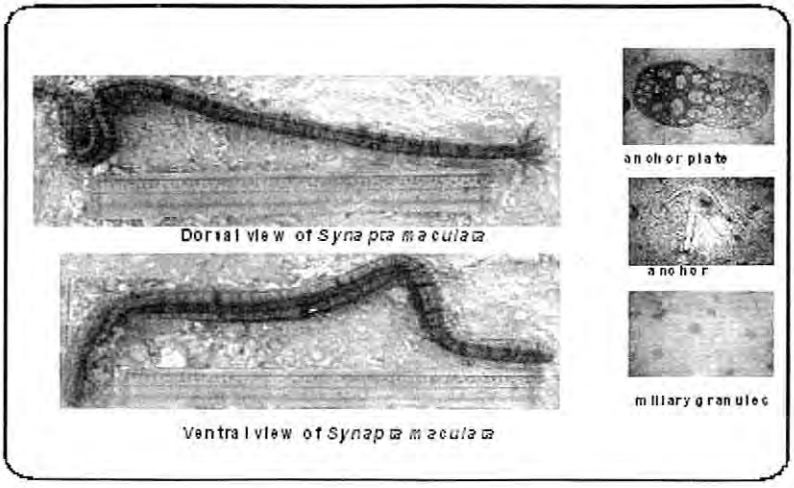

Plate 1 *Synapta maculata* Chamisso and Eysenhardt
Local name:Bahag-bahag(Visayan)
Habitat: commonly found on seagrass beds and sandy areas
Body length : 30-50 cm

Body is cylindrical and snakelike. The body surface is distinctly very rough to touch. There are 15 pinnate tentacles that are tan with white lines along the margins. There are five distinct light to brown longitudinal bands that extend over the body. They are ringed by transverse irregular bands of brown and black shades. The animal appears mosaic due to its irregular transverse bands. The species is not edible. Anchors, anchor plates and miliary granules were the ossicles found. Anchor's handle is finely notched or toothed on the edge. The vertex and arms are smooth. Anchor plate is almost rectangular in shape. The smooth holes that perforate the anchor plates are too many to count. There are large and small holes that perforate the anchor plate. A well defined cross bridge is found near the posterior end of the anchor plate. All holes are observed to be smooth. Miliary granules are gathered into round or ovoid formations. The ratio between the anchor arm to anchor length of *Synapta maculata* is 37.33% which lies within the range observed by Tan Tiu (1981). All of the morphological characteristics agree with those observed by Tan Tiu (1981).

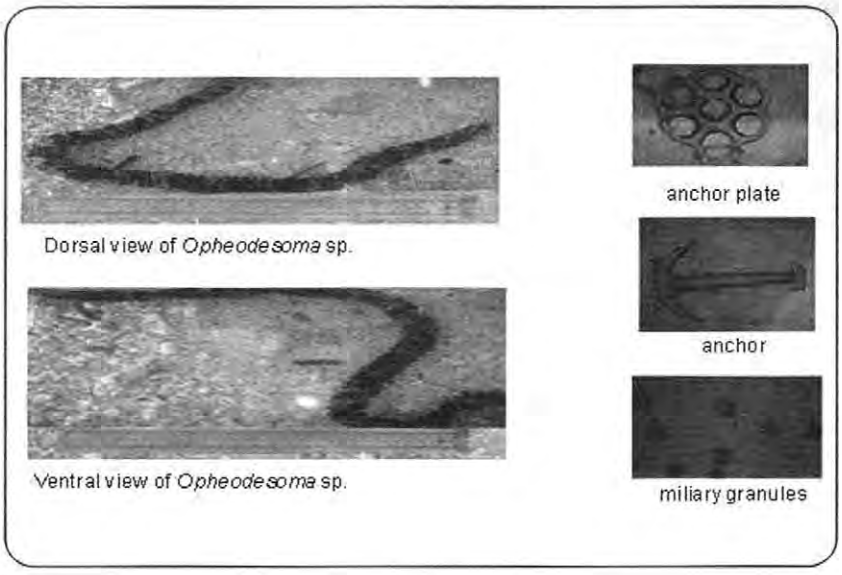

Plate2. *Opheodesoma* sp.
Local name : Bahag-bahag (Visayan)
Habitat : commonly found on seagrass beds and sandy areas
Body length : 30-50 cm Tentacles (in alcohol): 15 cm

Body is cylindrical and snakelike. The body surface is fleshy and skin is lax or indulgent. Body wall is thin. There are 15 pinnate tentacles that are yellow green in color. Ground color is dark green with irregular yellow green patches. The species is not edible and of no commercial value. Anchors, anchor plates and miliary granules were the ossicles found. The anchor's handle is irregularly branched. The arm and vertex are smooth. Anchor plate is steeply condensed posteriorly. There are six toothed or notched circumferential holes that surround a central one. A cross bridge curves smoothly on the posterior end. Several small holes are present at the posterior edge of the anchor plate. The irregular yellow green patches distinguish *Opheodesoma* sp. from the two other species. The morphological characteristics observed in the study do not agree with the observations and descriptions of Tan Tiu (1981) in *Opheodesoma grisea* and *Opheodesoma glabra*. However, characteristics of the anchor, anchor plates and miliary granules agree with the descriptions of Tan Tiu (1981) in those aforementioned species. In this study, the species is therefore assigned under genus *Opheodesoma*.

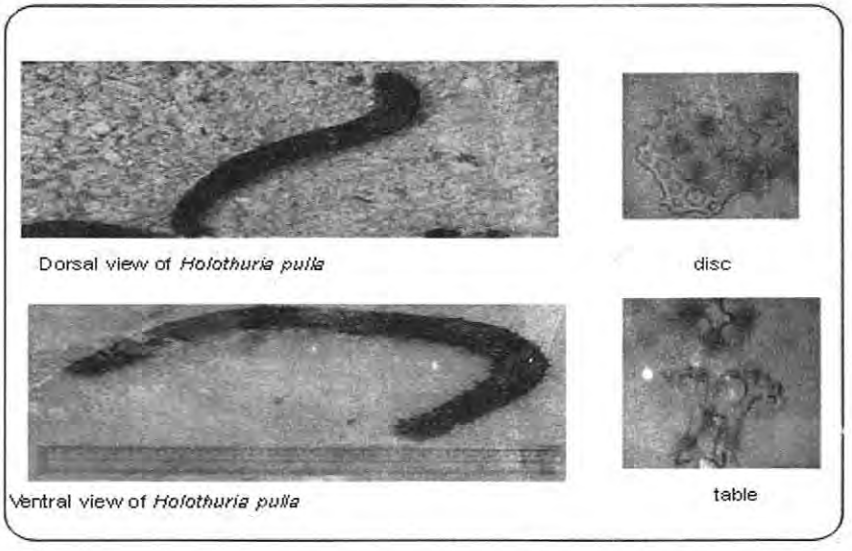

Plate 3. . *Holothuria pulla* Selenka

The body is cylindrical. The body surface is very fleshy to touch. Body wall is thin and soft. here are 20 black peltate tentacles. In life, individuals are dark reddish brown that looks black from a distance. There are thin black papillae that are found all over the body. This species is not edible.

The ossicles found are tables and buttons. The tables have smooth, flat and irregular discs. The disc is perforated by more or less ten circumferential holes surrounding a central one. The spire ends in two small spines that has four pillars and one cross bridge. All buttons are smooth that may have regular or irregular outline. There are two types of buttons one with one pair of holes and another with three pairs of large holes. These buttons make *Holothuria pulla* distinct from other species collected. *Holothuria pulla* is sold at 200 Php that is equivalent to 5 US$ (Schoppe, 2000).

Table 2 shows the holothuroids found in the different sampling areas of Talikud Island. It shows Station 1 with 13 species; followed by Station 8 with 10 species; Station 6 with 9 species; Station 2 with 7 species; Station 4, 5 and 10 with 6 species each; Station 3 and 9 with 5 species each and lastly Station 7 with 3 species.

Table 2. Distribution of holothuroids in the sampling areas

Species	Stations									
	1	2	3	4	5	6	7	8	9	10
1. *Synapta maculata*	+	+	+	+	+	+	+	+	+	+
2. *Polyplectana kefersteini*	+	+			+	+		+		
3. *Opheodesoma* sp.	+	+	+	+	+	+	+	+	+	+
4. *Thelenota* sp.									+	+
5. *Stichopus* sp.	+				+	+		+		
6. *Stichopus horrens*	+	+	+	+		+		+		+
7.*Pearsonothuria graeffei*	+	+						+		
8. *Holothuria hilla*	+	+	+		+	+		+		
9. *Holothuria pulla*	+	+	+	+	+	+	+	+	+	+
10. *Holothuria* sp. 1	+									
11. *Holothuria* sp. 2	+			+		+		+		
12. *Holothuria* sp. 3	+									
13. *Holothuria* sp. 4									+	+
14. *Holothuria* sp. 5	+			+		+		+		
15. *Holothuria* sp. 6	+									

Only *Synapta maculata*, *Holothuria pulla* and *Opheodesoma* sp. were consistently found at the 12 different stations while *Holothuria* species 1, 3 and 6 were found only in Station 1 and *Thelenota* sp. and *Holothuria* species 4 were found only in Station 10 and 9, respectively. The rest of the species were distributed in the different stations without a definite pattern, as seen in Table 2.

Twelve species included in this paper are benthic types that live in shallow water with depth not exceeding six meters. According to Schoppe (2000), *Thelenota anax* is commonly found on sandy areas and on the seaward reef slope from 10 to 30 m. Another species known as pineapple sea cucumber or *Thelenota ananas* is found on exposed sandy bottoms or rubble areas of the reef fringe on the same depth (Schoppe, 2000). *Synapta maculata*, *Polyplectana kefersteini* and *Opheodesoma* sp. were found on seagrass beds or under hard corals or partially covered with sand among the roots of seagrasses. The aforementioned findings are in consonance with the observations of Reyes-Leonardo (1984).

The three families represented by holothuroids in Talikud Island are ***Synaptidae*** (*Synapta maculata*, *Polyplectana kefersteini*, *Opheodesoma* sp.); ***Stichopodidae*** (*Thelenota* sp., *Stichopus* sp., *Stichopus horrens*); ***Holothuriidae*** (*Pearsonothuria graeffei*, *Holothuria hilla*, *Holothuria pulla*, *Holothuria* sp 1, *Holothuria* sp. 2, *Holothuria* sp. 3, *Holothuria* sp. 4, *Holothuria* sp. 5 and *Holothuria* sp. 6). *Holothuria* species 4 and 5 were found buried in sand. In the study of Reyes-Leonardo (1984) *H. hilla*, *H. coluber*, *H. fuscocinerea* and *Stichopus naso* were found under boulders. In the

study, *Stichopus horrens*, *Holothuria hilla* and *Holothuria pulla* were found under rocks. *H. pulla* was often seen associated with *Diadema setosum* (sea urchin) under rocks or boulders. *Holothuria* spp. 2, 3 and *Stichopus* sp. were often found partially covered by sand. *Holothuria* species 1 and 6 were seen under hard corals in the subtidal area. Lastly, *Thelenota* sp. and *Pearsonothuria graeffei* were fully exposed on the sand.

The substrate of the study areas is generally sandy and coralline. Station 1 has the highest number of holothuroid species. Station 1 is sparsely populated and located near the famous coral garden. Diversity as well as the number of holothuroids present is high. The absence or the limited exposure of Station 1 to human activities may explain the relative holothuroid diversity and abundance.

Stations 3, 4, 5, 6, 9 and 10 are sparsely populated and seagrass species and algae are common in the areas. Pitt *et al.* (2000) proved that seagrass pens are useful for holding small numbers of sandfish or *Holothria scabra*. It was observed from the study that survival was generally good while growth rates (0-1g/animal/day) appeared to depend on location as well as density. The number of holothuroid species present in the areas is moderate even if fishermen visit the area frequently. Station 7 has the least number of holothuroid species. Station 7 is densely populated. The area is near the port and the famous beach resort Isla Reta. There are plenty of shanties observed along the study area. People in the area were seen fishing mainly for consumption and livelihood. These observations may be supported by the report of Hasbun and Lawrence (2002) where low number of species observed in their study area is an indication of the degradation or unsuitability of the marine habitat due to its proximity to the coast. Further, a study in Malaysia by Baine *et al* (2000) reported that Langkawi has the least number of sea cucumbers species collected compared to the two other sampling areas because it is situated in the only clear-water zone on the west coast of Malaysia. A major tourist destination, in recent years the area has undergone rapid development, with even more reclamation of coastal areas. This in turn has resulted to increased sediment loading in the littoral zone. It was also speculated that overfishing in Langkawi has played a strong part in the decline of *Stichopus variegatus*. In the present study, human activities may be a primary factor for the observed low number of holothuroid species in Station 7.

Currently there are many areas in Davao Gulf wherein marine resources are exploited and damaged. Habitats of marine organisms are destroyed or altered due to various human activities. In the case of sea cucumbers, BFAR considers this group as a heavily exploited resource and acknowledges that localized depletion exists in many fishing grounds (Gamboa *et al.*, 2002). It was further reported that in Samal Island there is now low frequency of fishing which results to reduced catch volume as compared to the boom years. There are specific areas of Davao Gulf that have become famous ports or beach resorts. Some people build shanties along some shores of Davao Gulf that contributed to the degradation of marine habitat. Still there are areas in the gulf that is unaltered and preserved. The same thing is happening in the sampling areas chosen in Talikud Island, Island Garden City of Samal (IGaCoS).

Finally, different human existence and activities in the natural habitats affect the distribution of sea cucumbers collected in the study. Habitat includes substrate, depth and presence of seagrasses, algae and corals. Fishing for human consumption and for income are the most common human activities that can alter the marine environment

suitable for the survival of sea cucumbers in Talikud Island. Proper information and education of the coastal communities would improve the people's sense of responsibility for the sustainable management of the holothuroids and other marine resources.

REFERENCES

Alojado, L.R., Calicdan, M.E.,Maramion, M.M. and Rodriguez, M.C.1995. A taxonomic study of holothuroids in Dapia and Tastas, Talikud Island. Ateneo de Davao University. Ateneo Theses Collection, Davao City.pp.1-39.

Arnold, P.W. and Birtles, R.A.1989. Soft-sediment marine invertebrates of Southeast Asia and Australia: A guide to identification. Course notes from a workshop held at James Cook University, Townsville, Australia.

Baine, M. and Forbes, B. 2000. The taxonomy and exploitation of sea cucumbers in Malaysia. International Centre for Island Technology (ICIT), Isle of Orkney, Scotland.pp 45-67.

Baluat, B.G.2000. Holothuroid fauna of Lianga Bay, Surigao del Sur. Ateneo de Davao University Theses Collection, Davao City.pp.1-32.

Gamboa, R., Gomez, A.L., Nievales, M.F., Bangi, H.G. and Junio-Menez, M.A. 2004. The status of sea cucumber fisheries and mariculture in the Philippines. Beche-de –mer Bulletin (19).

Leonardo,L.R.1984. Taxonomic report of shallow water holothurians of Calatagan, Batangas. UP CAS Manila and University of the Philippines Marine Sciences Center. Vol 113:Nos.:3-4.pp.137-155.

Leonardo,L.R. and Cowan, M.E.1984. Shallow-water holothurians of Calatagan, Batangas, Philippines. Filipinas Foundation, Inc and the University of the Philippines Marine Sciences Center.

Madrid, I.B.2001.Assessment on the population of Holothuroid species present in San Pedro College Marine Station at Dasag, Babak, Island Garden City of Samal, Davao del Norte.Ateneo de Davao University Theses Collection, Davao City.pp.1-50.

Tan Tiu, A.S. 1981. The Intertidal Holothurian Fauna (Echinodermata: Holothuroidea) of Mactan and the Neighboring Islands, Central Philippines. The Philippine Scientist.18:45-119.