
Species composition of macroinvertebrates in Sto. Tomas Cove, La Union, Philippines

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Mamhot, J. R., Peralta, D. A. and Bejar, J. L. (2018). Species composition of macroinvertebrates in Sto. Tomas Cove, La Union, Philippines. *International Journal of Agricultural Technology* 14(7): 1413-1422.

Abstract Macroinvertebrates usually inhabit coastal areas. Being numerous in the shallow zones, they provide readily available food source. They are mostly exposed to high fishing pressure as most of them are immobile or slow moving animals. Results of the three-year survey from 2013 August to June 2016 on the status of macroinvertebrates collected by a modified trawl net (locally known as Karkar) at four established stations in Sto. Tomas cove are presented in this study. This include species composition, abundance and distribution of invertebrates in the area. Four groups were identified: Mollusks, Arthropods, Echinoderms and Cnidarians. Of these, mollusks were the most diverse, widespread and common group throughout the sampling months. The mollusks consist of three groups in the collections: Bivalves, Gastropods and Cephalopods. Two species: *T. terebra* and *A. pleuronectes* represented the most abundant taxa. Arthropods were also abundant in the collected samples and consisted primarily important species such as shrimps (*Metapenaeus* spp.); crabs: *Charybdis* sp., *Portunus* sp., *S. serrata* and other species of *Portunidae*. *S. mantis* is also common and abundant in the collected samples. Others were collected in small quantity. Echinoderms were less common and represented by two species of sea cucumbers (*H. ocellata* & *H. scabra*). Few samples of Cnidarians were collected and may come from other source or carried by water currents into the cove. They may also have entered the cove in search of food. Considering the catches of these resources, a need for an immediate action towards their sustainability seems necessary.

Keywords: assessment, macroinvertebrates, mollusks, arthropods, echinoderms, cnidarians, Sto. Tomas, Cove

Introduction

The marine waters of the Philippines contain significant marine habitats – coral reefs, seagrass beds, mangrove forests and the deep seas. These habitats are estimated to host at least 2,000 species of fish, 5,000 species of clams and other mollusks and crustaceans, 22 species of whales and dolphins, more than 900 species of seaweed, and more than 400 species of corals. Because of this

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rich diversity in marine life, some experts have acknowledged the Philippines as the global center of marine biodiversity (Greenpeace, 2013).

In La Union, one of the center of a heated debate between environmentalists and fishermen is the Lingayen Gulf because of its lying diverse coral reef system. Not only are the reefs a home to one of the most diverse marine communities in the world, but it also provide livelihood to hundreds of thousands of inhabitants of towns that surround the Lingayen Gulf (McManus and Thia-Eng, 1990).

Sto. Tomas Cove, also known as Raois Cove, is an important body of water in Northern Luzon and is located at the southwestern part of the municipality of Sto. Tomas, La Union. Philippines. It is about 600 ha of fertile seascape, receiving water from Lingayen Gulf and intermittently from seasonal runoff. The chosen site is also a part of the Agoo-Damortis Protected Landscape & Seascape (ADPLS) established by the Department of Environment & Natural Resources (DENR).

The cove is surrounded by 10 barangays, extending from Brgy. Damortis at its southern most end to Brgy. Narvacan in the eastern side. The western side is where the populace resides. Together with other barangays, they partially enclose the northern part of the cove. Mostly shallow, along with its narrow shores and deepens abruptly at its middle parts. Sto. Tomas cove not only provides foods for the villagers but also supplies fresh seawater to vast tracts of fishponds and cages where commercially important fishes and crustaceans are cultured, the major industry of the municipality. The cove is also a navigational highway for the coastal communities, as shelter for fishing vessels, and unloading dock for construction supplies and coals among other.

In the 90's onward, a noticeable decline in landings was observed. Particularly, after a smaller version of trawl net suited in coastal areas was introduced. Locally known as "karkar", the gear is very effective in collecting bottom fauna. Several of these gears are operating in coastal areas of the province. Years after its introduction, landings of fishes and other fauna started to decline. It would take added effort to fish for family consumption.

Other anthropogenic causes may also contribute to the decline in catch. An example are the on-going operations of fish cages in the area and use of the cove as docking area for cargo ships and fishing vessels such as trawlers. Uneaten foods from fish cages may alter the water quality while wastes from the water crafts may find their way into the cove during their landings or unloading of supplies, these contribute to water pollution that may affect the water bound organisms it contain. May it be marine flora or fauna.

Long before, good quantity and quality of prime fishes and invertebrates abound in the cove, that is, until the 90's. Before then, the cove offers various

resources, from high value fishes such as groupers, seabasses, siganids, breams to the lowly pony fishes. Invertebrates are dominated by important crab species, prawns and shrimps, sea mantis, echinoderms and various species of mollusks. They were numerous then and of good sizes. However, the increasing population of coastal villagers have exerted too much pressure on these resources. With gear improvements and improper harvesting, resources of Sto. Tomas cove rapidly decreased. Small fishes such as the leiognathids, mugilids, apogonids, all less valuable are now dominating the ichthyofauna. Invertebrates are also becoming scarce, with some important species becoming less in abundance due to over and improper harvesting.

Resources of the cove have been the subject of studies by undergraduate students of the College of Fisheries. These studies are usually unpublished, fragmented and often carried out in short durations. Among these are the assessment of commercially important fish fry (Nidoy and Tabelon, 2002); macrobenthic organisms (Japson and Lorenzo, 2001); catch composition of fish pots (Cabutotan *et al.*, 2004); taxonomic composition, abundance and distribution of shrimp fry (Caiquiep *et al.*, 2003), species composition of seashells (Estacio and Feliciano, 2008), and assessment of shrimp caught by modified push net (Bulldozer type) Quesada (2007).

Concern on the future of the cove and its sustainable use is the main reason why this study was conceptualized. This study aims to provide a picture of the present composition of invertebrates and their status in this important body of water. The findings here may also be of help to policy makers in the management of our coastal resources by providing benchmark information on the present status of the cove when it comes to macroinvertebrates.

Objectives: Generally, this study aims to provide information on the status of macroinvertebrate resources of Sto. Tomas cove specifically species composition and taxonomic classification.

Materials and methods

The sampling areas are within the Santo Tomas cove, a vast expanse of partially enclosed body of water in the western side of the province of La Union. Part of this body of water is bounded by sandbar on the east, the northern part is mostly large tract of fishponds while the eastern side is where the populace resides. The southern part serves as entry and exit of water into and from the cove. Fishing and aquaculture are the major industries. Agriculture consist mainly of rice, tobacco and vegetables farming.

Four sampling stations were established in the cove: Station I at Brgy. Damortis-Tubod (N16° 14.208', E120° 23.377'); Station II at Brgy. Casantaan-Ubagan (N16° 13.736, E119 49.905'); Station III at Brgy. Narvacan-Sungyot

Point (N16° 14.25' E120° 23.256') and Station IV at Brgy. Tubod-Damortis (N16° 15.142' E120° 23.219').

A once a month sampling at the four established stations was conducted using a modified trawl gear, locally known as karkar. It is similar to the trawl fishing gear but much smaller. The gear has a mesh size of #8 for the wings, #10 for the body and #14 for the bag. It is also equipped with wooden boards to facilitate spread of the wings.

The net was dragged at each station for a distance of 1000 meters. Collected samples were emptied into plastic containers and brought to the laboratory for sorting, identification and measurement. Representative taxa were preserved in five percent buffered seawater formalin for identity verification. Identification was made by comparing the samples with those published in the literatures. Abundance is expressed as number collected per station while distribution is based on where the fauna is collected. The data presented was for a period of three years, starting from August 2013 to July, 2016.

Results

Major Groups

Various species of invertebrates were collected in the cove. About 4184 individuals were collected from 2013 to 2016 samplings. The invertebrates were classified into 4 major groups and about 50 species. However, the number of invertebrate species may be even more. There were many unidentified species in the samples.

Samples collected only represented areas reached by Karkar, usually at depths of about 2 meters to 10 meters or more. Thus near shore areas (less than 1 meter) were not effectively sampled. This explains why the tailed mussels, blood cockles, carpet shells, etc. were few in the collections. Also those reported here are those retained by net, thus small invertebrates that passes thru the net were under estimated. The four major groups identified are the Mollusks, Arthropods, Cnidarians and Echinoderms.

Total abundance of major invertebrates varied widely during the samplings. Abundances for 2013 to 2016 were not complete since samplings started in August of 2013 and ends in July 2016. Abundance of mollusks was highest in 2014 to 2015 and is about half in other years. Arthropods were highest in 2013 and 2016 and less in 2014 and 2015. The echinoderms were few in 2013 and 2016 while the cnidarians were highest in 2014 and was absent in 2016.

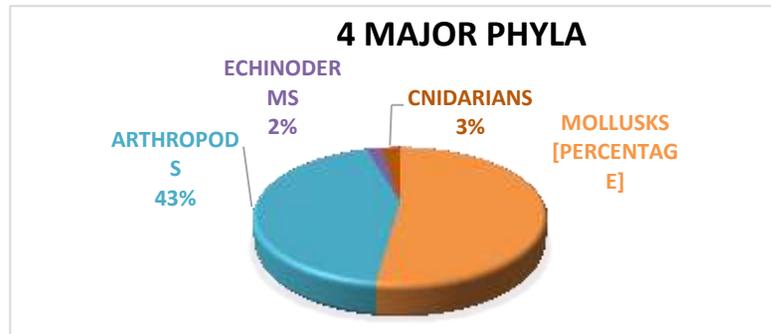


Figure 1. Four major Phyla of macroinvertebrates collected in Sto. Tomas Cove

Table 1. Species Composition from 2013 to 2016

A. MOLLUSC	2013	2014	2015	2016	Total
<i>Amusium pleuronectes</i>	32	168	23	1	224
<i>Anadara antiquata</i>	3	2	10	5	20
<i>Anomalocardia squamosa</i>	0	0	0	13	13
<i>Atrina pectinata</i>	0	0	2	0	2
<i>Bivalve spp.</i>	0	0	14	2	16
<i>Bursa rana</i>	10	10	22	4	46
<i>Conus sp.</i>	1	3	6	1	11
<i>Conus radiatus</i>	2	1	2	0	5
<i>Crassostrea sp.</i>	0	0	0	2	2
<i>Faciolaria filamentosa</i>	0	0	1	0	1
<i>Gastropad spp.</i>	0	1	63	0	64
<i>Loligo sp.</i>	8	23	1	4	36
<i>Mitra sp.</i>	2	4	3	0	9
<i>Nassarius oleaceus</i>	9	27	17	44	97
<i>Nassarius sp.</i>	1	3	23	12	39
<i>Octopus sp.</i>	1	2	3	3	9
<i>Paphia undulata</i>	1	1	0	4	6
<i>Placuna placenta</i>	0	1	2	0	3
<i>Phos senticosus</i>	1	4	11	1	17
<i>Sepia sp.</i>	0	3	4	2	9
<i>Strombus canarium</i>	1	0	1	0	2
<i>Strombus sp.</i>	0	7	3	6	16
<i>Turritella terebra</i>	86	485	571	391	1533
<i>Turris babylonia</i>	0	1	2	0	3

Table 1. (Con.)

	2013	2014	2015	2016	Total
B. ANTHROPODS					Total
<i>Arthropoda spp.</i>	0	4	11	3	18
<i>Carpilius maculatus</i>	2	38	53	5	98
<i>Charybdis ferratus</i>	0	21	9	8	38
<i>Charybdis sp.</i>	0	6	0	119	125
<i>Decapoda sp.</i>	0	10	5	4	19
<i>Metapenaeus ensis</i>	45	21	95	209	370
<i>Penaeus monodon</i>	7	14	28	40	89
<i>Penaeus sp.</i>	0	52	21	57	130
<i>Podolpthalmus vigil</i>	0	18	12	29	59
<i>Portunus pelagicus</i>	0	18	1	2	21
<i>P. sanguinolentus</i>	1	3	4	1	9
<i>Portunidae sp</i>	233	133	139	133	638
<i>Scylla serrata</i>	0	31	22	6	59
<i>Squilla mantis</i>	19	19	17	46	101
<i>Thalmita crenata</i>	0	2	2	11	15
<i>Uca sp.</i>	0	0	0	25	25
C. ECHINODERMS					
<i>Asrtopecten sp.</i>	0	2	2	1	5
<i>Asteroidea sp.</i>	0	18	2	4	24
<i>Echinoderm spp.</i>	1	4	0	0	5
<i>Holothuria ocellata</i>	6	7	2	0	15
<i>Holothurian scabra</i>	10	2	9	3	24
<i>Ophiuroidea sp.</i>	0	5	3	0	8
<i>Sea urchin sp.</i>	0	3	0	0	3
D. CNIDARIANS					
<i>Aurelia sp.</i>	22	18	8	0	48
<i>Chrysora sp.</i>	0	40	3	0	43
<i>Cnidarian spp.</i>	3	1	8	0	12
TOTAL	507	1236	1240	1201	4184

Species Composition

The mollusks were the most specious and abundant in the samples contributing 52% (Figure 1) to the total invertebrate catch. About 25 species were identified during the survey. Seven are from the bivalve group, with *Amussium pleuronectes* (Moon shell) dominating the group; ten from the gastropods with *Turitella terebra* (True augers) the most abundant and *N.*

olivaceus, common in the samples; and three from cephalopods, with *Loligo* sp. as the common species.

T. terebra is eaten as delicacy in the area. Catches are easily sold in the community and local market. Other species of commercial importance is *A. pleuronectis*. This species is the most expensive of the bivalve in the area. Several sizes of the species are found in the cove, emphasizing the importance of the cove as important habitat for moon shells.

Other species of the Bivalvia and Gastropoda were collected in small numbers. They were quite irregular in their occurrences (e.g. *Atrina pectinata*, *Faciolaria filamentosa*, *Placuna placenta*, *Strombus canarium*, *Turris babylonia*), possibly because of various reasons. One is that their preferred habitat is not reached by the sampling gear or because of their small size that they easily pass thru the meshes of the gear during sampling.

Arthropods ranked second in abundance and in number of species in the collection, contributing 43% of the total invertebrates. Sixteen species were identified, 9 species of crabs, 3 of shrimps and prawns, 1 mantis shrimp and many unidentified decapods and portunids.

The rough skin Echinoderms were also present in the samples sharing 2% to the total invertebrates. Cnidarians comprises the jellyfishes in which two species were identified, contributing 2.5% to the total number of collected macroinvertebrates.

Discussion

Diversity of marine macroinvertebrates under the 4 Phyla (Molluska, Arthropoda, Echinodermata & Cnidaria) in Sto. Tomas Cove can be attributed to the general features of the sampling sites which include substrate type, distance from the shore, water depth and location. The cove has a sandy to muddy substrate. Inner area of the cove is covered with seagrasses and fringed with mangroves. Outer area of the cove serves as entry and exit of water. Water depth of the sampling sites ranges from 2 to >6 m and distance from the shore ranges from 120-220.

Mollusks are the most diverse of the invertebrates. They include the snails, octopuses, squids, clams, scallops, oysters and chitons. They are important members of ecological communities. They can be found in various habitat to include terrestrial mountain tops to hot ocean vents and cold seeps of deep seas. They varied in sizes from about 20 meters long to microscopic forms. They are important as human foods, jewelry, tools and even pets. Shells of some species are quite beautiful and of high value.

Majority of the mollusks species collected in the cove are eaten and therefore there exist fishing pressure on these resources. However, they are now few in the samples. Cephalopods are considered as luxury food item, much relish by the fishermen and are often eaten immediately when caught.

The diverse Molluskan fauna reflects the suitability of the cove as habitat. The substrates in the cove are usually muddy, some has fine sand. Other areas near shore are rocky while some contain excellent growth of seagrasses. This explains the diverse molluskan fauna of the cove. Their few abundance however, may reflect the high fishing pressure of these resources.

Arthropods are invertebrate animals with exoskeleton and segmented body and are represented by the insects, arachnids, myriapods and crustaceans. They are found on land, sea and air. They are distributed from the deep sea to mountain peaks and ranges in size from King crab with its 12 foot arm span to microscopic insects and crustaceans. Commercially important invertebrates collected are the shrimps and prawns (*Metapenaeus* spp. and *Penaeus monodon*) and the portunid crabs (*S. serrata*, *Portunus pelagicus*, *P. sanguinolentus* and *Charybdis* spp.). These species are commercially exploited. Some in the unidentified samples are not eaten. They are generally collected as juveniles, similar with the other portunids. This observation may reflect the importance of the cove as nursery area for these species. Included in this group are unidentified species of portunids.

Results of this study is supported by a survey conducted on the fisheries resources of Lingayen Gulf by Lopez (1983). Sto. Tomas Cove receives water from Lingayen Gulf. It is framed by the provinces of Pangasinan and La Union and sits between the Zambales Mountains and the Cordillera Central (McManus and Thia-Eng, 1990). The study recorded one hundred twenty-eight (128) species including 10 species of crabs, 4 lobsters, 9 shrimps and prawns, 46 gastropods, 42 bivalves, 8 cephalopods, 7 sea cucumbers and 2 sea urchins were involved in the study. Hand gathering was the most extensively used method of fishing around the gulf. Other methods and gears used were hand dredges, spears, traps, corrals and nets. The area of the gulf within the 20 fathom isobath was roughly 850 cu km. With the assumption that the municipal fisheries were restricted to this depth zone, municipal catches were estimated to average at least 3.2 MT/cu km per year (Lopez, 1983).

Some commercially important species found in Sto. Tomas Cove were also found in the assessment study conducted by Bautista *et al.* (2017) in Anda, Pangasinan. This municipality shares the same gulf as Sto. Tomas Cove. The result showed that one of the species collected is *Holothuria scabra*, a high value sea cucumber species.

Echinoderms collected in the Cove are represented by two species of sea cucumbers: *Holothuria ocellata* and *H. scabra*; an unidentified form of echinoderm; three species of starfishes and a sea urchin. Except for the *H. scabra*, all are unimportant. *H. scabra* in the locality of Sto. Tomas are dried and sold as “trepan”, a very expensive delicacy in Chinese cuisine. *H. ocellata* are smaller than *H. scabra*. Its body is thinner and contains plenty of horny-like projections. They are considered as nuisance species because they are abundant and are usually caught together with the target species. However they may be utilized for some nutraceutical products. Cnidarians are all considered as predators of young fishes and other zooplankton. They are mostly present during summer months.

Implications of the results of the study

The presence of varied species of macroinvertebrates in the cove implies high productivity in the area. However, in terms of economic importance and commercial availability of the resources, the cove is now in poor condition. Only few resources dominated the macro invertebrate fauna. Among the molluscs, only two species (*T. terebra* and *A. pleuronectes*) are important and are still present in viable quantity. Other species were few and occurred sporadically.

Except for *H. scabra*, all the echinoderms collected in this study are of no commercial values. This species is effectively caught by the sampling gear. They are target species and sold as fresh or processed commodity. Other species of echinoderms such as the starfishes and sand dollars proliferate in the cove because they are of no importance and are returned to the water when collected.

Near shore areas are used as source of food by coastal communities. Gleaners, in particular, harvest resources from shallower reefs, flats, mud flats, sandy to rocky areas, sea grass beds and mangrove areas (Nieves *et al.*, 2010). Some excavate the substrates to get the burrowing species while others overturn boulders to see what lies beneath. More substantial results may therefore be achieved if catch data from gleaners are included.

The present use of the cove as mariculture site for finfishes, docking areas for fishing boats, navigation, oysters farm are all important activities in the coastal areas. They add to the coffers of the municipality which in turn are used to improve living standard of the populace. However, majority of the coastal dwellers are artisanal fishermen who rely much on the cove on day to day basis, exerting high fishing pressure on its resources. Unless serious study is done to

manage the remaining resources and maintain or improve the present condition of the cove all will lead to the rapid depletion of resources of Sto. Tomas cove.

Acknowledgement

The authors would like to offer particular thanks to Don Mariano Marcos Memorial State University-College of Fisheries, Local Government Unit of Sto. Tomas, Barangay Captains and boatmen of the coastal barangays where the study conducted.

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(Received: 30 August 2018, accepted: 25 October 2018)