PSU Journal of Natural and Allied Sciences
Vol. 1 No.1, pp. 12-16, December 2017

Assessment of Commercially Important Marine Invertebrates in Selected Areas of Anda, Pangasinan, Northern Philippines

Lemark M. Bautista, Emmanuel C. Capinpin Jr. and Francis Albert T. Argente
Pangasinan State University – Binmaley Campus
2417 Binmaley, Pangasinan

e-mail: lembautista08@gmail.com

***Abstract* — The status of commercial marine invertebrate resources was assessed in Anda, Pangasinan. A total of ten species of sea cucumbers were recorded in Cabungan, Imbo, and Imondayon, of which two were commercially important *Stichopus horrens* and *Actinopyga echinites*, and only one commercially important sea urchin *Tripneustes gratilla* was found particularly in one site (Imondayon). Two high-value gastropods were observed, the abalone, *Haliotis asinina* and top shell *Trochus niloticus*. Many other molluscs are found but considered low-value or non-commercial species and gathered only for home consumption. Low densities of these commercial marine invertebrates were found in the survey sites. Highest diversity index was observed in Imondayon with species diversity of H'=2.00, followed by Cabungan and Imbo with H'=1.88 and 1.59 respectively. Based on interviews, the artisanal multi-species fishery is at present primarily based on 3 sea cucumbers - *Holothuria scabra, Stichopus horrens* and *Bohadschia marmorata*, one sea urchin, *Tripneustes gratilla*, and two gastropods, *Haliotis asinina* and *Trochus niloticus*, although there are indications that other high-value species were fished to local extinction. The abalone fishery is observed to be overfished with densities of 1-2 individual per 250 m^2. For sea cucumbers, the small sizes (<15 cm body length) observed in this study, their low population densities, and the continuous decrease in catches are clear signs of an overexploited fishery that will likely collapse without management intervention.**

Keywords* — *Transect Survey, Echinoderms, Gastropods, Anda, Pangasinan

I. INTRODUCTION

Invertebrates have been given attention regarding their importance in terms of conservation and monitoring (New, 1998). Despite their ecological and economic importance, many species of molluscs are suffering from the threat of extinction. Moreover, there is also a distinct lack of basic information regarding their occurrence and conservation status in Asia, Africa and South America (Kay, 1995; Beasley et al., 2005).

Mollusks such as abalone and topshells, and echinoderms such as sea cucumbers and sea urchins, are among the most important and highly priced marine invertebrate resources in the Philippines. Their fishery serves as a significant source of livelihood for many of the coastal communities in the country. However, the high market demand and unsustainable fishery practices have led to a rapid decline in populations of high-value marine invertebrate resources throughout the Philippines and in many parts of the world. For instance, although the Philippines is the second largest exporter of sea cucumbers in the world, there has been no specific effort to effectively regulate and manage the fishery on a national scale (Olavides et al., 2007).

The scarcity of useful fishery baseline information in most regions is often cited as an obstacle in the formulation of a resource management plan. This paper presents results of the baseline surveys that recommend adaptive management

ISSN 2599-4646 (Print) *www.psurj.org/jonas* ISSN 2599-4654 (Online)

strategies for the continued productivity of benthic invertebrate resources in Anda, Pangasinan.

II. Materials and Methods

A. Site Selection and Survey Method

Three areas were selected in Anda – Imondayon, Cabungan, and Imbo (Figure 1). Three replicate 250 m^2 (50 m x 5 m) belt transects per sampling station were laid on each site and surveyed by pairs of observers for macroinvertebrates during daytime and within 1-10 m depth range.

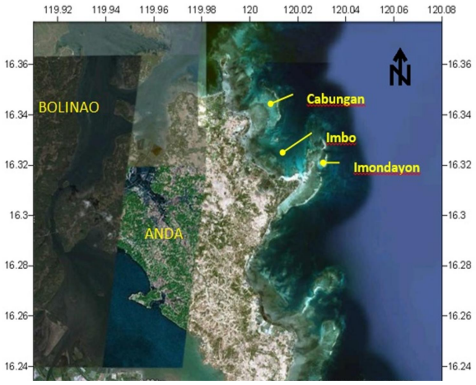

Figure 1. Location of the sampling stations in Anda, Pangasinan

B. Species Identification

Mollusks identification to genus and species level was done through examination of external morphology of shells using key identification references and for sea cucumbers using external morphology, microscopic dermal ossicles from tissue samples and using identification keys (Schoppe, 2000).

C. Data Analysis

The quantitative index of species diversity that takes into account both species richness and species evenness is the Shannon-Weiner index, given the equation $H' = - \sum p \log(pi)$ where pi is the proportion of individuals in the community that belong to species i. An H' = 0 means the community has only a single species; the higher the H' the higher is the species diversity of the community (Catibog and Heaney, 2006).

III. Results and Discussion

D. Species Composition

A total of 10 sea cucumber species were found in the three sampling stations in Anda reef system during the survey. Of the 10 species, only the Dragonfish sea cucumber or "Hanginan gadol" (*Stichophus horrens)* (Table 1) and the Deepwater redfish sea cucumber or "Khaki" (*Actinopyga echinites*) (Table 2) are commercially important. The rest *Holothuria albiventer, H. arenicola,* and *H. impatiens*, are non-commercial holothurians and not gathered. On the other hand, *H. fuscocinerea, H. coluber, H. edulis, H. hilla*, and *H. leucospilota*, are also gathered but are low-valued.

TABLE 1. Species of echinoderms and molluscs found in Imbo, Anda, Pangasinan.

Species	Common Name/Local Name	N	Length (mm)
Echinoderms			
Holothuria fuscocinerea	Variegated SC/Labuyo	6	32.4, 120.0, 130.0, 140.0, 160.0, 165.0
Strombus sinuatus	Laciniate conch/Liswik	2	68.0, 70.0
Holothuria coluber	Snakefish SC/Balat aso	1	125.0
Fasciolaria filamentosa	Filamentous horse conch	1	110.0
Stichopus horrens	Dragonfish/Hanginan gadol	1	220.0
Holothuria impatiens	Impatient SC/Sunlot	1	110.0
Haliotis asinina	Abalone	3	53.6, 56.0, 58.0
Molluscs			
Tectus pyramis	Top shell/Susong-balasang	11	38.4, 56.3, 61.0, 63.0, 46.0, 49.2, 50.8, 56.0, 57.0, 60.0, 60.0
Trochus niloticus	Top shell/Susong-balasang	3	51.0, 39.0, 44.4
Turbochrysostomus	Gold-mouth turban snail	2	39.5, 48.4
Cypraea eglantina	Eglantine cowrie	6	39.0, 41.0, 46.0, 46.7, 50.0, 54.0
Lambis lambis	Common spider conch/Pusa-pusa	1	128.0
Unidentified scallop	Scallop	2	63.0, 70.0

ISSN 2599-4646 (Print) www.psurj.org/jonas ISSN 2599-4654 (Online)

TABLE 2. SPECIES OF ECHINODERMS AND MOLLUSKS IN CABUNGAN, ANDA, PANGASINAN

Species	Common Name/Local Name	N	Length (mm)
Echinoderms			
Stichopus horrens	Dragonfish SC/Hanginan gadol	3	106.0, 160.0, 220.0
Holothuria fuscocinerea	Variegated SC/Labuyo	7	110.0,120.0, 140.0, 150.0, 170.0, 120.0, 140.0
Holothuria impatiens	Impatient SC/Sunlot	1	200.0
Actinopyga echinites	Deepwater Redfish SC/Khaki	1	101.0
Holothuria edulis	Pinkfish SC/Red beauty	1	240.0
Holothuria coluber	Snakefish SC/Balat aso	3	110.0, 120.0, 150.0
Haliotis asinine	Abalone	4	60.0, 44.3, 54.0, 63.0
Molluscs			
Cypraea tigris	Tiger cowrie	1	77.0
Tectus pyramis	Top shell/Susong balasang	12	51.0, 52.3, 55.0, 53.5, 57.0, 57.6, 60.0, 61.7, 53.0, 54.0, 58.0, 60.0
Turbo chrysostomus	Gold-mouth turban snail	13	33.0, 37.4, 43.0, 44.4, 29.0, 40.0, 41.0 52.0, 53.0, 36.0, 40.0, 43.0, 52.0
Cypraea eglantina	Eglantine cowrie	14	42.4, 43.0, 44.0, 45.5, 48.0, 52.0, 40.5, 44.0, 45.0, 47.5, 52.0, 53.0, 56.8, 57.0
Lambis lambis	Common spider conch/Pusa-pusa	1	102.0
Tripneustes gratilla	Sea urchin/Maritangtang	1	109.0
Tripneustes gratilla	Sea urchin/Maritangtang	1	103.0
Unidentified crab	Alimangong bato	2	65.0 CL , 95.00 CL

TABLE 3. SPECIES OF ECHINODERMS AND MOLLUSCS FOUND IN IMONDAYON, ANDA, PANGASINAN.

Species	Common Name/Local Name	N	Length (mm)
Echinoderms			
Holothuria coluber	Snakefish SC/Balat aso	21	80.0, 90.0 (3), 95.0, 100.0 (3), 107.0, 110.0 (2), 115.0 (3), 120.0, 140.0 (2), 150.0 (2), 160.0 (2)
Holothuria albiventer	Marten's SC/Rotong	16	60.0 (4), 65.0, 70.0, 80.0 (5), 85.0, 90.0 (4)
Holothuria arenicola	Burrowing SC/Rotong	1	180.0
Holothuria fuscocinerea	Labuyo	2	90.0, 95.0
Holothuria hilla	Tigertail SC/Rotong/Batuli	1	110.0
Holothuria luecospilota	White threadfish/Brown beauty	1	80.0
Haliotis asinina	Abalone	1	44.6
Molluscs			
Trochus niloticus	Top shell/Susong balasang	9	30.5, 33.0 (3), 33.5, 34.2 (2), 35.0, 38.0
Turbochrysostomus	Gold-mouth turban snail	3	33.0, 34.0, 37.0
Cypraea eglantina	Eglantine cowrie	2	37.4, 40.0
Dolabella sp.	Sea hare	3	89.0, 94.3, 119.0
Vasum turbinellus	Common Pacific vase	1	30.0
Tripneustes gratilla	Sea urchin/Maritangtang	11	64.5, 70.0, 71.0, 72.0, 73.0 (2), 74.0, 77.0, 78.0, 79.0, 85.0

Only one commercially important species of sea urchin *Tripneustes gratilla* was observed during the survey and was primarily observed in Imondayon (Table 3). Among the molluscs, only the abalone *Haliotis asinina* and the top shell *Trochus niloticus* are considered high-value species. The other species are collected but mostly for domestic consumption.

E. Density

Low densities of individuals per hectare were observed in the study (i.e., 1-2 per 300 m^2 for sea cucumbers *S. horrens* and *A. echinites*). According to

ISSN 2599-4646 (Print) *www.psurj.org/jonas* ISSN 2599-4654 (Online)

Purcell et al. (2009) densities less than 100 individuals per hectare is considered low, and less than 30 individuals may be a critical level at which populations will fail to repopulate. The population densities of sea cucumber in Anda may be too sparse to achieve a high probability of fertilization success during spawning events, thus, affecting contribution of the larval supply to repopulate surrounding areas. At present, the vulnerability of the marine invertebrate resources to decline is exacerbated by its unregulated fishery.

The mean density of abalone *Haliotis asinina* in the present study was found to be 1-2 per 250 m^2. Capinpin (2013) already reported low densities of *H. asinina* of 1.67 to 8 individuals per 250 m^2 surveyed area in Carot, Anda, Pangasinan. In that study, it was suggested that mariculture of abalone in cages should be done in strategic areas as a resource conservation strategy as they serve as reproductive reserves to supply larvae for continued productivity of the fishing grounds (Capinpin, 2013).

F. Species Diversity

In this study, the highest diversity index was observed in Imondayon with species diversity of H'=2.00, followed by Cabungan and Imbo with H'=1.88 and 1.59 respectively. A diversity index of H' = 0 means the community has only a single species; and the higher the H' the higher is the species diversity of the community (Catibog and Heaney, 2006).

However, in comparison to other studies, the H' values observed in this study were much lower than the diversity index observed in the study of Olavides et al. (2010), where the Shannon index for Bolinao-Anda reef complex were ranging from H' = 2.38 to 2.67. This may be due to the limited area sampled as the researchers surveyed the shallower part of the coastal area whereas Olavides et al. (2010) collected sea cucumbers up to 20 m in depth and they also surveyed much larger areas.

G. Size Structure

The majority of the sea cucumbers found have mean lengths less than 15 cm. The legal minimum length imposed in Queensland, Australia is 15 cm for all species (Bruckner, 2005). This, however, may not provide enough chance for sea cucumbers to reproduce. In this regard, the majority of the sea cucumbers in Anda is undersized and should not be collected, processed or sold. The low abundance of large, sexually mature sea cucumber reflects strong fishing pressure in the area, and indicates that reproductive potential is low

Most of the abalone found in the present study was > 3.5 cm shell length, the minimum size at sexual maturity for the species (Capinpin et al. 1998). Capinpin (2012) recommended a minimum harvest size limit of 5 cm for abalone that can be legally fished or traded. By setting the size limit of abalone at 5 cm, it could significantly contribute to replenishment of larvae in surrounding areas and aid in the recovery of depleted abalone populations.

IV. Conclusion and Recommendation

The results of the present study show that the population densities of high-value sea cucumber species (e.g. *Stichopus horrens*) fall critically below the level for fertilization success during spawning, which could indicate that the area is a poor larval source for sea cucumbers. Size structure of major commercial species indicates strong fishing pressure. Interviews provided corroborating anecdotal accounts of the fishery's decline due to overfishing. Taken together, these are clear signs of an overexploited fishery that is likely to collapse without proper management intervention. Hence, adaptive management strategies for Anda, such as supplemental livelihood of fisherfolks, protection of critical nursery areas where juveniles of high-value species were found, mariculture as reproductive reserves, size restrictions and stock enhancement are strongly recommended.

References

[1] Battaglene, S.C. and J.D. Bell. 2006. The restocking of sea cucumbers in the Pacific Islands. p. 109–132. In Bartley D.M., & K.L. Leber (eds.). Case Studies in Marine Ranching. FAO Fisheries Technical Paper No. 429.

[2] Beasley C.R., C.M. Fernandes, C.P. Gomes, B.A. Brito, S.M. Lima dos Santos and C.H Tagliaro. 2005. Molluscan diversity and

abundance among coastal habitats of Northern Brazil. Ecotropica 11: 9 – 20.

[3] Bruckner, A., 2005 (ed). The proceedings of the technical workshop on the conservation of sea cucumbers in the families Holothuriidae and Stichopodidae. NOAA Technical Memorandum NMFSOPR 44, Silver Spring, MD. 239 pp.

[4] Capinpin, E.C., Encena V.C. II and N.C. Bayona. 1998. Studies on the reproductive biology of the Donkey's ear abalone *Haliotis asinina* Linné. Aquaculture 166: 141-150.

[5] Capinpin, E.C. Jr. 2012. Using local ecological knowledge and environmental education in resource management of abalone in Carot, Anda, Pangasinan. Science Diliman 24(1): 43-55.

[6] Capinpin, E.C. Jr. 2013. Status of abalone fishery and experiential mariculture as a resource conservation strategy. Science Diliman 25(1): 50-69.

[7] Kay, E.A. 1995. Which molluscs for extinction? The conservation biology of molluscs. Proceedings of a symposium held at the 9th International Malacological Congress. IUCN/SSC Mollusc Specialist Group.

[8] Olavides, R.D.D., C.M.A. Edullantes and M.A. Juinio-Meñez. 2010. Assessment of the sea cucumber resource and fishery in the Bolinao-Anda reef system. Science Diliman 22(2): 1-12

[9] Purcell, S.W., H. Gossuin, & N.N. Agudo, 2009. Status and management of the sea cucumber fishery of la Grande Terre, New Caledonia. Programme ZoNeìCo. WorldFish Center Studies and Reviews No. 1901. The WorldFish Center, Penang, Malaysia. 138 pp.

[10] Reyes-Leonardo, L.D., 1984. A taxonomic report of shallow water holothurians of Calatagan, Batangas. The Philippine Journal of Science 113:137-172.

[11] Schoppe, S., 2000. Sea cucumber fishery in the Philippines. SPC Bêche-de-mer Information Bulletin 13:10–12.

[12] New, T.R. 1998. Invertebrate surveys for conservation. Oxford, Oxford University Press. 240 p.

[13] Catibog-Sinha, C.S. and L.R. Heaney. 2006. Philippine biodiversity: Principles and Practice. Haribon Foundation for the Conservation of Natural Resources, Inc., Quezon City. 495 p.

ISSN 2599-4646 (Print) *www.psurj.org/jonas* ISSN 2599-4654 (Online)