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Some Economically Important Bivalves and Gastropods found in the Island of Hadji Panglima Tahil, in the province of Sulu, Philippines

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Abstract

The Philippines is a haven of a rich diversity of marine organisms. Unraveling this diversity had posed a tremendous challenge. The existing security threat in some areas of the archipelago had led to a dearth of information with regard to the diversity of organisms especially the islands located in the province of Sulu. Marine mollusc studies are still among those that are overseen by many researchers. To date, there is still a lack of basic information such as diversity and species checklist that make it impossible to assess the rate of population lost among existing marine molluscs. There is no published information on the actual number of marine shelled molluscan species in the area. This work assessed, described and identified some economically important molluscs in the island of Hadji Panglima Tahil, in the province of Sulu, Philippines. There were a total of 18 molluscs (marine bivalves & gastropods) species found and identified in the island. The molluscs served as food, ornaments and as source of livelihood by residents in the area, which is separated by sea from Jolo, the capital municipality of the province. The natives of the island depended mainly on fishing and hunting of molluscs found along the seashore. Geographically, the northwestern part of the area is strategically enclosed, making it undisturbed by strong waves while, the eastern portion facing Jolo, is more exposed to strong waves that created an advantage by pushing the organisms thriving in the deeper coral regions towards the seashore hence, affording opportunities for more consumption by the people. The molluscs' meat were valuable and the shells itself are of equal importance to many shell dealers in the town of Jolo or in the nearby business hub, Zamboanga City. Habitats ranged from pristine waters in the northwestern portion of the island to disturbed waters in the eastern part attributed by anthropogenic activities in the area. It was noted that the most dominant species found was Mercenaria mercinaria, which thrived in the northwestern part of the island. This seashell is often found in Jolo market daily and other nearby municipalities like Maimbung and Siasi. At present, the residents in the area are still capable of sustaining the survival of these organisms. However, due to inevitable increase in commercial demand and overexploitation it may result to a possible depletion of these resources. Hence, they should be equipped with the proper scientific knowledge on the preservation and conservation of such organisms.

Keywords: Bivalves, gastropods, molluscs, Sulu, Philippines.

Introduction

Since, time in memorial many molluscs have been a part of the lives of men. Studies pertaining to Molluscs come with a long history since the fourth century BC where, luxury and high status products were made from molluscs. Theopompus once stated that the Tyrian purple made from the ink glands of murex shells, "…fetched its weight in silver." Hence, indicating their inevitable importance even during the Middle Minoan Period towards the 18th-20th century BC[1]. This group of organisms has received much clamor since; they constitute one of the largest phyla of animals both in terms of number of living species at around 85,000 and number of individuals[2]. Owing to the tremendous diversity of form and behavior, molluscs were grouped into three. The three major classes range from largely sedentary or sessile filter-feeding animals, such as clams and oyster (class Bivalvia), through aquatic and terrestrial snails and slugs (class Gastropoda), to the predatory cuttlefish, squids, and octopuses (class Cephalopoda). Molluscs have been found out to be extremely diverse in tropical and temperate regions but can be found at all latitudes[3,4].

Interestingly, this group of organisms also served as food and source of important luxury goods, notably pearls, mother pearl, Tyrian purple dye, and sea silk. The shells have been used as money in some pre-industrial societies such that bivalves and clams have been an important food source and often lead to over fishing[5,6]. Most molluscs possessing shells produced pearls, but only the pearls of bivalves and some gastropods whose shells are lined with nacre are said to be valuable[3]. Thus, a lot of attention was devoted on these two groups. Moreover, to the scientific community its uses expand to more than just economical. In fact, Thompson in 1917, said that "the mathematical patterns embedded within the forms of organisms have truly fascinated the human intellect since antiquity, and the gastropod shell has been the subject of much attention." Search for patterns on shells as sources of variations among and between species for delineation were evident. With this, the

quest for scientific knowledge about gastropods and bivalves become ever growing. Hence[7], this study.

In the Philippines, much is known about the diversity of these organisms found in some parts of the archipelago. However, due to security reasons there is a dearth of information with regard to the diversity of organisms in the province of Sulu especially islands located within the area. In Sulu, the natives have utilized it as food and the shells yielded to be of economic importance. Although, the existing security threat proved to be beneficial in freeing the area from overexploitation of resources, the same issue had kept the natives unaware and ignorant concerning updated information with regard to conservation and culture of the species which could possibly be a source of better livelihood if given the proper scientific knowledge. For this reason a research in the area is worthwhile, the results may indicate a broad indigenous knowledge of the ecology and biology of the valuable species in the area. The implications of the convergence of this up to date knowledge with scientific information, to further community based nature conservation education are harmonized for effective conservation of natural resources[8,9]. However, for this study due to time constrains and resources it focused only on the Bivalves and Gastropods found in the island. This work includes descriptions of molluscs in the island of Hadji Panglima Tahil, in the province of Sulu, Philippines. This will serve as a baseline data for future studies on molluscs in the area.

Material and Methods

A total of 18 molluscs species were collected and identified from the seashore in the island of Hadji Panglima Tahil, Sulu. Habitat range from regularly covered zones to uncovered at low-tide (figure 1). Digital images were taken for each of the samples. Scientific identifications were done through the assistance of a Personnel from the Marine Science Museum of MSU-Iligan Institute of Technology, College of Science and Mathematics, Department of Biological Sciences. Descriptions were made along with identification.

Results and Discussion

The samples collected for this study were commonly seen in the public market and shell dealers of Jolo, Sulu (figure- 2 and 3). A total of 18 molluscs species were collected and identified from the seashore in the island of Hadji Panglima Tahil, Sulu (table 1). These shells were valued as food like, *T. squamosa, Lambis lambis* and *Mercenaria inequivales.* However, there were shells that were commercially valued not for its meat but for its exoskeleton, and were believed to be exported for commercial purposes, examples of these were *M.mauritania, C. tigres, S. canarium, C. queranus, C. leopardus and C.litteratus.* As food, molluscs are a good source of calcium. These shells were even known by natives to strengthen the teeth of their young ones especially those fed with *Tridacna squamosa* or locally known as fluted clam. These shells were said to be a good source of iodine[10], and as an alternative viand for fish. Yet, due to commercial demands and over exploitation, it resulted to scarcity of these shells thus, making it more expensive in the market.

Moreover, the giant clams like *Tridacna* spp. found in the area have a variety of uses, such as in the manufacture of fashion accessories. Its meat is famous as a common delicacy to local folks while empty shells are highly sought for decorative purposes. At present, exporters are dealing with both shells and shell crafts at the same time although, some are mainly exporting fashion accessories made from shells. Generally, Wells (1989)[11] have described the following categories as follows: i. **Ornamental shellls.** These are shells exploited for their whole decorative value, used as souvenir items and decorations. They are relatively cheap and plentiful in the trade. Examples are the tiger cowry, *Cypraea tigris, Lambis lambis, Strombus* spp. *Conus* spp. and other common shell found in the shallow waters. These shells are exported primarily in the form of a shell pack or as unprocessed raw shells. Many of shells collected in the area are valued for ornamental purposes. ii. **Specimen and /or "Rare" shells.** These shells are sometimes endemic species of mollusks that are usually found in the deep seas, e.g. *Cypraea guttata, Cypraea valentia*, *Cypraea leucodon* and *Conus thomae*. In this study only *Cypraea tigris* was collected; iii. **Commercial shells.** These are the mollusks that are harvested for their nacre or mother-of-pearl. They are usually harvested in large quantities. The bivalve *Pinctada* spp. also known as pearl oysters. However, no specimen classified under this category was collected; iv. **Shellcrafts/ Handicrafts.** These refer to the products made from shells or in combination with other native raw materials; these are usually hand crafted by skilled individuals. For this reason, many of the shells collected were used in combination with other raw materials. Hence, valued for aesthetic purposes.

In view of this, the Philippines has been exporting shells and shellcraft to many countries since 1950's[12,13]. There are a number of laws existing to control and regulate the collection and export of shells, both national and international level. Foremost, of the international treaty is the Convention on International Treatise in Endangered Species (CITES) signed by over 109 countries, including the Philippines. The CITES prohibits the international commercial trade of seriously threatened species of plants and animals, as well the products made from them. It was created in 1973 as a conservation tool to prevent species from becoming threatened and to ensure their sustainable exploitation[14]. Included in the list are all species of giant clams belonging to the genera Tridacna and Hippopus. At the national level, Administrative Orders issued by the Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR) prohibit and regulate the collection and gathering of shells. These Administrative Orders provide some management schemes in the form of a permit system of prohibition of export on particular species and size limits of mollusks that can be collected from the Philippine waters.

However, there is an evident lack in the implementation of such laws and regulations as observed in these areas with much security threat. Local community folks remained unaware of the possible ecological and economical consequences if these resources are not sustainably managed. It is inevitable, that with a vanishing marine resources, it is likely that more livelihood opportunities will be lost if the community involved remained to be complacent about the unrestrained harvesting of shells for short-time gain. It has been demonstrated in many instances, that often management of resources only began after resources are depleted. Indiscriminate harvesting of marine resources is often indicated as a major cause of poverty in many areas of the country. The lack of foresight and concern has, in some cases, completely decimated the dwindling wildstock population of fishery products in the country[14,15]. If proper management schemes were implemented, considerable revenues and income could probably have been saved while shells will be harvested in a sustainable manner. Proper education and convergence of indigenous knowledge of the community with the professional scientific knowledge should be harmonized for the harmonious conservation of natural resources. With this, future studies about the extent of harvesting of these commercially important shells should be re-evaluated and that policy and regulation on this issue be implemented to prevent ecological imbalance and possible depletion of these rich natural resources.

Table-1
Marine Molluscs found in the Island of Hadj Panglima Tahil, Sulu, Philippines

Species	Uses	Description	Remarks
Anadara inaequivalvis, Bruguière, 1789 (Arc clam)	Food	shells vary in shape, thickness and convexity of the valves; color in white;internal ventral margin, strongly cenulate[16]	Opportunistic & resistant to a broad range of conditions size range: 70-75 mm
Aulica sp. (Volute shell)	Ornamental	Shell: shiny, large, thick and heavy; color:light brown with chocolate brown patterns extending throughout the body whorl; has 4 columellar plaits; short siphonal notch; short spire, brown apex[17]	Predatory sea snails also inhabit waters of polar circles Size range: 500 -550 mm
Conus leopardus (Leopard cone)	Ornamental	Cone: heavy and large;Spire: heavy though more raised than its near relative *C. litteratus;* color: white encircled with brown to black dots[18]	Predatory& venomous capable of stinging humans Size range: 500 -650mm
Conus litteratus (Lettered cone)	Ornamental	Shell: flat spire; color: white with dark chocolate spots[19]	Predatory & venomous common in sandy areas of lagoon interisland reefs Size range: 69.4 -80 mm
Conus marmoreus (Marbled cone)	Ornamental	Spire: noduled and flat; color: balck to dark chocolate with white patches all over[19]	Predatory & venomous less venomous compared to other cone snails,poses no danger to humans size range: 150-160 mm
Conus quercinus (Cone shell)	Ornamental	A heavy, solid and common shell; Color: pale yellow[20]	Predatory & venomous capable of stinging humans Size range: 47.9 -49.5mm
Cymbiola vespertilio (Bat volute)	Ornamental	Shell: smooth, light cream with brown patterns extending throughout the body whorl; short spire;Aperture: elongated with 4 columellar plaits; creamy white apex; shoulder with short spines[21]	Predatory sea snail Size range: varies between 45mm- 160mm
Mauritia mauritiana (Humpback cowry)	Food , Ornamental	Shell: heavy, smooth and shiny; color: dark brown with distinct large light brown dots[22,23]	Common in areas of heavy wave action, its wide base help the animal withstand the force of pounding surf. Size range: 50.8 -127 mm
Cypraea tigris (Tiger cowry)	Ornamental	Color: base is white and the dorsum has multiple black and brown spots[17]	Now less abundant due to shell collecting and destruction of its habitat by dynamite fishing carnivorous, adults eat coral;juveniles eat algae. Size range: 100-130 mm
Harpago chiragra (Chiragra spider conch)	Food , Ornamental	With six projections including long siphonal canal; color: white with brown mottling streak; columella: light orange with pleats[19]	Sexual dimorphism present/female larger than male. Livesin coral reef, known to be herbivores. Size range: 50-60 mm
Hippopus hippopus (Bear paw clam)	Food	Yellowish brown to olive green mantle wit white cream or golden splotches and /or with thin stripes; shell: whitish to gray, strongly inflated quite fat and even in small sizes, may have variable number of folds often as many as 13 -14 and can be relatively convex and rounded or more straight-angled box-like[24, 25]	Occur in sandy and rubble areas and seaweed beds.spend the first two to three years of life as males butdevelop organs that enable them to produce sperm and egg Size range: 76.2-127 mm

Lambis lambis (Spider conch)	Food , Ornamental	Pointed spire of about 8 whorls, spirally and axially striate, with sharp angular shoulders carrying small knobs; body whorl: fine, blunt knobs; that nearest the parietal wall, a mere lump; the next much bigger; the third well developed, the fourth, the largest and the fifth joined; lip flores widely and is spirally and axially corded; edge of lip forms six long spires, posterior to being the longest ones lying against spire; color: creamy white, motted with brown; spine retain the periostracum, columella and parietal area and interior flesh is pinkish[26, 17]	Not just slowly creep along instead, it can move in jerks. Feed on red algae. Threatened by habitat degradation, over collection for food and as souvenirs Size range: 100-200 mm
Mercenaria mercenaria (Hard clam)	Food	Shell: heavy and large, the exterior of shell except nearest the umbo is covered with a series of growth rings; color: white[27]	Feed on plankton by filter feeding. Specialist name for different sizes of this species:countnecks for smallest; littlenecks, then topnecks. Above are the cherrystones and largest are called quahogs or chowder clams. Size range: 60-70 mm
Oliva miniacea (Olive shell)	Ornamental	Shell: heavy, solid with short spire, deep channelled suture and slightly inflated body whorl; color: two, broad broken bands of dark brown with cream band between it. Columella: white and axial streaks are brown[28]	Carnivorous sand-burrowers shell surface is glossy,and are popular with shell collectors forjewelry and decorative items. Size ramge: 45-100mm
Spondylus princeps (Thorny oyster)	Ornamental	Shell: strong festoons and curve spines ; the hinge ridges are so interlocked that the valves cannot be separated without breaking the teeth; color: off white[29]	Cement themselves to rocks rather than using byssus. Shells are much sought after by collectors. Size range: 130-300mm
Laevistrombus canarium (Dog conch)	Food, Ornamental	shell:heavy with a rounded outline, outer surface is smooth; color: white to light yellow[30]	Edible sea snail , lives on mud and sandy bottom, graze on algae and detritus. Due to shell being heavy and compact it is used as sinker for fishing nets. Size range: 29-71 mm
Terebra sp. (Auger shell)	Ornamental	Irregular aperture with a short anterior canal or notch. Medium spired and the apex, which is pointed is at the "posterior" end and the aperture on the anterior end of the shell;color: chocolate brown in the body whorl and black to grayish towards the apex[31]	Predatory sand-dwelling carnivores Size range: 32-57 mm
Tridacna squamosa (Fluted giant clam)	Food	Equivalved and elongate with about five,strong, low rounded radial ridges, each carrying curved fluted scales growing larger further form the break.Byssal gape: large;non-boring, lies freely on reefs; color: light orange becoming white towards margin. [32, 33]	Get most of its nutrients from algae and through filter feeding. If disturbed it will close slowly. Does not harm other organism. Size range:

Figure-1
The Island of Hadji Panglima Tahil where molluscs were commonly harvested by local residents; habitat ranged from pristine to disturbed waters

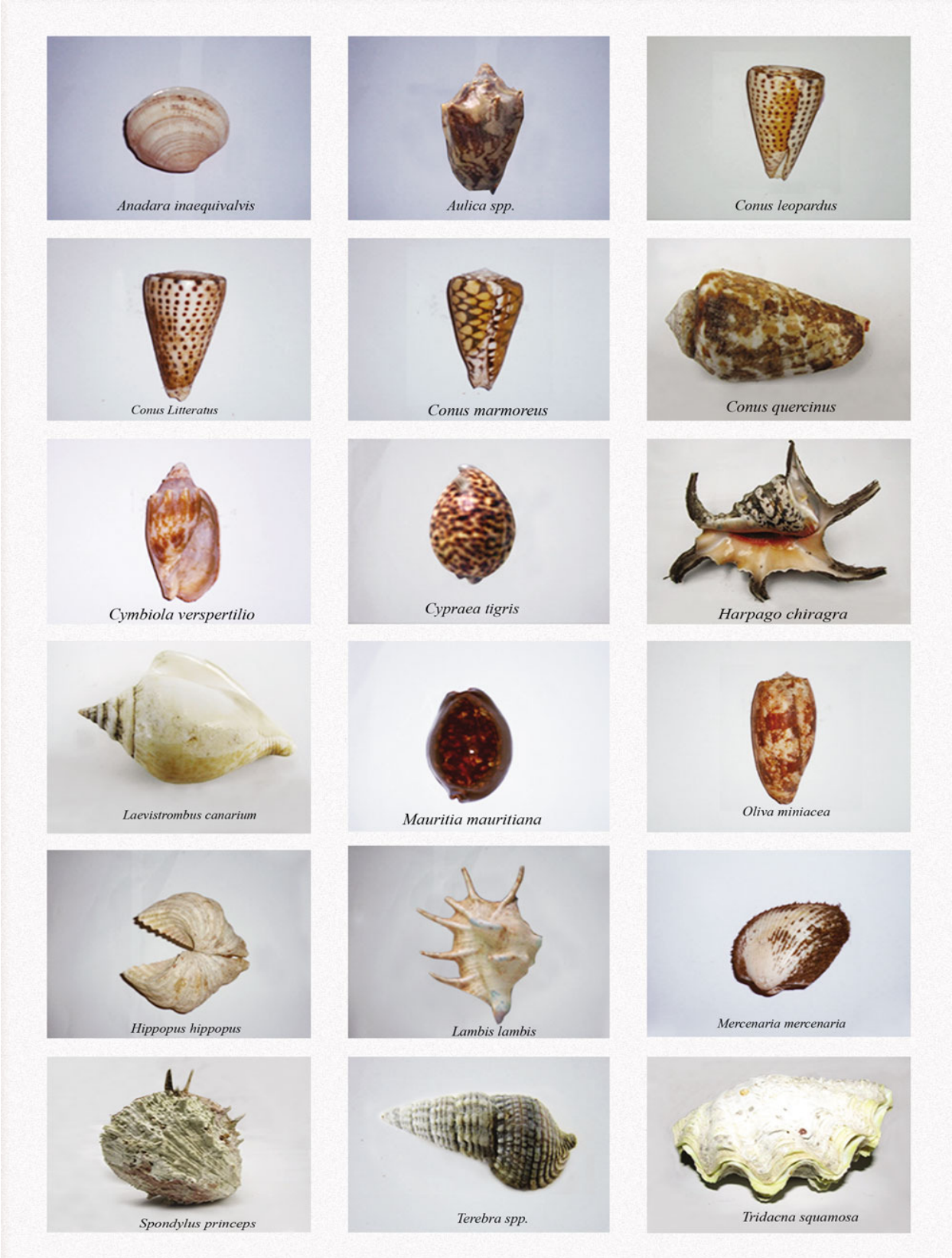

Figure -2
Bivalves and Gastropods Identified in the Island of Hadji Panglima Tahil, Sulu, Philippines

Figure – 3
Bivalves and Gastropods are commonly sold in the marketplace of Jolo, Sulu

Conclusion

The present study shows that there were a total of 18 molluscs (3 bivalves and 15 gastropods) species found and identified in the island of Hadji Panglima Tahil, in the province of Sulu, Philippines. Some were valued as food like (the spider conch, hard clam, thorny oyster, dog conch and fluted giant clam) and others served both for food and for aesthetic purposes like ornaments which serve mainly as a source of livelihood in the area.

The molluscs' meat and shells were valuable and are of equal importance to dealers of the town of Jolo, however, due to inevitable increase in commercial demand and overexploitation it may result to a possible depletion of these resources. Hence, it is recommended for future studies to evaluate the harvesting policy of these economically important marine bivalves and gastropods as well as to help implement laws for the conservation of natural marine resources.

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References

1. Gulick C.B., Athenaeus, The Deipnosophists, Cambridge, Mass.: Harvard University Press, (**1941**)
2. Chapman A.D., Numbers of Living Species in Australia and the World, 2nd edition, Australian (**2009**)
3. Ruppert E.E., Fox R.S. and Barnes R.D., *Invertebrate Zoology* (7 ed.). Brooks / Cole, 367–403, (**2004**)
4. Giribet G., Okusu A., Lindgren A.R., Huff S.W., Schrödl M. and Nishiguchi M.K., Evidence for a clade composed of molluscs with serially repeated structures: Monoplacophorans are related to chitons, *Proceedings of the National Academy of Sciences of the United States of America*, **103 (20)**, 7723–7728, Bibcode 2006 PNAS..103.7723G. doi:10.1073/pnas.0602578103. PMC 1472512. PMID 16675549. Retrieved 2008-09-30 **(2006)**
5. Mannino M.A. and Thomas K.D., Depletion of a resource? The impact of prehistoric human foraging on intertidal mollusc communities and its significance for human settlement, mobility and dispersal, *World Archaeology*, **33(3)**, 452–474 (**2002**)
6. Garrow J.S., Ralph A. and James W.P.T., *Human Nutrition and Dietetics*. Elsevier Health Sciences, 370, **(2000)**

7. Thompson D.W., On Growth and Form, Cambridge: Cambridge University Press **(1917)**

8. Bisong F. and Andrew-Essein E., Indigenous Knowledge Systems for Promoting Community Conservation Educationin a Nigerian Protected Area, *International Journal of Biology*, **2(2)**, 149-157 **(2010)**

9. Umali-Garcia M., *Gmelina - A Primer,* Institute of Forest Conservation, UPLB, Laguna **(1990)**

10. Berhimpon S. and Dien H., Exotic food from the sea. PerhimpunanAhliTeknologiPangan Indonesia, Surabaya (Indonesia) (**2000**)

11. Wells S.M., Impacts of the Precious Shell Harvest and Trade:Conservation of Rare or Fragile Resources. In:Marine Invertebrate Fisheries:Their Assessment and Management, John F. Caddy (editor), John Wiley and Sons, New York, 443-454 (**1989**)

12. Woods S. and Wells S.M., International Trade in Ornamental Shells. IUCN Conservation Monitoring Centre, Cambridge, U.K. 22 (**1981**)

13. Wood E.M. and Wells S.M., The Marine Curio Trade: Conservation Issues. A report for the Marine Conservation Society, 120 **(1988)**

14. Wells S.M. and Barzdo J.G., International Trade in Marine Species: Is CITES a useful Control Mechanism? *Coastal Management,* **19**, 135-154 **(1991)**

15. Rosell N.C., Mariculture of Kapis, Placuna placenta: a pilot study, *Fisheries Research Journal of the Philippines,* **9**, 1-2 **(1984)**

16. Rinaldi E., Molluschi di origine extra Mediterranea entrati a far parte della malacofauna della costa Romagnola, *Pagine de Museo Ornitologico e di Scienze Naturali di Ravenna*, **19(1-2)**, 104-108 **(1994)**

17. Poutiers J.M., The Living Marine Resources of the Western Central Pacific: Bivalvia, 123-128 **(1998)**

18. Röding P.F., Museum Boltenianum sive Catalogus Cimeliorum e Tribus Regnis Naturae Quae olim Collegerat Joa., **2(I-VIII)**, 1-199 **(1798)**

19. Linnaeus C., Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Editio decima, reformata, Laurentius Salvius: Holmiae, ii, 824, *available online at* http://www.archive.org/details/ systemanaturae 01linnuoft, (**1758**)

20. Lightfoot J., A catalogue of the Portland Museum, lately the property of the Duchess Dowager of Portland, deceased: Which will be sold by auction by Mr. Skinner and Co. On Monday the 24th of April, 1786, and the thirty-seven following days (...) at her late dwelling-house, in Privy-Garden, Whitehall, by order of the Acting Executrix. - pp. i-viii [= 1-8], 3-194, pl. [1]. [London]. (Skinner), (**1786**)

21. Bail P. and Poppe G.T., A conchological iconography: a taxonomic introduction of the recent Volutidae, ConchBooks, Hackenheim, 30, **(2001)**

22. Verdcourt B., The cowries of the East African Coast (Kenya, Tanganyika, Zanzibar and Pemba), *Journal of the East Africa Natural History Society*, **22(4)**, 96, 129-144, **(1954)**

23. Burgess C.M., The Living Cowries. AS Barnes and Co, Ltd. Cranbury, New Jersey, (**1970**)

24. Knop D., Giant Clams: A Comprehensive Guide to the Identification and Care of Tridacnid Clams, Kraft Druck GmbH, Ettlingen, Germany, **(1996)**

25. Ellis S., Spawning and Early Larval Rearing of Giant Clams (Bivalvia: Tridacnidae), Publication Number No. 130, Center for Tropical and Subtropical Aquaculture, Hawaii, **(1997)**

26. Kiat T.S. and Woo H.P.M., Preliminary Checklist of The Molluscs of Singapore, Raffles Museum of Biodiversity Research, National University of Singapore, **(2010)**

27. Rice M.A., The Northern Quahog : The Biology of Mercenaria Mercenaria, (**1992**)

28. Vermeij G.J., Kay E.A., and Eldredge L.G., Molluscs of the northern Mariana Islands with special reference to the selectivity of oceanic dispersal barriers, *Micronesica*, **19**, 27–55, **(1983)**

29. Berrin K., The Spirit of Ancient Peru:Treasures from the Museo Arqueológico Rafael Larco Herrera, New York: Thames and Hudson, **(1997)**

30. Cob Z.C., Arshad A., Bujang J.S. and Ghaffar M.A., Age, growth, mortality and population structure of Strombus canarium (Gastropoda: Strombidae): variations in male and female sub-populations, *Journal of Applied Sciences*, **9(18)**, 3287–3297 **(2009)**

31. WoRMS, Terebrinae. Accessed through: World Register of Marine Species at http://www.marinespecies.org/aphia.php?p=taxdetails&id=411816 on 2011-04-01, **(2010)**

32. Wells S., Tridacna squamosa. In: IUCN 2006. 2006 IUCN Red List of Threatened Species. www.iucnredlist.org, **(1996)**

33. Copland J.W. and Lucas J.S., Giant Clams in Asia and the Pacific, ACIAR, Canberra, 274, **(1988)**