

Effects of poaching on Topshell *Tectus niloticus* population of Tubbataha Reefs Natural Park, Palawan, Philippines

Jean Beth S. Jontila*, Benjamin J. Gonzales and Roger G. Dolorosa

College of Fisheries and Aquatic Sciences

Western Philippines University,

Sta. Monica, Puerto Princesa City

*Corresponding author: jbeth_sufi@yahoo.com

ABSTRACT

Poaching a significant volume of the reef gastropod topshell *Tectus niloticus* in Tubbataha Reefs Natural Park (TRNP) in 2006 to 2007 has prompted the management to seek detailed information on the impact of such illegal activities. To determine the present status and trends of topshell population in TRNP and to gather background information about poaching and trade, a follow up assessment in 2008 was conducted. Data on trading and poaching were derived from interviews and other secondary data. Abundance of topshells varied according to three surveyed depths; the highest was in the middle sites (~1.5m), followed by intertidal (1m); and the lowest abundance occurred at 5m deep sites. The abundance in 2008 was 75% lesser than in 2006. Since 2004, there were 33 cases of poaching apprehensions in the park, of which, 15 were topshell related, involving 26 boats and 190 fishermen. The promising economic benefit and the demand in black markets, plus the assurance to collect much volume, appeared to be the driving forces for topshell collection in TRNP. To prevent further decline on topshell populations, there is a need to sustain law enforcement and patrolling in the park.

Keywords: density, poaching, *Tectus niloticus*, Tubbataha Reefs

INTRODUCTION

The Topshell *Tectus niloticus* locally known as *samong* is one the most abundant gastropods in shallow rocky waters of Tubbataha Reefs Natural Park (TRNP) (Dolorosa & Schoppe 2005) – the only pure marine park in the country inscribed as World Heritage Site in 1993 by the United Nations Educational Scientific and Cultural Organization (UNESCO) (Songco & Jack 2009). The shell of this large reef gastropod is a valuable raw material in making jewelry, buttons, accessories and various cosmetic products (Hoang et al. 2007; Nash 1993). Because of overharvesting, Fisheries Administrative Order (FAO) 208 series of 2001 classified topshell as threatened species and section 97 of Philippine Fisheries Code of 1998 (RA 8550) prohibits its collection and trade (Department of Agriculture 1998, 2001). Despite of these prohibitions, topshells are still collected mainly for economic gain.

The TRNP holds large population of topshells (Dolorosa et al. 2010) much higher than those reported in other studies (Chambers 2007). The TRNP is a no take zone park, yet, illegal collectors persistently enter the park to harvest topshell (TMO unpublished data, Dolorosa et al. 2010).

Topshells of TRNP has been surveyed in 2006 (Dolorosa et al. 2010), but monitoring was not sustained the following year due to limited resources. If illegal collection is persistently taking place, topshell's populations in the Park could have been reduced at an undetermined degree. Thus, the general objective of this study was to investigate the impact of poaching on the population of topshell in TRNP and to provide recommendations for future management. Specifically, it sought to determine the density, depth distribution and size composition of topshells in Tubbataha Reefs in 2008; and to provide background information on the gathering and trade of topshell in Palawan relative to its poaching in TRNP.

MATERIALS AND METHODS

The Study Site

Tubbataha Reefs Natural Park (TRNP) is located in the Middle of the Sulu Sea within 8°43'-8°57' N latitude and 119°48'-120°3' E longitude (Figure 1). It lies 150km southeast of Puerto Princesa City, Palawan and 130km south of Cagayancillo, the nearest land mass and the municipality with political jurisdiction over Tubbataha.

The park was inscribed in the United Nations Educational Scientific and Cultural Organization (UNESCO) World Heritage Site in 1993 and was included in the List of Wetlands of International Importance or the Ramsar List in 1999. By virtue of Presidential Proclamation 1126 dated August 23, 2006, the park was renamed from Tubbataha Reef National Marine Park (TRNMP) to Tubbataha Reefs Natural Park (TRNP). The same proclamation expanded the TRNP's area from 33,200ha to 96,828ha to include the Jessie Beazley Reef (TRNP Management Plan, unpublished data). In 2009, TRNP Act of 2009 (R.A 10067) established TRNP as a protected area under the NIPAS Act (R.A. 7586) and the Strategic Environmental Plan (SEP) for Palawan Act (R.A. 7611) (Congress of the Philippines 2009).

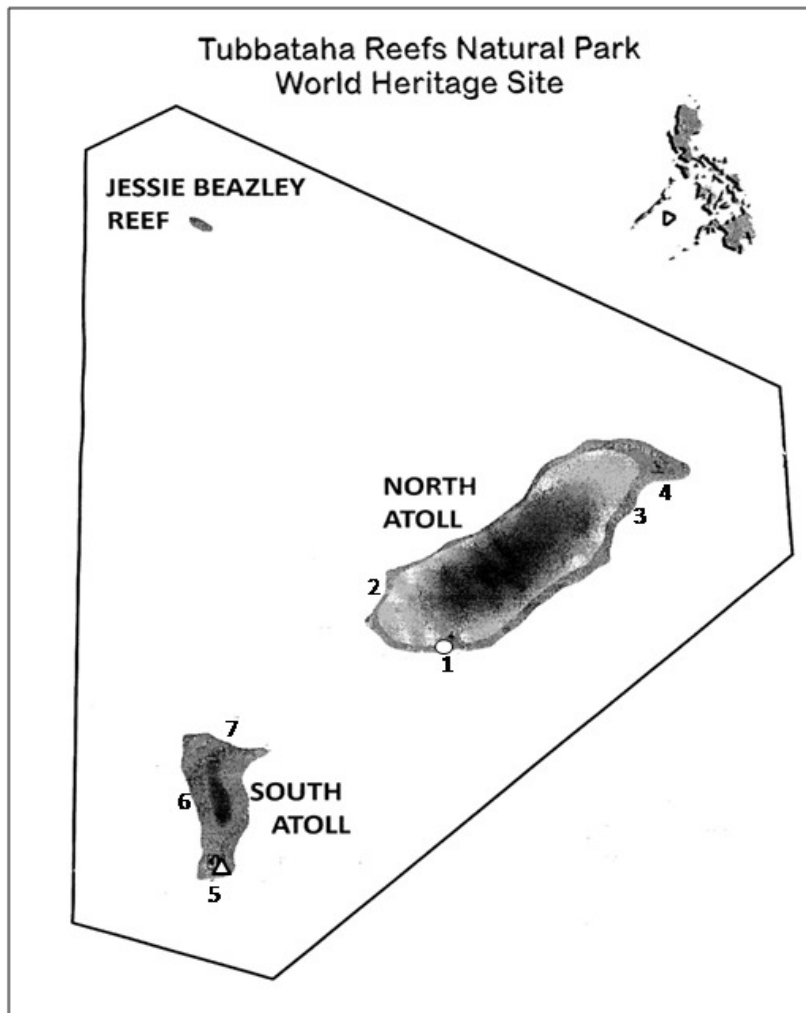


Figure 1. Map of TRNP indicating the seven permanent monitoring sites (Modified after Songco & Jack 2009).

Data Gathering Procedure

A topshell density assessment was conducted between May 27 and June 3 in 2008. Seven permanent sites at 1.5m water depth established in 2006 were revisited. At each site, 100m x 2m permanent transect was augmented with replicates in the intertidal zone (1m) and a deeper zone (5m) in 2008. All depths were surveyed during day high tide with the aid of scuba gears. In total, 21 transects were surveyed covering an area of 4,200m². The basal diameter of each topshell found along 1m both sides of the transect line was measured with a ruler glued to the slateboard (Dolorosa et al. 2010). To obtain background information on trade and poaching in TRNP, 17 fishermen were interviewed on

November 11, 2008 in Barangay I and IV of Roxas, Palawan (known residence of apprehended poachers) and matrix of cases in TRNP was obtained from Tubbataha Management Office (TMO).

Data Analysis

Abundance of topshells at each transect (individuals per 200m²) was converted into individuals per hectare. For size structure, individuals with shell diameter measuring <50mm were considered juveniles, while those measuring >50mm are classified as adults or sexually mature (Ponia et al. 1997). Data obtained from fishers were linked with the poaching incidences in TRNP. Similarly, information on poaching incidences from TMO was used to support the findings on present population of topshells as impacted by poaching.

RESULTS AND DISCUSSION

Density and Distribution

The mean density of topshells in permanent monitoring sites (1.5m depth zone) was abruptly reduced from nearly 6,000ind.ha⁻¹ in 2006 to only about 2,000ind.ha⁻¹ in 2008. All sites displayed reduced densities with Site 7 as the most affected. In 2006, the mean density (>11,000ind.ha⁻¹) in Site 7 dropped to 1,000ind.ha⁻¹ in 2008. Only Sites (1 and 2) close to the Ranger Station remained to have relatively high density (Figure 2). Replicate sites in the intertidal (1m) and deeper (5m) zones had much lower average density of topshells at 129ind.ha⁻¹ and 50ind.ha⁻¹, respectively (Figures 3 & 4). Most of the monitoring sites in both areas which have no topshells as substrates are either sandy in intertidal areas, or packed with live corals as in case of the deep sites. Such types of substrates do not favor the occurrence of topshells (Colquhoun 2001) due to less amount or absence of algae to which topshells primarily feed on. In intertidal areas though, it is possible also that the topshells were heavily exploited. Note that sites 1 and 2 in intertidal sites have considerable number of topshells but the rest of the sites that are away from the ranger station did not have any topshells at all.

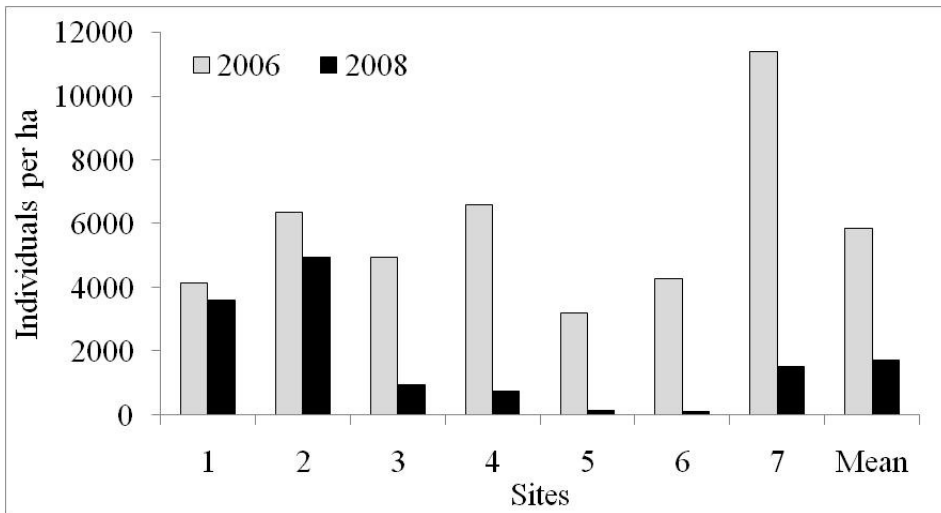


Figure 2. Topshell density (ind.ha⁻¹) in 2006 and 2008 recorded in seven permanent monitoring sites (middle sites) of TRNP.

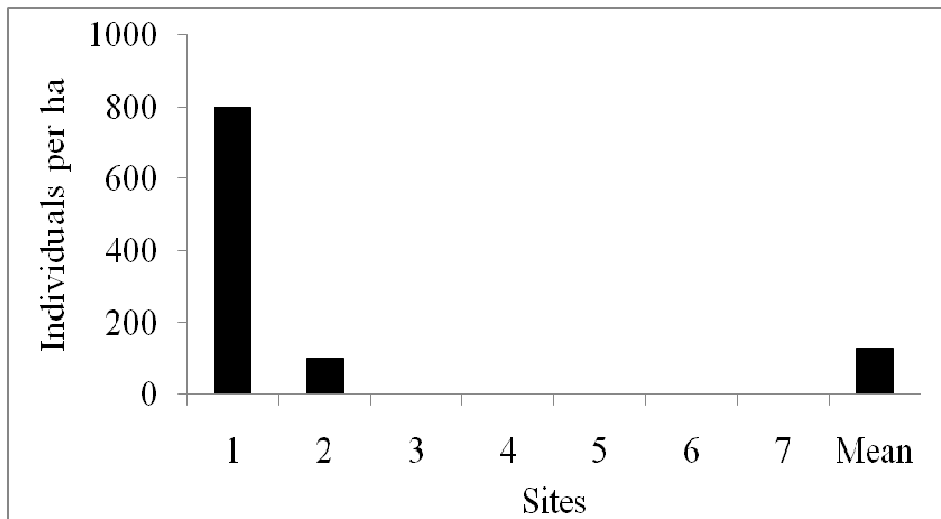


Figure 3. Topshell density (ind.ha⁻¹) recorded in intertidal sites (1m) of TRNP in 2008.

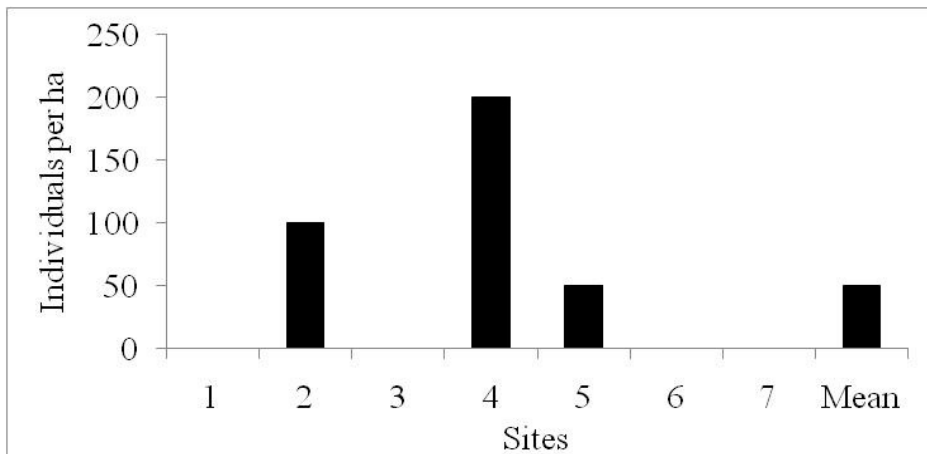


Figure 4. Topshell density (ind.ha⁻¹) recorded in the deep sites (5m) of TRNP in 2008.

Size Structure

The size of topshells ranged between 30mm and 160mm. In 2006, size range was at 17mm to 130mm (Dolorosa et al. 2010). However, the overall number of young topshells (n=3) noted this time is much lower than in 2006 (n=236). In Jessie Beazley, no live topshell was recorded though empty shells were found. The mean basal diameter (MDB) was larger in 2008 (82.1mm) compared to 2006 (67mm, Dolorosa et al. 2010) as a possible result of the underrepresentation of juveniles. Such could indicate that recruitment has been affected by the removal of large individuals during poaching.

Poaching has greatly reduced the topshell density in seven permanent monitoring stations by around 75% in the span of two years. But even then, the recorded density remained exceptionally high compared to other sites in the country and elsewhere in its geographic range. For instance, Sabang Reef of Binduyan and its adjacent unprotected reefs in Puerto Princesa only had densities of 190ind.ha⁻¹ and 27ind.ha⁻¹, respectively (Gonzales 2005). In the Great Barrier Reef and the Cartier Reef in Australia, topshells were estimated at 500 ind.ha⁻¹ (Castell 1997) and 3ind.ha⁻¹ (Smith et al. 2002) respectively. Omaka Village and Tongareva Marine Research Center in Cook Islands had a density only of 750ind.ha⁻¹ and 650ind.ha⁻¹, respectively (Chambers 2007). Much lower densities were recorded in regions of Chuuk State Micronesia at 37ind.ha⁻¹ (Gawel 1997), and Okinawa, Japan with 80ind.ha⁻¹ (Isa et al. 1997).

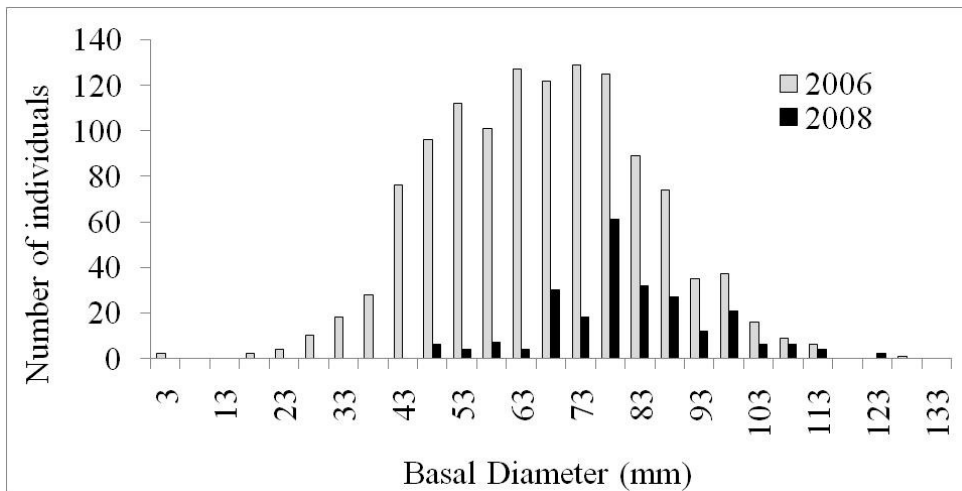


Figure 5. Number and size composition of topshells in the middle sites in years 2006 and 2008.

Topshells occur in coral reef flats from intertidal to sub-tidal zones that are moderately exposed to wave actions (Castell 1997, Nash 1993, Lemouellic & Chauvet 2008). Individuals are distributed according to age with juveniles found in rubble on the reef flat while adults display an increasing density towards the shallow reef slope down to the reef crest (Chambers 2007).

The same was also observed in Tubbataha but no distinct age distribution was established. Instead, mixtures of young and mature individuals were observed across three varying depths with much of the population (98%) concentrating in the sites with depth of 1.5m. At such depth, the area is characterized by presence of rocks (smoothened dead corals corals) and dead corals covered with filamentous algae that topshell primarily feed on. On the other hand, intertidal areas were covered mainly with sand and rubble having patches of live corals. Deep sites were dominated by live corals having some patches of sand and rubble. Both the intertidal and deep sites appeared to be less preferred by large topshells. Such may be due to the limited supply of food and the nature of substrates having lesser crevices to which topshells seek refuge especially at daytime when they are less active.

Trading and Poaching

The collection of topshell for commercial trading purposes in Roxas, Palawan started in 2002. The buying price of topshell then was only PhP25.00kg⁻¹ but due to the demand and topshells becoming scarce in nearby areas, the price gradually went up until 2008. Poaching of

topshells in TRNP was first documented in 2006. Its trend and other events related to it are shown in Table 1.

An increasing trend on topshells' price was observed over the years (2002 to 2008) (Figure 6). In 2006, traders instituted size classification with large individuals getting the highest price as much as PhP 180kg⁻¹ (fishers' selling price) to 350.00kg⁻¹ (traders' selling price). The increasing price might have been brought by the limited supply of topshell and the continuous demand for the same in the world market. Floren in 2003 reported that around 10,000-20,000 of topshells from Palawan are shipped to Cebu and exported to Korea and Taiwan. If each shell weighs 200g and sold at PhP 50kg⁻¹, income generated would be from PhP 100,000.00 to PhP 200,000.00. In TRNP, the difference between 2006 and 2008 mean density at 4120 individuals weighing around 824kg could amount to PhP 247,170.00 if a kilogram is sold at PhP 300.00. The amount could be much higher if many sites aside from TRNP have been exploited for topshell. These increasing prices of topshell could drive more fishermen to venture in the illegal harvesting of the species, further harming the remaining breeding populations in the wild.

Since 2006 until 2008, a total of 15 apprehensions were recorded involving 26 boats and 190 fishermen. A matrix of cases of Tubbataha Management Office (TMO) (TMO unpublished data) shows that earlier apprehensions involved mainly fishermen from Roxas, Palawan, comprising around 45% of the total apprehended persons. In early 2008, however, fishermen from various barangays of Puerto Princesa City and other parts of the province like Aborlan and Brooke's Point have replaced fishers from Roxas in gathering of topshells in the Park. The latest apprehension in 2008 involved 45 fishermen coming from as far as Cebu (TMO unpublished data).

Table 1. Highlights of events related to poaching and trade of topshell based on interview with topshell gatherers in Roxas, Palawan (TMO unpublished data).

Year	Chronological Event
2002	A Chinese businessman from Cebu came to Roxas, Palawan and started buying topshells at PhP25.00kg ⁻¹ . Fishermen started collecting topshells near shore not just for consumption but for selling purposes as well.
2003	Demand for topshell increased and so its price increase to PhP 50.00kg ⁻¹ . Topshell collection intensified further resulting to massive decline of its population in near shore areas. Fishermen started venturing farther even in TRNP despite of being aware that the latter is a protected area. Fishermen kept among themselves their operation to avoid competitors. There were also fishermen from Sitio Anilawan, Bgy. Babuyan venturing to TRNP. Elders from Cagayancillo revealed to some fishermen that topshells are abundant in “gusong”, their term for TRNP
2004	Price of topshell further increased to PhP 70.00kg ⁻¹ as a result of reduced supply. Traders and middlemen started to finance operation. A minimum of PhP 20,000.00 is staked for a 3-day period of operation in TRNP.
2005	Topshell reached a price of PhP 100.00kg ⁻¹ . It has replaced fishing as the main source of livelihood of fishers engaged in topshell collection, which has indeed become a lucrative business. Large scale illegal operations came into picture. Fishermen went in fleets to TRNP on bigger boats with high powered engines.
2006	April 18, 2006 marked the first apprehension on illegal collection of topshell in TRNP. A total of three boats and 25 fishermen from Roxas were arrested. Prices of topshell increased and price based on sizes; small-PhP 110.00kg ⁻¹ , medium- PhP 150.00kg ⁻¹ , large-PhP 180.00kg ⁻¹ . In May 2006, the baseline data of topshell in TRNP were gathered by the park rangers.
2007	A total of eight cases involving 79 fishermen loaded 18 boats were recorded (TMO unpublished data). Majority of arrested fishermen still come from Roxas, Palawan. In June 2007, a total of 20 sacks topshells being shipped from Roxas to Puerto Princesa were sequestered.
2008	Illegal collection of topshell continued despite of the rigorous effort of the management to curb it. Six more apprehensions were made involving 86 fishermen (45 were from Cebu) on board of five boats. On December 22 and 23, 2008, the first arrest on reported buyers of topshell in Puerto Princesa was made in collaboration with the National Bureau of Investigation (TMO unpublished data).

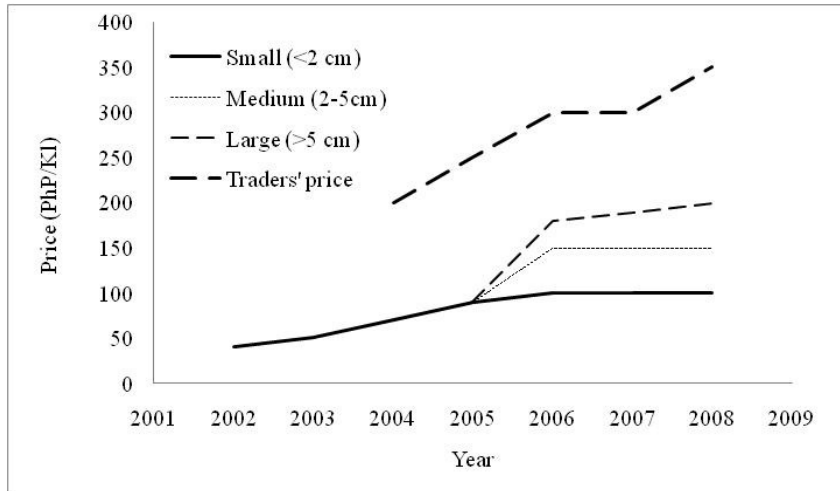


Figure 6. Buying price of topshell and their size classification set by traders in Palawan (2002-2008). (Note: price and size estimates were given by fishers/respondents. No interview was made with the traders).

Since topshells are sedentary and mostly abound in shallow sites, they are very vulnerable to poaching. Fishermen in Roxas, Palawan, revealed that they started collecting from Tubbataha in 2004. They added that they went in batches of two to three boats, each having four to eight men depending on the boat's capacity. Such is necessary for them to be able to collect topshells as much as they can in the shortest possible time. Operations are normally done at night using an improvised underwater flashlight. It took them only two to three hours to collect five sacks of topshell in TRNP.

In April 2006, five sacks and 119 individuals of topshells were confiscated while in 2007, 81 sacks and 761 individuals were sequestered in Roxas (Dolorosa et al. 2010), all approximately weighed more than 3 metric tons. Based on the measurements of seized topshells, poachers collected bigger shells and this might have significantly reduced the spawning stocks that resulted to low population of juveniles noted in this survey. It has to be noted though that juveniles are also hard to find since they tend to camouflage and hide thus, even in their known habitat in rubble of reef flat (Castell 1997), they were barely noted.

It is reported that selling price was at PhP 300.00kg⁻¹ in 2006, but fishermen only get PhP 110.00-280.00kg⁻¹, depending on shell size, from buyers or traders who usually fund their operations through provision of fuel and food in advance. A minimum of PhP 20,000.00 is put at stake by buyers in return of buying the topshells which are then shipped either to Cebu or Manila. Due to high demand, illegal collection continued reaching its peak in

2007 with nine apprehensions made involving 93 persons. In 2008, cases reduced to 5 involving 78 people. This could be directly attributed to the intensified patrolling and surveillance in the park and also to the continued filing and prosecution of cases coupled with consistent information and education campaign (IEC) activity in hot spots coastal areas.

CONCLUSION AND RECOMMENDATIONS

Most of the topshells were found in the 1.5m depth zone, which could be the preferred and suitable habitats in TRNP. Poaching has significantly reduced the population of topshells in the park. The removal of large individuals could have affected the recruitment as shown by extremely low number of juveniles encountered in this study than what has been recorded in 2006. Yet compared to other local sites, the remaining overall abundance is still higher suggesting the importance of TRNP as the last stronghold of topshell populations in the country.

Strategies like strengthened law enforcement and (IEC) must be sustained to halt poaching incidences in TRNP. Stock restoration through translocation of wild populations, and breeding and culture of topshell for stock enhancement may help restore the depleted areas in the country (Dolorosa et al. 2013a, 2013b). Regular topshell assessment in TRNP should be pursued and could become one of the indicators for evaluating the effectiveness of park management.

ACKNOWLEDGMENTS

This study was funded by the World Wide Fund for Nature Philippines (WWF-Phils) Tubbataha Project. The assistance of Tubbataha Project Manager Ms. Marivel Dygico together with the crew of Minerva, TMO rangers and TMO management staff is highly appreciated.

REFERENCES

- Castell L. 1997. Population studies of juvenile *Trochus niloticus* on a reef flat on the north-eastern Queensland coast, Australia. *Marine Fresh Water Research*, 48: 211-217.
- Chambers CNL. 2007. *Trochus (Trochus niloticus)* size and abundance in Tongareva Lagoon, Cook Islands. *SPC Trochus Information Bulletin*, 13: 2-5.

- Colquhoun JR. 2001. Habitat preferences of juvenile trochus in Western Australia: implications for stock enhancement and assessment. SPC Trochus Information Bulletin, 7: 14-20.
- Congress of the Philippines. 2009. Republic Act 10076. An Act establishing the Tubbataha Reefs Natural Park in the Province of Palawan as a protected area under the NIPAS Act (RA 7586) and the Strategic Environmental Plan (SEP) for Palawan Act (RA 7611), providing for its management and for other purposes. 26pp. Accessed on 25 November 2013 at http://www.tubbatahareef.org/downloads/ra_10067.pdf.
- Department of Agriculture. 1998. Administrative Order No. 3, Series of 1998, Implementing Rules and Regulations Pursuant to Republic Act No. 8550: "An Act Providing for the Development and Management and Conservation of the Fisheries and Aquatic Resources, Integrating all Laws Pertinent Thereto, and for other Purposes". Accessed on 25 November 2011 at <http://www.bfar.da.gov.ph/pages/Legislation/fisheriestocodera8550.html>
- _____. 2001. Fisheries Administrative Order No. 208, Series of 2001. Conservation of rare, threatened and endangered fishery species. Accessed on 25 November 2011 at <http://www.bfar.da.gov.ph/pages/Legislation/FAO/fao208.html>
- Dolorosa RG, Grant A, and JA Gill. 2013a. Translocation of wild *Trochus niloticus*: Prospects in enhancing depleted Philippine reefs. Reviews in Fisheries Science, 21 (3-4): 403-413.
- Dolorosa RG, Grant A, Gill JA, Avillanosa AS and BJ Gonzales. 2013b. Indoor and deep sub-tidal intermediate culture of *Trochus niloticus* for restocking. Reviews in Fisheries Science, 21 (3-4): 414-423.
- Dolorosa RG, Songco AM, Calderon V, Magbanua R and JA Matillano. 2010. Population structure and abundance of *Trochus niloticus* in Tubbataha Reefs Natural Park, Palawan, Philippines with notes on poaching effects. SPC Trochus Information Bulletin, 15:17-23.
- Dolorosa RG and S Schoppe. 2005. Focal benthic mollusks (Mollusca: Bivalvia and Gastropoda) of selected sites in Tubbataha Reefs National Marine Park, Palawan, Philippines. Science Diliman, 17(2): 1-8.

- Floren AS. 2003. The Philippine Shell Industry with special focus on Mactan, Cebu. Coastal Resource Management Project. Department of Environment and Natural Resources. 12-15pp.
- Gawel M. 1997. Status of *Trochus* exploitation in Chuuk State, Federated States of Micronesia, p27. In: Workshop on *Trochus* Resource Assessment, Management and Development: Report and selected papers. Integrated Coastal Fisheries Management Project. Technical Document No. 13. South Pacific Commission, New Caledonia. 150 pp.
- Gonzales BJ. 2005. Community-based stock enhancement of topshells in Honda Bay, Palawan, Philippines. Department of Agriculture; Bureau of Fisheries and Aquatic Resources; Fishery Resources Management Project, 49-57.
- Hoang DH, Tuan VS, Hoa NX, Sang HM, Lu HD and HT Tuyen. 2007. Experiments on using hatchery-reared *Trochus niloticus* juveniles for stock enhancement in Vietnam. SPC *Trochus* Information Bulletin, 13:13-18.
- Isa J, Kubo H and M Murakoshi. 1997. *Trochus* resource exploitation in Okinawa Japan, pp39-40. In: Workshop on *Trochus* Resource Assessment, Management and Development: Report and selected papers. Integrated Coastal Fisheries Management Project. Technical Document No. 13. South Pacific Commission, New Caledonia, 150pp.
- Lemouellic S and C Chauvet. 2008. *Trochus niloticus* (Linnaeus 1767) growth in Wallis Island. In: SPC *Trochus* Information Bulletin, 14: 2-4.
- Nash WJ. 1993. *Trochus*, pp 451-496. In: Wright A and Hill L (eds). Nearshore Marine Resources of the South Pacific: Information for Fisheries Development and Management. Institute of Pacific Studies, Suva and International Centre for Ocean Development, Canada.
- Ponia B, Terekia O and T Taime. 1997. Study of trochus introduced to Penrhyn, Cook Islands: 10 years later. SPC *Trochus* Information Bulletin, 5:18-22.
- Smith L, Rees M, Heyward A and J Colquhoun. 2002. Stocks of *Trochus* and bêche-de-mer at Cartier Reef: 2001 surveys. Australian Institute of Marine Science. Townsville, Queensland, Australia, 30 pp.

The Palawan Scientist, 6: 14-27

©2014, Western Philippines University

Songco AM and K Jack. 2009. Tubbataha Praymer. Tubbataha Protected Area Management Board. Puerto Princesa City, Philippines.