The Philippines: a hotspot of sea cucumber fisheries in Asia

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SUMMARY

Commercial exploitation of sea cucumbers in the Philippines dates back to the late eighteenth century. Almost all the sea cucumbers harvested in the Philippines are processed into the dried form (trepang or bêche-de-mer) and exported predominantly to China Hong Kong Special Administrative Region (SAR), Singapore, Republic of Korea, Taiwan Province of China and Japan. There are no restrictions on the export of any species of sea cucumbers in the Philippines, even though some species have reached endangered status, nor is there a size restriction on any sea cucumber species for export.

The number of species harvested commercially has increased over the years. There were five commercial species in the 1900s, 24 in the 1980s and currently there are 33 species. Species utilized in the commercial trepang trade has evolved from traditionally high value, low volume species like teatfish and sandfish to the lower value high volume species. Presently the most valuable commercial species are *Holothuria fuscogilva, H. scabra, H. whitmaei, Stichopus chloronotus, S. herrmanni, S. horrens* and *Actinopyga* spp. Many anecdotal reports point to the overexploitation of sea cucumbers which have been confirmed in surveys carried out recently.

Sea cucumber landings and exports statistics from FAO can be confusing and need to be verified. When comparing the FAO data on annual volume produced from capture fishery with the volume of exports, the former is found to be lower (when it should be higher), implying that either the landings or the export data have not been accurately recorded. Acquiring accurate statistics is hindered by two issues: catches from the Philippines are lumped together as Holothuroidea and not separated into individual species; and species are called by various local names. A species can have more than one local name or one local name is shared by two or more species.

Fisheries management in the Philippines in general is regulated by the New Fisheries Code (Republic Act 8550). Currently there are no specific clauses directed at the management of sea cucumbers. The open access nature of the resource encourages overfishing, as leaving them behind means that someone else will collect them. Illegal, unregulated and unreported (IUU) fishing also poses problems. Poaching of fish and invertebrates by foreign fishers in Philippine waters has been documented. As sea cucumber resources become depleted, fishing by Filipino fishers in foreign waters, as well as in Philippine Marine Protected Areas (MPAs) has also become a problem. Although there are more than 150 sites in the Philippines with MPAs, most of these

sanctuaries need improved vigilance to enforce the no-fishing boundaries. The lack of enforcement on the use of destructive fishing techniques also caused the destruction of corals and reef inhabitants like sea cucumbers. Various NGOs have established programmes on community-based management and co-management of natural resources in the Philippines, but not all have encountered success.

Currently, sea cucumbers are mainly harvested in one of three ways: commercial fishing targeting solely sea cucumbers; artisanal fishing for sea cucumbers as bycatch; and gleaning in intertidal reef flats during low tide. In many islands and coastal villages in the Philippines, income from sea cucumber fishery used to contribute a significant portion of a family's total income especially where the holothurians were abundant in the intertidal zones. However, current commercial sea cucumber populations in many shallow coastal areas have been reported to be overfished and income derived from sea cucumber gleaning has become less important. Commercial fishers who harvest sea cucumbers from the deeper areas derive a better income compared to those who glean in shallow coastal areas where the resources are already depleted.

Fishers in the commercial and artisanal sectors are recognized to belong to the formal work sector with their livelihood given considerable attention by the government. However, the plight of informal sector workers, like the sea cucumber gleaners, is often ignored and their livelihood given scant consideration.

The Philippine Council for Aquatic and Marine Research and Development (PCAMRD) and several individuals have recommended strategies for the conservation of sea cucumbers in the Philippines. A framework for a national sea cucumber management plan was outlined after the National Forum on Sea Cucumber Fisheries and Management held in June 2007.

1. BIOLOGICAL AND POPULATION STATUS

Commercial exploitation of sea cucumbers in the Philippines dates back to the late eighteenth century; during that period, the Sulu Sultanate was known to have prospered from bêche-de-mer or trepang[1] trade with Spain, Britain and China (Warren, 1985 cited in Akamine, 2001). This trade flourished in the South Pacific during the early nineteenth century and Manila was then an active entrepôt for trepang trade between the Pacific countries and China (Ward, 1972 cited in Akamine, 2001).

Seale (1911) reported the presence of 64 species of Holothurians in the Philippines, with many species bearing different genus names from those reported in the more recent literature, while Domantay (1957) mentioned 99 species and Schoppe (2000), 100 species. Tiu (1981) recorded the presence of 27 species of intertidal holothurians from Mactan and the neighbouring islands in central Philippines.

1.1 Current species in trade and their uses

Almost all the sea cucumbers harvested in the Philippines are processed into trepang and exported predominantly to China Hong Kong Special Administrative Region (SAR), Singapore, Republic of Korea, Taiwan Province of China and Japan (Gamboa, Gomez and Nievales, 2004). A small amount, however, of the harvested sea cucumbers used to be consumed in roasted form by traditional communities in the Busuanga group of islands (Seale, 1911). When sea cucumbers were abundant in Danao Bay, people often brought cooked rice, bananas or root crops to eat together with sea cucumbers found at the beach (Heinen, 2001). They are also consumed by men together with "tuba", a local alcohol (LeBlanc, 1997). The itinerant Boholano divers in Batangas consume some species fresh without the internal organs in salad dishes. The internal organs of

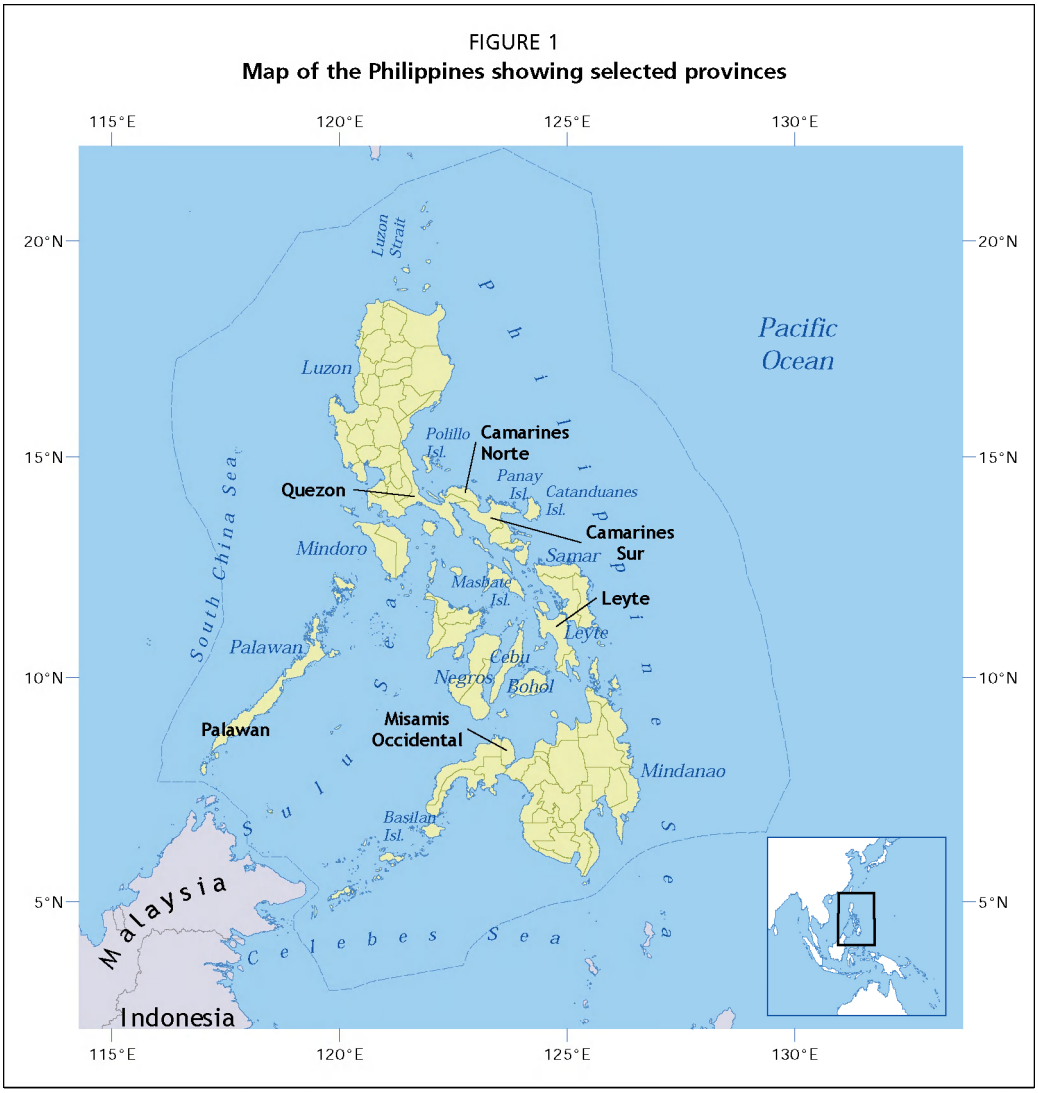
[1] The term trepang is used throughout this document as it is the term normally used in Philippines, Indonesia and other Asian countries.

some *Stichopus* species are fermented and consumed by some traditional communities (Trinidad-Roa, 1987). In the Island Garden City of Samal and nearby communities along Davao Gulf, the body wall of *Holothuria hilla, Stichopus horrens* and *Thelenota rubralineata* are blanched, sliced into bite size, and sold soaked in clean seawater. They are pickled in vinegar and garnished with garlic and onions and are in demand among the Muslims during the Ramadan season (Gamboa, Aurelio and Abreo, 2007). Sea cucumbers are also sold frozen in Davao in Mindanao province (Purcell, S., The WorldFish Center, New Caledonia, personal communication).

Traditionally, sea cucumbers have often been regarded as a functional food and are credited with curative powers to treat high blood pressure and muscular disorders. The cuvierian tubules are used as a crude plaster for minor wounds (Trinidad-Roa, 1987). Akamine (2005a) noted that a species of sea cucumber, *H. coluber*, locally known as "patola white" is reportedly no longer used as food for humans but instead is exported to China and used as a fertilizer.

Collection and processing of sea cucumbers have been reported in almost all the islands in the Philippine archipelago including: Bolinao, Bani and Alaminos in Pangasinan; San Fernando in La Union; San Vicente in Cagayan; Masinloc in Zambales; Polillo Island in Quezon; Calatagan in Batangas; Cebu; Negros Occidental; Surigao del Norte; South Cotabato; and Tawi-Tawi in Sulu (Trinidad-Roa, 1987). Sea cucumbers are also harvested in Mangsee Island in the southern part of the Palawan province and in the Spratly Islands (Akamine, 2001); in the islands of Apid, Digyo and Mahaba off

FIGURE 1
Map of the Philippines showing selected provinces



the shore of Inopacan, Leyte (Shoppe *et al.,* 1998) as well as in Cataban Island, central Philippines (Morgan and Panes, 2004). Heinen (2001) reported that sea cucumbers are harvested from Danao Bay located in the province of Misamis Occidental on the island of Mindanao, where a large part of the Bay belongs to the municipal waters of Baliangao. Subsistence and artisanal fisheries are also present in West Central Visayas (Nievales, 2007), Iligan Bay, northern Mindanao (Metillo, Tarranza IV and Arado, 2004) and Davao Gulf, southern Mindanao (Gamboa, Gomez and Nievalaes, 2004). During the 1900s, Seale (1911) noted that trepang supplies for Manila were mainly from Tacloban City in Leyte province, Polillo in Quezon province and Ambos Camarines province. In recent times Zamboanga City in western Mindanao and Puerto Princesa City in Palawan province are the largest entrepôts in the Philippines (Trinidad-Rao, 1987).

The number of commercial species has increased over the years. Seale (1911) listed only five commercial species traded in Manila in the 1900s, with *H. atra* being the most valuable. However, according to Kim Friedman (Secretariat of the Pacific Community, New Caledonia, personal communication), the species might have been wrongly identified as *H. atra* has always been a low value species. Trinidad-Roa (1987) listed a total of 16 commercial species from the Philippines, against 25 species described by Shoppe (2000), 24 species by Akamine (2005a) and 33 species documented in this report (Table 1). In the beginning of 2000s, the most valuable commercial species were *Holothuria fuscogilva*, *H. scabra*, *H. whitmaei*, *Stichopus chloronotus*, *S. herrmanni*, *S. horrens* and *Actinopyga* spp. in descending order of value (Akamine, 2001). Akamine (2001) noted that two unidentified species, known by their Makassar names "tacheritang" and "tundang" were considered as valuable as *H. fuscogilva* and *H. scabra*. Like in other countries in the Southeast Asian region, species utilized in the commercial trepang trade in the Philippines has evolved from traditionally high value, low volume species like teatfish (*H. fuscogilva; H. whitmaei*) and sandfish (*H. scabra*) to the lower value higher volume species, commonly known as the "worm" species (for example *H. leucospilota*).

Five species of sea cucumbers commonly collected from Apid, Digya and Mahaba include *Actinopyga echinites, Bohadschia argus, B. marmorata, Holothuria atria* and *Holothuria rigida* (Schoppe *et al*., 1998). Heinen (2001) mentioned that *Holothuria difficilis*, locally known as "mani-mani" is commonly harvested by fishers from Danao Bay.

1.2 Population status

Overexploitation of sea cucumbers from anecdotal reports by various authors (Trinidad-Roa, 1987; Schoppe *et al.,* 1998; Akamine, 2001; Heinen, 2001; Gamboa, Gomez and Nievales, 2004) has been confirmed by the results of the first nationwide stock and fishery survey of shallow-water sea cucumbers conducted by Labe *et al.* (2007). Such status is mainly attributed to a very lucrative export trade. The same explanation was earlier offered by Ganchero (2007) at the first nationwide Sea Cucumber Forum held at Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR) in Dagupan, Pangasinan, in June 2007.

The survey confirmed the overfishing of small-sized individuals (Figure 2) which existed in all the 14 study areas spread across the archipelago. Such practice was reported as early as the late 1980s by Trinidad-Roa (1987) where dried samples in Cebu, Pangasinan, Batangas, and Cagayan were as small as 4–5 cm. About two decades after, Metillo, Tarranza and Arado (2004) documented the same practice for northwestern Iligan Bay as indicated by the catch–effort and heavy collection of 5–10 cm individuals. They cited that fishers in Lopez Jaena spent a maximum effort of up to 30 man hours to collect ten commercial species while those in Plaridel spent up to 25 hours for only three. Another recent study conducted in Bolinao and Anda, Pangasinan showed that since 2004, the monthly average landings of *H. scabra* has been around 20 kilograms, way below the 109 kilograms peak in 2002 (Pastor, Catbagan and Ragos, 2007).

TABLE 1
Commercial species currently exploited in the Philippines

Latin name	Common name	No. specimens/kg (average dried weight of specimen in g)	Length of dried specimens (cm)	Size categories
Actinopyga lecanora	Buliq-buliq; Monang; Munang		7.6 6.4 2.5–6.4 <2.5	L M S XS
A. mauritiana	Bakungan; Monang		>7.6	L
A. obesa or *A. miliaris*	Khaki			
A. echinites	Hudhud; Brown beauty; Buli-buli; Khaki; Uwak			
Bohadschia sp.	Lawayan hongkong			
Bohadschia marmorata	Lawayan; Pulutan; Tagukan		10.2 6.4 <6.4	L M S
B. argus	Leopard; Matang Itik; Mat-anan			
B. graeffei	Bulaklak, trompa, pinya			
Holothuria sp.	White beauty			
Holothuria sp. (black colour)	Patola black			
H. scabra	Putian; Cortido; Curtido; Kagisan	15 (67) 20 (50) 40 (25) 60 (17) 80 (13)		XL L M S XS
H. scabra var. *versicolor*	Curtido Bato			
H. fuscogilva	Susuan	3–4 (250–333) 5–6 (167–200) 7–8 (125–143) 8–10 (100–125) 11–15 (67–91)		XL L M S XS
H. whitmaei	Bakungan; Kagisan; sus-an	5–6 (167–200) 7–8 (125–143) 8–10 (100–125 g) 11–15 (67–91 g)		L M S XS
H. atra	Black beauty, Mani		>12.7 10.2–12.7 5.1–10.2	L M S
H. rigida, H. inhabilis	Batunan (fresh for local consumption), Bat-onan			
H. pulla	Patola red			
H. coluber	Patola white; Tambor; Bat-uwak			
H. edulis	Red beauty; Red-black; Hotdog			
H. leucospilota	Patola			
H. fuscopunctata	Sapatos			
H. difficilis	Mani-mani			
H. hilla	Mani-mani			
H. fuscocinera	Labuyuq			
Stichopus horrens, S. herrmanni	Hanginan; "loaf bread"		>7.9 6.4–7.6 5.1–6.4 <5.1	L M S XS
S. chloronotus	Katro kantos			
T. ananas	Tinikan; Pinya-pinya			
T. anax, T. rubralineata	Legs, paag daga			
Neocucumis proteus	Bola-bola			

Source: Schoppe *et al.*, 1998; Schoppe, 2000; Akamine, 2005b; Gamboa, R., University of the Philippines, Mindanao, personal communication.

FIGURE 2
Harvesting of small sea cucumbers in Mindanao

COURTESY OF S. PURCELL

Other local examples of exploitation of the fishery are as follows. According to Heinen (2001), the collapse of the fishery in Danao Bay had become "the symbol of mismanagement and conflict between meal and market" where despite the ban order issued by the mayor, poaching continued. Solandt *et al.* (2001) recorded extremely low temporal and spatial abundance of commercial holothurians in Danjugan Island, Negros Occidental, and did not find a single sea cucumber in North Wall and Hilary's Rock during a 2-year survey. Akamine (2001) believed that the more than 30 years of exploitation in Mangsee Island has resulted in local women no longer involved in fishing and men resorting to hookah diving in search of species in deeper areas.

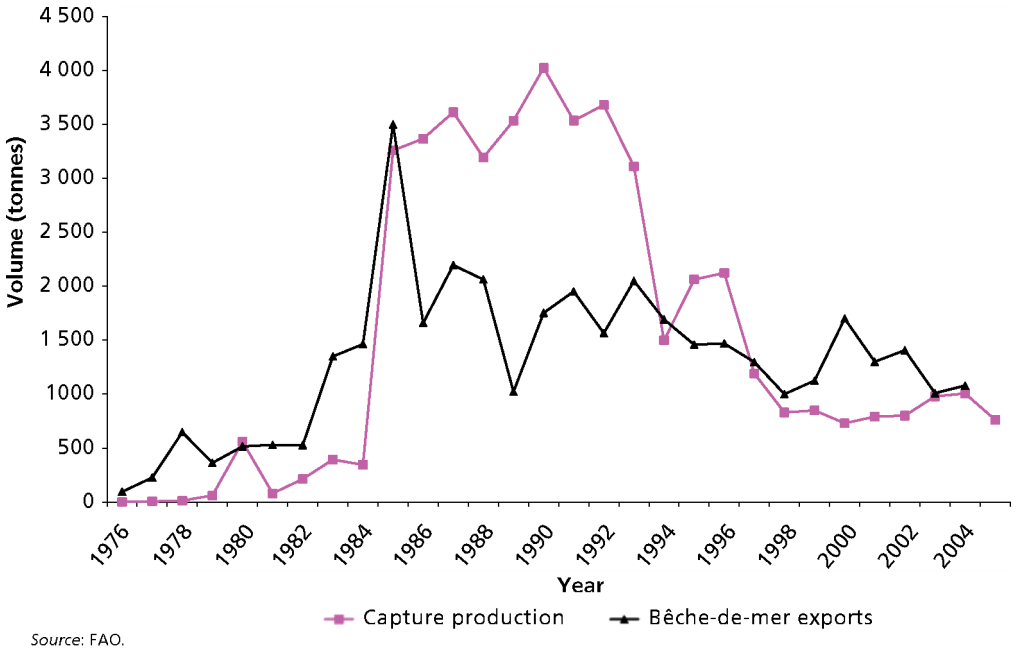
1.3 Catches

1.3.1 Total catch

The FAO statistics on Philippine's sea cucumber landings and exports can be confusing and need to be verified. A 15-year data on catches and export shows a sharp peak and decline in export quantity in 1985–86 but without corresponding changes in catch volume (Figure 3). The highest catch volume recorded at around 4 000 tonnes in 1990 showed a declining rate thereafter and stayed in a plateau at less than 1 000 tonnes for the last ten years.

Acquiring accurate statistics is hindered by two issues. First, catches from the Philippines are lumped together as Holothuroidea. They are not segregated by species. Furthermore, the country to date has no commercial hatchery for sea cucumbers, thus, all export products are from capture fishery. When comparing the FAO annual volume data derived from capture fishery with the export volumes (see Figure 3), the former is found to be lower (when it should be higher), implying that either the landings or the export data have not been accurately recorded. Assuming that the annual domestic consumption is minimal, and adopting the commonly used wet:dried weight

FIGURE 2
Sea cucumber (Holothuroidea) capture production and trepang exports from the Philippines



Source: FAO.

conversion factor of 3:1 (FAO, 2000), capture production would correspond roughly to three times the amount of trepang export. However, Kim Friedman (Secretariat of the Pacific Community, New Caledonia, personal communication) commented that very few species give a 30 percent return while most sea cucumbers yield 5 to 12 percent of their wet weight when processed. Interestingly, Ganchero (2007) noted that the Philippine volume-price data obtained from Singapore are much higher than that in national reports indicating a under declaration in the latter.

Second, species are called by various local names. The commercial species shown in Table 1 are difficult to rank. Confusion in taxonomy, as experienced by Gamboa, Gomez and Nievales (2004), is easily apparent in that a species can have more than one local name or one local name is shared by two or more species. Aside from looking at the population status, the nationwide assessment undertaken by the National Fisheries Research and Development Institute (NFRDI) from January 2006 to July 2007 (Labe *et al.*, 2007) was also to address lack of knowledge on nomenclature and taxonomy.

1.3.2 Types of fishing and harvesting techniques

Seale (1911) described the historical harvesting of sea cucumbers by fishers who usually went out at low tide, wading in the shallow waters, dragging a small canoe or "banca" into which they threw all the sea cucumbers which they picked up. Sometimes the fishers harvested from a boat using a long spear with which they gathered the trepang in waters of 3–4 m.

Currently, sea cucumbers are mainly harvested in one of three ways described below: commercial fishing targeting solely on sea cucumbers; artisanal fishing for sea cucumbers as bycatch; and gleaning in intertidal reef flats during low tide.

Sea cucumbers collected through commercial and artisanal fishing are carried out by skin diving or diving with the use of air compressor (Figure 4). Statistics are, however, not available to differentiate the volume of catch resulting from the different forms of sea cucumber harvesting.

FIGURE 4
Woman diver from Mindanao collecting sea cucumbers

COURTESY OF R. GAMBOA

Commercial fishing

The commercial fishers are more organized than the artisanal fishers and gleaners, and they gather sea cucumbers exclusively for direct sales to middlemen (Gamboa, Gomez and Nievales, 2004). Commercial fishing for sea cucumbers in the deeper waters involves the use of motorized vessels (39-foot length keel with a 56 hp engine) which are equipped with echo sounders to locate good habitat for sea cucumbers and have 10–15 crew on board (Akamine, 2001). Fishers spent several weeks out at sea and dived for sea cucumbers with the use of hookah. Ninety-five percent of fishers from Mangsee Island in Palawan were ethnic Bajaus and they usually dived for sea cucumbers in the Spratly Islands.

Akamine (2001) recorded at least 15 commercial vessels fishing in the Spratly Islands in 1998 but in 2000, only a few vessels were still operating. Boat owners advanced the cash for all necessary expenses and deducted them from the catch and divided the net profit among the crew. The former, as boat owner, generally qualified for three shares (for owning boat, engine and echo sounder) and net profit, and handled all transactions without sharing details with the divers (Akamine, 2001).

Harvesting sea cucumbers as bycatch

Harvesting sea cucumbers as bycatch is carried out by traditional fishers whose target fisheries are mainly fish and molluscs. Sea cucumbers encountered along the path are collected. The fishers normally go out alone or in groups of 2–3 and fish by skin diving or with the use of air compressors. Akamine (2001) noted that the fishers may fish early in the morning for sea cucumbers and in the afternoon harvest different kinds of fish and molluscs. In Barangay Bato, Davao del Sur, divers generally fish between 7 pm and 4 am (Gamboa and Junio-Menez, 2007).

Gleaning

Sea cucumbers are also collected by small-scale or artisanal fishers, involving not only men but women as well as children. This activity is carried out during low tide in shallow intertidal reef flats. Gleaning is often classified as "informal" work[2] acting as a safety net for the rural landless (LeBlanc, 1997). Gleaning of sea cucumbers is becoming more and more uneconomical as a source of livelihood because of the decades of uncontrolled overfishing in shallow reef flats that has led to localized depletion of the resource.

1.3.3 Illegal, unreported and unregulated fishing

Poaching of fish and invertebrates by fishers from neighbouring countries in the Philippine coastal waters has often been highlighted as a problem. Illegal fishing in the 1980s by fishers from Malaysia and the Sulu Archipelago in Danao Bay had been

[2] Informal work has been defined by the International Labour Office (cited in LeBlanc, 1997) as "a way of doing things" characterized by: ease of entry; reliance on indigenous resources; family ownership; small-scale operation; labour-intensive and adapted technology; skills acquired outside the formal school systems and unregulated and competitive market.

documented to harvest sea cucumbers by the boatload (Heinen, 2001). Since 2006, 600 Chinese nationals have been arrested for illegal fishing in Philippine waters (The Manila Times, 2007). In 2002, 95 Chinese nationals were detained for poaching 10 sacks of dried sea cucumbers from the Tubbataha Reef Marine Park (a World Heritage Site) off Palawan province (Jimeno, 2007). In December 2006, 32 Chinese, crewmen of the fishing vessel Hoi Wan were arrested by Philippine authorities when their vessel was found loaded with live fish and dried sea cucumbers (The Daily Tribune, 2007).

As sea cucumber resources become depleted in Philippine waters, illegal fishing by Filipino fishers in foreign territorial waters such as in Malaysia, has also been documented (Akamine, 2001), and widespread poaching in Marine Protected Areas (MPAs) in the Philippines had also been noted (Uthicke and Conand, 2005). In 1998, Heinen (2001) documented that large quantities of sea cucumbers were poached from Danao Bay sanctuary by fishers from Tugas village in the Baliangao municipality, landing sacks full of sandfish.

The proliferation of non-Filipino middlemen, usually married to Filipino women, in the last decade was confirmed at the national forum in June 2007 by the trader participants. The traders regard those non-Filipinos as formidable competitors both in terms of financial capital as well as access to domestic and international networks. For example, in Davao City there are at least two foreign traders: a Korean and a Japanese. While both are basically traders of seafood products they are also middlemen and direct exporters of trepang (Gamboa and Junio-Menez, 2007).

1.4 Management of the fishery

Fisheries management in the Philippines in general is regulated by the New Fisheries Code (Republic Act 8550). Currently there are no specific clauses directed at the management of sea cucumbers, although recommendations specific to its management were suggested as early as the late 1980s and early 1990s (see Trinidad-Roa, 1987 and PCAMRD, 1992). For further detail on these recommendations see Section 5.

There are no regulations or monitoring of the sea cucumber fishing activities at the local level and no taxation on the landings; the only payment required is a fee to operate a motorized boat (Gamboa, Gomez and Nievales, 2004). The open access nature of the resource also encourages overfishing, as leaving them behind means that someone else will collect them.

The Philippines is perhaps one of the most advanced countries in the East Asian region with respect to its appreciation and practice of coastal management as a strategy to address problems in the coastal zones (Jacinto *et al.*, 2000). Since the mid-1980s, there have been at least 45 coastal management programmes and projects involving 150 sites all over the Philippines, with MPAs incorporated in many of these plans (Jacinto *et al.*, 2000). Regulations in MPAs include no-fishing zones, regulated fishing zones or a combination of these, as well as open- and closed-season fishing zones (Jacinto *et al.*, 2000). However, enforcement of the regulations is best accomplished in smaller MPAs while the larger ones have only moderate enforcement. A study which surveyed eight MPA sites in Bohol and one in Siquijor in 2003 found a relative lack of sea cucumbers in the study sites reflecting heavy collecting (White *et al.*, 2003). They suggested that the sanctuaries surveyed needed improved vigilance to enforce the no-fishing boundaries.

According to Trinidad-Roa (1987), sea cucumber fishery in the Philippines is uncontrolled and non-selective; if the fishery is to survive, there is an obvious need for appropriate and realistic guidelines to regulate it. Under the Local Government Code, coastal municipalities are empowered to develop their own coastal development plans, but these plans face huge challenges in their implementation due to: (i) the lack of political will in prosecuting illegal fishers; (ii) the lack of support from the community; and, (iii) a shortage of funds for enforcement and where marine police operate on a volunteer basis (Gamboa, Gomez and Nievales, 2004).

Various Non-governmental Organizations (NGOs) have established programmes on community-based management and co-management (working with coastal municipalities) of natural resources in the Philippines with various degrees of success. These initiatives include those in the island of Apo (Negros Oriental province), Balicasag and Pamilacan (Bohol province) and San Salvador (Zambales province) which were established and maintained by organized communities, and are now recognized by coastal resource managers worldwide for their success in using the community-based coastal resource management approach (Oneocean, undated). The Pipuli Foundation formed a community-based management system in 1991 with the establishment of a sanctuary or no-take-zone for the conservation of sea cucumbers and other aquatic organisms in Danao Bay. In that year, local fisher leaders and the NGO began to work on a written resource management plan (Heinen, 2001). The ordinance was well accepted and embraced by the municipal councilors of Plaridel, one out of the six communities around the Bay. In another example, the co-management system for coastal resource management in Banate Bay which was established in 1996 proved very successful, and in 1998, received the Galing Pook national award as one of the most successful development oriented rural organizations in the Philippines (Fernandez Jr., Matsuda and Subade, 2000).

In Sagay, Negros Occidental, the Presidential Proclamation that declared its Marine Reserve was elevated into a Republic Act (law) which gave the local stakeholders more power to implement sustainable fisheries (Gamboa, R., University of the Philippines in Mindanao, Philippines, personal communication). The reserve is administered by a multisectoral Protected Area Management Board (PAMB). It boasts two national awards: the 1997 Gawad Galing Pook Award for innovation and replicability and the 2003 Best Aquatic Resource Management Award. While several species of sea cucumber can be found in the reserve, the fishery is monospecific on *Neocucumis proteus* (*bola-bola*) (Cucumariidae). The regulated harvesting and monitoring of this species is an example of co-management even prior to acquiring scientific baseline information. However, the administrators were quick to realize that handicap and are now making collaboration with academic and research institutions (Dacles, 2007).

Fishers in the commercial and artisanal sectors belong to the formal work sector with their livelihood given considerable attention by the government. However, the plight of informal sector workers, like the sea cucumber gleaners, is often ignored and their livelihood given scant consideration. LeBlanc (1997) reported that the implementation of the Philippines Local Government Code in 1991 provided for changes in Bais Bay use and access patterns, with many gleaners deprived of their gathering activities in intertidal areas which were converted to mussel and oyster farms.

2. TRADE

2.1 Main export destination, trade route, illegal trade

The Philippines is one of the important sea cucumber fishing countries that have no pertinent national management or regulatory measures for sea cucumbers (Labe, 2007). Consequently, there are no restrictions on the export of any species of sea cucumbers even though some species have reached endangered status (although not officially declared as such), nor is there a size restriction on any sea cucumber species for export. All export consignment conforming to trade regulations are therefore allowed to leave the country legally. Philippines is a signatory to the World Trade Organization (WTO) but according to Salayo (2000) fish and its products are not classified as sensitive agricultural products and therefore do not fall under the WTO Agreement on agriculture. However, fishery trade is covered by the general rules of the General Agreement on Tariffs and Trade (GATT).

China Hong Kong SAR is the major direct importer of Philippine trepang. There, the products are either further processed or repackaged after which almost half are "exported" to China at higher prices. The Republic of Korea ranks second and Singapore third while North American and Western European countries with sizeable Oriental populations are minor markets (Ganchero, 2007). For the trade route, Akamine (2001, 2005a) noted that in the early 2000s there were four major trepang exporters, all of whom operated from Manila, and the exporters were either ethnic Chinese or who had a spouse with Philippine citizenship. Apart from sea cucumber, these exporters also traded other dried marine products like sharkfin and dried sea horse whose main market is China.

FIGURE 5
Trade relationship between the different suppliers and buyers in the sea cucumber trade in the Philippines

Akamine (2001, 2005a) indicated that wholesale dealers often classify trepang into five categories: (i) those that can be stored without further treatment; (ii) those that require a half day of sun drying; (iii) those that require more than one day of sun drying; (iv) those that require smoking; and (v) those that require further treatment. Further treatment includes procedures which require rinsing away salt, removing odour, spoiled meat, scorched parts, sand in the body, and layer of lime used in processing.

Figure 5 shows the relationship among the major importing countries and the various suppliers, buyers and fishers in the sea cucumber supply chain in the Philippines. The recent visible proliferation of non-Filipino middlemen in key cities outside Metro Manila poses strong competition among local middlemen (Gamboa, R., University of the Philippines in Mindanao, Philippines, personal communication).

Given the above flow of sea cucumber trading, some big-time middlemen finance local contacts creating more competition among local traders (Gomez, 2007). This can potentially drop the buying price making the local fishers the real losers. Gomez (2007) recommended examining the value chain and identifying activities critical to buyer satisfaction or market success. This can serve as guide in improving the value of the sea cucumbers especially for local stakeholders.

Table 2 compares the volume and value of the Philippines exports to the world exports of sea cucumbers. The value index, calculated as the ratio between the percent value and percent volume of exports from the Philippines compared to the world exports, provides an indication of the relative value of the exported products. For instance, the indices calculated from 1983 to 2004 are well below one, indicating that the trepang exported are low value species or the processed products are of low quality. In contrast, Sri Lanka[3], which exports a small volume of higher value products, have value indices for 2003 and 2004 of 2.45 and 0.99 respectively. These statistics form another warning sign for the need to put in place national regulations to increase the economic benefits from sustainable sea cucumber fisheries.

[3] Sri Lanka exported 2 tonnes (USD 31 000) of sea cucumbers in 2003 and 36 tonnes (USD 103 000) in 2004.

TABLE 2
Export volume and value of sea cucumber (dried, salted or in brine) from the Philippines

Year	Philippines		World		Percentage world production		Value index
	Volume (tonnes)	Value (USD x1 000)	Volume (tonnes)	Value (USD x1 000)	Volume	Value	% Value / % Volume
1983	1 349	2 008	5 116	10 651	26.37	18.85	0.72
1984	1 463	1 145	6 214	11 648	23.54	9.83	0.42
1985	3 499	2 993	13 040	19 854	26.83	15.08	0.56
1986	1 659	1 772	10 787	18 947	15.38	9.35	0.61
1987	2 195	2 532	12 179	24 770	18.02	10.22	0.57
1988	2 062	2 364	12 481	36 397	16.52	6.50	0.39
1989	1 022	1 465	5 372	20 310	19.03	7.21	0.38
1990	1 752	3 253	7 661	30 145	22.87	10.79	0.47
1991	1 952	3 560	9 292	40 991	21.01	8.69	0.41
1992	1 609	3 216	10 350	41 045	15.55	7.84	0.51
1993	2 049	3 986	23 216	115 386	8.83	3.45	0.39
1994	1 692	4 120	22 688	123 895	7.46	3.33	0.45
1995	1 459	4 803	17 939	87 006	8.13	5.52	0.68
1996	1 469	4 827	21 383	120 925	6.87	3.99	0.58
1997	1 297	4 505	18 776	103 636	6.91	4.35	0.63
1998	NA	NA	–	–	–	–	–
1999	1 125	3 653	17 850	85 774	6.30	4.26	0.68
2000	NA	NA	–	–	–	–	–
2001	NA	NA	–	–	–	–	–
2002	1 407	2 386	4 420	14 642	31.8	16.30	0.51
2003	1 009	2 095	3 264	14 715	30.91	14.23	0.46
2004	1 079	2 176	4 928	21 080	21.90	10.32	0.47

Source: Landings in volume and values obtained from FAO.

2.2 Prices to fishers and exporters

Trinidad-Roa (1987) reported that fresh animals harvested in the 1980s were sold by fishers to middlemen with prices varying from 0.50 pesos (USD 0.01) to 1.50 pesos (USD 0.03) per piece for less preferred species like *H. atra* and *S. chloronotus* (however, currently *S. chloronotus* is sold for USD 90/kg in Japan according to Jun Akamine (Nagoya City University, Japan, personal communication), while more preferred species like *H. whitmaei, T. ananas* and *A. mauritiana* were sold between 7 pesos (USD 0.15) to 15 pesos (USD 0.32) per piece; for *A. echinites* and *A. miliaris*, the middle price range was 3 pesos (USD 0.06) to 5 pesos (USD 0.11) per piece. LeBlanc (1997) reported that gleaners sold Balat-bagisan or *H. scabra* at 5 pesos (USD 0.11) per kg, while Batuli or *H. leucospilota* were sold by gleaners for 0.10 pesos (USD 0.002) per piece.

Sea cucumbers are processed into trepang usually by middlemen who then sell them to wholesalers who would grade the products. High value trepang is categorized according to individual weight estimated by hand or according to length as measured against the middle finger (Akamine, 2001). Low value species are not categorized into weight or length classes. Middlemen and traders have often been considered as the main beneficiaries in the sea cucumber trade at the expense of the fishers. Most recently, good quality *H. scabra* in China Hong Kong SAR can fetch up to USD 110/kg (Ganchero, 2007). This is a specific point where value chain analysis, as pointed out by Gomez (2007), can help fishers optimize their share of profit in this international trade.

Fishers are not well compensated for their catches. In the 1900s, fishers received a price which was 30 percent lower than the retail price of sea cucumbers in Manila (Seale, 1911), whilst Gamboa, Gomez and Nievales (2004) reported that fishers received only 12–20 percent of the export price when they sold *H. scabra* bought at 187 pesos/kg (USD 4/kg) and then exported at 888 pesos/kg (USD 19/kg) to 1 075 pesos/kg (USD 23/kg).

Wholesale prices of almost all species of sea cucumbers have increased, especially the high value species. Akamine (2005a) noted that *H. scabra* has shown a steady increase in price in Puerto Princesa City over the years between 1998 to 2002, but prices of low

TABLE 3
Wholesale prices of trepang in Puerto Princesa City from 1998 to 2002

Species	Size: Number of specimens/kg (mean dried weight of specimen)	Price (USD/kg)				
		1998	1999	2000	2001	2002
H. scabra	XL: 15 (67 g)	29.7	35.0	36.7	37.3	40.4
	L: 20 (50 g)	22.8	27.5	31.1	29.4	36.5
	M: 40 (25 g)	16.0	18.8	24.4	21.6	23.1
	S: 60 (17 g)	9.1	11.3	16.7	13.7	15.4
	XS: 80 (13 g)	6.9	8.8	12.2	12.7	13.5
H. fuscogilva	XL: 3–4 (250–333 g)	21.7	30.0	35.6	35.3	35.6
	L: 5–6 (167–200 g)	20.5	27.5	34.4	33.3	34.6
	M: 7–8 (125–143 g)	17.1	22.5	26.7	21.6	24.0
	S: 8–10 (100–125 g)	12.6	15.0	17.8	15.7	16.3
	XS: 11–15 (67–91 g)	9.1	12.5	12.4	9.8	10.6
S. horrens	L: >7.9 cm	12.6	20.0	21.1	21.6	28.8
S. herrmanni	M: 6.4–7.6 cm	9.1	12.5	14.4	15.7	20.2
	S: 5.1–6.4 cm	6.9	10.0	11.6	11.8	14.4
	XS: <5.1 cm	4.1	6.3	6.7	5.9	6.7
Actinopyga spp.	L: >7.6 cm	14.8	20.0	24.4	21.6	25.4
	M: 6.4 cm	10.3	13.8	15.6	15.7	19.6
	S: 2.5–6.4 cm	8.0	11.3	11.6	11.8	12.5
	XS: <2.5 cm	5.7	10.0	6.7	7.8	9.6
H. whitmaei	L: 5–6 (167–200 g)	14.8	17.5	26.7	19.6	23.1
	M: 7–8 (125–143 g)	12.6	15.0	22.2	17.6	19.2
	S: 8–10 (100–125 g)	10.3	11.3	17.8	13.7	15.4
	XS: 11–15 (67–91 g)	9.1	8.8	11.1	9.8	9.6
A. mauritiana	L: >7.6 cm	8.2	11.3	14.4	12.7	13.5
	M: 6.4–7.6 cm	5.0	7.5	11.1	8.8	8.7
	S: 3.8–6.4 cm	3.7	6.3	8.0	5.5	5.4
	XS: 2.5–3.8 cm	2.3	3.0	4.0	2.4	2.3
A. echinites		9.6	11.3	15.6	12.7	13.5
B. argus		5.3	7.0	8.4	8.2	8.3
Bohadschia spp.	L: >10.2 cm	3.7	5.5	6.9	5.9	6.0
	M: 6.4 cm	2.7	5.0	6.2	5.3	5.4
	S: <6.4 cm	1.8	3.0	4.0	3.3	3.3
H. edulis	L: >12.7 cm	2.3	3.3	5.3	4.7	4.6
	S: 5.1–12.7 cm	–	–	4.9	3.9	4.1
H. atra	L: >12.7 cm	2.5	4.0	5.3	3.9	4.2
	M: 10.2–12.7 cm	1.6	2.1	3.1	2.4	2.7
	S: 5.1–10.2 cm	0.7	1.0	2.2	1.6	1.5
H. leucospilota	–	1.8	3.3	4.9	3.9	4.0
T. anax	–	3.4	4.3	4.9	3.7	4.0
H. fuscopunctata	–	1.8	2.8	2.9	2.7	2.9
B. graeffei	–	1.4	2.1	2.4	1.8	2.1

Source: Akamine, 2005a.

value species (*H. leucospilota*, *T. anax*, *H. fuscopunctata* and *B. graeffi*) appeared to be more stable (Table 3). Prices listed in Table 3 were for class A top quality products whilst class B products consist of semi-dried, out of shape, or poorly processed products of high value species (*H. fuscogilva*, *H. whitmaei*, *H. scabra*, *S. herrmanni*, *S. horrens* and *Actinopyga* sp.). These were classified as "rejects" and sold at 40 percent of the prices of class A products (Akamine, 2001). On the other hand, rejects of "bola-bola" in Sagay are bought at 50–70 percent lower than the prices for healthy looking pieces (Dacles, 2007).

3. SOCIO-ECONOMIC IMPORTANCE TO LOCAL FISHING COMMUNITY

In the Philippines, like in many other Southeast Asian countries, sea cucumber fishing, along with fishing for molluscs and other aquatic organisms, provides an income to many poor coastal fishers. In Mangsee Island, commercial sea cucumber fishing in deep waters is carried out not at subsistence level, but as an activity to supplement the

fisher's income (Akamine, 2001). In many islands and coastal villages in the Philippines, income from sea cucumber fishery used to constitute a significant portion of a family's total income especially where the holothurians are abundant in the intertidal zone (Trinidad-Roa, 1987). In Barangay Bato, Sta. Cruz, Davao del Sur sea cucumbers, even as bycatch can contribute as much as 41 percent to the daily take home income of fishers (Gamboa, Aurelio and Abreo, 2007). However, current commercial sea cucumber populations in many shallow coastal areas have been reported to be overfished and income derived from sea cucumber gleaning has therefore become less important. In Bais Bay, in a survey carried out from July to November 1993, and in January 1994, sea cucumbers comprised only 1.2 percent of the total value of organisms gleaned during that period (LeBlanc, 1997).

Fishers who harvest sea cucumbers from the deeper areas derive a better income compared to those who glean in shallow coastal areas where the resources are now scarce. Although gleaning is an important harvesting method, there is no official statistics to indicate the volume of sea cucumbers collected by this method. Gleaning is usually adopted by the self-employed, poor coastal fishers who cannot afford to be without work and livelihood. LeBlanc (1997) noted that those who must find employment are likely to do so by entering the flexible income sector or the informal sector, and gleaning for sea cucumbers and other shellfish in the Philippines contributes to an important means of livelihood for the poor and landless. LeBlanc (1997) noted that in Bais Bay located on the island of Negros, a total of 25 223 gleaners (39 percent women, 35 percent men and 26 percent children) were recorded from July 1993 through to January 1994. They shared the coastal waters with an estimated 3 077 coastal fishers many of whom were involved in shellfish and seaweed cultivation. A study conducted by Schoppe *et al.* (1998) in the islands of Apid, Digyo and Mahaba off Leyte revealed that gleaning is a year round activity and 70 percent of the gleaners were females, 30 percent males with children in the age group between 7 to 15 years representing almost 40 percent of all gleaners. In Danao Bay, Heinen (2001) reported that 30 percent reef gleaners were males and gleaning was mainly carried out by women. In Apid and Mahaba, 85 percent and 62 percent of gleaners respectively, worked for subsistence purposes with the surplus catch being sold in the local market. Reef gleaning on the islands ranked second in the list of economic activities conducted to augment income derived from marine resources; 3.7 percent of the gleaners concentrated on collecting sea cucumber resources, with echinoderms comprising 16.6 percent of the catch in Apid, 10 percent in Digyo and 8.4 percent in Mahaba (Schoppe *et al.*, 1998).

LeBlanc (1997) classified the social roles of gleaning in Bais Bay into three categories:

1. Gleaners from households for which collecting shellfish and other invertebrates was the main income generating activity all year round;
2. Gleaners from households for which collecting shellfish and other invertebrates was not the most important income generating activity;
3. Gleaners from households involved in shellfish and other invertebrate collection for their own consumption.

Gleaning proved not to be a small and unstructured activity, but rather highly organized fishing affecting large numbers of people (LeBlanc, 1997). LeBlanc (1997) further noted that gleaning requires skill and knowledge to know where and when to find large quantities of the targeted species, and these skills are passed down from the adults to the children of the neighborhood.

Access to gleaning areas has traditionally been open to everyone, but this is slowly changing (LeBlanc, 1997). Gleaners' access to collection sites is being increasingly compromised by changes in the Philippines legislation; the Philippines Local Government Code indirectly produced changes in both access and use patterns in the coastal zone. Gleaners face steep competition when sites are no longer accessible when coastal areas were converted to mussel or oyster farms (LeBlanc, 1997).

4. ADDITIONAL THREATS TO SEA CUCUMBER POPULATIONS

Other reasons driving the decline of the sea cucumber resources in the Philippines include the fact that it is a common pool resource with a high demand and fetching a lucrative price. The absence of fishing regulations and poor understanding of its ecology also contributes to its overfishing (Morgan and Panes, 2004). There are various management regimes to sustain the sea cucumber resources, ranging from open access to co-management with local municipalities and to community-based management. Very few of these systems, however, seem to work because of the lack of enforcement on regulations and political will to prosecute wrong-doing. Other factors include the vulnerability of sea cucumbers which are easily harvested because of their sessile and defenseless nature, the low larval recruitment, the intermediate time of 2–6 years to reach maturity, as well as the dependence on high animal density for successful reproduction (Morgan and Panes, 2004; Uthicke, Welch and Benzie, 2004; Bruckner, Johnson and Field, 2003).

The use of destructive fishing techniques for finfish (such as cyanide, blast-fishing, hookah), destroys corals and reef communities. Hookah fishing of sea cucumbers is unsustainable because it enables fishers to stay longer in deeper waters thus contributing to increased fishing pressure of an already depleted resource. In "muro-ami" fishing, an encircling net is used with blocks of stone or cement slabs which are lowered into reefs to break up the corals (thus destroying sea cucumber habitats) and scare the fish into the nets.

In Polillo Islands, the greatest direct threat to the reefs and associated organisms was attributed to the use of explosives and poisonous substances (LeBlanc, 1997). Gleaning also contributes to the destruction of corals, and human impacts in gleaned areas are often evident from broken corals caused by stepping, and breaking of corals in order to gain access to the sea cucumbers (Schoppe *et al.*, 1998).

5. RECOMMENDATIONS FOR IMPROVING FISHERIES MANAGEMENT AND CONSERVATION OF SEA CUCUMBER POPULATIONS

Trinidad-Roa (1987) noted that the most practical method to regulate sea cucumber fishery is to impose a size regulation allowed for exports, and to restock depleted reefs with seeds produced from a hatchery. Experiences by fishers and traders reveal that size regulation is not necessarily enforceable (Gamboa, R., University of the Philippines in Mindanao, Philippines, personal communication). For example, a local trader buys undersized pieces out of benevolence to fishers who wasted time and effort in fishing and processing those catches. Hatchery production, on the other hand, is relatively expensive, takes years before real benefits can be noticed and need sustained community involvement.

The following strategies suggested by PCAMRD in 1992 are hereto revisited and commented by Gamboa (University of Philippines in Mindanao, Philippines, personal communication) using available information:

1. Establishment of catch quotas and minimum size limits for exported species.
   Although the Philippines has no national regulatory and monitoring system in place, at the local level the harvesting of *N. proteus* (*bola-bola*) in Sagay Marine Reserve observes catch quota and size limits, among others. The regulated fishery started only in 2004 and monitoring is in progress. Two visible successes at this early stage are: i) keeping off non-local residents from the fishing ground; and ii) income to the city and incentives to "barangays" (smallest political unit) as a result of profit-sharing (Dacles, 2007).
2. Establishment of closed season for harvesting during the breeding season.
   In the Sagay Marine Reserve this measure was relatively easy to enforce because the fishery is confined to one species, *N. proteus*, despite the presence of other commercial (but less valuable) species.

3. Rotational harvesting in reef areas. With collection areas divided into sections and each section opened to harvesting during certain periods on a rotational basis.
   A majority of the sea cucumber fishing grounds around the archipelago consists of several commercial species. One knowledge gap to this strategy is local information on the reproductive biology of those species. This review found information available only for three species:
   a) *H. scabra* is a continuous breeder but with reproductive pulses in June and December (Ong Che and Gomez, 1985);
   b) *H. pulla* spawns only in October (Batoy, Alino and Pocsidio, 1998);
   c) *H. coluber* in December (Batoy, Alino and Pocsidio, 1998).
   According to Gamboa, dissertations and technical reports available in universities and offices of government fisheries and marine bureaus may help fill some of the knowledge gaps about the biology, ecology and taxonomy of other commercial species.
4. Designation of permanent survey sites for monitoring the harvesting pressure and seasonal variation of sea cucumber populations.
   The national survey made by the National Fisheries Research and Development Institute can help identify those sites. There is likewise a need to standardize monitoring tools for easy comparison of data.
5. Establishment of reserve areas to help in the recruitment of stocks.
   This is perhaps the most popular strategy because of the presence of a national legal framework under the National Integrated Protected Areas System (NIPAS) Act. However, two common handicaps at the barangay level is the lack of properly trained enforcers and a sound monitoring and reporting system. Poaching and lack of political will are two other problems. Successful poaching can be attributed to insufficient logistic and financial support while the lack of political will often occurs in municipalities whose political leaders and their extended families are themselves engaged in fishing trade.
6. Ban on the use of SCUBA for harvesting except for species that are not found in intertidal regions and are found only in deep waters where the use of SCUBA is necessary.
   The reality is that SCUBA is too expensive for marginal fishers but hookah is affordable and does not need any formal licensing. The ban on the latter is at the discretion of the local government. A big common handicap in its implementation is defining political boundaries in the coastal waters and policing the area especially at night.
7. Monitoring the volume of harvests and sales/exports to assess catches from natural stocks. Existing stocks in exploited and unexploited areas should be monitored for effective management of the resource.
   This recommendation suffers again from the lack of a national regulatory system in place. Furthermore, the monitoring officers at the municipality including those at the Bureau of Fisheries, the Coast Guard, and the Immigration Department need to have some training on the taxonomy of the many species as well as a common Identification Guide to fresh and dried species (Gamboa, R., University of the Philippines in Mindanao, Philippines, personal communication).
8. Artificial propagation of commercial species to provide seeds for mariculture and restocking of depleted reefs.
   Sea cucumber culture was pilot tested at the Bolinao Marine Laboratory of the University of the Philippines Marine Science Institute in 2001 (Gamboa and Juinio-Menez, 2007). Follow through attempts attained 15–33 percent survival to early juvenile stage, and grow-out experiments demonstrated that field cages provided better survival when larger-sized juveniles were used (Gamboa, Gomez

and Nievales, 2004). In 2005, Nievales (2007) successfully produced juveniles of both *H. scabra* and *B. marmorata* var. *marmorata* in experimental scale at the University of the Philippines Visayas. These efforts, so far, have yet to reach the grow-out phase.

In 2006, the Department of Science and Technology (DOST) – PCAMRD in collaboration with the Australian Centre for International Agricultural Research (ACIAR) – The WorldFish Center and NFRDI took cognizant of the need for concerted research efforts on sea cucumber fisheries. They provided financial support to a national programme on hatchery production and resource management was initiated by the University of the Philippines (Marine Science Institute, Visayas and Mindanao). The 3-node project took off the next year simultaneous with that at the NFRDI. In the next 3–6 years the programme will try to: a) meet the needs for R&D on juvenile production and management of *H. scabra*; b) train fisher groups on sea ranching, restocking, processing and marketing; and c) develop incentives for responsible management of the said fishery (Gamboa and Juinio-Menez, 2007).

A commercial-scale multi-species hatchery for high value finfish and invertebrates such as abalone, sea cucumber, sea urchin (USAID, 2007) is about to be completed in Bongao, Tawi-Tawi, southwestern Mindanao. It is a joint project by the provincial government, BFAR, the Western Mindanao Community Initiatives Project (WMCIP) and Growth with Equity in Mindanao (GEM–USAID). The hatchery is meant to supply quality seed stock for mariculture parks which are being promoted by BFAR nationwide (BFAR, 2007). Kim Friedman (Secretariat of the Pacific Community, New Caledonia, personal communication), however, commented that the various sea cucumber culture systems are not market ready even for *H. scabra* and will take many years before other species come on line. Even when these species are farmed successfully, management of the natural stocks is still needed as total dependence on hatchery produced seed will be very expensive.

Sea cucumber farming using wild broodstock has been attempted by several growers who were participants at the National Forum (Gamboa, R., University of the Philippines in Mindanao, Philippines, personal communication) The problems encountered included:

- Lack of knowledge in the right stocking density and grow-out practices in general;
- Uncooperative and less enthusiastic cooperative members;
- Low production;
- Market access and strategies.

Some of the key points raised at the National Forum were:

- The need to regularly maintain the pens;
- The significance of an organized group and their contribution;
- The need to coordinate with "barangay" officials;
- The need for proper monitoring and documentation.

Among local traders, the problems raised were as follows:

- Dwindling stock due to destruction of reefs;
- Knowledge of processing techniques;
- Prices depend on up-line traders;
- Proliferation of non-Filipino traders/middlemen.

Sea cucumber species are now currently under review by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to examine whether its enlistment as an endangered species under CITES would help in the conservation and management of the sea cucumber resource and fishery. The international technical workshop on the conservation of sea cucumbers in the families

Holothuriidae and Stichopodidae convened by CITES in March 2004 in Malaysia recommended that commercially important species under these two families could be enlisted under Appendix II. Several benefits to the CITES enlistment include: curtail of illegal trade and harvest; awareness rising amongst stakeholders; comprehensive measures to comply with CITES provisions and perpetuation of sustainable fisheries (Toral-Granda, 2006). Under Appendix II listing, sea cucumber trade can be managed to yield the greatest sustainable benefits to fishers, exporters and importers, while they can be sustainably maintained to serve their important ecological roles (Bruckner, Johnson and Field, 2003).

In the Philippines, when an animal or plant species is listed under CITES, the national legislation does not permit the trading of the species, irrespective of the Appendix the species fall under. Although listing sea cucumbers under CITES may give them some respite from fishing, the ban may affect the livelihood of the poor people who are dependent on sea cucumber fishery. A plan to provide alternative livelihood to those affected by the ban must be in place to ensure that fishers dependent on sea cucumber fishery will not be left without livelihood. Toral-Granda (2006) suggested that including sea cucumber species in the Appendices of CITES may curtail trade and harvest. On the contrary, the listing of sea cucumbers under CITES may actually enhance illegal fishing and trade especially for the high value species whose black market price may sky rocket and make it very lucrative for fishers and traders to take risk and break the law. Enforcement of fisheries regulations has always been a problem in the Philippines; placing sea cucumbers under CITES control may not be an effective means to prevent fishing. Without strict enforcement on harvesting regulations, CITES listing may encourage smuggling and illegal trade for sea cucumbers that were caught illegally.

Some difficulties which need to be resolved before addressing whether it is appropriate to enlist sea cucumbers under CITES include: taxonomic uncertainties within the families, ability to distinguish taxa in the form they are traded, adequacy of biological information for making non-detriment findings, and ability to make legal acquisition findings (Bruckner, Johnson and Field, 2003). Bruckner, Johnson and Field (2003) also mentioned that it is possible to identify most of the common species that are traded as live animals for home aquaria and other uses, based on the gross morphology but it is very difficult to determine the dried products. With the listing in CITES, enforcement and custom officials in both exporting and importing countries will need to familiarize themselves with the identification of trepang which may not be so easy, especially to the less-scientific and sometimes, uninitiated personnel.

Akamine (2005b) suggested that international intervention is not the only way to save depleting resources and is against enlisting sea cucumber under CITES. He noted that the management of trepang resources requires commitment and support from trepang traders. Akamine (2005b) further noted CITES intervention will undermine cultural diversity and deny certain communities their historical preferences for trepang consumption and rob them of the use of sea cucumbers for medicinal purposes.

Other ways of conservation, such as regulating the catch by introducing community-based management where fishers are invited to play an active role in the decision-making process can be an alternative to CITES enlistment. Such community-based fisheries management and co-management efforts have proved successful in some small-scale pilot projects for example in the project implemented in Danao Bay and Banate Bay (Heinen, 2001; Fernandez, Matsuda and Subade, 2000). Akamine (2005b) suggested that all levels of stakeholders, especially trepang traders (whose trade may run from one generation to another) because of their vast knowledge (scientists are able to benefit from their knowledge and experiences) should be involved in issues on sea cucumber management and conservation. Akamine (2005b) also claimed that without actual knowledge of the trepang market, it is impossible to plan a management programme for more than 20 commercial species. La Viña (2002) noted that in the

Philippines, local governments must support community initiatives and the national government must ensure that community efforts are supported. He further noted that community-based resource management approach should not be grounded merely on the improvement of management of resources by reinforcing control and enforcement mechanisms through greater participation, but emphasis should be placed on the rationale of equity and justice which are necessary conditions for the attainment of environmental sustainability in the Philippines.

6. TOWARDS A NATIONAL SEA CUCUMBER MANAGEMENT PLAN

Ruth Gamboa (University of the Philippines, Mindanao, personal communication) provided the following information highlighted in a National Forum on Sea Cucumber Fisheries and Management which was held in Dagupan City, Pangasinan in June 2007. The forum was a first step towards a nationwide initiative to promote responsible and sustainable management of the sea cucumber fisheries.

The salient issues highlighted are:

Production

- Degradation of habitat and declining catch;
- Lack of scientific information and technical know-how on the biology, taxonomy, production and marketing;
- Unavailability of juveniles for grow-out due to absence of commercial hatcheries.

Post-harvest

- Poor handling and processing methods.

Marketing and trade

- Absence of a formal marketing system in local trade.

At the end of the forum a framework for a national sea cucumber management plan was agreed upon. Its objectives and programmes are:

General objectives:

- To assess the status of sea cucumber fishery and industry and develop management recommendations for national policies that can help ensure sustainability of the resource and equitable benefits to stakeholders;
- To formulate a multi-sectoral action plan towards a comprehensive management strategy for Philippine sea cucumber resources.

Specific objectives:

- To provide an overview of the current state of knowledge and practices related to the fisheries;
- To facilitate information sharing and leveling of understanding among various stakeholders;
- To identify key issues and strategic actions to improve the management of the fisheries and culture practices.

Programme areas include:

- Management of capture fisheries
- Grow-out culture
- Post-harvest
- Marketing

The participants decided on a one-year Action Plan to finalize the framework and help address the issues raised.

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