PHILIPPINE MARINE TURTLE COUNTRY ASSESSMENT AND CONSERVATION ACTION PLAN

Department of Environment and Natural Resources
Biodiversity Management Bureau
Quezon City, Philippines
2018

In partnership with:

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
of the Federal Republic of Germany

MARINE WILDLIFE WATCH OF THE PHILIPPINES

Table of Contents

LIST OF FIGURES 4
LIST OF TABLES 4
EXECUTIVE SUMMARY 5
BACKGROUND 6
1. INTRODUCTION 7
2. SPECIES INVENTORY, HABITATS, AND MOVEMENT 8
2.1. Green Turtles 8
2.2. Olive Ridley Turtles 11
2.3. Hawksbill Turtles 11
2.4. Leatherback Turtles 12
2.5. Loggerhead Turtles 12
2.6. Important Nesting Beaches and Feeding Habitats 12
3. THREATS TO MARINE TURTLES IN THE PHILIPPINES 17
3.1. Bycatch 18
3.2. Harvesting of Eggs and Trade of Marine Turtles 19
3.3. Abandoned Nets and Debris/Plastic waste 20
3.4. Habitat Change and Degradation 20
3.5. Natural Mortalities 21
3.6. Climate Change 21
3.7. Other Threats 22
4. CONSERVATION AND POLICY 22
4.1. INTERNATIONAL AGREEMENTS 22
4.1.1. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 22
4.1.2. Convention on Migratory Species of Wild Animals (CMS) 22
4.1.3. The United Nations Convention on the Law of the Sea (UNCLOS) 23
4.1.4. International Organizations' Programs and Initiatives 24
4.2. REGIONAL PROGRAMMES AND INITIATIVES 24
4.2.1. Coral Triangle Initiative (CTI) 24
4.2.2. Sulu-Sulawesi Marine Eco-Region (SSME) – Marine Turtle Corridor Strategy 24
4.2.3. Turtle Island Heritage Protected Area (TIHPA) 25
4.2.4. Western and Central Pacific Fisheries Commission (WCPFC) 25
4.2.5. ASEAN Institutions 25
4.2.5.1. Memorandum of Understanding on ASEAN Sea Turtle Conservation and Protection (1997) 26

4.2.5.2. Southeast Asian Fisheries Development Center (SEAFDEC) 26
4.3. NATIONAL POLICIES 26
4.3.1. National Conservation Programs 26
4.3.2. National Laws 28
4.4. LOCAL LAWS AND INITIATIVES 31
5. RESEARCH RECOMMENDATIONS 32
5.3. Vulnerable Life Stages and Habitats 33
5.4. Population Dynamics 34
5.5. Population Stocks and Genetics 34
5.6. Other Research 35
6. POLICY ANALYSIS AND RECOMMENDATIONS 36
7. MARINE TURTLE CONSERVATION FRAMEWORK 41
8. MARINE TURTLE CONSERVATION ACTION PLAN 49
9. ACKNOWLEDGEMENTS 52
10. REFERENCES 53

LIST OF FIGURES

Figure 1. Map showing the difference between the observed values and the values predicted by a regression model. Negative values mean the model predicted more encounters than were actually recorded, while positive numbers mean more encounters were observed than predicted by the model. 10
Figure 2. Nesting sites of green turtle, hawksbill turtle, and olive ridley turtles with highest value ratings per species for prioritization excluding green turtles in the Turtle Islands Wildlife Sanctuary. The numbers represent the Site ID (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)). 14
Figure 3. Sites where green, hawksbill, and olive ridley turtles occur together (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)). 15

LIST OF TABLES

Table 1. Priority nesting sites excluding green turtles of the Turtle Islands Wildlife Sanctuary. 12
Table 2. Sites where green, hawksbill, and olive ridley turtles occur together. 16
Table 3. Policy Gap and Effectivity Assessment. Values indicate number of participants choosing a category they feel strongly about. Red indicates a lack of regulation, yellow means regulations available but implementation is poor, and green means the existing regulation is sufficiently implemented. 37
Table 4. Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA) Conservation and Management Plan. 41
Table 5. Philippine Marine Turtle Conservation Action Plan Workshop Output. 49

EXECUTIVE SUMMARY

A review on the status of marine turtles in the Philippines was done based on existing published literature, unpublished reports, and the results of over thirty years of tagging and field report data from the Department of Environment and Natural Resources were used. The review showed the Philippine Seas as a habitat for five species of marine turtles: green, olive ridley, hawksbill, leatherback, and loggerhead. The complex lifecycle of marine turtles was exemplified by the various habitats that they occupy. Except for the loggerhead turtle, all other species have confirmed nestings in the Philippines. As the location of the nestings were too numerous, priority areas were recommended in this report as conservation sites for better monitoring and management. Aside from nesting habitats which include the life stages eggs, hatchlings, and adult females; mating, feeding, development habitats, and migratory corridors can also be identified in the country. Various threats are present in all these habitats, most notable were coastal zone development affecting nesting beaches and seagrass/coral feeding areas, as well as fishery interactions affecting all pelagic life stages. Data gaps were acknowledged in marine turtle abundance, mortality, survival, and habitat status with less information available on the leatherback and loggerhead turtles compared to the other three species. In lieu of these gaps, research recommendations were provided in this report.

Philippine legislation and international and regional management schemes seem to be sufficient on paper but actual protection of species and their habitats remain troublesome with the persistence of poaching both of whole adult turtles and eggs, and the degradation of nesting beaches and coastal mating, feeding, and developmental habitats. Policy gaps were identified based on emerging and potential problems or threats, even within the conservation activities themselves, such as standardized conservation protocols for hatcheries and ecotourism interaction guidelines.

Several iterations of marine turtle conservation frameworks have been developed with local, national, and regional scopes. To address threats and conservation issues on marine turtles, the Conservation and Management Plan agreed upon under the Conservation of Migratory Species of Wild Animals' Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and Southeast Asian (IOSEA) was adapted due to its appropriateness, comprehensiveness, and its consideration of marine turtles as a shared resource throughout its range.

BACKGROUND

Conservation of marine turtles in the Philippine has a long history beginning in the 1940s. The mandate to conserve this resource is with the Department of Environment and Natural Resources (DENR) by virtue of the Republic Act 9147 of 2001 or the Wildlife Resources Conservation and Protection Act. The Biodiversity Management Bureau (BMB) is tasked to implement a conservation program to ensure that marine turtles in the Philippines are protected.

One of the activities of the BMB, under its Wildlife Resources Division, is research, an important component to any conservation initiative. However, research on marine turtles in the Philippines is best described as sporadic, mostly with tagging and recapture of nesters and hatchery management implemented mostly by the DENR through their regional offices as well as by some private and academic groups. The overall number of published research papers related to marine turtles in the Philippines is relatively small, the majority of the research to date has not been species specific, and equally, the geographical scope has been quite limited and rather focused on the national level than on specific sites which has made it difficult to come up with a national status on marine turtle populations in the Philippines.

This gap is partly addressed through support from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) under the Sulu-Sulawesi Seascape Project, where tagging and field reports data obtained by the DENR from 1986-2015 were analyzed for the first time in 35 years. Majority of this data came from the Turtle Islands Wildlife Sanctuary (TIWS), which is considered the most important nesting ground for green turtles in the Philippines and the only remaining green turtle rookery in the ASEAN region (DeVeyra 1994, 1996 in Sagun, 2004). Completed in 2018, one of the outputs of the project is the report "Occurrence, Distribution, Nesting Incidence, Habitat Connectivity, and Fishery Interaction of Marine Turtles in the Philippines Based on Tagging and Field Reports Data from 1986 to 2015" by the DENR. It contains results of the analysis from the tagging and field reports data and emphasizes the commitment of Philippine Government to conserve the Sulu Sulawesi large marine ecoregion. However, the report does not provide the actual status of marine turtles in the country, especially on abundance and recruitment, but it does provide insights on trends for prioritization of sites, not only as habitats but also fishery hotspots, that are important to the conservation of the different marine turtles in the country.

As such, this report uses several other sources of information, including a review of relevant literature on marine turtles in the Philippines to supplement the report on tagging and field reports data to provide a more comprehensive status report of marine turtles in the Philippines. It further highlights the need to develop long-term research strategies and programs that will broaden the information available on marine turtles in the Philippines and to better inform decision makers to develop science-based policies on the local, national, and regional level. A well-designed research strategy is recommended with specific research objectives in mind to be able to focus on information needed for management interventions and the conservation of these species.

It is hoped that this report and its impacts will significantly contribute to marine turtle conservation in the Philippines and in the region.

1. INTRODUCTION

Marine turtles are some of the most recognizable marine animals in the Philippines. Of the seven (7) species of marine turtles, five (5) are found in the country. Marine turtles utilize the whole archipelago with its 7,641 islands, coastal areas, inner seas, and open ocean for the different habitat requirements of their several life stages. They occupy various habitats throughout their lifecycle for development, feeding, and reproduction which may vary among the species. Cruz and Torres (2005) classified marine turtle activities in specific habitats in the Tubbataha Reefs into four categories: 1) nesting, (i.e. for nesters, eggs and hatchlings); 2) developmental habitats for juveniles, sub-adults and adults; 3) foraging grounds; and 4) resting areas. Other life stages may require different habitats than the ones listed above such as mating, inter-nesting habitats for adult females or habitats for life stages that are not well-researched, such as the lost years of post-hatchlings. The passage between these habitats are called migratory corridors and are equally important to marine turtles and thus for protection. Therefore, marine turtles are an integral part of the Philippine marine ecosystems.

However, the Philippine marine ecosystems are also amongst the most threatened ecosystems in the world. The life cycle of marine turtles exposes them to a multitude of threats at all stages including the terrestrial, coastal, and pelagic habitats. These threats are mostly anthropogenic through direct and indirect causes, including poaching, bycatch, habitat destruction and degradation, and marine debris. In addition, growing concerns are voiced on the consequences and impacts of climate change on marine ecosystems and potential ecosystem collapse. Throughout the years, an increasing number of threats has developed, with all its social, political, biological, and economic complexities, that makes conservation even more challenging.

Conserving marine turtles is a concern addressed nationally and regionally. The Philippines began protecting its marine turtle populations in 1948 with the signing of Fisheries Administrative Order (FAO) No. 23 to establish a closed season for egg harvesting in the Turtle Islands. Several administrative orders followed, but still mainly focused on the Turtles Islands. It was only in 1979 that a national program for the conservation of marine turtles in the Philippines was established. The Executive Order (EO) No. 542 created the Task Force Pawikan. The Philippines protects its biodiversity nationally through the Wildlife Resources Conservation and Protection Act of the Philippines (Republic Act 9147 of 2001) and the Fisheries Code (Republic Act 8550 as amended by RA 10654 of 2015). Through national protection, direct exploitation of marine turtles was significantly reduced over the years, but still persists to this day in several hotspots throughout the country.

In addition, given the migratory behavior of marine turtles, their protection is best addressed through international cooperation. Three programs, the Turtle Islands Heritage Protected Area (TIHPA), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Convention on the Conservation of Migratory Species (CMS) Memorandum of Understanding (MoU) on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and Southeast Asian (IOSEA), have been established to tackle regional and global conservation issues regarding marine turtles. Other regional efforts include the Sulu-Sulawesi Seascape Program and the Coral Triangle Initiative which have targets specific for marine turtles.

These programs, although in full swing, need to rely on scientific data to ensure that the strategies are appropriate to meet conservation targets. Creation of a sound management program for marine turtle conservation entails sufficient information. It is hoped that information in reports, such as this one, will help address this and provide better platforms to implement conservation programs focused on marine turtles in the Philippines.

2. SPECIES INVENTORY, HABITATS, AND MOVEMENT

The Philippines has recorded five species of marine turtles out of the seven species found globally, namely: the green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), olive ridley turtle (*Lepidochelys olivacea*), loggerhead turtle (*Caretta caretta*), and leatherback turtle (*Dermochelys coriacea*). The marine turtles are collectively called *pawikan* in the Philippines but are also known in different local names such as *katuan* for green turtles, *sisikan* for hawksbill turtles, *kantiwan* for olive ridley turtles, *bulawon* for loggerhead turtles and *balimbing* for leatherback turtles, among others.

Found throughout the Philippine seas, the abundance of the *pawikan* has made them a part of culture and tradition, especially in coastal communities, in particular direct exploitation for their eggs and meat. There is a consensus on the decline of marine turtle populations in the Philippines based on exploitation records (Negeri & Tow, 1977; Eckert, 1993; Gomez, 1979; De Celis, 1982). Often cited is the decline in the total egg production of green turtles in Taganak Island, Turtle Islands in Tawi-Tawi from 1951 to 1983 of 84 percent (WWF-Philippines, 2005).

2.1. Green Turtles

The highest incidence of nesting in the Philippines of all the marine turtles in the country is recorded for the green turtle. The highest concentration is documented in the southern Sulu Sea specifically in the TIWS. Considered one of the major rookeries for green turtles in the world, the TIWS is identified as both, a nesting beach (which hosts the life-stages nesters, eggs and hatchlings) and as a mating ground. Green turtles in the TIWS, together with some hawksbill turtles, provided an average of 13,817 complete nests per year from 1984 to 2013 (Julsadjiri, 2015). In 2011, one of the TIWS islands, Baguan, registered its highest recorded egg production of 1.44 million green turtle eggs since 1984, based on number of crawls with complete nests (International Union for Conservation of Nature, 2012). However, there seems to be a declining trend in the number of tagged nesters reported in the area during the past three decades (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)).

Aside from the TIWS, there are at least 17 more sites that have regular and relatively high incidence of nesting (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)). These are located in the provinces of Tawi-Tawi; Zamboanga del Sur; Bataan; Zambales; Albay-Sorsogon-Camarines Sur; Misamis Oriental-Agusan del Norte-Bukidnon-Camiguin; Palawan; Occidental Mindoro; Oriental Mindoro; Manila Bay; Catanduanes; Marinduque; La Union; Romblon; and Negros Occidental.

Antonio and Matillano (2016), list three types of nesting areas in Camiaran Island, Balabac, Palawan: shoreline vegetation (most preferred with 58 nests), beach forest (30 nests), and open beaches (8 nests).

In Candaraman Island, Balabac Strait, Palawan, most of the green turtle nestings occur in the months of June to August. However, the majority of the locals agree that there is also a pronounced nesting season from November to February during the Northeast Monsoon (Antonio & Matillano, 2016). Chaloupka (2001), having project sites in Malaysia and the Philippines, observed that nesting occurs year-round with a distinct dry season peak. In Baguan Island, the nesting season is from July to September. Sagun (2002), who also researched the nesting seasons in Baguan Island, mentions another nesting peak from November to February. During their research in the Calamianes Islands, Poonian et al. (2016) identified Pamalican Island, Linamodio

Buenavista and Galoce Tototan as the beaches with the highest nesting densities of > 10 body pits/km for green turtles and hawksbills, with nesting occurring all year round.

The sizes of green turtles found in the Philippines are from 40 to 50 cm Curved Carapace Length (CCL), which are within the range of juveniles to sub-adults. This data was derived from bycatch records outside the TIWS. Nesters, on the other hand, measured 95 to 105 cm CCL from records in the TIWS (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)).

Numerous feeding grounds of green turtles are found across the Philippines. These are usually shallow seagrass beds and algae patches near coral communities and reefs, where juveniles and sub-adults are usually mixed with adults. Juveniles and adults are commonly encountered in popular dive sites in the Philippines including the Tubbataha Reefs Natural Park (Pilcher N. , 2010b; Cruz & Torres, 2005). Some of the identified feeding sites are Apo Island, Negros Oriental; Pandan Island, Mindoro Oriental; Balicasag Island, Bohol; and Cobrador Island, Romblon.

The majority of juvenile green turtles encountered by Cruz and Torres (2005) in the Tubbataha Reefs Natural Park were concentrated in shallow waters. The latter finding is confirmed by Araujo et al. (2016) as the green turtles in the shallow interaction area (2.7 m to 12 m depth) in Oslob, Cebu appeared to be mostly immature. Antonio and Matillano (2016) also encountered green turtles feeding in the shallow seagrass meadows, on a most frequent basis in Unok Island, Balabac in Palawan. However, this observation does not seem to be confined to juveniles only.

Araujo et al. (2016) found that the mean residency of green turtles at the assessment site in Oslob, Cebu was 873 days and they were absent from the study site for a mean time period of 324 days, within a total time period from 11 May 2012 until 11 March 2016 (1,401 days). This site fidelity, which has been reported on before, was attributed by the authors to the extensive seagrass beds providing excellent foraging grounds. As most green turtles at the interaction site seem to be immature, it seems like the seagrass beds are visited by immature individuals “before moving to adult-dominated foraging habitats”.

Residual model analysis of tag recoveries from TIWS nesters revealed their dispersal throughout the Philippines with preference for the waters around Palawan and the northern Visayas Seas (Figure 1). These are potentially important terminal feeding habitats where green turtles migrate to after the nesting season in the TIWS, which needs to be further investigated (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)).

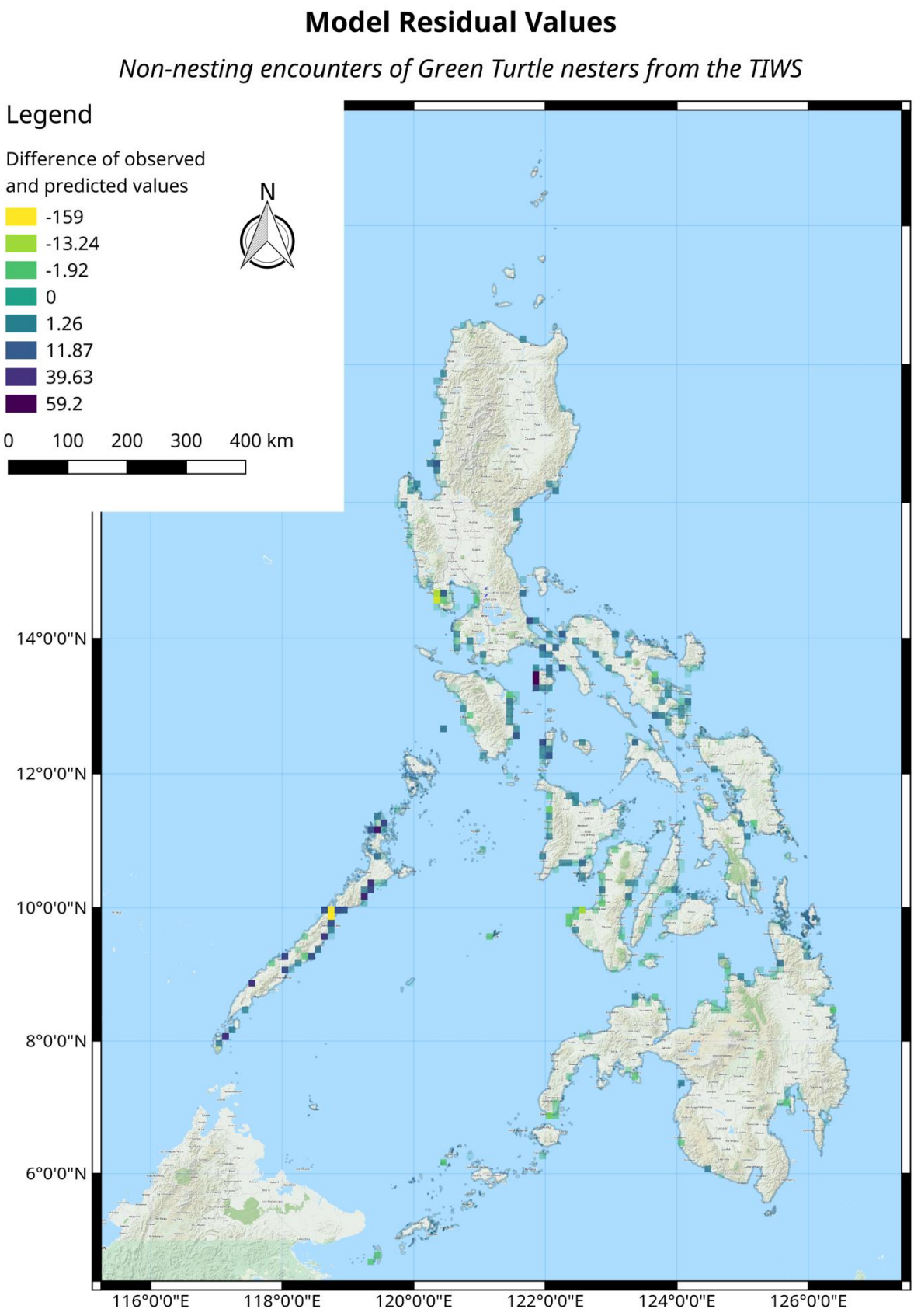

Figure 1. Map showing the difference between the observed values and the values predicted by a regression model. Negative values mean the model predicted more encounters than were actually recorded, while positive numbers mean more encounters were observed than predicted by the model.

The long-distance movements of green turtles were mostly determined through tag recoveries, e.g. from those turtles tagged at the Sabah Turtle Islands (TI), which were recovered near several Philippine islands bordering the Sulu Sea (Bagarinao, 2011). Nesting green turtles from the Philippine Turtle Islands moved to Tawi-Tawi, Antique, Jolo, Basilan, Negros Occidental, Zamboanga, Oriental Mindoro, Masbate and Indonesia (Sagun, 2002; Sagun, 2004).

Ramirez de Veyra (1994) reports a green turtle from Yap, Micronesia encountered in South Cotabato, Mindanao. Sagun (2002) reports foreign tag recoveries in the Philippines to include mostly green turtles with tags from Guam, Japan, Taiwan, Malaysia, Micronesia and Palau. From this report, anecdotal evidence from fishermen even pointed to turtles recovered in the Philippines that were tagged in Australia and Italy. Yeh et al. (2014) stated that a tagged green turtle, which was rescued in Hainan, China, swam back to the Philippines by crossing the South China Sea travelling on average 0.9 km/hr, and swam first to Luzon, later to Palawan.

2.2. Olive Ridley Turtles

The olive ridley turtle has the second highest nesting incidence in the country, concentrated mainly in Bataan and Zambales, including the Manila Bay area. Other sites with regular nesting reports include Oriental Mindoro, Batangas, Camarines Sur, Sarangani, Marinduque, Davao del Sur and Davao del Norte (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)). Nesting occurs from September to February in Morong, Bataan (Sagun, 2002).

Most of the encounters are with nesters of 68 to 78 cm CCL. This species is rarely seen in dive sites, probably because of their preference for pelagic habitats. Movement from the nesting grounds in Bataan and Zambales shows migration towards the Visayan Sea including the waters around Negros, Panay, Sorsogon, and Camarines Sur (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)).

2.3. Hawksbill Turtles

The hawksbill turtle has the third highest incidence of nesting in the Philippines. Eight priority sites were identified, including the provinces of Agusan del Norte-Misamis Oriental-Camiguin, Marinduque, Agusan del Sur-Surigao del Sur, Palawan, Tawi-Tawi, Oriental Mindoro, Misamis Oriental, and the TIWS with relatively higher nesting reports than the rest of the country (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)). Encounters with juveniles/sub-adults (35 to 45 cm CCL) are more frequent than nesters, which may indicate that the country is used extensively as a developmental habitat. Hawksbill turtles are commonly encountered in dive sites or as bycatch as they frequent near-shore coral areas and reefs as habitats. Quimpo (2013) observed reef crests to be nesting and foraging areas of sub-adult and adult hawksbill turtles in Macalajar and Gingoog Bays in Mindanao.

Torres et al. (2004) observed that hawksbills preferred nesting in coralline sand under vegetation as the authors recorded 313 hawksbills hatching from four clutches laid from July to August 2003 in Punta Dumalag, Matina Aplaya, Davao City. Quimpo (2013) observed year-round nesting, with peaks during the first and third quarter of the year in Macajalar and Gingoog Bays, Mindanao. The author reported the highest nesting incidence in 2007 with 14 nests. The lowest was documented in 2010 with one recorded nest, with a mean clutch size of 158 (±28) eggs (range of 105-208 eggs), and a mean emergence period of 63 (±8) days. The shortest emergence period was 52 days and the longest emergence period was 82 days between 2005 and 2011. The hatching rate for successful nests was 84 percent, with a four percent mortality rate for the newly hatched turtles.

2.4. Leatherback Turtles

The leatherback turtle has rarely nested in the Philippines, with only one well-documented successful nest in Legazpi City, Albay in 2013 (Arguelles, 2013). However, there are reports of nestings elsewhere which remain unconfirmed (Cruz R. , 2006). Stranding, bycatch, and sightings happen, but are quite rare. This may indicate the low abundance of the species in the Philippines. Cruz (2006) suggests that the Philippines is an important migratory corridor and foraging ground for leatherback turtles, who migrate through the Philippine waters on their way to nesting grounds in Malaysia and Indonesian West Papua. He reports that leatherback turtles tagged in Indonesian West Papua were encountered in the Davao Gulf and females tagged in Malaysia were spotted at the southern parts of Mindoro, Iloilo and in the central part of Negros Occidental. Pilcher (2010a) states that the residence of leatherback turtles in Mindoro and Palawan is time specific, with "a residence period in the Spring [sic] between Mindoro and northern Palawan, and with a southerly migration to southern Palawan and the Balabac Straits by the fall".

Benson et al. (2011), showed the utilization of the waters adjacent to Palawan and the Sulu archipelago of post-nesting leatherback turtles. Pilcher (2010a) provided the first evidence on the presence of a substantial number of leatherback turtles in Palawan, utilizing it as a foraging area, through aerial surveys.

2.5. Loggerhead Turtles

The loggerhead turtle is the rarest marine turtle out of the five species in the Philippines. There is no confirmed nesting in the Philippines, although there were some unconfirmed reports. However, these are considered misidentifications of green or hawksbill turtles. Most of the reports in the Philippines come from strandings or fishery interaction reports. Ramirez-de Veyra (1994) reported two loggerheads caught in Basilan and Albay that were tagged in Japan.

2.6. Important Nesting Beaches and Feeding Habitats

As mentioned, the most significant nesting area in the Philippines for the green turtle is the TIWS in Tawi-Tawi which is currently the focus of much conservation efforts. In addition to this site, a map and table from DENR-BMB study shows areas of high nesting records combined with high number of years with nestings for the most common species in the Philippines (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)). These nesting sites are recommended for conservation prioritization (Table 1 and Figure 2).

Table 1. Priority nesting sites excluding green turtles of the Turtle Islands Wildlife Sanctuary.

No.	Site ID	Provinces Included	Municipalities Included
GREEN TURTLE NESTING SITES			
1	337	Tawi-Tawi	Bongao, Languyan, Panglima Sugala, Sapa-Sapa, Tandubas
2	332	Zamboanga del Sur	Dimataling, Dinas, Margosatubig, Pitogo, Tabina, Vincenzo A. Sagun
3	222	Bataan, Zambales	Abucay, Bagac, Balanga City, Hermosa, Limay, Mariveles, Morong, Olongapo City, Orani, Orion, Pilar, Samal, San Antonio, Subic
4	258	Albay, Camarines Sur, Sorsogon	Bacacay, Tabaco City, Legazpi City, Rapu-Rapu, Malinao, Manito, Pio Duran, Tiwi, Casiguran, Castilla, Sorsogon City, Donsol, Gubat, Pilar, Prieto Diaz, Sagnay
5	323	Agusan del Norte, Bukidnon, Camiguin, Misamis Oriental	Alubijid, Balingasag, Balingoan, Baungon, Binuangan, Buenavista, Butuan City, Cabadbaran City, Cagayan de Oro City, Carmen, Catarman, El Salvador City, Gingoog City, Guinsiliban, Jasaan, Kinoguitan, Lagonglong, Laguindingan, Libona, Magallanes, Magsaysay, Mahinog, Malitbog, Mambajao, Manolo Fortich, Medina, Nasipit, Opol, Sagay, Salay, Sugbongcogon, Tagoloan, Talisayan, Villanueva

No.	Site ID	Provinces Included	Municipalities Included
6	330	Palawan	Balabac
7	317	Palawan	Aborlan, Narra, Quezon, Sofronio Espanola
8	262	Occidental Mindoro	Calintaan, Rizal, Sablayan
9	306	Palawan	Aborlan, Puerto Princesa City
10	220	Bulacan, Cavite, Metropolitan Manila, Rizal	Bulacan, Cavite City, Las Piñas, Manila, Navotas, Obando, Parañaque, Pasay City
11	247	Catanduanes	Baras, Bato, San Andres, Virac
12	259	Occidental Mindoro	Sablayan
13	255	Marinduque	Boac, Buenavista, Gasan, Mogpog
14	207	La Union	Aringay, Bacnotan, Bauang, Caba, San Fernando City, San Juan
15	274	Romblon	Alcantara, Ferrol, Looc, Odiongan, San Agustin, San Andres, Santa Fe, Santa Maria
16	314	Negros Occidental	Cauayan, Hinoba-An, Sipalay City
17	251	Oriental Mindoro	Baco, Calapan City
HAWKSBILL TURTLE NESTING SITES			
1	717	Agusan del Norte, Camiguin, Misamis Oriental	Buenavista, Carmen, Gingoog City, Magsaysay, Medina, Sugbongcogon, Talisayan Salay, Guinsiliban, Mahinog, Mambajao, Sagay
2	678	Marinduque	Boac, Gasan
3	722	Surigao del Sur	Hinatuan
4	725	Palawan	Balabac
5	931	Tawi-Tawi	Turtle Islands
6	680	Oriental Mindoro	Pola
7	719	Misamis Oriental	Balingasag, Cagayan de Oro City, El Salvador City, Jasaan, Tagoloan, Villanueva
OLIVE RIDLEY NESTING SITES			
1	854	Bataan, Zambales	Abucay, Bagac, Morong, Pilar, Olongapo City, San Antonio
2	853	Bulacan, Cavite, Metropolitan Manila	Bacoor, Bulacan, Cavite City, Imus, Kawit, Las Piñas, Manila, Navota, Noveleta, Obando, Parañaque Pasay City

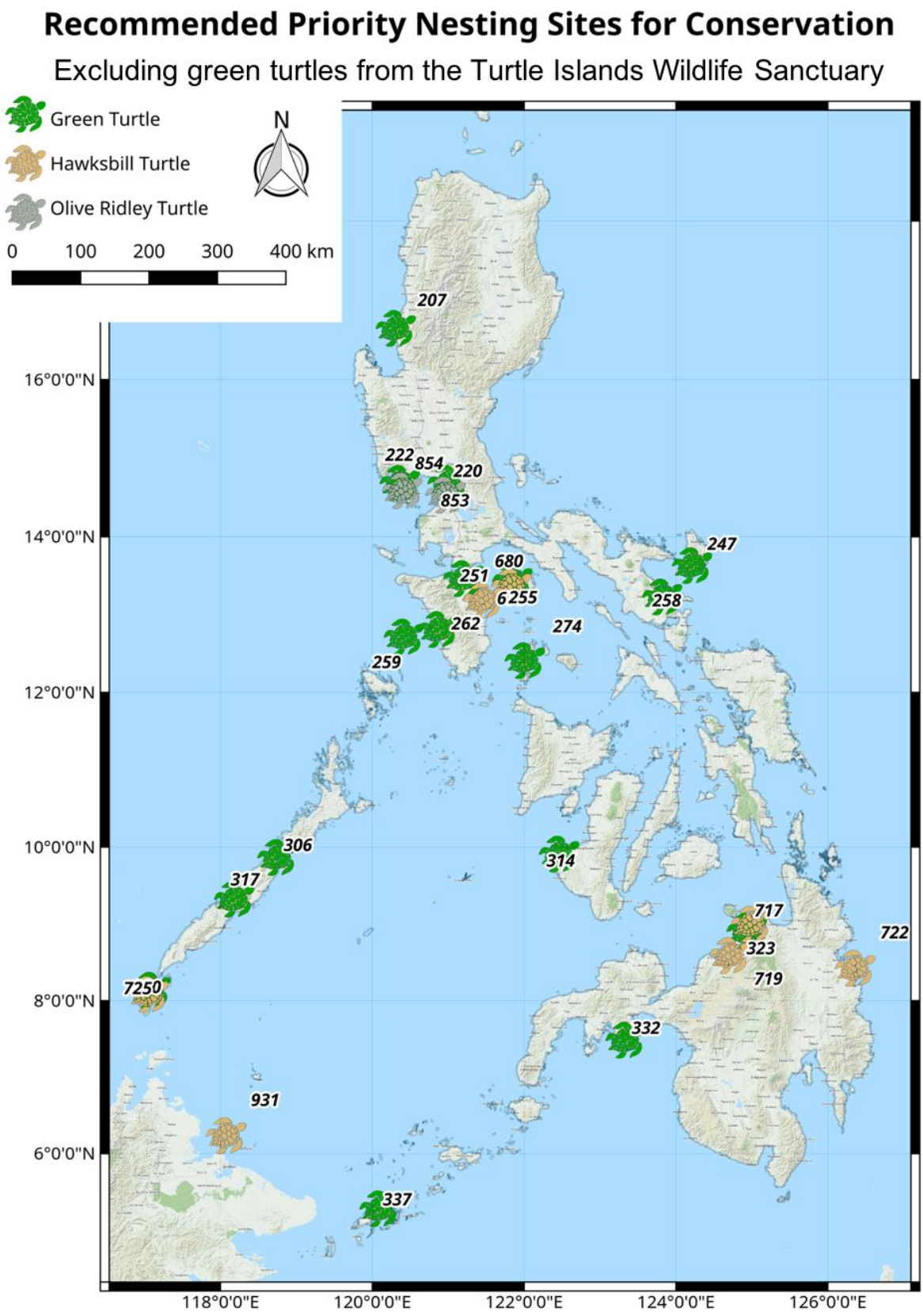

Figure 2. Nesting sites of green turtle, hawksbill turtle, and olive ridley turtles with highest value ratings per species for prioritization excluding green turtles in the Turtle Islands Wildlife Sanctuary. The numbers represent the Site ID (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)).

There are also sites where at least the three most common species are present together based on DENR reports (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)). This information is important as a basis for candidate sites in the establishment of Critical Habitats for marine turtles (Figure 3 and Table 2).

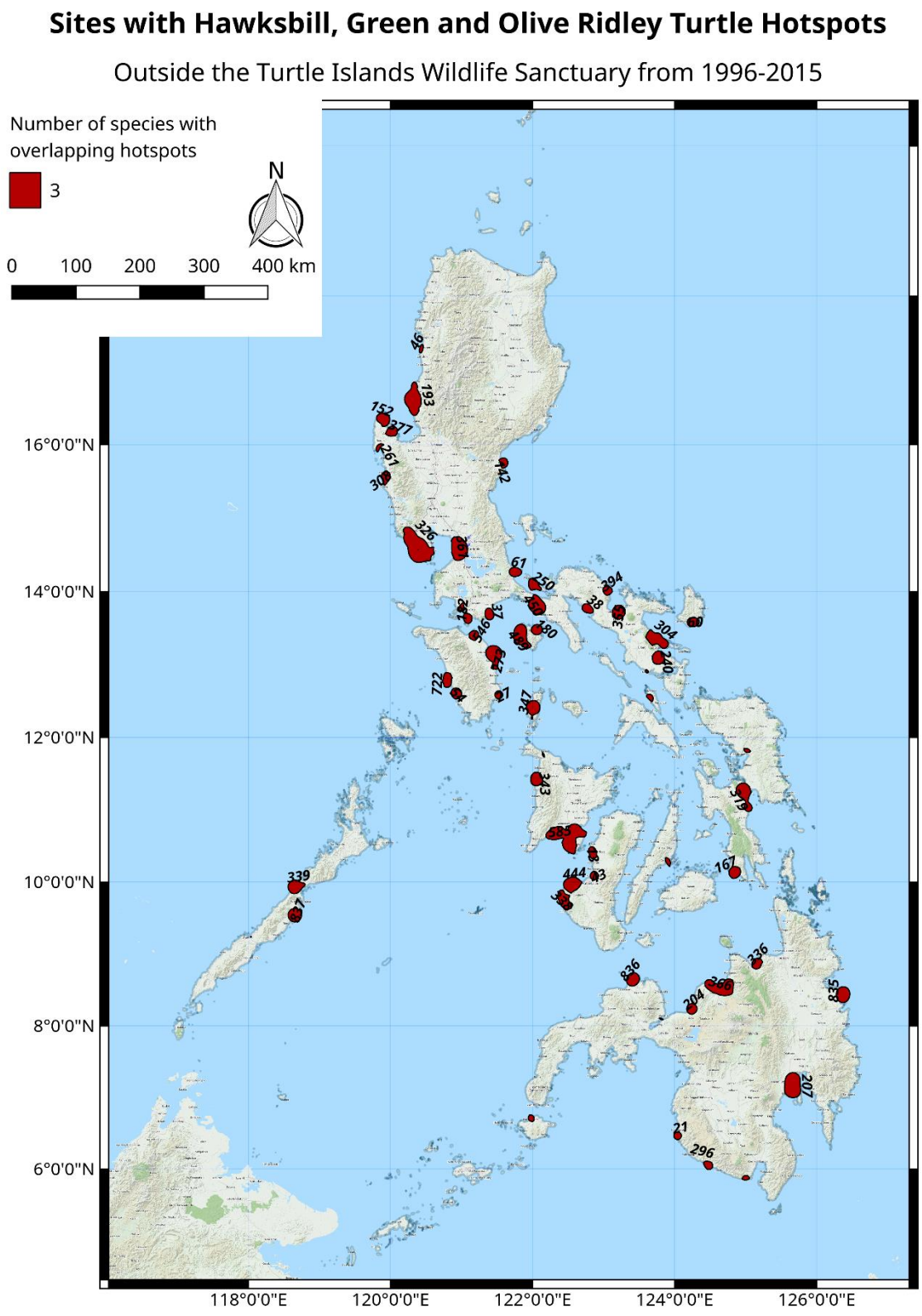

Figure 3. Sites where green, hawksbill, and olive ridley turtles occur together (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)).

Table 2. Sites where green, hawksbill, and olive ridley turtles occur together.

Site ID	Municipalities Included	Provinces Included
13	Hinigaran, Pontevedra, Pulupandan, San Enrique, Valladolid	Negros Occidental
21	Kalamansig, Palimbang	Sultan Kudarat
27	Bongabong, Mansalay, Roxas	Oriental Mindoro
37	Lobo, San Juan	Batangas
38	Lupi, Ragay	Camarines Sur
43	Himamaylan City, Kabankalan City	Negros Occidental
46	San Esteban, Santa Maria, Santiago	Ilocos Sur
54	Calintaan, Rizal, Sablayan	Occidental Mindoro
57	Looc	Romblon
60	Bato, Virac	Catanduanes
61	Mauban	Quezon
142	Baler, Dipaculao	Aurora
152	Anda, Bani, Bolinao	Pangasinan
167	Maasin City, Macrohon	Southern Leyte
180	Santa Cruz	Marinduque
182	Batangas City	Batangas
193	Aringay, Bacnotan, Balaoan, Bauang, Caba, Luna, San Fernando City, San Juan	La Union
204	Iligan City	Lanao del Norte
207	Carmen, Davao City, Panabo City, Samal City	Davao del Norte, Davao del Sur
240	Legazpi City, Manito	Albay
250	Alabat, Perez, Quezon	Quezon
261	Dasol	Pangasinan
273	Gloria, Naujan, Pinamalayan, Pola	Oriental Mindoro
275	Cebu City, Cordoba, Lapu-Lapu City, Mandaue City	Cebu
296	Kiamba, Maitum	Sarangani
304	Bacacay, Malilipot, Malinao, Santo Domingo, Tabaco City, Tiwi	Albay
308	Candelaria, Masinloc, Palauig	Zambales
319	Babatngon, Basey, Dulag, Palo, Santa Rita, Tacloban City, Tanauan, Tolosa	Leyte, Samar
326	Abucay, Bagac, Limay, Mariveles, Morong, Olongapo City, Orion, Subic	Bataan, Zambales
336	Gingoog City, Magsaysay	Misamis Oriental
338	Cauayan, Hinoba-An, Sipalay City	Negros Occidental
339	Puerto Princesa City	Palawan
343	Culasi, Sebaste, Tibiao	Antique

Site ID	Municipalities Included	Provinces Included
347	Alcantara, Ferrol, Looc, Odiongan, San Agustin, San Andres, Santa Maria	Romblon
348	Monreal, San Jacinto	Masbate
351	Donsol, Pilar	Sorsogon
355	Calabanga	Camarines Sur
361	Bacoor, Bulacan, Cavite City, Kawit, Las Piñas, Malabon, Manila, Navotas, Obando, Parañaque, Pasay City	Bulacan, Cavite, Metropolitan Manila
366	Alubijid, Cagayan de Oro City, El Salvador City, Jasaan, Laguindingan, Opol, Tagoloan, Villanueva	Misamis Oriental
377	Alaminos City, Anda, Sual	Pangasinan
394	Basud, Mercedes	Camarines Norte
396	Isabela City	Basilan
444	Cauayan	Negros Occidental
449	Quezon	Palawan
450	General Luna, Gumaca, Macalelon, Pitogo, Plaridel, Unisan	Quezon
489	Boac, Buenavista, Gasan, Mogpog	Marinduque
546	Baco, Calapan City	Oriental Mindoro
585	Buenavista, Guimbal, Iloilo City, Jordan, Leganes, Miagao, Nueva Valencia, Oton, San Lorenzo, Sibunag, Tigbauan, Zarraga	Guimaras, Iloilo
672	Motiong, Paranas	Samar
674	Maasim	Sarangani
679	Kolambugan, Ozamis City	Lanao del Norte, Misamis Occidental
722	Sablayan	Occidental Mindoro
731	Batangas City, Bauan, San Pascual	Batangas
835	Barobo, Hinatuan	Surigao del Sur
836	Dapitan City, Dipolog City, Sibutad	Zamboanga del Norte
837	Aborlan, Puerto Princesa City	Palawan

3. THREATS TO MARINE TURTLES IN THE PHILIPPINES

The threats to marine turtles in the Philippines could be classified into either direct anthropogenic and indirect/non-anthropogenic threats. Based on literature, 1) bycatch, especially in fish corrals/pens; 2) killing/poaching, especially the consumption of turtle meat; and 3) marine pollution, especially the ingestion of and entanglement in plastics, range among the top three anthropogenic threats; followed by 4) egg collection, 5) beach forest conversion, and 6) shoreline utilization.

Analysis of DENR-BMB data in 2018 shows that direct marine turtle threats include bycatch or fishery-related interactions as well as non-fishery encounters such as stranding of various known and unknown cause, captivity, and boat strike (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)).

The anthropogenic threats that marine turtles face are numerous and lead to a continued decimation of their population. This accentuates that the human-nature relationship becomes ever more crucial

to balance and manage activities and developments that negatively impact marine turtle survival. Mortalities can be mitigated and even prevented by understanding the triggers of unsustainable practices and by addressing them. The following review provides information on threats to marine turtles in and relevant to the Philippines with some recommendations on possible research to address these issues.

3.1. Bycatch

Bagarinao (2011) observed in the northeastern Sulu Sea that about 77 percent of green turtles were caught in fish corrals, about 75 percent of olive ridley turtles in gillnets and longlines, hawksbill turtles were caught by various gears, and leatherback and loggerhead turtles were mostly caught by gillnets. Although most of the turtles could be released, some of them died from entanglement.

Bagarinao (2011) reinforced the importance of research on marine turtle mortality for conservation in determining interventions towards fishing gear operation, regulation and design, with a focus on coastal fishing gears. At best, this would be complemented by research on incentives for small-scale fishers to change or modify their gear, so they do not experience a significant increase in their operating cost. Pilcher (2010a) recommended looking into the bycatch rate of foreign poaching vessels, whereas Limpus (2002) narrowed it down to the geographic location by stating that the focus should be on directed catch in the Sulu Sea and the Asian longline fleet bycatch and pelagic take in commercial fisheries.

Hamann et al. (2006) were more specific about the kind of data that needs to be gathered to arrive at a more comprehensive picture of bycatch and the threats it poses to turtles. These are ecological, social and economic aspects of fisheries bycatch in territorial waters and high seas, such as the impact of fishing effort and the temporal and spatial variation in distribution. Proposed instruments to counteract bycatch are spatial closures, onboard observer programs, and bycatch assessment and mitigation strategies. The authors request further research on innovative gear modification, impacts of fisheries on foraging, migration and nesting of turtles, as well as the impact of plastic pollution and ghost nets on turtles.

Eckert (1993) called for data gathering on taxonomic diversity, number and fate of marine turtles captured as bycatch in driftnets, as well as fishing techniques, gear types and geographic distribution and seasonality of fishing effort. The author states that this data should include “species, carapace length and width, condition (e.g., previously dead, killed during capture or processing, released unharmed, released injured, escaped from net, treated as catch), whether the turtle was tagged, and details of time, date, location of catch, and ancillary data, such as whether the turtle was associated with flotsam or other fauna prior to capture”. Another priority when measuring the impacts of driftnet bycatch is to identify “the reproductive assemblage from which an individual turtle was derived and the size of the stock,” e.g. via mitochondrial DNA analysis, to provide information on the origin of the caught turtles, feeding grounds, migration and the census of marine turtles (Eckert, 1993).

Complementary research should not only focus on the estimation of mortality causes, but also on the consequences of stress experienced by marine turtles after capture and release (Eckert, 1993). The author therefore stipulates to obtain more information on the “cause and effect relationships between high energetic output (stress) and slowed development, enhanced vulnerability to disease, and impaired reproductive capacity”.

3.2. Harvesting of Eggs and Trade of Marine Turtles

Marine turtle shells remain a much sought-after commodity, as well as turtle meat and whole specimens. As a result, hawksbill turtles and other marine turtle populations are under heavy exploitation pressure according to a TRAFFIC report (Lam , Xu Ling, Takahashi, & Burgess, 2011). It is stated in the report, that evidence from current seizure records and market surveys highlights a consistent illegal trade route to mainland China from the Coral Triangle region of Southeast Asia, mainly the Philippines, Malaysia, and Indonesia.

Regarding poaching, Antonio and Matillano (2016) pointed out Hong Kong, China and Singapore (via Malaysia) as main trade destinations. They also mention that scutes and meat are used for traditional activities (Antonio & Matillano, 2016; Cruz R. , 2002; Poonian, Ramilo, & Lopez, 2016). However, Humber et al. (2014) claimed that "it becomes increasingly difficult to distinguish between legal indigenous harvest and illegal commercial exploitation," as turtle products are being sold on the black market with almost no monitoring and enforcement present. This is also cited by Cruz (2002), who listed the following reasons as to why the killing and selling of turtle eggs and meat is still considered a predominant problem: "Lack of law-enforcement personnel/agency in the area, lack of implementation of existing local and national law/ordinances/orders, the penalties incorporated in the particular ordinance/order are not enough to deter violators, traditional use of the species especially in the celebration of town fiestas and weddings, and poverty." In addition, Antonio and Matillano (2016) pointed out a serious lack of knowledge on turtle biology in taking up the observations of Dijk and Shepherd (2004) that poachers burn off carapacial scutes from the live animals and return the dying turtles back to the sea, in the hope they will grow new scutes. The poachers were not in all cases Philippine nationals, but originated from vessels operated by foreign states, such as Vietnam and China (Pilcher N. , 2010a; Pilcher, Heng, & Trono, 2008).

The data on exploitation and trade dynamics of marine turtles and marine turtle derivatives is still scarce in Balabac, Palawan, as stated by Antonio and Matillano (2016). When engaging in data gathering on trade and exploitation, the authors strongly recommend to "conduct undercover visits" as respondents might be reluctant to share information. Moreover, the timeframe of the research should allow for detailed data gathering, e.g. volume of eggs for sale and for household consumption, under consideration of seasonality. Pilcher et al. (2008) call for further research on the market forces influencing the poaching business and stipulate the design of economic deterrents to this form of illegal wildlife trade. The authors also call for the Association of Southeast Asian Nations (ASEAN) to take on its role in enforcing turtle protection through collaborative initiatives, following a multinational and multi-sector approach (Pilcher, Heng, & Trono, 2008).

Marine turtle eggs were collected immediately in the morning after they were laid as reported by Antonio and Matillano (2016). This was regardless of there being a small or large number of nests as the rule "first come, first served" applied – if people choose not to collect eggs from a nest, other people would do so, thus exemplifying the dilemma of common pool resources, which the eggs are considered to be. This could lead to the significant long-term decline in egg production that was observed by Chaloupka (2001), Eckert (1993), and Torres et al. (2004).

The distinction between commercial harvest, through a legal permitting system, and indigenous harvest can be difficult and requires different response mechanisms (Humber, Godley, & Broderick, 2014). Population growth and resulting cheating for permits further aggravate the situation and render regulation efforts challenging. This is particularly the case as the cultural and

socio-economic factors related to the use of eggs and "the level of exploitation in relation to the size of the population" are unknown (Hamann, Limpus, Hughes, Mortimer, & Pilcher, 2006). As regulated harvesting seeks to strike a balance between biodiversity conservation and upholding the rights and traditions of local and/or indigenous people, research should further explore, which options there are to combine these two goals best (Poonian, Ramilo, & Lopez, 2016; Esteban, 2008). Limpus (2002) suggested to extrapolate data from the turtles taken for subsistence purposes (e.g., diet, breeding history, maturity, size etc.) to make use of the permit holders' knowledge.

3.3. Abandoned Nets and Debris/Plastic waste

Marine litter, in particular marine plastics, is nowadays high on the political agenda. It poses one of the biggest threats to marine turtles. Schuyler et al. (2014) stated that the likelihood for green turtles to ingest plastics increased from 30 percent in the 1980s to 50 percent in 2012, which can lead to a rupture or blockage of the digestive tract and eventually to a necrosis of the intestines. Further, plastic material absorption over time can lead to an accumulation of toxic substances in the turtles' bodies and the animals might also fall ill due to microorganisms attached to the plastic's surface (Carson, Nerheim, Carroll, & Eriksen, 2013).

As concerns plastic waste, Abreo et al. (2016) called for further studies on plastic ingestion by marine fauna to gather more information on the interaction between marine organisms and plastic waste. This should also build on already existing research, as the authors cite studies presenting results on the accumulation of toxic materials within plastics through adsorption, the likelihood of marine turtles to ingest plastics, and on the type of plastics that turtles prefer ingesting. Abreo et al. (2016) called for determining the distribution and amount of plastic waste in the Davao Gulf, an undertaking that could easily be scaled up to the whole Philippines. By overlaying this information with data on predominant foraging areas of turtles, high risk areas can be identified and countermeasures taken. This research could be further refined and made more context-specific by considering the dominant types of waste being discarded in the Philippines. It should be stressed that this topic is especially relevant seeing that the Philippines is the third biggest marine plastic polluter worldwide (Jambeck, et al., 2015).

As for abandoned nets as another cause of turtle mortality, Cruz and Torres (2005) recommended a more detailed study of the turtle skeletons [or remains] found in abandoned nets, including "1) species; 2) size classes; 3) age class; and 4) population affiliation" as well as sex, the date of the bone and the time period when the bone was cut.

3.4. Habitat Change and Degradation

Antonio and Matillano (2016) established that the turtles in their study site prefer nesting near the shoreline vegetation but point to the decline of beach forest in the area due to its removal, thus aggravating sand shifting patters. Further research should therefore combine the identification of preferred turtle nesting sites in the Philippines with an overlay of anthropogenic activities threatening these habitats, e.g. by linking the illegal logging of mangrove forests to a decline in turtle offspring.

As marine turtle clutches are very vulnerable to beach erosion and sand shifts, which can be caused by monsoons, leading to egg exposure and damage, (Cruz & Torres, 2005) recommended monitoring the sand/shoreline movements by setting up a fixed concrete base marker. Equally important would be a tide cycle monitoring during nesting time, as nesting during low tide may lead to inundation and subsequent drowning of the nests during high tide.

Lucero et al. (2011) mentioned the increased shoreline utilization for residential purposes as one of the threats and Poonian et al. (2016) also pointed out the degradation of nesting and foraging sites to be a major threat to marine turtles.

Cruz and Torres (2005) mentioned seawalls further inland to be problematic, as these can trap marine turtles crawling inland after the nesting. Thus, the potential dangers posed by inland structures for turtle post-nesting safety should be evaluated, combined with a regular monitoring of these sites to prevent mortalities.

3.5. Natural Mortalities

In literature, indirect/non-anthropogenic threats are much less reported in number, which is confirmed by Quimpo (2013), who stated that "22 percent of the nests have not reached hatching due to poaching (14 percent) and natural causes (8 percent)." Natural predators, such as ants and birds seem to pose the greatest threat for this category. Lucero et al. (2011) mentioned ants as possible predators, which could easily reach the eggs, as plant roots from coconut trees provided "portals of entry" to the hatcheries. Although rats were not observed as predators in the papers reviewed, they pose as one of the most common natural threat to turtle eggs.

Torres et al. (2004) observed that plant roots interfered with the hatching of the turtles, thus leaving one hatchling dead and several trapped in their study site. Further research into hatching success and obstacles to hatchlings should be conducted in order to increase their survival rate. Hamann et al. (2006) pointed out that the predation of turtle eggs by pigs and dogs presents a problem in some regions. A predator assessment should thus form part of the research studies conducted on hatchling survival.

3.6. Climate Change

A changing climate directly impacts the survival of marine turtles in several aspects—the availability of food might become limited, disappearing nesting sites with ocean acidity and temperatures change—possibly leading to altered migration patterns. Sea level rise and erosion due to monsoons and typhoons will most probably become a much larger threat in the future. As a relatively new field of research in combination with marine turtles, climate change should be treated as a cross-cutting issue and thus be incorporated into all future studies.

Sea level rise can have a considerable impact on the nesting grounds of marine turtles, as formerly preferred nesting grounds may become inundated (Lucero, et al., 2011). This reduces the dry area needed for the nesting and structures, such as seawalls, can obstruct the turtles when these try to move further inland (Cruz & Torres, 2005; Lucero, et al., 2011). Due to possible inundation, some of the eggs are already transferred to drier areas, however, that affected the survival rate negatively (Lucero, et al., 2011). Further research should take up the challenges posed by sea level rise and the implications for marine turtle nesting grounds (Lucero, et al., 2011).

Chaloupka (2001) stated that favorable environmental variability, which can lead to temporarily higher breeding rates, can mask a long-term declining marine turtle nesting population stock abundance. Therefore, research on the impacts of environmental variability on breeding behavior, and thus stock abundance, and the identification of underlying factors benefitting increased breeding rates should be conducted.

Research into climate change will also cause sand temperatures to rise, which is expected to "negatively impact on population sex ratio and incubation success of leatherback turtle eggs" (Hamann, Limpus, Hughes, Mortimer, & Pilcher, 2006). This will most likely affect all turtle species, and yet there appears to be no adequate monitoring in place so far. The sand temperatures pose

another threat to hatchlings, as their bodies cannot cope with the high sand temperatures increasingly experienced, causing them to die. First cases have already been reported (Lodge, 2017) and further research is needed to find solutions to this tragedy.

Aca (2013), in a study on climate change impacts on marine turtles in the Philippines, recommended better research solutions to be able to monitor changes and to adapt appropriately when needed. The recommendations were: 1) Standardize data collection and movement of data across stakeholders; 2) Encourage and support research on marine turtle conservation in the Philippines; 3) Relay current innovation, technologies, knowledge and information to the academe, environmental NGOs and the people on the ground; 4) Work closely with the academe and the environmental NGOs in creating a research design for a particular nesting ground; and 5) Encourage gathering of more climate variable data that can be use in the adaptation strategies in the future.

3.7. Other Threats

Fibropapillomatosis is put forward by Lucero et al. (2011), who stated that this disease might even lead to a possible extinction of marine turtles and call for the urgency to gather more information on its incidence.

4. CONSERVATION AND POLICY

4.1. INTERNATIONAL AGREEMENTS

4.1.1. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

The CITES is an international agreement between governments that entered into force in 1975 and aims to ensure that the international trade of wildlife does not threaten the species' survival. The agreement recognizes that, with wildlife trade commonly crossing borders between countries, international cooperation is needed to prevent the over-exploitation of certain species, particularly those that are threatened. Although it is a voluntary international agreement, signatory parties are legally bound by the framework provided by CITES and several strategies have been developed to address non-compliance of a state. One of these mechanisms are threats of bilateral sanctions, which successfully led Japan in 1991 and 1992 to ban and phase out imports of olive ridley and hawksbill turtles, respectively, and to revoke any reservations after the US considered imposing trade sanctions. In order to implement the CITES framework at the national level, the parties still have to adjust and adopt their own domestic laws. The Convention has 183 parties as of October 2016, including the Philippines who already signed in 1981. In the Philippines, the CITES rules and regulations are enforced through Republic Act 9147 (Wildlife Resources Conservation and Protection Act).

The CITES has three Appendices or listings of wildlife, for which international trade is either illegal (Appendix I species), strictly regulated (Appendix II species), or permitted with a certificate of origin and an appropriate permit (Appendix III species). As of 2016, all marine turtles are listed under Appendix I.

4.1.2. Convention on Migratory Species of Wild Animals (CMS)

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention, not to be confused with the Bonn Agreement) is an inter-governmental treaty concluded under the aegis of the United Nations Environment Programme in 1979, which entered into force in 1983. It is concerned with the conservation

of wildlife and habitats on a global scale and aims to conserve terrestrial, marine and avian migratory species throughout their range. The Philippines ratified its membership to CMS in 1993 through an Instrument of Ratification – Philippine Senate Resolution No. 28 and so far, remain the only ASEAN member state to have signed the convention.

The Convention provides guidance and direction for the conservation of migratory species and includes the CMS Appendices, listing migratory species threatened with extinction, requiring immediate trans-boundary interventions, and species in need of special protection. The Convention's Appendix I is the list of migratory species threatened with extinction. The Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. The Convention also promotes concerted action among the Range States of many of these species. Migratory species that need or would significantly benefit from international co-operation are listed in Appendix II of the Convention. For this reason, the Convention encourages the Range States to conclude global or regional Agreements. As of June 2015, there are 154 species in Appendix I and 262 species in Appendix II. All marine turtles are listed in Appendix I except the flatback turtle, which is listed in Appendix II.

The CMS also promotes international cooperation for the conservation of migratory species through legally binding treaties (called Agreements) and less formal instruments, such as Memoranda of Understanding. The Philippines is a signatory to three CMS-MoUs for: 1) dugongs, 2) marine turtles, and 3) migratory sharks.

For marine turtles, the IOSEA came into effect in 2001 and is a non-binding agreement concluded under the auspices of the CMS. The objective is for member states to protect, conserve, replenish and recover marine turtles and their habitats based on the best scientific evidence, taking into account the environmental, socio-economic and cultural characteristics of the Signatory States. In 2014, there were 35 member-countries to the MoU since its inception in 2001, which was also the year the Philippines signed in. The Conservation and Management Plan of the MoU contains 24 programs and 105 specific activities, which focuses on conserving critical habitats, reducing threats, exchanging scientific data, promoting regional cooperation, increasing public awareness and participation, and seeking resources for implementation. All marine turtle species occurring in the region (six out of seven) are covered by the MoU.

4.1.3. The United Nations Convention on the Law of the Sea (UNCLOS)

Due to the migratory nature of marine turtles, they pass four different legal regimes during their life cycles: during nesting, turtles are within the terrestrial territory of a state, and when journeying though the ocean, turtles pass municipal waters, the EEZ and the high seas. For each regime, different rules of sovereignty apply and different stakeholders are required to uphold the agreements forged under the international conventions mentioned above. These zones and according rights are determined under the United Nations Convention on the Law of the Sea (UNCLOS). Moreover, UNCLOS dedicates its Part XII to the Protection and Preservation of the Marine Environment, in e.g. emphasizing the obligation states have to protect and preserve the marine environment. This is well complemented by the Convention on Biological Diversity (CBD), which requires parties to keep populations above minimum viable populations and relates to all threats.

4.1.4. International Organizations' Programs and Initiatives

Inter-governmental organizations, such as the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), initiated programs, e.g. on habitat protection, which allows for an indirect conservation of marine turtles, as in Thailand where this program, in the context of Integrated Coastal Management, sparked a Sea Turtle Conservation Programme. The Sustainable Development Goals also trigger regional action on marine turtle conservation, like the Sea Turtle Restoration and Protection Programme proposed by Papua New Guinea. This is complemented by programs initiated by NGOs, such as the Asia Pacific Marine Turtle Programme by World Wildlife Fund (WWF) that was active in the mid-2000s. The WWF continues to work with local communities to reduce turtle harvesting and egg collection, protects critical habitats and collaborates with other NGOs, like TRAFFIC, in combatting illegal trade of marine turtles from the Coral Triangle. The Nature Conservancy (TNC) offers turtle videos and "The Turtle Times" wherein turtles can be traced online by the public via satellite telemetry as they were outfitted with satellite trackers. The TNC also works with communities and governments across the Asia Pacific to protect marine turtles and their habitats. Conservation International (CI) supports research on the topic by collaborating with the Marine Turtle Specialist Group of IUCN.

4.2. REGIONAL PROGRAMMES AND INITIATIVES

4.2.1. Coral Triangle Initiative (CTI)

In May 2009, the six governments of Indonesia, Malaysia, Philippines, Papua New Guinea, Solomon Islands, and Timor Leste agreed to jointly implement a 10-year Regional Plan of Action (RPOA) for a Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security (CTI-CFF). The RPOA identified five regional goals including the improvement of the status of threatened species such as marine turtles, sharks, sea birds and marine mammals. Among the regional actions identified and building on existing regional plans and efforts, and on national marine turtle conservation efforts, the CTI countries agreed to jointly develop, adopt and implement a region-wide Sea Turtle Conservation Action Plan that identifies the most important measures needed (at regional and national levels) to improve the status of marine turtles across the CT Implementation Area and will build on already existing efforts mentioned below.

4.2.2. Sulu-Sulawesi Marine Eco-Region (SSME) – Marine Turtle Corridor Strategy

In 2006, the three countries of Indonesia, Malaysia, and Philippines signed an MoU to jointly implement the Sulu-Sulawesi Marine Ecoregion (SMME) Conservation Plan. The MoU likewise created the SSME Tri-national Committee (TRICOM) and three technical tri-national sub-committees, i.e., Sustainable Fisheries; Marine Protected Areas (MPAs) and MPA Networks; and Threatened, Charismatic, and Migratory Species which considered marine turtles a priority transboundary species. In 2011, the SSME TRICOM approved the Comprehensive Action Plans of the three Sub-committees. The Short-Term Goals for the Action Plan for Threatened, Charismatic, and Migratory Species are to: 1) facilitate effective management of feeding grounds, migratory routes, and protection of target species from overfishing and as bycatch; 2) design MPAs and MPA networks in relation to the protection and management of target species and their habitat; and 3) promote implementation of best practices in habitat conservation and management.

Upon recommendation of the Sub-committees, the TRICOM approved the Regional Sea Turtle Conservation Strategy as well as the Design of a Network of MPAs for Sea Turtles in the SSME,

which was formally established in Manila in 2017. During the CTI Ministerial Meeting held in the Solomon Islands in 2011, the six CTI member countries recognized SSME as the first priority Seascape under the CTI.

4.2.3. Turtle Island Heritage Protected Area (TIHPA)

In May 1996, the Governments of Malaysia and Philippines signed a landmark Memorandum of Agreement (MoA) formally establishing the Turtle Islands Heritage Protected Area (TIHPA) which is now recognized as the world's first transboundary protected area for marine turtles. The TIHPA encompasses six islands within the Philippine TIWS and three islands within the Sabah Turtle Islands Park. This group of nine islands is recognized as having the largest nesting population of green turtles in the ASEAN region with as many as 5,000 nesting females laying around 2.5 million eggs per year. As stipulated in the MOA, the two countries agreed to jointly implement the TIHPA Integrated Management Program, which includes:

1) Implementation of an integrated and uniform approach to conservation and research oriented towards wise management of TIHPA;
2) Establishment of a centralized database and information network on sea turtles;
3) Development of appropriate information awareness programs primarily targeting inhabitants of the Turtle Islands on conservation of marine turtles and the protection of their habitat;
4) Implementation of a joint marine turtle resource management program;
5) Development and implementation of a training and development program for TIHPA staff;
6) Development and undertaking of ecotourism programs; and
7) Adoption of a Turtle Conservation and Research Program.

In recent years, however, the formerly implemented protection scheme (60/40 system) has suffered and cases of poaching have not been followed up appropriately. The attention, however, that the TIHPA received due to these negative headlines seems to have revived conservation efforts. A recommendation that has long been pending and would most probably help the conservation efforts in this Protected Area would be the declaration of the TIHPA as an ASEAN Heritage Park. This status would increase the visibility of the TIHPA in the international realm, and increased funding could possibly also contribute to peace processes in the region and the park management would receive trainings on management effectiveness.

4.2.4. Western and Central Pacific Fisheries Commission (WCPFC)

The WCPFC is a Regional Fisheries Management Organization (RFMO) and seeks to address issues in the management of high seas fisheries, thereby considering environmental impacts and impacts on other species. In 2005, the Resolution to Mitigate the Impact of Fishing for Highly Migratory Fish species on Sea Turtles was passed. It was replaced by the CMM 2008-03, which calls for members and non-members of the RFMO to (i) implement the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing (FAO 2005); (ii) employ specific turtle avoidance measures and conduct research on FAD designs and longlines; (iii) stipulate to report turtle incidences to the Commission; and (iv) to act responsibly in case a turtle is caught, e.g. making a quick recovery possible.

4.2.5. ASEAN Institutions

There are additional mechanisms and institutions in place at the ASEAN level that can contribute to improved marine turtle protection. The objective of the ASEAN Working Group

on Coastal and Marine Environment is to conserve and sustainably manage marine and coastal ecosystems, which includes the protection of species. The ASEAN Working Group on Nature Conservation and Biodiversity is another working group concerned with the conservation and sustainable use of biodiversity in the region. Regional institutions, such as the ASEAN Centre for Biodiversity, the ASEAN Wildlife Enforcement Network etc. are equally in a good position to tackle the challenges marine turtles face and to ensure better protection and efficient transboundary cooperation amongst the ASEAN Member States. Another form of turtle protection is responsible snorkeling and diving, ensuring the adherence to a Code of Conduct when engaging in marine tourism activities, e.g. stipulating the interaction with wildlife. One organization promoting that in Southeast Asia and the Indian Ocean is Green Fins, which started as an initiative by the United Nations Environmental Programme (UNEP) and was subsequently implemented by the Secretariat of the Coordinating Body on the Seas of East Asia (COBSEA). Members of Green Fins follow a Code of Conduct and receive consultations, environmental trainings and a wide variety of environmental awareness raising materials.

4.2.5.1. Memorandum of Understanding on ASEAN Sea Turtle Conservation and Protection (1997)

The MoU has the objectives to promote the protection, conservation, replenishing and recovery of marine turtles and of the habitats based on the best available scientific evidence and was signed in 1997.

4.2.5.2. Southeast Asian Fisheries Development Center (SEAFDEC)

The SEAFDEC is an autonomous inter-governmental body established in 1967, the Secretariat is based in Thailand, with a mission of to promote and facilitate concerted actions among the member countries to ensure the sustainability of fisheries and aquaculture in Southeast Asia. One of its technical departments, the Aquaculture Department (AQD) based in the Iloilo has signed a MoA on the protection and conservation of marine turtles at their Igang Marine Station in Nueva Valencia, Guimaras in September 2016.

4.3. NATIONAL POLICIES

4.3.1. National Conservation Programs

4.3.1.1. Philippine Biodiversity Strategic Action Plan (PBSAP) 2015 – 2028

The Philippine Biodiversity Strategy and Action Plan (PBSAP) is the country's roadmap to conserve its biodiversity with a vision - "By 2028, biodiversity is restored and rehabilitated, valued, effectively managed and secured, maintaining ecosystem services to sustain healthy, resilient Filipino communities and delivering benefits to all."

It integrates and mainstreams CBD objectives into the national development and sectoral planning framework. The participative stocktaking process in biodiversity planning, plus its focus on new thematic areas like agrobiodiversity and urban biodiversity, strengthens national government initiatives to involve local governments to play a greater role in biodiversity conservation.

This is embodied in the DENR AO 2016-12: Adopting the Philippine Biodiversity Strategy and Action Plan 2015-2028 through the BMB that will coordinate the implementation and mainstreaming of the PBSAP to all concerned sectors of society.

4.3.1.2. Pawikan Conservation Project (PCP)-Wildlife Resources Division-Biodiversity Management Bureau

The PCP is a program of the national government dedicated to the conservation and protection of the ecologically important marine turtles. Evolving from then Task Force Pawikan, which was created pursuant to Executive Order No. 542 of 26 June 1979, the PCP became a regular project under the Department for Environment and Natural Resources (DENR)-Biodiversity Management Bureau. The PCP expanded its functions and included the conservation of dugongs as part of its mandate, starting in 1991 pursuant to DENR Administrative Order 55. The PCP's activities included: 1) habitat surveys and Information, Education and Communication; 2) rescue and rehabilitation of marine turtles and dugongs; 3) capacity building; and, 4) establishment of partnerships, networking and monitoring of MOA-related activities. The PCP was absorbed under the Wildlife Resources Division of the DENR-BMB in 2013 and does not exist anymore in its original form/set-up.

4.3.1.3. Coastal and Marine Division-Biodiversity Management Bureau

The Coastal and Marine Division of BMB is currently strengthening habitat protection through two programmes: The Coastal and Marine Ecosystems Management Program (CMEMP) and the Strengthening Marine Protected Areas to Conserve Marine Key Biodiversity Areas (MKBAs)/ SMARTseas project in the Philippines:

4.3.1.3.1. Coastal and Marine Ecosystems Management Program (CMEMP)

The CMEMP is implemented by the DENR and aims to comprehensively address, manage, and effectively reduce the drivers and threats of degradation of the coastal and marine ecosystems. Although the objectives are mostly food security, climate change resilience and disaster risk reduction for the coastal population, the implementation of the program will most probably also improve the habitat of marine turtles, i.e. through the reduction of threats and factors of degradation on coastal and marine ecosystems. The establishment and strengthening of MPA Networks, sustainable management of coastal and marine resources, and awareness training and capacity building are other expected outcomes of the program.

4.3.1.3.2. Strengthening Marine Protected Areas to Conserve Marine Key Biodiversity Areas in the Philippines (MKBA) Project

The MKBA Project, or SMARTseas project, is a UNDP/GEF funded project in 2012 that seeks to address key barriers in the effective management of MKBAs in order to 1) strengthen and increase management effectiveness; 2) improve financial sustainability; and 3) establish an enabling policy framework for marine biodiversity and conservation of MPAs and MPA Networks. In particular point no. 3 is important in order to account for the transboundary pathways of migratory animals.

4.3.1.4. Integrated Coastal Resources Management Project (ICRMP)-Asian Development Bank

The ICRMP was a GEF-financed project implemented by the Asian Development Bank (ADB) from 2007-2013. The objectives were to enhance coastal resources and to reduce poverty among municipal fisherfolks. During the project, the policy environment and legal framework for integrated coastal resources management (ICRM) were rationalized, institutional capacities strengthened, and governance improved. ICRM was institutionalized and is functional at the local levels. On the environmental side, coastal ecosystems and resources in the threatened areas of biodiversity were protected and managed. On the social side, alternative and supplementary livelihoods were provided

and the health and social conditions in the coastal communities improved. Component B of the project, ICRM and Biodiversity Conservation, constituted the main part of the ICRMP and also dealt specifically with marine turtle protection. About 49 MPA-based conservation projects and three corridor-wide conservation projects were implemented, the latter including humpback whale and turtle conservation. In detail, one conservation project of marine turtles took place in the Zambales Marine Ecosystem Corridor (Region 3) and one in the Ticao Pass Corridor (Region 4B).

4.3.2. National Laws

4.3.2.1. State Policy

Article XII, Section 2 of the 1987 Constitution states that "All lands of the public domain, waters, minerals, coal, petroleum, and other mineral oils, all forces of potential energy, fisheries, forests or timber, wildlife, flora and fauna, and other natural resources are owned by the State. With the exception of agricultural lands, all other natural resources shall not be alienated. The exploration, development, and utilization of natural resources shall be under the full control and supervision of the State." Furthermore, and with regard to the ocean, the Constitution states in the same Section and Article "The State shall protect the nation's marine wealth in its archipelagic waters, territorial sea, and exclusive economic zone, and reserve its use and enjoyment exclusively to Filipino citizens."

4.3.2.2. Republic Act 9147 (Wildlife Resources Conservation and Protection Act) of 2001

Approved on 30 July 2001, this Act aims to: 1) conserve and protect wildlife species and their habitats to promote ecological balance and enhance biological diversity; 2) regulate the collection and trade of wildlife; 3) pursue, with due regard to the national interest, the Philippine commitment to international conventions, protection of wildlife and their habitats; and, 4) initiate or support scientific studies on the conservation of biological diversity. The law is enforceable for all wildlife species found in all areas of the country, including protected areas under R.A. No. 7586, otherwise known as the National Integrated Protected Areas System (NIPAS) Act, and critical habitats. It also applies to exotic species, which are subject to trade, are cultured, maintained and/or bred in captivity or propagated in the country.

Sections 27 and 28 of the Republic Act prohibit the exploitation of wildlife resources and their habitats, listing illegal acts and giving the penalties in case of violation thereof. The punishable acts include unauthorized killing and destroying of wildlife; inflicting injury which cripples and/or impairs the reproductive system of wildlife species; trading of wildlife; collecting, hunting or possessing wildlife, their by-products or derivatives; gathering or destroying of active nests, nest trees, host plants and the like; maltreating and/or inflicting other injuries not covered by the preceding paragraph; transporting of wildlife; introduction, reintroduction or restocking of wildlife resources; and, effecting any of the following acts in critical habitats: dumping of waste products detrimental to wildlife, squatting or otherwise occupying any portions of the critical habitats, mineral exploration and/or extraction, burning, logging, and quarrying.

The Act grants jurisdiction over wildlife resources to the DENR, the Department of Agriculture (DA), and the Palawan Council for Sustainable Development (PCSD). The DENR has jurisdiction over all terrestrial plant and animal species, all turtles and tortoises and wetland species, including but not limited to crocodiles, water birds and all amphibians and dugong. The DA exercises jurisdiction over all declared aquatic critical habitats, all

aquatic resources including but not limited to all fishes, aquatic plants, invertebrates and all marine mammals, except dugong. The PCSD has authority over all wildlife resources in the Province of Palawan pursuant to R.A. No. 7611.

Section 25 allows the establishment of Critical Habitats where threatened species are found considering species endemicity and/or richness, presence of man-made pressures/threats to the survival of wildlife living in the area, among others outside protected areas under Republic Act No. 7586. All designated, Critical Habitats are protected, in coordination with the local government units and other concerned groups, from any form of exploitation or destruction which may be detrimental to the survival of the threatened species dependent therein. Two areas had been assigned for marine turtles, particularly the: Carmen Critical Habitat for hawksbill turtles in the province of Agusan del Norte and the Magsaysay Critical Habitat for Hawksbill Turtle in the province of Misamis Oriental.

In 2004, as part of the implementing rules and regulations of R.A. 9147, the DENR issued Administrative Order (DAO) No. 2004-58, as amended, and DAO 2004-55:

4.3.2.2.1. DAO 2004-58

DAO 2004-58 required private individuals and entities possessing threatened and exotic species of wild fauna to have their wildlife collections registered with the DENR on or before March 07, 2005. Those who availed of this privilege were issued the corresponding Certificate of Wildlife Registration (CWR). In effect, holders of CWR are authorized to maintain wild fauna, which species and quantity are specified in the certificate.

4.3.2.2.2. DAO 2004-55

DAO 2004-55, especially Section 23 thereof, allows the collection of threatened wildlife, by-products and derivatives only for scientific, or breeding or propagation purposes and only by accredited individuals, business, research, educational or scientific entities. Consequently, possession or collection of marine turtles in accordance with the aforementioned DENR issuances is lawful.

4.3.2.3 Ecological Destination Development Guidelines for Turtle Islands, Tawi-Tawi

DAO 1999-31 was issued to support initiatives in the TIWS by ensuring that environmental considerations are incorporated at the earliest stage of any development within the Turtle Islands and to protected the species biodiversity and environment in the area while assuring the socio-economic benefit for the community through ecotourism.

4.3.2.4 Republic Act 8550 (Fisheries Code of the Philippines) and its amendment by the Republic Act 10654 (signed 2015)

This Act makes coastal and marine conservation a concern of the state while at the same time attempting to ensure food security, which is the ultimate mandate of the Bureau of Fisheries and Aquatic Resources (BFAR). Chapter II, Section 11 of the Act (Protection of Rare, Threatened and Endangered Species) mandates the DA through BFAR to create conservation and rehabilitation measures to conserve and protect our marine resources particularly those that are rare, threatened and endangered, which includes the taking of eggs and offspring. Chapter IV (Fisheries Reserves, Refuge and Sanctuaries) calls for the establishment of fish refuge and sanctuaries and for the efficient administration and protection of marine habitats. Chapter VI (Prohibited Acts), Section 97 (Fishing or Taking

of Rare, Threatened and Endangered Species) imposes a penalty for the fishing or taking of these rare, threatened and endangered species as listed by CITES and as determined by the DA. Section 105 (Obstruction of Defined Migration Paths) further extends the scope of protection to include migratory species by acknowledging the significance of their migratory paths to the survival of these species. This particular section has a major impact on marine turtle conservation, given the highly migratory nature of the animal.

4.3.2.5. Republic Act No. 8371 (Indigenous Peoples Rights Act) of 1997

The Indigenous Peoples Rights Act (IPRA) was approved on October 29, 1997. The Act provides for the recognition and promotion of the right of indigenous cultural communities/indigenous peoples within the framework of the Constitution.

Chapter VIII, Section 57 stipulates that Indigenous Cultural Communities/Indigenous Peoples (ICCs/IPs) have priority rights in the harvesting, extraction, development or exploitation of any natural resources within the ancestral domains. However, the R.A. 9147, passed in 2001, overrides the IPRA, in that the killing, hurting, trading of marine turtles and their derivatives, even for traditional purposes, is prohibited (Repealing Clause, Section 40). It is imperative to significantly curb or prohibit these practices at least until the turtle populations have stabilized, again. For this purpose, awareness raising campaigns are essential as well as the identification of legal substitutions. That confers with Chapter III, Section 9 of the Act concerning the responsibilities of ICCs/IPs to their ancestral domains, in particular to maintain an ecological balance.

4.3.2.6. Republic Act No. 7611 (Strategic Environmental Plan for Palawan) of 1992

Republic Act No. 7611 was approved on June 19, 1992. It provided for the adoption of a comprehensive framework for the sustainable development of Palawan compatible with protecting and enhancing the natural resources and endangered environment of the province. The framework, known as the Strategic Environment Plan (SEP) for Palawan, shall serve as guide to the local government of Palawan and the government agencies concerned in the formulation and implementation of plans, programs and projects affecting said province. The governance, implementation and policy direction of the SEP is exercised by the Palawan Council for Sustainable Development (PCSD).

The SEP established a graded system of protection and development control over the whole of Palawan, including its tribal lands, forests, mines, agricultural areas, settlement areas, small islands, mangroves, coral reefs, seagrass beds, and surrounding sea. This is known as the Environmentally Critical Areas Network, or ECAN, which served as the main strategy of the SEP. The ECAN shall, among others, ensure the protection of rare and endangered species and their habitat.

4.3.2.7. Presidential Proclamation No. 171 (Turtle Islands Wildlife Sanctuary) of 1991

Presidential Proclamation 171 established the TIWS in 1999, covering the Turtle Islands Municipality, including its surrounding municipal waters pursuant to R.A. 7586. The TIWS encompasses an area of 242,967 hectares including six nesting islands and a nesting population considered as the largest aggregation of nesting green turtles in the Philippines. However, in recent years poaching has considerably increased, which calls for immediate and effective action from the local, provincial and national levels.

4.3.2.8. *Executive Order (EO) 899 of 2010*

The EO authorized the formation of an Ad Hoc Committee for the implementation of the Philippine Action Plan (PAP) on Enforcement of Environmental Laws in the Turtle Islands, Tawi-Tawi and Balabac, Southern Palawan. It designated the Philippine Coast Guard as Lead Agency to coordinate with eight other relevant national government agencies. Non-Government Organizations, People's Organization, Church-based Organizations and other concerned civil society groups are also encouraged to contribute to the achievement of the goals and objectives of the PAP which was formulated to support the CTI and SSME goals.

4.3.2.9. *Writ of Kalikasan*

In case the abovementioned laws and proclamations are not being followed properly, there exists a mechanism by which people can demand justice: The "Rules of Procedure for Environmental Cases", developed and issued by the Supreme Court as A.M. No. 09-6-8-SC became effective since April 29, 2010. Also known as "Writ of Kalikasan", this legal framework aims to give people an opportunity to petition against any organization or individual, who violates or threats to violate the person's constitutional right to a balanced and healthful ecology.

4.4. LOCAL LAWS AND INITIATIVES

Some provincial and municipal government units have implemented marine turtle conservation programmes within their jurisdiction. For example, the three provinces Cavite-Bataan-Zambales with significant olive ridley nestings plan to work together through a 'CABATALES' marine turtle conservation initiative. The following is a list of some more local government units implementing marine turtle conservation projects in their areas:

- Morong, Bataan: Resolution 24 (1999): Creation of a Pawikan Conservation Project
- Hinatuan, Surigao del Sur: Resolution MJ808 (2002): Establishment of a Pawikan Hatchery
- Province of Zambales: Resolution 99 (2004): Declaring Coastal Areas of Zambales a Critical Habitat of Endangered Marine Turtles
- Samal City, Davao: Resolution 792 (2005): Pawikan and Dugong Conservation and Protection Project
- Davao City: Resolution 02616 (2006): Declaring portions of Punta Dumalag, Matina Aplaya as Critical Habitat of Hawksbill Turtle
- San Juan, Batangas: Resolution 05 (2006): Creation of a Pawikan Conservation Project
- Province of Antiques: Resolution 132 (2012): Support to the Antique Marine Wildlife Protection Network for Marin Wildlife Response and Protection
- San Agustin, Romblon: Resolution 08 (2012): Establishment of a Pawikan Rescue Center

The DENR-BMB has also over 100 MoUs with various local partners, mostly private groups, NGOs, or academe on the ground. The most visible and active, to date, are in:

- San Narciso, Zambales: PawiCare and Sea Turtle Harbor-Zambales
- San Juan, La Union: Coastal Underwater Resource Management Actions (CURMA)
- Morong, Bataan: Bantay Pawikan
- Mati, Davao Oriental: Amihan sa Dahican
- Maitum, Saragani: Pa We Can Do It
- Davao City: Aboitiz Foundation "Better World for the Pawikan"
- Naic, Cavite: Pawikan Conservation and Protection Project

- Calaca, Batangas: Phoenix Petroterminals and Industrial Park
- Abra de Ilog, Mindoro: Pawikan Patrol

Some NGOs have been active and consistently involved in marine turtle conservation in the country, such as: WWF-Philippines, Conservation International-Philippines, Marine Wildlife Watch of the Philippines, Large Marine Vertebrate Research Institute Philippines, Save Philippine Seas' program Pawikan Watchers, and the Turtle Conservation Society of the Philippines.

Tourism business facilities in marine turtle habitats are some of the stronger partners, as they rely on the natural assets in the area to attract visitors. Some of the more active ones are: El Nido Resorts, El Nido, Palawan; Puerco Island Private Resort, Roxas, Palawan; Arena Island Resort, Narra, Palawan; Secret Paradise Resort, San Vicente, Palawan; Playa La Caleta, Morong, Bataan; and Montemar Beach Club, Bagac, Bataan. However, there is an indication that some private institutions may operate marine turtle conservation activities without the proper training and permits, which needs to be investigated and immediately dealt with. Worse, there are tourism facilities that capture marine turtles, without a permit, as part of their tourism attraction.

5. RESEARCH RECOMMENDATIONS

Information on marine turtles in the Philippines is limited by the research conducted. In a non-exhaustive review of papers containing relevant information on marine turtles, with a strong focus on the Philippines, 44 papers, reports, conference proceedings etc. published mainly within the last two decades, were reviewed. From 38 papers, information on the species assessed and on the study site could be derived. The majority of papers does not focus on species but is rather topic-centered and deals with marine turtles in general without going into details concerning particular species. The few papers having a species-centered research focus, mainly present information on green turtles and leatherback turtles. Hawksbill, olive ridley and loggerhead turtles have only marginally or not at all been the center of attention for research in the Philippines and in the region so far. Of the papers reviewed, ten had a regional or worldwide scope and 28 contained research conducted in the Philippines. Of these, most concerned marine turtle research in the whole Philippines, followed by research conducted in the TIHPA.

Research relevant information could only be found in 24 of the 44 reviewed studies and covered a range of topics including: Data on the life stages and life history of marine turtles by using new techniques such as Photo-ID in combination with photogrammetry, status of turtles such as turtle population dynamics, abundance and occurrences, diversity, stranding and nesting incidence, habitat distribution, threats and causes of mortality, ingestion of marine plastic debris, exploitation, indigenous hunting, trade dynamics, capture by coastal fisheries, transborder conservation, fibropapillomatosis, satellite tracking to original foraging grounds and public education.

The following grouping presents the information gaps that were most frequently listed by the authors of the reviewed papers and thus reflect the topics where further research is needed and has been requested. Some topics can be categorized as rather complementary research to already existing information, e.g. on population dynamics, but others are relatively new topics in need to be taken up more intensely, such as climate change and its implications for the marine turtle life cycle.

To effectively predict trends and patterns and to detect irregular data possibly indicating significant changes, monitoring on a regular basis is indispensable. This was brought up many times by the authors of the reviewed papers with regard to numerous topics. Equally important is research into efficient enforcement measures in order to put regulation into practice and to implement, e.g. protected area management and turtle conservation.

The Sulu-Sulawesi Sea Turtle Workshop held in Clark, Pampanga in February 2017 allowed the prioritization of research opportunities within the Sulu-Sulawesi region among Malaysia, Indonesia, and the Philippines which includes genetics origin and fingerprinting, habitat utilization, population dynamics, survival, activities, community participation, and threats (Gesellschaft für Internationale Zusammenarbeit, 2017).

The life-cycle of a marine turtle takes place in various habitats, each presenting their own challenges to the marine turtles' survival. Whereas some stages of these life-cycles can be monitored with relative ease, others require substantial effort and time. However, to understand the life-cycle of marine turtles and associated opportunities for marine turtle conservation is crucial, which is why the following information should be addressed by future research.

5.3. Vulnerable Life Stages and Habitats

Araujo et al. (2016) stated that further marine turtle research should concentrate on the life-cycle not taking place on or near the nesting sites: "The developmental, post-pelagic stage of green turtles in the Philippines remains unclear, as is their recruitment to foraging grounds." Research of the lost years, for all turtle species, can lead to significantly improved conservation strategies.

Another recommendation is for research to focus conservation efforts on life-history stages where marine turtles are particularly vulnerable, e.g. during nesting (Poonian, Ramilo, & Lopez, 2016). It was stated that there is "a severe deficiency of current scientific research on marine turtles in the Philippines", as well as for Southeast Asia in general and the research that is existing should be expanded.

Although there is quite some knowledge on leatherback turtle nesting beaches, there is not much information available on their marine habitat use (Pilcher N. , 2010a). The author identified several information gaps: critical foraging habitats, oceanic residence patters, time spent on the water surface by the leatherback turtles and their dive profiles in terms of foraging activities, nutritional value, energetics and quality of the forage material, importance of specific foraging grounds and frequency of habitat use. Information on these aspects should be gathered and available for all marine turtle species in the Philippines. Limpus (2002) called for research on an increased production of hatchlings at nesting sites and for an assessment of key index nesting sites, using aerial surveys followed by ground truthing. The identification of further critical habitats is also requested by (Hamann, Limpus, Hughes, Mortimer, & Pilcher, 2006) in addition to information on diet, foraging areas and habitat use (oceanic and coastal). Yeh et al. (2014) also stated the lack of knowledge on foraging grounds and migratory routes of marine turtles, making it difficult to protect the turtles from poaching. Moreover, information on residency and movement patterns and how these change as turtles mature was also requested by Eckert (1993).

Araujo et al. (2016) called for "a wider-ranging photo-ID program" to cover additional study sites and "to understand when individuals emigrate from immature-dominated sites to subadult- or adult-dominated foraging sites." As the authors recommend that photo-ID should continue to be combined with photogrammetry in the future, it leads them to request for a code of conduct underwater whilst doing the assessments. The combination of these two methods will allow for determining residency patterns of turtles, leading to the appropriate protection of turtle resting sites, such as seagrass beds and algal pastures. Further aspects requested to be monitored are turtle site fidelity and the establishment of growth rates of individual turtles. Eckert (1993) mentioned the need for regular surveys in order to determine "nesting numbers, reproductive output and hatch success, as well as rates of survival, recruitment and remigration", which is in accord with Hamann et al. (2006), suggesting to initiate a standard monitoring of rookeries.

5.4. Population Dynamics

Pilcher (2010a) identified several information gaps for leatherback turtles on population and gender, namely: populations and their distribution, gender ratios in the wild, population dynamics (especially survival, growth, the proportion of turtles to the breeding population), time spent on the water surface and dive profiles in terms of foraging activities, nutritional value, energetics and quality of the forage material, importance of specific foraging grounds and frequency of habitat use. Further data missing on the following parameters is listed by Hamann et al. (2006): number of clutches per female per year/nesting season, number of years between breeding seasons, rate of recruitment into the breeding population, breeding distribution and census, distribution and size of current and/or historical leatherback turtle rookeries, nest success and hatchling recruitment, internesting areas, breeding distribution and census, remigration interval, reproductive output and hatchling production. Similar to Limpus (2002), the authors suggested to use a combination of aerial surveys and ground truthing for the collection of data. As additional substantial gaps, age, growth, and annual survivorship were listed. Eckert (1993) is a proponent of long-term research in the area of population dynamics at sea and on the nesting beaches, to enhance the understanding of "growth and survivorship among consecutive life history stages (hatchling, juvenile, subadult, and adult), longevity, fecundity, and natural stock replacement and recovery rates." Further topics mentioned are "temporal and spatial patterns of distribution and abundance, migration corridors, and geographically specific developmental habitats." This research, and the one requested in the preceding studies, should be conducted for each marine turtle species, but according to the author, especially the data for leatherback, loggerhead and olive ridley turtles seem to be fragmented, whereas the first two are the ones most often captured by North Pacific driftnets.

Another gap in information presented by Limpus (2002) concerns "stock enhancement protocols": as priorities regarding species and stocks, leatherback turtles were mentioned for the East and West Pacific and hawksbill turtles for the Southwestern Pacific. For research on foraging areas, the Sulu-Sulawesi Sea was identified as the focal area for Western Pacific green turtle foraging, the Bicol region and Central Philippines for leatherback turtles and the South China Sea for green turtles and hawksbills.

Pilcher (2010b) called for more in-depth studies on population abundance trends. Other research topics proposed, concern the turtles' diets, the change of sex ratio over time, "at sea" sex ratio and reproductive activity, which could reveal recruitment rates entering the breeding population, age class, residence periods and growth rates.

5.5. Population Stocks and Genetics

Genetics is a relatively new method to complement other turtle research methods, but it presents unprecedented possibilities of obtaining information on the origin of turtles, their migration routes and to combat poaching.

Regarding research priorities in order to delineate turtle stocks, Limpus (2002) suggested to integrate "1) DNA stock identification; 2) satellite tracking; and 3) continued flipper tagging." Yeh et al. (2014) made use of satellite telemetry in order to trace captured turtles back to their original foraging grounds. Thus, they recommend to deploy more satellite tags on rescued turtles. Researchers already agreed to set up a meta-database with the purpose of managing tag information telemetry/migration data, tag returns and genotypes (Limpus, 2002). Cruz and Torres (2005) called for extending the existing tagging database by contacting and interviewing the persons formerly involved in tagging and for a timely submission of the tagging datasheets to the

databases. This should then form the basis for a much-needed standardization of tagging practices and monitoring across the Southeast Asian region.

Limpus (2002) presented a statement of a Data Gaps Working Group on turtle research gaps, stating that the greatest information gaps can be found in genetic identification of management units, stock assessments and in aquatic habitat characterization. Pilcher (2010a) also stated that there is little information to date on the genetic structure of the foraging turtle population. Pilcher (2010b) mentioned that genetic studies could reveal linkages between foraging and nesting grounds and the genetic origin of the marine turtles. In addition, Yeh et al. (2014) claimed that DNA analysis can be used as another forensic tool to match illegally caught marine turtles "with the population of turtles in the inferred capture area from satellite tracking", which would strengthen investigations against poaching. With regard to enforcement, Poonian et al. (2016) pointed out that research should look into law enforcement possibilities, especially in isolated islands hosting turtle nesting sites.

5.6. Other Research

New research should always be based on already existing research and knowledge to be efficient and thus prevent duplications, which is why a coherent collection of data and entry into standardized databases in the Philippines is of utmost importance. Standardization is also called for by Pilcher (2010b) with regard to turtle measuring procedures. The author also promotes a broader site coverage, e.g. by using manta tows in combination with SUCBA surveys.

Another overarching recommendation from the authors is to extend the time period of the research, as only a continuous data collection and analysis allows for determining trends and an evaluation of point-in-time events, e.g. establishing a stronger correlation between hatching and emergence success.

Lecturers and participants identified a lack of knowledge on the interaction between humans and marine turtles in the Western and Central Pacific, especially with regard to the quantification of harvested eggs and the catch of turtles and derived trends (Limpus, 2002). Capacity building, public campaigns and education are only some of the instruments that can help to foster the awareness of, e.g. turtle biology and Red List status, enforcement activities, the provision of alternative livelihoods and benefit to the socio-ecological systems (Antonio & Matillano, 2016). Therefore, an assessment of the local situation to recommend properly designed awareness raising campaigns should accompany each study. Research into the correlation between awareness raising activities on turtle conservation and reduced poaching as an effect may also be needed, as the Pilcher (2010a) stated that they do not have any data to make this cause-effect link.

When conducting further research, traditional knowledge should be capitalized on and should involve indigenous people in order to complement scientific data such as those concerning intergenerational changes in marine turtle occurrence (Poonian, Ramilo, & Lopez, 2016). The involvement of fishermen in the research is also considered crucial to gather needed information and to mitigate the fisheries impacts (Limpus, 2002). Esteban (2008) suggested that more ethnographic/historical studies should be conducted, so it can be understood "how human behavior could be made more compatible with nature" (Frazier, 2004). This also includes research on the provision of alternative livelihoods (Esteban, 2008).

Eventually, new research tools regarding marine turtle conservation can provide new perspectives, as the Contingency Valuation Method (CVM) used by Jin et al. (2010), uses "a single

CVM survey instrument and common survey procedure" to value marine turtle conservation on a cross-country scale. The continued use of CVM could be helpful in order to determine people's knowledge about, attitude and incentives to turtle conservation.

In the Philippines, starting with the development of a research program, the following are specific research recommendations based on the latest information from the DENR-BMB database (Department of Environment and Natural Resources-Biodiversity Management Bureau, 2018 (unpublished)):

- Continued research and monitoring of the TIWS and Bataan marine turtles through tagging of nesters and egg production monitoring but with a consistent observation effort.
- Development of a more appropriate tagging program and other methodology for monitoring.
- Satellite tagging and tracking of mature turtles to determine definite movement patterns.
- Population identification through genetic studies.
- Identification and characterization of important non-nesting habitats.
- Monitor identified feeding and developmental habitats of marine turtle in terms of habitat use and habitat status.
- Develop simpler and coherent data collection and reporting protocols specifically one that is assisted by an automated technology with a standardized menu.
- Data should be easily verifiable to include prescribed photographs and confirmation before being entered into a centralized database.
- Develop a centralized database system/information management system that is accessible online, sufficiently funded, and managed by trained personnel.
- Include other sources of data to come up with a more comprehensive status for the Philippines.
- Monitor and collect more detailed data on threats, including fishery interaction specific gears, illegal trade, diseases, marine debris etc.

6. POLICY ANALYSIS AND RECOMMENDATIONS

To validate and assess the implementation performance of the relevant laws in relation to marine turtle conservation, participants in the Philippine Marine Turtle Conservation Program Workshop and Presentation held last 14-15 August 2017 were asked to evaluate the implementation of these laws. They were asked to assess whether the implementation of each law was *excellent*, *poor*, or *no regulation*. Participants from the local governments were also encouraged to list local policies that address the identified threats.

The policy gap analysis was structured according to threats to marine turtles and corresponding relevant laws. The threats listed for the policy analysis were identified from existing literature and the project team's experience in marine turtle conservation. The threats identified were categorized into the following: habitat destruction, exploitation, other interactions, conservation activities, captive facility, and incident response. The outcome of the exercise can be seen in Table 3.

Table 3. Policy Gap and Effectivity Assessment. Values indicate number of participants choosing a category they feel strongly about. Red indicates a lack of regulation, yellow means regulations available but implementation is poor, and green means the existing regulation is sufficiently implemented.

Marine Turtle Threat	Cause of Threat	Existing Relevant Laws	Participant's Perception		
			Excellent implementation	Poor implementation	No regulation
HABITAT DESTRUCTION					
Nesting beach degradation/loss	Construction along beaches	Local Government Code	1	26	1
	Large debris on beach	NONE	3	8	2
	Land reclamation	Local Government Code	1	17	1
	Sand mining	Mining Act	4	17	1
	Port construction	Local Government Code	2	14	2
	Breakwater construction	Local Government Code	3	12	2
	Noise pollution	NONE	1	6	16
	Light pollution	NONE	2	7	15
Water habitat degradation	Plastic pollution	Solid Waste Management Act	1	27	
	Ghost nets	Fisheries Code	2	15	7
	Marine debris	NONE	1	10	13
	Chemical pollution	Clean Water Act EMB Policy	4	17	3
	Oil spills	Oil Pollution Compensation Act	5	15	2
	Mangrove deforestation	Fisheries Code, SEP	3	17	
	Seagrass bed destruction	Fisheries Code, SEP	5	15	1
	Coral and reef destruction	Fisheries Code, SEP	6	18	
	Benthos destruction	Fisheries Code, SEP	4	13	1
EXPLOITATION					

Marine Turtle Threat	Cause of Threat	Existing Relevant Laws	Participant's Perception		
			Excellent implementation	Poor implementation	No regulation
Extraction	Domestic animal predation	Animal Welfare Act Local Government Code	5	14	1
	Egg collection	Wildlife Act, SEP	9	13	
	Egg trading	Wildlife Act, SEP	9	12	
	Turtle harvesting	Wildlife Act, SEP	8	13	
	Turtle meat trading	Wildlife Act, SEP	6	10	
	Stuffed turtle	Wildlife Act, SEP	6	10	
	Scutes trading	Wildlife Act, SEP	7	11	
Predation	Domestic animals	Animal Welfare Act	6	11	2
Wildlife trade	Local	Wildlife Act, SEP	6	14	
	International	Wildlife Act, CITES	6	12	
Fishery interaction	Bycatch release	Fisheries Code, SEP	4	13	1
	Bycatch utilization	Fisheries Code, SEP	4	13	2
Boat traffic	Boat strikes	NONE	3	6	10
	Traffic disturbance	NONE	1	3	10
Illegal fishing	Dynamite fishing	Fisheries Code, SEP	4	16	
OTHER INTERACTIONS					
Tourism interaction	In-water disturbance	NONE	1	10	10
	Land disturbance	NONE	1	11	9
	Hatchling handling	NONE	6	7	10
Research interaction	Collection of samples	Wildlife Act, SEP	8	9	2
	Permit systems	Wildlife Act, SEP	7	9	1
CONSERVATION ACTIVITIES					
Management activities	MPAs	MKBAs, NIPAS, Critical Habitat	5	16	
	Beach protection	Critical Habitat	6	15	1
	Hatchery management	Wildlife Act, SEP	8	14	1

Marine Turtle Threat	Cause of Threat	Existing Relevant Laws	Participant's Perception		
			Excellent implementation	Poor implementation	No regulation
	Data management system	NONE	1	11	6
	Training on Conservation Management	Wildlife Act, SEP	7	13	1
	Comprehensive Conservation Plan Developed	NONE	3	21	11
	Red list population assessments	NONE	5	7	7
	Research programs	Wildlife Act, SEP	6	16	1
	Enforcement (apprehension, confiscation, prosecution)	Wildlife Act, SEP	8	16	
CAPTIVE FACILITY					
Zoos and aquaria/Tourist facility	Permit systems	Wildlife Act	9	10	4
	Standards	NONE	2	5	10
	Accreditation	Wildlife Act	5	13	4
Rescue Centers	Standards	Wildlife Act	8	11	2
	Accreditation	Wildlife Act	8	9	2
	Rehabilitation and Release protocols	NONE	8	7	5
INCIDENT RESPONSE					
Stranding, salvage, rescue	Response network organization	NONE	3	13	7
	Standardized data collection and procedure for release/disposition	NONE	3	15	4
	Training	Wildlife Act	3	19	
OTHERS					
	Public awareness				
	Management Effectiveness				
	Extraction of Wildlife		1		
	Illegal trading		1		
	Avian Flu		1		

Marine Turtle Threat	Cause of Threat	Existing Relevant Laws	Participant's Perception		
			Excellent implementation	Poor implementation	No regulation
	Visitor Management				1

Results of the evaluation show that the participants perceived implementation of most of the policies as poor, hence, they greatly need improvement. Only for rehabilitation and release protocols did more people think that implementation is excellent rather than poor, despite the lack of policies. This might be the case because the local governments and regional DENR offices present during the workshop encounter strandings of marine turtles quite frequently and have experience on rehabilitation and release. There also seems to be better perception in implementing laws on threats related to illegal trade such as meat, scutes, and egg harvesting. However, it is still recommended that the enforcement of the protection of marine turtles, including their habitat, needs to be improved and fully implemented.

There are three national laws that address the majority of the threats to marine turtles: Republic Act 9147 (Wildlife Act), Republic Act 10654 (Fisheries Code), and Republic Act 7611 or the Strategic Environmental Plan (SEP) for Palawan Act. These laws are directly concerned with wildlife resources, thus including any activity or action concerning marine turtles and their habitats. Other national laws such as the Local Government Code of the Philippines, Animal Welfare Act, Solid Waste Management Act, Clean Water Act, among others, are not directly intended for wildlife resources, but nonetheless affect marine turtle conservation initiatives.

There needs to be harmonization on the classification status of marine turtles in the country which is different among the IUCN, the Philippine Wildlife Act, and the SEP law in Palawan. Under the IUCN, the hawksbill turtle is Critically Endangered, the green turtle is Endangered and other three (leatherback, olive ridley, and loggerhead turtles) are Vulnerable (IUCN, 2017); while all species are considered Endangered in the Philippines except for the hawksbill turtle which is Critically Endangered based on DAO 15 (2004); and all are considered Critically Endangered in Palawan due to their CITES Appendix I listing under PCSD Resolution No. 15-521 in 2015. Although a national population status is encouraged by the IUCN, it is recommended that the IUCN Red List assessment method be used for this, which already needs to be updated, and the resulting status be adopted by the PCSD to be consistent.

One of the most noticeable threats to marine turtles is pollution. In this analysis, it appears that the Philippines only has laws addressing solid waste, chemical pollution, and oil spills. Marine debris, noise pollution, and light pollution are not addressed by any laws. This gap needs to be addressed especially in developing coastal areas that are developmental/feeding and nesting habitats. The problem of ghost nets also needs to be tackled.

On the other hand, tourist interaction with marine turtles, as well as other marine wildlife through diving, snorkeling, and boat tours, has been on the rise across the country, and has been identified as an emerging threat to marine turtles. Disturbance from observing marine wildlife in their natural habitat is becoming a concern. There are no laws in the Philippines that regulate tourist interactions. In 2015, the DENR, DA, Department of Interior and Local Government (DILG) through the initiative of the Department of Tourism (DOT) have drafted a Joint Administrative Order on the Rules and Regulations Governing the Conduct of Marine Wildlife Tourism Interactions in the Philippines. To date, it has yet to be signed by the Department Secretaries.

Furthermore, there appears to be a lack of policies on major conservation activities such as data collection and management, implementation of conservation plans, Red List population assessments, and protocols for rehabilitation and release. While there are existing response and data collection protocols in published manuals (Marine Wildife Watch of the Philippines, 2014) not only for turtles but also for dugongs and other marine mammals, as well as sharks and rays, they are not institutionalized, thereby having weak and inconsistent implementation. It is recommended that the Wildlife Resources Division of the DENR-BMB works on including the manuals in the government legal gazette.

The results of the literature review suggested by the authors need to be reflected back into the policy realm, in order to help decision-makers pass effective laws and thus to really evoke change. As marine turtles are migratory, it will not be sufficient to gather information on marine turtles only in the Philippines, but this data should be rather combined with datasets from all countries in Southeast Asia, in order to arrive at a regional management scheme. Palma and Trono (1998) further examined the role the ASEAN could play in marine turtle protection. Derived from their observations, further research might look into the benefits of a turtle protection program launched by ASEAN, anticipate challenges and provide suggestions for strategies on how to achieve it. Trono and Cantos (2002) raised the issue of political conflicts and security problems, hindering effective (border) conservation interventions. Further research should thus explore how conservation can effectively take place in conflict areas and which conservation tools are most appropriate to mitigate conflicts and to promote cooperation.

With the emerging significance of adopting sustainable development, which the UN has defined through 17 Goals to be achieved by 2030 (United Nations, 2018), directly relevant to marine turtles are Goal 14 (life below water) for most of a marine turtle's life and Goal 15 (life on land) for the nesting, eggs, and initial hatchling phase. However, sustainable development means all the 17 goals will have to be addressed in order to be successful. In the Philippines, a program to integrate biodiversity conservation into local development has been addressed through the United Nations Development Programme (UNDP) Global Environment Facility (GEF) program with DENR called the Biodiversity Partnerships Project (BPP) launched in 2012 (United Nations Development Programme, 2018).

7. MARINE TURTLE CONSERVATION FRAMEWORK

During the Philippine Marine Turtle Conservation Program Workshop and Presentation in August 2017, the participants decided that the conservation framework the Philippines should adopt is the IOSEA Conservation and Management Plan with its six objectives as seen below and with the targets and activities in Table 4.

Table 4. Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia (IOSEA) Conservation and Management Plan.

Objective 1. Reduce direct and indirect causes of marine turtle mortality

Program	Activity
1.1 Identify and document the threats to marine turtle populations and their habitats	a. Collate and organize existing data on threats to marine turtle populations b. Establish baseline data collection and monitoring programmes to gather information on the nature and magnitude of threats

	c. Determine those populations affected by traditional and direct harvest, incidental capture in fisheries, and other sources of mortality
1.2 Determine and apply best practice approaches to minimizing those threats to marine turtle populations and their habitats	a. Identify and document best practice protocols for conserving and managing marine turtle populations within the region b. Adapt and adopt the best conservation and management practices for marine turtle populations
1.3 Implement programmes to correct adverse economic incentives that threaten marine turtle populations	a. Conduct socio-economic studies among communities that interact with marine turtles and their habitats b. Identify desired modifications to the economic incentives in order to reduce threats and mortality, and develop programmes to implement the modifications c. Identify resources and sources of funding for the programmes
1.4 Reduce to the greatest extent practicable the incidental capture and mortality of marine turtles in the course of fishing activities	a. Develop and use gear, devices and techniques to minimize incidental capture of marine turtles in fisheries, such as devices that effectively allow the escape of marine turtles, and spatial and seasonal closures b. Develop procedures and training programmes to promote implementation of these measures, such as vessel monitoring systems and inspections at sea, in port and at landing sites, and national on-board observer programmes c. Exchange information and, upon request, provide technical assistance to other signatory States to promote these activities d. Liaise and coordinate with fisheries industries and fisheries management organizations to develop and implement incidental capture mitigation mechanisms in national waters and on the high seas e. Support the UN General Assembly resolution 46/215 concerning the moratorium on the use of large-scale driftnets on the high seas f. Develop and implement net retention and recycling schemes to minimize the disposal of fishing gear at sea and on beaches g. Provide and ensure the use of port facilities for the disposal of ship-borne waste
5. Prohibit the direct harvest (capture or killing) of, and domestic trade in, marine turtles, their eggs, parts or products, whilst allowing exceptions for traditional harvest by communities within each jurisdiction provided that: such harvest does not undermine efforts to protect, conserve and recover marine turtle populations and their	a. Enact, where not already in place, legislation to prohibit direct harvest and domestic trade b. Assess the level and impact of traditional harvest on marine turtles and their eggs c. Establish management programmes that may include limits on levels of intentional harvest

habitats; and the marine turtle populations in question are able to sustain the harvest	d. Determine the cultural and traditional values and economic uses of marine turtles (both consumptive and non-consumptive) e. Negotiate, where appropriate, management agreements on the sustainable level of traditional harvest, in consultation with other concerned States, to ensure that such harvest does not undermine conservation efforts
6. Develop nesting beach management programmes to maximize hatchling recruitment	a. Evaluate the effectiveness of nest and beach management programmes b. Reduce the mortality of eggs and hatchlings to maximize hatchling recruitment and survival, preferably using conservation techniques that emphasize natural processes wherever possible c. Minimize the mortality of eggs, hatchlings and nesting female turtles caused by feral and domestic animals

Objective 2. Protect, conserve and rehabilitate marine turtle habitats

Program	Activity
2.1 Establish necessary measures to protect and conserve marine turtle habitats	a. Identify areas of critical habitat such as migratory corridors, nesting beaches, inter-nesting and feeding areas b. Designate and manage protected/conservation areas, sanctuaries or temporary exclusion zones in areas of critical habitat, or take other measures (e.g. modification of fishing gear, restrictions on vessel traffic) to remove threats to such areas c. Develop incentives for adequate protection of areas of critical habitat outside protected areas d. Undertake assessments of the environmental impact of marine and coastal development and other human activities that may affect marine turtle populations and their habitats e. Manage and regulate within each jurisdiction the use of beaches and coastal dunes, for example location and design of buildings, use of artificial lighting, and transit of vehicles in nesting areas f. Monitor and promote the protection of water quality from land-based and maritime pollution, including marine debris, that may adversely affect marine turtles g. Strengthen the application of existing bans on the use of poisonous chemicals and explosives in the exploitation of marine resources
2.2 Rehabilitate degraded marine turtle habitats	a. Re-vegetate, where appropriate, frontal dunes at nesting beaches, with indigenous flora as far as possible, in order to provide visual

	barriers to coastal development and to restore appropriate beach temperature regimes b. Remove debris that impedes turtle nesting and hatchling production c. Enhance recovery of degraded coral reefs d. Enhance recovery of degraded mangrove and seagrass habitats

Objective 3. Improve understanding of marine turtle ecology and populations through research, monitoring and information exchange

Program	Activity
3.1 Conduct studies on marine turtles and their habitats targeted to their conservation and management	a. Conduct baseline studies or gather secondary information on marine turtle populations and their habitats b. Initiate and/or continue long-term monitoring of priority marine turtle populations in order to assess conservation status c. Characterize genetic identity of marine turtle populations d. Identify migratory routes through the use of tagging, genetic studies and/or satellite tracking e. Carry out studies on marine turtle population dynamics and survival rates f. Conduct research on the frequency and pathology of diseases of marine turtles g. Promote the use of traditional ecological knowledge in research studies h. Review periodically and evaluate research and monitoring activities
3.2 Conduct collaborative research and monitoring	a. Identify and include priority research and monitoring needs in regional and sub-regional action plans b. Conduct collaborative studies and monitoring on genetic identity, conservation status, migrations, and other biological and ecological aspects of marine turtles
3.3 Analyze data to support mitigation of threats and to assess and improve conservation practices	a. Priorities populations for conservation actions b. Identify population trends c. Use research results to improve management, mitigate threats and assess the efficacy of conservation activities (e.g. hatchery management practices, habitat loss, etc.)
3.4 Exchange information	a. Standardize methods and levels of data collection and adopt or develop an agreed set of protocols for *inter alia* monitoring of

	nesting beaches, feeding ground studies, genetic sampling, and collection of mortality data b. Determine the most appropriate methods for information dissemination c. Exchange at regular intervals scientific and technical information and expertise among nations, scientific institutions, non-governmental and international organizations, in order to develop and implement best practice approaches to conservation of marine turtles and their habitats d. Disseminate traditional knowledge on marine turtles and their habitats for conservation and management e. Compile on a regular basis data on marine turtle populations of regional interest

Objective 4. Increase public awareness of the threats to marine turtles and their habitats, and enhance public participation in conservation activities

Program	Activity
4.1 Establish public education, awareness and information programmes	a. Collect, develop and disseminate education materials b. Establish community learning / information centers c. Develop and implement accurate mass media information programmes d. Develop and conduct focused education and awareness programmes for target groups (e.g. policy makers, teachers, schools, fishing communities, media) e. Encourage the incorporation of marine turtle biology and conservation issues into school curricula f. Organize special events related to marine turtle conservation and biology (e.g. Turtle Day, Year of the Turtle, symposia, Track-a-turtle)
4.2 Develop alternative livelihood opportunities for local communities to encourage their active participation in conservation efforts	Identify and facilitate alternative livelihoods (including income generating activities) that are not detrimental to marine turtles and their habitats, in consultation with local communities and other stakeholders
4.3 Promote public participation	a. Involve stakeholders, and local communities in particular, in planning and implementation of conservation and management measures b. Encourage the participation of Government institutions, non-governmental organizations, the private sector and the general

	community (e.g. students, volunteers, fishing communities, local communities) in research and conservation efforts c. Implement, where appropriate, incentive schemes to encourage public participation (e.g. T-shirts for tag returns, public acknowledgement, certificates)

Objective 5. Enhance national, regional and international cooperation

Program	Activity
5.1 Collaborate with and assist signatory and non-signatory States to the IOSEA to regulate and share information on trade, to combat illegal trade, and to cooperate in enforcement activities relating to marine turtle products	a. Encourage signatory States that have not already done so to become Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) b. Review at a national level compliance with obligations under CITES relating to trade in marine turtles, their eggs, parts or products c. Facilitate better compliance with CITES through training of relevant authorities in cooperation with other signatory States, the CITES Secretariat and other relevant organizations d. Identify routes of international illegal trade through monitoring, and seek cooperation to take action to prevent, deter and, where possible, eliminate illegal trade e. Exchange and discuss information on compliance and trade issues at regular intervals, such as through annual reporting to the MoU Secretariat and at meetings of the signatory States f. Identify, prevent, deter and, where possible, eliminate domestic illegal trade through monitoring, implementation of legislation, identification of gaps in enforcement capabilities in each country, and training of enforcement officers
5.2 Assist signatory and non-signatory States to the IOSEA, upon request, to develop and implement national, sub-regional and regional action plans for the conservation and management of marine turtles and their habitats	a. Develop a set of key management measures that could be used as a basis for action plans, through consultation with concerned Government authorities, research institutions, NGOs, local communities and other stakeholders b. Identify existing action plans that could be used as models c. Identify specific local management issues where cooperation among States is required for successful conservation and management d. Review action plans at regular intervals to take into account recent advances in skills and knowledge regarding marine turtle conservation and management, as well as changes in conservation status of marine turtle populations

5.3 Enhance mechanisms for cooperation and promote information exchange	a. Identify and strengthen existing mechanisms for cooperation at the sub-regional level b. Develop a website and/or newsletter to facilitate networking and exchange of information c. Develop a web-based information resource for marine turtle conservation (including data on populations, nesting, migration, on-going projects) d. Create a directory of experts and organizations concerned with marine turtle conservation e. Develop networks for cooperative management of shared populations, within or across sub-regions, and, where appropriate, formalize cooperative management arrangements f. Cooperate where possible in the establishment of transboundary marine protected areas using ecological rather than political boundaries g. Develop a streamlined format for reporting and exchanging information (through the MoU Secretariat and among signatory States to the IOSEA) on the state of marine turtle conservation at the national level h. Encourage MoU signatory States that have not already done so to become Parties to the Convention on Migratory Species (CMS) i. Encourage signatory States to become Parties to global fisheries agreements such as the UN Fish Stocks Agreement (1995) and the FAO Compliance Agreement (1993) and implement the FAO Code of Conduct for Responsible Fisheries (1995) j. Establish relationships with regional fisheries bodies with a view to obtaining data on incidental capture and encourage them to adopt marine turtle conservation measures within EEZs and on the high seas
5.4 Build capacity to strengthen conservation measures	a. Identify needs for capacity-building in terms of human resources, knowledge and facilities b. Provide training (e.g. through workshops) in marine turtle conservation and management techniques to relevant agencies, individuals and local communities c. Coordinate training programmes and workshops d. Develop partnerships with universities, research institutions, training bodies and other relevant organizations
5.5 Strengthen and improve enforcement of conservation legislation	a. Review domestic policies and laws to address gaps or impediments to marine turtle conservation b. Cooperate in law enforcement to ensure compatible application of laws across and between jurisdictions (including through bilateral/multilateral agreements and intelligence sharing)

Objective 6. Promote implementation of the IOSEA MoU including the Conservation and Management Plan

Program	Activity
6.1 Broaden membership in the MoU, and ensure continuity of MoU activities	a. Encourage non-signatory States to sign the MoU b. Arrange sub-regional workshops involving non-signatory States to raise awareness of the MoU c. Consider at the first meeting of the signatory States the development of a timetable for possible amendment of the MoU to make it a legally binding instrument
2. Promote the role of the Secretariat and the Advisory Committee of the MoU in ensuring the objectives of the Conservation and Management Plan are met	a. Secure reliable sources of funding to support the MoU Secretariat b. Appoint at the first meeting of the signatory States the members of the Advisory Committee c. Establish lines of communication between the MoU Secretariat and the Advisory Committee to facilitate advice to the signatory States
6.3 Seek resources to support the implementation of the MoU	a. Priorities conservation and management activities for funding b. Explore funding options with Governments and other donors such as the Asian Development Bank, World Bank, UNDP, European Union, UNEP, GEF, etc. c. Solicit funding and other contributions from industries that have impacts on marine turtles and their habitats (e.g. fisheries, tourism, oil industry, real estate) d. Explore the use of economic instruments for the conservation of marine turtles and their habitats e. Approach the private sector, foundations and NGOs that may have an interest in funding activities in particular countries to catalyze the creation of a small grants fund f. Generate funding for conservation and management activities through managed ecotourism and other self-supporting schemes (while benefiting local communities) g. Seek synergies (with respect to fund-raising, provision of institutional support, etc.) with other regional/global convention secretariats h. Explore international funding support and other incentives for signatory States that effectively manage marine turtle populations, which might include the complete prohibition of direct harvest (capture or killing)
6.4 Improve coordination among government and non-government sectors in the conservation of marine turtles and their habitats	a. Review the roles and responsibilities of government agencies related to the conservation and management of marine turtles and their habitats

	b. Designate a lead agency responsible for coordinating national marine turtle conservation and management policy c. Encourage cooperation within and among government and non-government sectors, including through the development and/or strengthening of national networks

8. MARINE TURTLE CONSERVATION ACTION PLAN

During the Philippine Marine Turtle Conservation Program Workshop and Presentation in August 2017, Research, Governance, and Policy were identified as important components of an Action Plan. The following objectives were set for each component:

1. Research: Establish a responsive and consistent data management system at all levels.
2. Governance: Strengthen law enforcement and increase the level of awareness in the conservation of marine turtles.
3. Policy: Mainstream marine turtle conservation in the national, regional, and local programs.

Following the approval of the objectives for each component, the participants were tasked to determine specific actions that will lead to achieving the objectives. They were reminded to develop national targets, and to provide a timeframe whether short term (within one year), medium term (within 3-5 years), or long-term (more than 5 years). The resulting Action Plan is presented in Table 5.

Table 5. Philippine Marine Turtle Conservation Action Plan Workshop Output.

Component 1: Research

Objective: Establish a responsive and consistent data management system at all levels.

Targets	Activities	Timeframe	Agencies Involved
Identifying gaps in marine turtle and habitat research	Create an inventory of past and current research	1 year	Academe, Researchers, NGOs
	Establish a repository for research results that is online/accessible	3 years	DENR, PCSD
Standardize data collection parameters	Workshops and trainings	1 year	All
Address info gaps of marine turtles and habitat research	Habitat suitability research	1 year	DENR, PCSD
	Establish a baseline data in prioritized sites	2 years	All
	Impacts of fisheries and other anthropogenic factors	8 years	BFAR; others
	Research on impact of climate change	Long-term	All
	Analyse genetic stock of marine turtles in Philippines in collaboration with SEA region	Long-term/Opportunistic	NFRDI, Academe, NGOs
	Generate scientific publications	Long-term	All
	Provide venue for exchange of information for managers practitioners	Biennial	All

	for sea turtle conservation (symposium)		
	Map detailed long-term migrations of marine turtles in and out of PH and sea	5 years	All
	Monitoring scheme in the long term	Long-term	DENR, PCSD
Data management plan	Address data reporting efficiency		Data management unit
	Learn from model of NSAP		
	Outsource development of data management system		
Creation of inter-agency MOA for marine turtle monitoring protocol with agreements on data sharing	Creation of TWG	Short-term	TWG (DENR, NGOs, academe, local partners
	Meetings/workshop		
	Formulation of MOA		
	Review and formulate Research/management questions		
Issuance of technical bulletin on the standardized monitoring form	Formulate, review and disseminate technical bulletin	Short-term	DENR
Generation of reliable data	Interagency capacity building training on the standardized terms	Medium-term	Representative of partner agencies and stakeholders
	Data collection		
	Reporting system of hard copy		
Data management system	Employ technical training on data banking and management	Short-term	DENR (data banking/data entry at CENRO and PENRO level)
	Technical infrastructure		Data management at regional and national level
Publication	Data analysis (annual reports)	Long-term	DENR

Component 2: Governance

Objective: Strengthen law enforcement and increase the level of awareness in the conservation of marine turtles.

Target	Activities	Timeframe	Agencies Involved
Improve management of NIPAS sites MPAs and LGU sanctuaries using MEAT and METT by 2022	Identify, collaborate and link with stakeholders	5 years	GIZ, Protect wildlife, USAID, MWWP, WWF, CI, UNEP,

			TIEZA, DTI, DOT, DSWD
	Capacitate stakeholders		
Reduce by 50% bycatch/MT fisheries from the current data by 2022	Harmonize implementation RA9147 and 10654	5 years	PNP maritime, LGUs, DENR, Coastguard
	Intensify effective patrolling activity of composite team		
Reduce by 50% targeted fisheries from reported levels by 2022	Provide logistic support and incentives/token and funding to the composite team	5 years	Blue brigade, bantay dagat, PNP, coastguard, LGI, DA BFAR, civil society DepEd
Improve implementation of RA 9147 by 2028	Diversification of livelihood of communities dependent on turtle by products	10 years	TIEZA NAPC, DOT, DTI, DSWD
	Effectively enforce provisions of RA 9147 relevant to marine turtles by 2028		
Develop and implement an effective communication strategy by 2020	Integrate marine turtle conservation in basic education curriculum by 2020	3 years	NGO media donors DepEd
	Intensify CEPA thru conduct of social events (e.g. araw ng pawikan)		
	MOA with agencies involved		DepEd, private schools

Component 3: Policy

Objective: Mainstream marine turtle conservation in the national, regional, and local programs.

Target	Activities	Timeframe	Agencies Involved
At least 10 marine turtle priority areas established as marine turtle critical habitats with updated foreshore MP, ECLUP and or ECAN	Identify 10 priority areas for marine turtle critical habitats	Short-term	DENR-BMB, NGO
	Establish priority areas as marine turtle critical habitats	Short-term	
	Integrate marine turtle conservation policies in their Forest Management Plan (FMP), Enhanced Comprehensive Land Use Plan (ECLUP), Coastal Resource Management Program (CRMP)	Medium-term	
	Establish marine turtle conservation management structures and system	Medium-term	
Policy/guidelines on mf interaction/tourism	Support the signing of the guidelines in public and social media by Sept 2017	right before CMS CoP12 2017	
Policy guides to reduce sources of mortalities	Training/retraining of relevant agencies		

Policy promotion to establish critical habitat			

9. ACKNOWLEDGEMENTS

This project was carried out with support from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) through Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) under the Sulu-Sulawesi Seascape Project and was implemented by the Marine Wildlife Watch of the Philippines. The following have contributed significantly to this report through their participation in consultations, meetings, workshops, write shops, reviews, and administration of this project:

Biodiversity Management Bureau: Josefina de Leon, Anson Tagtag, Merliza Arture, Rizza Salinas, Nilo Ramoso, Renato Borja, Toto Hilomen, Jerry Damasem, Pablo delos Reyes, Leroy Salvador, AB Quintana, Aldrin Divina, Jerry Damasem. *GIZ Philippines:* Franca Sprong, Marion Daclan, Victor Tumilba, Jemimah Penaranda, Marlene Timm. *Marine Wildlife Watch of the Philippines:* AA Yaptinchay, Fra-and Quimpo, Dolf Andringa, Patricia Talaue, Teri Aquino, Dianne Datu, Mo Maguyon, Henry Appleton, Cecilia Fischer. *DENR Regional Offices:* Omar Ali (DENR Region 1), Minda Birulla (Turtle Islands Wildlife Sanctuary), Reginaldo Bueno (DENR Region 7), Rachel Casio (DENR Region 6), Maria Cristina delos Santos (DENR Region 5), Georgina Fernandez (DENR Region 9), Ingelina Lantajo (DENR Region 8), Alexander Mancio (El Nido-Taytay Management Resource Protected Area), Joseph Angelus Palomar (DENR Region 4A), Cidur Jul Sadjiri (DENR Region 9). *Conservation Partners:* Rowell Alarcon (Tubbataha Management Office), Nino Caguimbal (De La Salle University), Anabella Cayabyab (LGU Cavite), Arvin Diesmos (National Museum), Maria Isabella Escobar (University of Sto. Tomas), Antonio Foronda (PawiCare), Jessica Labaja (LaMaVe), Edward Lorenzo (USAID Protect Wildlife), Alvin Nacu (Seastems, Inc.), Aiza Nunez (Palawan Council for Sustainable Development), Retch Pagliawan (Tubbataha Management Office), Joel Palma (WWF-Philippines), Hreskera Dasi Pascua (Project CURMA), Davelyn Pastor (Conservation International – Philippines), Liberato Ramos (PawiCare), Liza Resurreccion (Project CURMA), Ellen Flor Solis (SEAFDEC), Max Sudonvsky (UP MSI/NOAA), Jeanne Tan (Reef Check Philippines), Dan Torres (Turtle Conservation Society of the Philippines), Romy Trono (Turtle Conservation Society of the Philippines).

10. REFERENCES

Abreo, N., Macusi, E., Blatchley, D., & Cuenca, G. (2016). Ingestion of Marine Plastic Debris by Green Turtle (Chelonia mydas) in Davao Gulf, Mindanao, Philippines. *Philipp. J. Sci.*, 145, 17–23.

Aca, E. (2013). *Vulnerability Assessment of Marine Turtle Nesting Sites in the Philippines (Dissertation).* Singapore: National University of Sinagpore.

Antonio, R., & Matillano, J. (2016). Nesting Incidence, Exploitation and Trade Dynamics of Sea Turtles in Balabac Strait Marine Biodiversity Conservation Corridor, Balabac, Palawan, Philippines. *Palawan Sci. 8, 32–47*.

Araujo, G., Montgomery, J., Pahang, K., Labaja, J., & Murray, R. (2016). Using minimally invasive techniques to determine green sea turtle Chelonia mydas life-history parameters. *J. Exp. Mar. Biol. Ecol. 483* , 25–30.doi:10.1016/j.jembe.2016.06.004.

Arguelles, M. (2013, July 15). *Giant turtle lays eggs on Legazpi City shore*. Retrieved from Inquirer.Net: http://newsinfo.inquirer.net/445481/giant-turtle-lays-eggs-on-legazpi-city-shore

Bagarinao, T. (2011). The sea turtles captured by coastal fisheries in the northeastern Sulu Sea, Philippines: documentation, care, and release. . *Herpetol. Conserv. Biol. 6, 353–363*.

Benson, S., Eguchi, T., Foley, D., Forney, K., Bailey, H., Hitipeuw, C., . . . Dutton, P. (2011). Large-scale movements and high-use areas of western Pacific leatherback turtles, Dermochelys coriacea. *Ecosphere*, 2(7):art84.

Byrne, R., & Hines, E. (2005). The Marine Turtles of Hinatuan Bay, Surigao del Sur, Mindanao, Philippines. *Mar. Turt. Newsl. 107*.

Carson, H., Nerheim, M., Carroll, K., & Eriksen, M. (2013). The plastic-associated microorganisms of the North Pacific Gyre. *Mar. Pollut. Bull.*, 75126-132.

Chaloupka, M. (2001). Historical trends, seasonality and spatial synchrony in green sea turtle egg production. . *Biol. Conserv.* , 101, 263–279.

Conservation International Philippines. (2017). *Establishing the Sea Turtle Marine Protected Area (MPA) Network in the Philippines. Philippine Inputs to the Transboundary Sea Turtle MPA Network in the Sulu-Sulawesi Seascape, a Priority Seascape in the Coral Triangle Initiative Regional Action Plan.* GIZ.

Cruz, R. (2002). Awareness and Participation in Marine Turtle Conservation in the Philippines. *Priorities for Research in the Region. Presented at the Western Pacific Sea Turtle Cooperative Research and Management Workshop* (pp. 111-114). Honolulu, HI: Western Pacific Regional Fishery Management Council.

Cruz, R. (2006). *Status of the Leatherback Turtle in the Philippines* . IOSEA Marine Turtle MoU.

Cruz, R., & Torres, D. (2005). *Report on the Preliminary Assessment of Marine Turtle Habitat Use and the Causes of Marine Turtle Mortality in the Tubbataha Reef National Marine Park.* Puerto Princesa, Palawan: Tubbataha Reefs Natural Park Management Office.

De Celis, N. (1982). The status of research, exploitation, and conservation of. *Biology and Conservation of Sea Turtles: Proceedings of the World Conference on Sea Turtle Conservation* (pp. 323-326). Washington D.C.: Smithsonian Institute.

Department of Environment and Natural Resources-Biodiversity Management Bureau. (2018 (unpublished)). Occurrence, Distribution, Nesting Incidence, Habitat Connectivity, and Fishery Interaction of Marine Turtles in the Philippines Based on Tagging and Field Reports Data from 1986 to 2015. Quezon City: GIZ.

Dijk, P., & Shepherd, C. (2004). *Shelled out? A Snapshot of Bekko Trade in Selected Locations in South-east Asia. .* TRAFFIC Southeast Asia.

Eckert, K. (1993). *The Biology and Population Status of Marine Turtles in the North Pacific Ocean.* Honlulu: Honolulu Laboratory, SWFSC and National Marine Fisheries Service, NOAA.

Esteban, R. (2008). The Turtle Island Heritage Protected Area: The Possibilities and Limits of Trans-border Conservation. *Governing Shared Resources: Connecting Local Experience to Global Challenges, 12th Biennial Conference of the International Association for the Study of the Commons.* Cheltenham, UK.

Frazier, J. (2004). Marine Turtles of the Past: A Vision for the Future? . In R. Lauwerier, & I. Plug, *The Future from the Past: Archaeozoology in Wildlife Conservation and Heritage Management* (pp. 103-116). Oxford: Oxbow Books.

Gesellschaft für Internationale Zusammenarbeit. (2017). Report on the Sulu-Sulawesi Sea Turtle Workshop. Clark, Pampanga: Gesellschaft für Internationale Zusammenarbeit.

Gomez, E. (1979). A Review of Sea Turtle Publications in the Philippines. *Joint SPC-NMFS Workshop on Marine Turtles in Tropical Pacific Islands.* South Pacific Comission and the U.S. National Marine Fisheries Service.

Hamann, M., Limpus, C., Hughes, G., Mortimer, J., & Pilcher, N. (2006). *Assessment of the conservation status of the leatherback turtle in the Indian Ocean and South East Asia.* IOSEA Species Assessment: Volume I.

Humber, F., Godley, B., & Broderick, A. (2014). So excellent a fishe: a global overview of legal marine turtle fisheries. *Diversity Distrib.*, 20, 579-590.

International Union for Conservation of Nature. (2012, February 18). *IUCN: International Union for Conservation of Nature*. Retrieved from IUCN: https://www.iucn.org/content/green-turtle-nesting-boom-philippines

IUCN. (2017, February 13). *The IUCN Red List of Threatened Species* . Retrieved from IUCN REdlist: http://www.iucnredlist.org/

Jambeck, J., Geyer, R., Wilcox, C., Siegler, ,., Perryman, M., Andrady, A., . . . Law, K. (2015). Plastic waste inputs from land into the ocean. *Science*, 347, 768–771. doi:10.1126/science.1260352.

Jin, J., Indab, A., Nabangchang, O., Thuy, T., Harder, D., & Subade, R. (2010). Valuing marine turtle conservation: A cross-country study in Asian cities. *Ecol. Econ.*, 69, 2020–2026. doi:10.1016/j.ecolecon.2010.05.018.

Julsadjiri, C. (2015, March 3). Site information sheet for the Turtle Islands Wildlife Sanctuary (TIWS). *IOSEA Marine Turrtle Network*. UNEP-CMS.

Lam , T., Xu Ling, Takahashi, S., & Burgess, E. (2011). *Market Forces: An Examination of Marine Turtle Trade in China and Japan.* Hong Kong: TRAFFIC East Asia.

Limpus, C. (2002). Priorities for Research in the Region. *Western Pacific Sea Turtle Cooperative Research and Management Workshop* (p. 300). onolulu, HI: Western Pacific Regional Fishery Management Council, Honolulu, Hawaii, USA.

Lodge, J. (2017, February 13). *Hundreds of baby turtles dying as sand temperature hits 75C*. Retrieved from ABC News: http://www.abc.net.au/news/2017-02-04/mon-repos-turtles-hurting-in-heatwave-qld/8230036

Lucero, M., Parcasio, S., Gencianeo, M., Lucero, R., Avenido, P., Moran, A., . . . Lucero, F. (2011). Marine turtle stranding and nesting in Malita, Mindanao, Philippines. *Proceedings of the 6th International Symposium on SEASTAR2000 and Asian Bio-logging Science (The 10thSEASTAR2000 workshop)* (pp. 65-68). Kyoto: Kyoto University Research Information Repository.

Lyons, Y. (2013). *Marine Biodiversity in Southeast Asia: An International Guide for Marine Resaerchers.* Singapore: Center for International Law, National University of Singapore.

Marine Wildife Watch of the Philippines. (2014). *Philippine Aquatic Wildlife Rescue and Response Manual: Marine Turtles.* Makati: Marine Wild Fauna Watch of the Philippines, Inc.

Meylan, P., Meylan , A., & Gray, J. (2011). The Ecology and Migrations of Sea Turtles 8. Tests of the Developmental Habitat Hypothesis. *Bull. Am. Mus. Nat. Hist. 357, 1–70. doi:10.1206/357.1*.

National Marine Fisheries Service and U.S. Fish and Wildlife Service. (2007). *Loggerhaed Sea Turtle (Caretta caretta) 5-year Review: Summary and Evaluation.* National Marine Fisheries Service, Silver Spring, MD.

Negeri, P., & Tow, S. (1977, 3 7). Observations on the Exploitation of Marine Turtles in the Philippines. *Marine Turtle Newsletter*, p. 1.

Palma, J., & Trono, R. (1998). Initiatives towards an ASEAN regional management regime for sea turtles. . *Proceedings of the Seventeenth Annual Sea Turtle Symposium* (pp. 75-83). Orlando: NOAA and NMFS.

Pilcher, N. (2010). *Population Abundance, Structure and Dynamics of Marine Turtles in the Tubbataha Reefs, Cagayancillo, Palawan, Philippines.* Marine Research Foundation.

Pilcher, N. (2010a). *Aerial Surveys of Leatherback Nesting and Foraging Habitats in the Sulu-Sulwesi Region.* Saabah, Malaysia: Marine Research Foundation.

Pilcher, N. (2010b). *Population Abundance, Structure and Dynamics of Marine Turtles in the Tubbataha Reefs, Cagayancillo, Palawan, Philippines.* Puerto Princesa, Palawan: Tubbataha Reefs Natural park.

Pilcher, N., Heng, C., & Trono, R. (2008). *SWOT Report: Mass Turtle Poaching: A Case Study from Southeast Asia.* (No. Vol. III).

Poonian, C., Ramilo, R., & Lopez, D. (2016). Diversity, habitat distribution, and indigenous hunting of marine turtles in the Calamian Islands, Palawan, Republic of the Philippines. *J. Asia-Pac. Biodivers. 9, 69–73. doi:10.1016/j.japb.2015.12.006*.

Quimpo, F. (2013). Sea turtles of Macajalar and Gingoog Bays Mindanao. *Philippines. Asian J. Biodivers. 4*, doi:10.7828/ajob.v4i1.302.

Ramirez-de Veyra, R. (1994). Foreign Tag Recoveries from the Philippines, . *Marine Turtle Newsletter*, pp. 64:6-9.

Sagun, V. (2002). Updates on Marine Turtle Conservation in the Philippines. *Proceedings of the 3rd Workshop on SEASTAR2000.*

Sagun, V. (2004, 104). Postnesting movements of green turtles tagged in the Turtle Islands, Tawi-Tawi, Philippines. *Mar. Turt. Newsl.*, pp. 5-7.

Schuyler, Q., Hardesty, B., Wilcox, C., & Townsend, K. (2014). Global Analysis of Anthropogenic Debris Ingestion by Sea Turtles. *Conservation Biology*, 28(1): 129-139.

Torres, D., Santa Cruz, E., & Manzanero, L. (2004). Conservation of a remnant Hawksbill (Eretmochelys Imbricata) population nesting in Punta Dumalag, Barangay Matina Aplya, Davao City, Philippines. *Agham Mindanaw*, 2, 35–39.

Trono, R., & Cantos, J. (2002, December). Conserving Migratory Species Through Ecoregion Conservation Approach: The Case of Sea Turtles in Sulu-Sulawesi Marine Ecoregion. *Tropical Coasts*, pp. 44–49.

United Nations. (2018, May 10). *United Nations*. Retrieved from https://www.un.org/sustainabledevelopment/sustainable-development-goals/

United Nations Development Programme. (2018, May 10). *United Nations Development Programme*. Retrieved from http://www.ph.undp.org/content/philippines/en/home/operations/projects/environment_and_energy/Biodiversity-Partnerships-Project.html

Wallace , B., DiMatteo , A., Hurley , B., Finkbeiner, E., & et al. (2010). Regional Management Units for Marine Turtles: A Novel Framework for Prioritizing Conservation and Research across Multiple Scales. *PLoS ONE 5(12): e15465. https://doi.org/10.1371/journal.pone.0015465*.

WWF-Philippines. (2005). *Turtle Islands Resources and Livelihoods Under Threat: A Case Study on the Philippines.* Quezon City: WWF-Philippines.

Yeh, F., Balazs , G., Parker, D., Ng, C., & Shi, H. (2014, 1). Novel use of satellite tracking as a forensic tool to determine foraging ground of a rescued green turtle (Chelonia mydas). . *Mar. Turt. Newsl.*