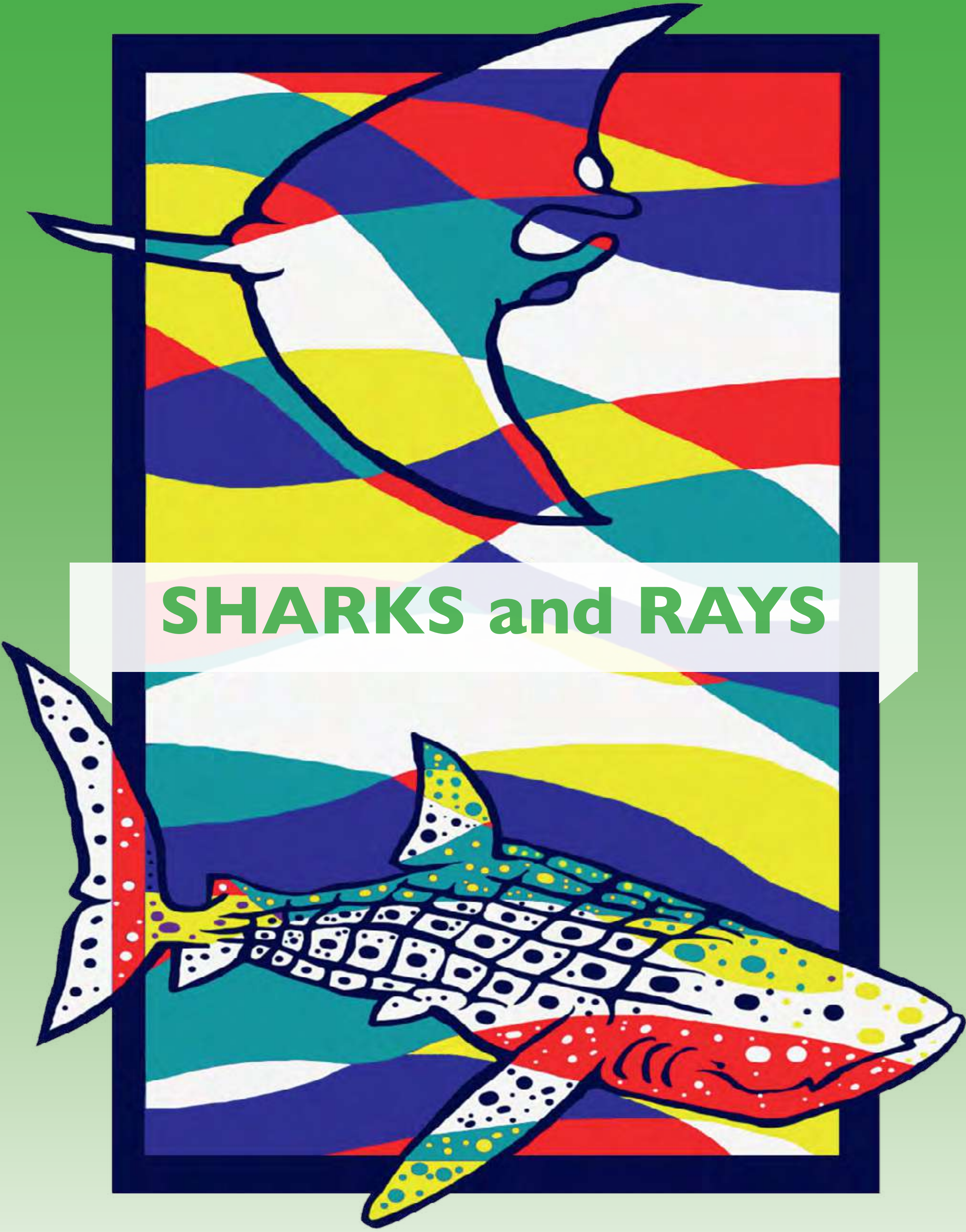
PHILIPPINE AQUATIC WILDLIFE RESCUE AND RESPONSE MANUAL SERIES



SHARKS and RAYS

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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

ACCCoast Adaptation to Climate Change in Coastal Areas

Marine Wildlife Watch of the Philippines

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Philippine Aquatic Wildlife Rescue and Response Manual Series: Sharks and Rays

A collaboration of the
Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR)
National Fisheries Research and Development Institute (NFRDI)
Marine Wildlife Watch of the Philippines (MWWP)
and the
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

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Preface

It is not unusual for coastal communities in the Philippines to encounter whale sharks that have stranded, or are entrapped and entangled in fishing gears. There have also been documented reports of net entanglement of manta rays and even the rare megamouth shark. These elasmobranchs (sharks, skates, and rays) are fish that can easily die when out of the water or asphyxsiate when entangled in nets. Mostly larger species are encountered as bycatch and strandings. Reports of such incidents have increased in number in the past few years. Some of these animals eventually die or are eaten in the coastal community due to the lack of knowledge on how to respond to these incidents properly.

The appropriate response to shark and ray incidents may include the release or salvage of the animal, proper documentation, and data collection. All these activities need to be organized and coordinated for the safety of both the animal and the responders, and to maximize collection of information for future research and conservation activities. This manual seeks to provide a standard operating procedure to deal with responders of shark and ray strandings with the goal of successfully releasing them back to the sea after every stranding or capture event.

About 200 elasmobranch and chimaera species could possibly occur in Philippine waters. Currently, there are 110 species confirmed to be present based on voucher specimens and photos (Compagno et al., 2005; Last and Gaudiano, 2011; Aquino et al., 2013; Ebert and Wilms, 2013; Last and Alava, 2013; Alava et al., in press). About 34 more species are reported present based on distributional information but which needs further confirmation on the ground while about 56 more are potentially new species needing to be described or new records in the Philippines pending taxonomic review (Alava et al., in press.). Of these species, only two are protected throughout the Philippines while the others in certain provinces only, e.g., eight in Palawan and all sharks in Cebu. Sharks and rays are susceptible to fishing pressures as they reproduce slowly unlike most other fishes. There is need to conserve their populations to preserve the integrity of our marine ecosystems.

This manual addresses goals and actions outlined in the Coral Triangle Initiative – National Plan of Action (CTI-NPOA), specifically Goal #5 which is to improve the monitoring of threatened species status in the region through Action 5.2, or the endorsement and implementation of the National Plan of Action for the Conservation and Management of Sharks and Other Cartilaginous Fishes (NPOA-Sharks). It also responds to the Sulu-Sulawesi Marine Ecoregion (SSME) Comprehensive Action Plan for Threatened, Charismatic, and Migratory Species. The Tri-National Committee of the SSME developed the Comprehensive Action Plans (CAP) that identified seven Key Result Areas (KRAs) to improve the status of sharks and rays in the SSME, as follows: (a) Develop and promote options and new conservation and management agreements for whale sharks and other CITES-listed species in the SSME; (b) Provide recommendations on the management of threatened pelagic migratory sharks and rays in overfishing or as bycatch in specific fisheries and fishing gear; (c) Promote conservation and management of endemic cartilaginous species (sharks and rays).

This manual is an important step to address gaps and issues on threatened marine wildlife in the Philippines in order to better protect and conserve marine biodiversity in the Coral Triangle.

Acknowledgment

This manual was made possible through the collaborative efforts of field practitioners and the generous support of local chief executives, the academic community, and private sector. We thank those who have been instrumental to the formation of the content of this publication: Bantay Dagat from the province of Batangas, Andrea Leonor Barcelona, Dr. Hilconida P. Calumpong, Christine Louise Emata, Nancy Ibuna, Jessie delos Reyes, Kitsie Torres, Romeo Trono, and Patricia Sorongon-Yap. Thanks also go out to those who contributed additional photographs: Jérôme Christophe Chladek, Jürgen Freund, Keith Lapuos, Steve de Neef, and Stewart Sy.

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List of Abbreviations

ACCCoast	Adaptation to Climate Change in Coastal Areas
ASEAN	Association of Southeast Asian Nations
BERT	Batangas Environment Response Team
BFAR	Bureau of Fisheries and Aquatic Resources
BFAR PFO	Bureau of Fisheries and Aquatic Resources Provincial Fishery Office
BRUMW	Bohol Rescue Unit for Marine Wildlife
C/M/B FARMC	City/Municipal/Barangay Fisheries and Aquatic Resource Management Council
CAO	City Agricultural Office
CAP	Comprehensive Action Plan
CBD	Convention on Biological Diversity
CCC	Coral Cay Conservation
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
cm	centimeter/s
CMARNET	Cebu Marine Animal Rescue Network
CMS	Convention on Migratory Species
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTI-NPOA	Coral Triangle Initiative-National Plan of Action
DA	Department of Agriculture
DENR	Department of Environment and Natural Resources
DNA	Deoxyribonucleic acid
DOH-RHU	Department of Health-Rural Health Unit
DOT-R10	Department of Tourism-Region 10
EB	Elasmobranch Form
ENSO	El Niño Southern Oscillation
EO	Executive Order
FAO	Fisheries Administrative Order
FIRST5	Fisheries Regional Emergency Stranding Response Team-Region 5
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
ID	Identification
KRA	Key Result Areas
LAMAVE	Large Marine Vertebrate Project
LGU	Local Government Unit
m	meter/s
MAO	Municipal Agricultural Office
MOA	Memorandum of Agreement
MWWP	Marine Wildlife Watch of the Philippines
NFRDI	National Fisheries Research and Development Institute
NGO	Not Government Organization
NPOA-Sharks	National Plan of Action-Sharks
P/C/M ENRO	Provincial/City/Municipal Environment and Natural Resources Office
PAWCZMS	Protected Area, Wildlife Coastal Zone and Management Services
PCA	Philippine Coconut Authority
PCG	Philippine Coast Guard
PCSD	Palawan Council for Sustainable Development
PN	Philippine Navy
PNM	Philippine National Museum
PNP-MG	Philippine National Police-Maritime Group
PO	People's Organization
PVSO	Provincial Veterinary Services Office
RA	Republic Act
RLECC	Regional Law Enforcement Coordinating Committee
SCUBA	Self-Contained Underwater Breathing Apparatus
SEAFDEC	Southeast Asian Fisheries Development Center
SSME	Sulu-Sulawesi Marine Ecoregion
SU-IEMS	Silliman University-Institute of Environmental and Marine Sciences
TDR	Temperature/Depth Recorder
TSRCP	Thresher Shark Research and Conservation Project
UNCLOS	United Nations Convention on the Law of the Sea
WWF-Philippines	World Wide Fund for Nature-Philippines

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Definition of Terms

Acclimatization – gradual, long-term response of an organism to changes in its environment.
Asphyxiation – suffocation from lack of oxygen.
Benthic –pertains to the bottom of the sea.
Bilobate – has two lobes.
Bycatch – accidental capture of a non-targeted species in fisheries whether retained and sold or discarded.
Cartilaginous – made of cartilage, a type of dense connective tissue. Cartilage is composed of cells called chondrocytes which are dispersed in a firm gel-like ground substance, called the matrix.
Caudal – at or near the tail or the posterior part of the body.
Cephalopods – any mollusk of the class Cephalopoda, having tentacles attached to the head, such as the cuttlefish, squid, and octopus.
Dorsal – with reference to the upper or top part of the animal.
Dorsoventral – pertaining to the dorsal and ventral aspects of the body.
Fecundity – the actual reproductive rate of an organism or population.
Friable – easily crumbled.
Fusiform – spindle-shaped; rounded and tapering from the middle toward each end.
Lateral – with reference the side of the animal.
Melanistic – characterized by dark-colored pigment melanin in the skin.
Metabolites – A metabolite is any substance produced during metabolism (digestion or other bodily chemical processes).
Monotypic – including a single representative —used of a genus with only one species.
Nictitating membrane – a thin, tough membrane or inner eyelid in the eye of many species of sharks. This membrane covers the eye to protect it from damage, especially just prior to a feeding event where the prey may inflict damage while trying to protect itself.
Osmoregulation – the process by which cells and simple organisms maintain fluid and electrolyte balance with their surroundings.
Osmotic – having the property to diffuse fluids through membranes or porous partitions.
Oviparity – expulsion of undeveloped eggs rather than live young (egg laying).
Ovovivipary – embryos develop inside eggs that are retained within the mother's body until they are hatched and expelled live.
Pelagic – pertains to the surface and water column in the sea (not benthic).
Release – the act of bringing an animal back to its natural habitat.
Rescue – to free or deliver an animal from confinement, danger, or a situation that is not normal.
Response – to act on a report of a marine wildlife incident.
Rostral – situated or occurring near the front end of the body.
Rostrum/Rostra – mouth of an elasmobranch.
Subterminal – located just below the end.
Terminal – located at the end.
Ventral – underside, bottom part of the animal.
Viviparity – retention and growth of the fertilized egg within the maternal body until the young animal, as a larva or newborn, is capable of independent existence (live birth).
Voucher specimen - preserved whole animal kept for future reference.

Overview of the Manual

Rationale

Since the protection of the whale shark and the manta ray was in place in 1998, coastal communities have become more aware of the plight of these animals. Their popularization as tourism attractions, particularly the whale shark, contributed to this further. Whale shark bycatch and strandings would normally result to the animal being slaughtered. However, there have been successful rescues of whale sharks recently.

Of the 27 whale shark incidents reported from 2003 to 2010, 11 were strandings with more than half dead or were dying animals. Three were alive and released successfully, the fate of the rest is unknown. The ones recovered revealed garbage in the gut which may have or have not contributed to the death of the animal.

Protocols for a rescue response for sharks and rays are largely based on marine mammals stranding response, but with more incidents involving sharks and rays, it is necessary to develop specific protocols for them. Response protocols are intended to support the protection of these species under the Fisheries Code (Republic Act No. 8550) and related Fisheries Administrative Orders (FAO) in an attempt to improve on the conservation and management of aquatic resources in the Philippines. There is also a need to develop standard research and monitoring protocols for threatened populations and habitats.

This manual aims to establish, enhance, and standardize stranding response protocols for sharks and rays in the country. Lessons learned from actual experiences of responders on field have been collected and included in this manual to provide users with tried and tested techniques to effectively rescue and release stranded or accidentally captured sharks and rays in the country.

Purpose

The purpose of this manual is to provide understandable, step-by-step instructions to coastal resource managers and communities whenever they encounter sharks and rays that need to be rescued or salvaged. This will also serve as the official manual in support of capacity-building programs of the Department of Agriculture (DA).

Considering the species covered by this manual are threatened and protected, this publication will strengthen the implementation of relevant local and national policies and supports international commitments especially with the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Migratory Species (CMS), and Convention on Biological Diversity (CBD). Furthermore, this manual serves as a tool that can add to the scientific knowledge on sharks and rays in the country when properly documented. It also ensures that the response is carried out safely for both shark or ray and the rescue team.

Scope

This manual gives more attention to whale sharks as most reported stranding occurrences and experiences of field practitioners in the Philippines commonly involve this species. Some modifications have been made for responding to manta rays (*Manta* sp.) and devil rays (*Mobula* sp.), as these have also been reported occasionally. It is viewed that the procedures are applicable to most other sharks, skates, and rays as they generally share the same anatomy.

The manual begins with discussions on biology and ecology of sharks and rays, relevant conservation measures in the Philippines, as well as past and current research.

The main content outlines step-by-step, illustrated, and easy-to-follow procedures to be used by immediate responders at the site. Illustrations are not drawn to scale except those indicated.

The last chapters deal with necropsy procedures and data collection. It is strongly advised that the users implementing that portion of the manual have a background on shark and ray anatomy and physiology.

Inset boxes are color-coded to signify: policy (blue), procedural emphasis (red), and biological explanations (yellow).

policy

procedural emphasis

biological explanations

Other concerns such as data management, tissue bank, sample repository, training program (rescue team, design, and program), response team accreditation, and stranding network organization are not addressed in this manual. These are currently being considered for future steps to be undertaken.

Finally, this rescue and response manual does not cover enforcement procedures and other legal protocols. It is best to contact law enforcers in matters involving enforcement issues.

Target Users

This manual is intended for the use of individuals and communities in the field who encounter sharks and rays in need of a response. It is preferred that these individuals and groups be trained and certified by the Department of Agriculture. Whenever these incidents occur, it is recommended that the mandated agency be contacted immediately to supervise the response.

CHAPTER 1: INTRODUCTION TO SHARKS AND RAYS

TAXONOMY

The class Chondrichthyes or cartilaginous fishes are primitive vertebrates that are gill-breathing, with fins and have fish-like jaws (Compagno, 2001). Sharks, skates, and rays belong to this group and are collectively called elasmobranchs. They are closely related to chimaeras or ghost sharks and can be differentiated by the absence of a soft gill opening or operculum. Sharks have a fusiform body while skates and rays are characterized by their dorso-ventrally flattened bodies and enlarged pectoral fins fused to the head, which give them the appearance of being "wing-like" (Fig. 1). Skates and rays are also called batoid fish, and look very similar but can be distinguished from the other as skates have a bilobate pelvic fin.

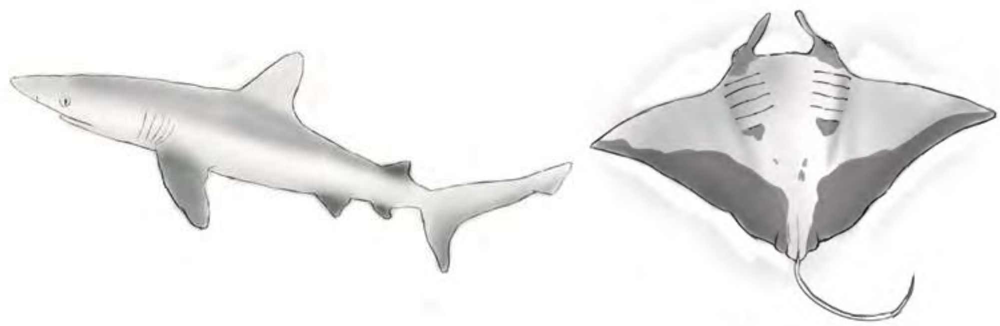


Figure 1 Examples of shark (left) and ray (right) body forms rays.

BIOLOGY

The life histories of sharks and rays are generally characterized by slow growth, late maturity, low fecundity, and long life (Branstetter, 1993). Embryonic development involves considerable maternal investment to produce fully-developed young and follows three main patterns: (1) development of young within egg cases that are laid and left to hatch (oviparity, the primitive type), (2) the attachment of the embryo by a placenta (placental viviparity), or (3) development of unattached embryo in the uterus with energy supplied from a large egg yolk (ovoviviparity). The latter is the most common form of reproduction at present. Litter size in most species is usually between two to 20 pups, although a female whale shark was documented to carry as many as 300 pups. One major difference between rays and skates is in their reproductive strategy. Rays are live-bearing or viviparous while skates are egg-laying or oviparous. Eggs of skates are encapsulated in hard casing when released.

The body of a shark can be divided into three main parts: (1) the head, which is from the snout to the gill openings, (2) the trunk, which covers the pectoral fin all the way to the pelvic fin area, and (3) the tail section, from the pelvic fin area to the pre-caudal peduncle (Fig. 2). Rays have a wing-like shape, sometimes pointed at the tip or entirely circular or ovate in shape. External features are shown and labeled in Figure 3 for ease of identification of body parts. These terms will be used throughout this manual.

Shark and ray skin is covered with modified scales called dermal denticles. These are hardened structures similar to the composition of teeth with an enamel coating giving the skin its characteristic roughness. The interlocking denticles provide protection as well as help decrease drag and turbulence while swimming. Like most bony fishes, shark and ray skin is also covered with a mucous layer, which functions in osmoregulation, protection from pathogens, and also reduction of drag.

Respiration or breathing is similar to that in bony fishes which is facilitated by the gills (Fig. 2 and 3). The structure inside the gill slits (usually 5 in number, except for a few species) includes a cartilaginous gill arch which supports the gill filaments (organs where oxygen absorption takes place) and the gill rakers (projections that are used for food entrapment). Sharks and rays adapt two methods of passing water through the gills: buccal pumping and ram ventilation. Buccal pumping, as its name suggests, involves the muscular movement of the cheeks. Water rich in oxygen is taken into the mouth and pumped over the gill arches and out the gill slits. With this method, the animal could be stationary or stay on the bottom. Ram ventilation, on the other hand, requires constant swimming in order for oxygen-rich water to flow through the mouth and the gills. Some species can switch from one breathing method to another while others are more obligate ram ventilators. The gills are important to the overall health of sharks and rays – a fact that should be kept in mind when responding to stranding incidents.

Unlike bony fishes that have swim bladders, sharks and rays maintain buoyancy in the water by controlling the balance of water and solutes (salt and urea) in their body in a process called osmoregulation. This process takes place primarily at the gills, as well as in the kidney, and rectal gland (Hammerschlag, 2006). The oily liver, which takes up a large portion of the abdominal cavity and up to 25% of the animal's weight, is also used to keep the animal buoyant.

Sharks and rays are mostly predatory, feeding on a range of prey from planktonic crustaceans, benthic invertebrates, pelagic cephalopods, bony fishes, other smaller cartilaginous fishes, and even marine mammals. There are some species that are bottom-dwelling scavengers. A lot of the shark species are considered apex predators in the aquatic ecosystem. Interestingly, some of the world's largest sharks and rays are filter-feeders that feed on plankton and small fishes. Examples of these are the megamouth shark, basking shark, manta rays, and whale shark. These filter-feeders with their massive mouths have tiny teeth which have no use in feeding but instead have gill rakers to filter out food particles from the water.

Sharks and rays utilize a lot of sensors to pick up cues from the environment: water vibrations and pressure are sensed through the lateral lines along the length of the body and the head region, which has a network of electric field receptors called the ampullae of Lorenzini. They also have acute sense of scent and sight. The organs used are very sensitive to stimuli and should be considered when handling animals.

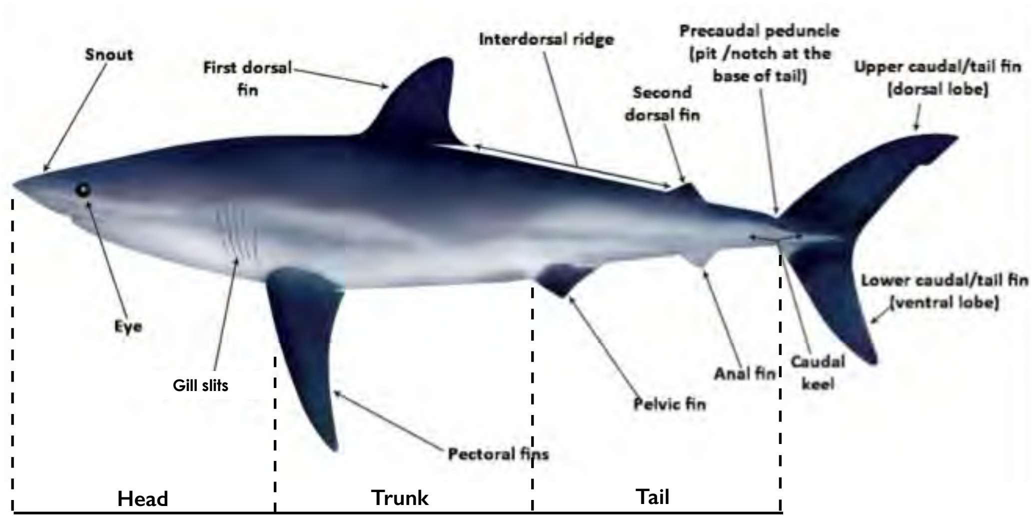


Figure 2 Parts of a shark, lateral profile.

Figure 3 Parts of a ray, dorsal (top) and ventral (bottom).

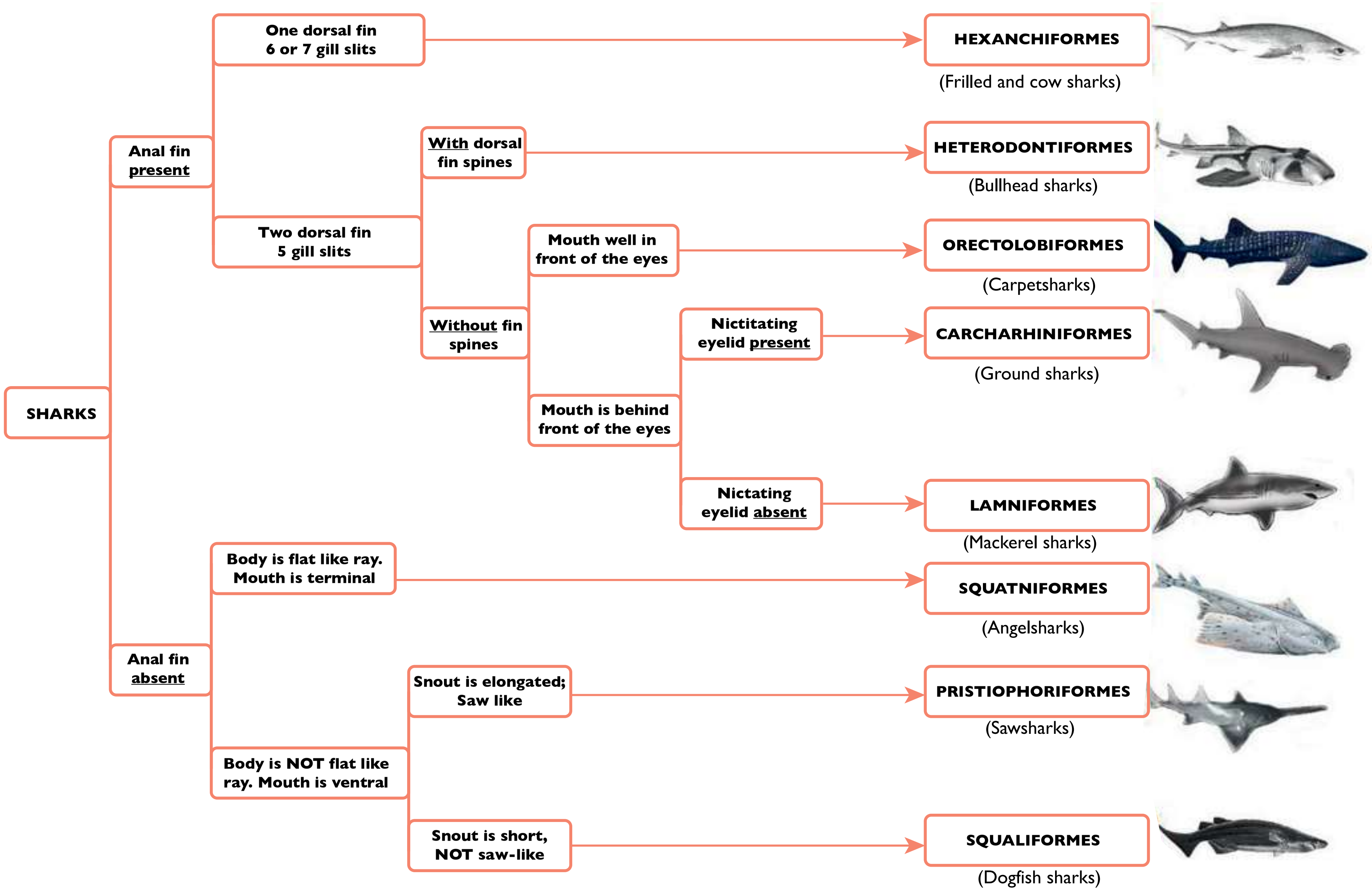


Figure 4 Differentiation of sharks according to body form (some images are modified from Ebert et al., 2013).

SPECIES IDENTIFICATION

Sharks and rays are among the most diverse and oldest surviving taxa of marine fauna existing across a wide habitat range. Most species live in marine environments but a few have adapted to freshwater (Last and Stevens, 1994). According to Ferretti et al. (2010), most marine species inhabit continental shelves, although, there are a few shark species that are fully oceanic (e.g., blue shark, oceanic whitetip shark, mako shark) and some that migrate between oceanic and coastal waters (e.g., hammerhead sharks, silky shark, tiger shark, white shark). Only a few sharks, including the whale shark and many commercially important species are known to make oceanic migrations (Camhi et al., 1998).

Body forms vary among sharks, rays, and skates, and have been used to identify the species. Figure 4 illustrates this in a simple guide for sharks that will make identification easier using key external physical features of the animal.

In the Philippines, there are at least 60 species of sharks, 32 species of rays, and one species of skate. Annex 1 comprehensively describes some of these species for proper identification.

In this manual, special attention is given to the whale shark and manta rays because of their economic importance to tourism, the historical fishery impact on their respective populations, and their frequent stranding occurrences. The megamouth shark is also mentioned as the Philippines ranks second to Japan with the most number of bycatch and stranding records in the world. All these species are pelagic, obligate ram ventilators, and filter-feeders. These animals need to swim constantly to create hydrodynamic lift, to aid respiration, and to circulate body fluids (Gendron Menzies, 2004), an important consideration in a stranding/bycatch incident.

WHALE SHARK *(Rhincodon typus)*

The whale shark is the largest fish. One of the largest whale sharks recorded, reportedly from the Taiwanese fishery in 1987, measured 20 m and 34 tons in mass (Chen et al., 1997) as seen in Figure 5. Most of the whale sharks found in the Philippines have lengths of five to seven meters, meaning they are juveniles as sexually mature individuals are eight to nine meters long, at around 20 to 25 years of age. The smallest whale shark in the world was found in Bicol waters at 0.46m in length. The whale shark has a distinguishable checkerboard and spots pattern on its body except in the ventral side. Another distinguishing feature of the whale shark would be its terminally located mouth. They are found throughout

Figure 5 A whale shark

the Philippines with a number of feeding aggregations near the coast, such as the Ticao/Burias Pass, Bohol/Mindanao Sea, and Puerto Princesa Bay. These feeding aggregation sites are the location of a lucrative whale shark interaction tourism enterprise.

MANTA RAYS AND MOBULID RAYS (DEVIL RAYS)

The manta ray is the largest of the batoid fishes. It iseasily distinguishable from other batoid fishes by its pair of cephalic fins. Unlike mobula rays that which subterminal mouths located on the underside of the head, the manta ray's mouth is terminal and is found at the edge where the dorsal and ventral aspects of the body meet as seen in Figure 6.

Figure 6 Mouth position of manta (left) and mobula rays (right).

The genus Manta was previously considered monotypic having only one species, the giant manta ray (*Manta birostris*) until a published study by Marshall et al. (2009) placed a similar looking ray, the reef manta ray, which had been described as early as 1906 (Stead, 1906) as another species, *M. alfredi*. Due to the taxonomic confusion, no previous records of *M. alfredi* existed in the Philippines before 2010. This is why FAO 193 only protects *M. birostris*.

In 1996, a photograph of *M. alfredi* that was supposedly submitted to Fishbase had been initially identified as *M. birostris*. It was corrected by MacEachran in 2010 (Froese and Pauly, 2013). This photograph was also verified as having been taken at Tubbataha Reefs Natural Park (Aquino et al., 2013).

The two manta ray species can be differentiated using external physical attributes. The occurrences of melanistic morphs (e.g., black and white variations) are not absolute characteristics for identification purposes. In any case, one or more of the more common features (Fig. 7) of the *M. alfredi* may be used:

1. Absence of a stinging spine near the tail base (some may retain a small bump but no stinging spine can be found inside)
2. Presence of black spots in between the left and right columns of gill slits
3. Presence of black pattern on the posterolateral aspect of the last gill slits that is limited to only a fraction of the gill length and appears to be anchored to its lateral end
4. Presence of Y-shaped shoulder patch

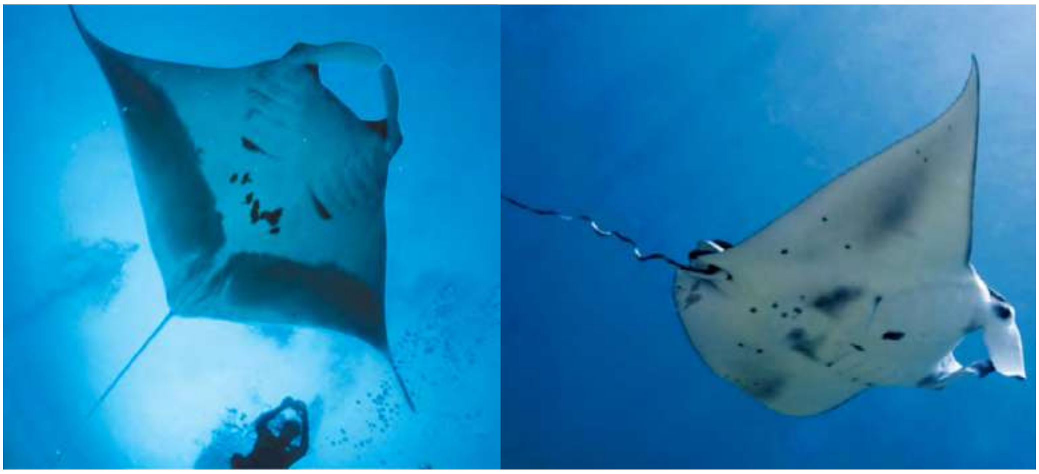


Figure 7 *Manta birostris* (left) Photo credit: K Lapuos; *Manta alfredi* (right) Photo credit: S Sy.

Males have two claspers found under the pelvic fins. It may be difficult to determine the sex externally in juveniles. It is only when they mature that claspers extend beyond the fins, making sex distinguishable (www.mantamatcher.org; www.mantatrust.org). Mobula rays are less studied species and there are five recognized species in the Philippines. Note that mobula rays are not protected in the Philippines, hence differentiation from the mantas is necessary. The species are listed below:

- *Mobula eregoodootenkee* (longfin devilray)
- *Mobula japanica* (spinetail devilray)
- *Mobula kuhlii* (shortfin devilray)
- *Mobula tarapacana* (sicklefin devil ray)
- *Mobula thurstoni* (smoothtail mobula)

MEGAMOUTH SHARK *(Megachasma pelagios)*

Reaching a length of more than 5m, the megamouth shark is the world's third largest fish next to the whale shark and basking shark (Fig 8). The species is wide-ranging and is recorded to occur in depths between 15 to 150m. The megamouth shark is one of the rarest sharks in the world with only 63 records since the first specimen was recovered in 1976. Fourteen of those incidences were reported from the Philippines as strandings or as bycatch.

Figure 8 A megamouth shark that was netted in Cagayan de Oro in 2014. Photo credit: MR Labajan

THREATS

Fishery and Fishery Bycatch

In the Philippines, shark fisheries started out in small numbers and only for subsistence. However, the Philippines started supplying the growing international market for shark meat, skin, and fins beginning in the 1960s. From 1990 to 1997, four primary fishing sites in the Bohol Sea supplied the Taiwanese market with a total of almost 800 whale sharks. By 1993, a sharp decline in fish catch was observed, with catches averaging 27% less per year in subsequent years (Alava et al., 2002; WWF-Philippines, 2007). This was attributed to unregulated fisheries. Whale shark fisheries stopped after a total ban on the capture and trade of whale sharks (FAO 193) although isolated reports of poaching still occur. Manta and mobulid rays continue to be hunted in the Philippines despite the protection of the former. Various nets and gears, such as the 'lambaklad,' have been implicated in the capture of rays.

Bycatch is listed as a major threat to 102 out of 118 (86%) globally threatened sharks and rays (Žydelis et al., 2008). Bycatch of whale sharks in the early 1990s were caused mainly by entrapment in fish corrals and, to a lesser extent, by net entanglement. Incomplete records from 2003 to 2010 with 27 incidents involving whale sharks show half involved fishing gear. According to the Butanding Network of the Philippines, those associated with fish corrals ended in the successful release if the animal is still alive (www.butandingnetwork.net).

Fourteen megamouth sharks have been reported in the Philippines since 1998 most of which was bycatch in fishing net. One case in Tubay, Agusan del Norte was released after it got caught in a net on 23 June 2014. The other reported incidents were of megamouth sharks that washed ashore dead or died during entanglement. In some cases, these were consumed.

Manta rays have been reported to have fishing hook and line snagged in its wings and body. These can imbed in the tissue that could cause serious injuries. Although rays would not bite on a baited fishing line, other sharks would and have been caught. There are also three incidents in the Philippines of whale sharks entering the insides of a pillared port. They were probably following food fish attracted to the inside of the port by strong lights. Once inside, the whale sharks were unable to get out. For the three cases documented, the animals were released successfully.

Boat Strikes

There is a record of a whale shark caught in a cargo ship's icebreaker in Cebu in 2008 which is considered a boat strike mortality. Monitoring of whale sharks in tourism sites also reveal that a majority of the animals exhibit propeller cuts and scars on the body and fins (Ponzo, pers. comm.). Whale sharks and other filter feeding sharks that forage near the surface are highly susceptible to boat accidents.

Figure 9 Propeller cuts on the eye of a whale shark due to boat strike. Photo credit: Physalus-LAMAVE

In 2011, fishermen in the municipality of Oslob, Cebu started to feed whale sharks for tourism purposes, resulting in animals constantly approaching boats for food. The following year, a whale shark frequenting the waters of Oslob showed up with propeller cuts through its eye (Fig. 9), an injury believed by researchers to have occurred as a consequence of the provisioning (www.lamave.org).

Poorly managed tourism and unsustainable tourism practices

As the case with the propeller cuts on a whale shark in Oslob, Cebu, it may be a significant problem and highly likely to occur again if behavioral changes are not addressed. Additionally, tourist non-compliance to the code of conduct for whale shark interaction was found to have significant effects on whale shark swimming behavior. Numerous predictors of behavioral change were noted during a study of whale sharks in the Philippines and Belize (Quiros, 2007). This may lead to displacement of the animal from their feeding area and migration route.

Marine Debris

Marine debris is another major threat to sharks and rays, especially to filter-feeders, as these may be ingested accidently during feeding. In two whale shark stranding cases, in Manila Bay (2009) and the other in Ilog, Negros Oriental (2011), respective necropsies revealed plastic materials in their stomachs as shown in Figure 10 (Santos pers. comm.; Chladek pers. comm.). It is highly possible that future necropsies will show similar results if the use and disposal of plastics will continue unregulated.

Figure 10 Whale shark stomach content reveal plastic ingestion. (Photo credit: J Chladek)

Climate Change Impacts

There are no actual studies regarding the effects of climate change on whale sharks and other sharks and rays. However, using prediction models, Chin and Kyne (2007) were able to illustrate the vulnerability of chondrichthyan fishes in the Great Barrier Reef to climate change. The study assessed the exposure, sensitivity, and inadaptability of these animals in relation to ten direct and indirect climate change drivers deemed most likely to affect the taxa in the next 100 years. Direct climate change drivers include sea and air temperature rise, ocean acidification, and freshwater input due to rainfall and salinity variability. Indirect climate change drivers include changes in currents and upwelling linked to El Niño Southern Oscillation (ENSO) and severe weather conditions such as more frequent storms and cyclones with greater intensities.

Direct drivers affect the physiology of sharks and rays resulting in possible changes in metabolism, energetic costs and requirements, behavior, and movement patterns. Indirect drivers affect the condition and vulnerability of critical habitats or may alter ecological processes, such as the alteration of habitats crucial for shelter, foraging, nursing and changes in biological productivity and prey availability.

Many sharks are able to tolerate a wide range of environmental conditions. They are able to live in a variety of habitats, ranging from inland waters all the way to pelagic environments. In terms of vulnerability to climate change drivers, freshwater and estuarine groups are most vulnerable, while the open pelagic species rank least vulnerable. Within each group, however, the respective species' adaptive capacities vary as well as their respective vulnerabilities to climate change drivers. In the freshwater and estuarine group, rare species with high habitat and trophic specificity or preference are most vulnerable (e.g., stingrays). In pelagic waters, relatively rare, plankton feeders such as the whale shark and the devil rays are considered most vulnerable.

LEGAL FRAMEWORK FOR CONSERVATION

In 2009, the Department of Agriculture Bureau of Fisheries and Aquatic Resources (DA-BFAR) and the National Fisheries Research and Development Institute (DA-NFRDI) published the National Plan of Action for the Conservation and Management of Sharks in the Philippines (NPOA-Sharks). It provides a list of legal and management instruments for sharks (including skates and rays) among several binding international treaties (e.g., CMS, CBD, CITES, UNCLOS), regional treaties (e.g., ASEAN Agreement on the Conservation of Nature and Natural Resources), and non-binding management tools (e.g., International Union for the Conservation of Nature or IUCN).

Only national laws and local ordinances are acknowledged as direct protective measures for sharks and rays in the Philippines. The most important is the Philippine Fisheries Code (RA 8550) of 1998 which covers all aquatic species, except the dugong and marine turtles which are under the Department of Environment and Natural Resources. The Fisheries Code states:

> Section 11: to take conservation and rehabilitation measures for rare, threatened, and endangered species, as it may determine, and ban the fishing and/or taking of rare, threatened, and/or endangered species, including their eggs/offspring as identified by existing laws in concurrence with concerned government agencies.

Fisheries Administrative Order (FAO) No. 193, series of 1998, was the catalyst in the protection of sharks and rays, primarily whale sharks and the giant manta ray:

> Ban on the taking or catching, selling, purchasing and possessing, transporting and exporting of whale sharks and manta rays whether dead or alive, in any state or form whether raw or processed. When these species are accidentally taken as by-catch in gears targeting other species, they shall be immediately released without harm. In cases of stranding, these species shall be reported or surrendered to the nearest DA Regional Field Unit or Bureau of Fisheries Regional or Provincial Fishery Office for proper response.

Local initiatives have also been enacted with the similar goal of conserving and protecting shark and ray species. An example of this is the declaration of Donsol's municipal waters as a protected area for whale sharks through a Municipal Resolution No. 1, series of 1998 which was enacted in March that year. The same municipality enacted Ordinance No. 1-98 to totally ban whale shark fisheries within the territorial waters of the municipality, even before a national FAO. Other species are also protected in the Palawan province under the Palawan Council for Sustainable Development (PCSD) through Resolution Number 10-413, pursuant to the Philippine Wildlife Act classifying sharks and rays as vulnerable and near threatened, except for the whale shark which is classified as endangered (Table 1). The Philippine Wildlife Act (RA 9147) states:

> to protect the country's fauna from illicit trade, abuse, and destruction, through (1) conserving and protecting wildlife species and their habitats, (2) regulating the collection and trade of wildlife, (3) pursuing, with due regard to the national interest, the Philippine commitment to international conventions, protection of wildlife and their habitats, and (4) initiating or supporting scientific studies on the conservation of biological diversity.

The province of Cebu also declared the common thresher shark (*Alopias vulpinus*) protected in all its municipalities through Cebu Provincial Resolution No. 691-2012/ Ordinance No. 2012-05. The Resolution also includes the giant manta ray (*M. birostris*) and whale shark under its protection. In August 2014, the Cebu Provincial Board approved an amended version of Ordinance No. 2012-05 protecting all species of sharks in Cebu waters. The Resolution states that:

> It shall be unlawful to fish or take, possess, transport, deal in, sell or in any manner dispose of any shark species.

Due to reported poaching incidents on whale sharks, the Philippine Government issued Administrative Order No. 282 of 2010 which intensifies the protection of the whale shark in the Philippines. This AO encompasses key guidelines for monitoring and rescuing whale sharks, as well as penalties for violators, and a reward system to informants. Unfortunately, this law has not been fully implemented.

CITES provides measures to regulate the international trade of species listed in its Appendices. Table 1 shows all shark and ray species with some form of protection and trade regulation in the Philippines.

Table 1. List of protected and CITES-listed shark and ray species in the Philippines.*

	Common Name	Scientific Name	Legal Basis
1	blue-spotted ribbontail stingray	*Taeniura lymma*	PCSD Res. No. 10-413
2	reef manta ray	*Manta alfredi*	CITES Appendix II
3	giant manta ray	*Manta birostris*	CITES Appendix II, RA 8550, FAO 193
4	knifetooth sawfish	*Anoxypristis cuspidata*	CITES Appendix I
5	largetooth sawfish, freshwater sawfish	*Pristis pristis*	CITES Appendix I
6	green sawfish	*Pristis zijsron*	CITES Appendix I
7	white-spotted giant guitarfish	*Rhynchobatus australiae*	PCSD Res. No. 10-413
8	gray reef shark	*Carcharhinus amblyrhynchos*	PCSD Res. No. 10-413
9	oceanic whitetip shark	*Carcharhinus longimanus*	CITES Appendix II, PCSD Res. No. 10-413
10	blacktip reef shark	*Carcharhinus melanopterus*	PCSD Res. No. 10-413
11	tiger shark	*Galeocerdo cuvier*	PCSD Res. No. 10-413
12	whitetip reef shark	*Triaenodon obesus*	PCSD Res. No. 10-413
13	tawny nurse shark	*Nebrius ferrugineus*	PCSD Res. No. 10-413
14	great white shark	*Carcharodon carcharias*	CITES Appendix II
15	whale shark	*Rhincodon typus*	CITES Appendix II, RA 8550, FAO 193, AO 282, PCSD Res. No. 10-413, Donsol Municipal Resolution No. 1, series of 1998
16	scalloped hammerhead shark	*Sphyrna lewini*	CITES Appendix II
17	great hammerhead shark	*Sphyrna mokkaran*	CITES Appendix II
18	smooth hammerhead shark	*Sphyrna zygaena*	CITES Appendix II
19	leopard shark or zebra shark	*Stegostoma fasciatum*	PCSD Res. No. 10-413

*Note: All shark species in Cebu are protected under Cebu Provincial Resolution No. 691-2012/Ordinance No. 2012-05.

CHAPTER 2: SHARK AND RAY RESEARCH AND STRANDING NETWORK IN THE PHILIPPINES

RESEARCH ON PHILIPPINE SHARKS AND RAYS

Biologocial studies of sharks and rays are very limited. Those that are available were focused on fisheries and trade (Alava et al., 2002), animal movement using satellite tags (Eckert et al., 2002), and tourism compliance to interaction guidelines with animal behavioral study (Pine et al., 2007; Quiros, 2007). In 1997, Alava et al. (2002) conducted a study on the catch volume and trade of the whale shark and manta ray fisheries of Bohol Sea. In 1998, WWF-Philippines started working with the municipality of Donsol to establish whale shark interaction tourism in the area. However, it was only in 2007, that they began a scientific study of whale sharks in Donsol through photo-identification and satellite tagging with the help of WWF-Denmark. Since then, their research has expanded to include studies on plankton, physico-chemical parameters, and genetics.

Other shark and ray studies include the Elasmobranch Biodiversity and Conservation Project undertaken by WWF-Philippines in 2000 in collaboration with the Silliman University Institute of Environmental and Marine Sciences (SU-IEMS), DA-BFAR-NFRDI, and with the participation of various research and academic institutions in the country. Project activities included training on elasmobranch taxonomy and biology, species data collection and analysis, field surveys, and fishery assessments of selected markets and landing sites. Trainings and specialist workshops were conducted with global elasmobranch experts Dr. Peter Last and Dr. John Stevens of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Dr. Leonard Compagno of the Shark Research Center at the South African Museum. Voucher specimens were subsequently deposited in the SU-IEMS Museum (Fig. 11) and the Philippine National Museum (PNM) while tissue samples were equally shared with BFAR-NFRDI. Until its termination in 2001, this project was probably the first and most comprehensive elasmobranch research conducted in the country, with over 50 species found to be new records to the Philippines and/or to science (Compagno et al., 2005). Part of the tissue collection was later used for molecular analysis by Dr. Gavin Naylor of the Medical University of South Carolina for studies on the evolutionary relationships of sharks, skates, and rays (Naylor et al., 2012).

Figure 11 Museum specimens at Silliman University Institute of Environmental and Marine Sciences. Photo credit: J Utzurrum

Photo-identification surveys of whale sharks were also carried out in Sogod Bay, southern Leyte by Coral Cay Conservation (CCC) Philippines from 2006 to 2007. In 2010, Physalus, through its Large Marine Vertebrates (LAMAVE) Project, commenced whale shark photo-identification research in northern Bohol. They later expanded the survey in 2012 to cover Oslob, southern Cebu and southern Leyte. Tissue collection for genetics, behavioral observations, and deployment of archival Temperature/Depth Recorder (TDR) tags on whale sharks were included in their study scope.

Soliman and Burce (2012) conducted a coastal habitat study and fisheries assessment in the Donsol Marine Conservation Park and observed whale sharks swimming along the same path as sardines. This finding raised concerns that the overlap between whale shark aggregations and sardine fishing grounds could harm the local community-based tourism industry. The study identified the need for the management harmonization of the sardines fisheries and tourism industries to ensure the survival of whale sharks and the sustainability of local fisheries.

Figure 12 Screenshot of the Butanding Network website which aims to help disseminate information on whale sharks to the public.

Information, education, and communication campaigns have also been undertaken via the website www.butandingnetwork.net created by Elson Aca in 2009 through a grant from Duke University Center for Marine Conservation (Fig. 12). The website aims to promote awareness of whale sharks in the Philippines and involve stakeholders in the protection of whale sharks. It provides access to news, reports, presentations, and publications on whale sharks in the Philippines and features a downloadable stranding report form.

In the same year, the Thresher Shark Research and Conservation Project (TSRCP) began in Malapascua, Cebu. Pelagic thresher sharks (*A. pelagicus*) have been observed to visit Monad Shoal eight kilometers away from Malapascua, Cebu for the past two decades and their associations with cleaner wrasse has been implied as the cause for occurrence in these shallow waters (Oliver et al., 2011).

On the other hand, manta and mobulid rays catch surveys have been carried out by NGOs (Balyena.org, Manta Trust, and Physalus-LAMAVE) and the DA-BFAR-NFRDI (Rayos et al., 2012), respectively. Monitoring and a three-month rapid resource assessment (in the case of BFAR-NFRDI) were based in Bohol.

SHARK AND RAY STRANDING NETWORK IN THE PHILIPPINES

The interest on shark and ray stranding response is a derivative of the marine mammal stranding network from the early 1990s. Trainings on stranding response conducted by Marine Wildlife Watch of the Philippines (MWWP), Balyena.org, Butandingnetwork.net, and Physalus-LAMAVE include whale shark rescue in the program. Communities and line agencies have been quick to respond to whale shark entrapment with high success in release even without prior training or standardized protocols.

Cetacean and whale shark stranding occurrences had been more frequent and regular, prompting BFAR in the Bicol Region to form its BFAR-Fisheries Regional Emergency Stranding Response Team-Region 5 (FIRST5). This group actively monitors and responds to stranding incidences in the region. BFAR-FIRST5's structure and composition was adopted from the Philippine Marine Mammal National Stranding Network (Fig. 13).

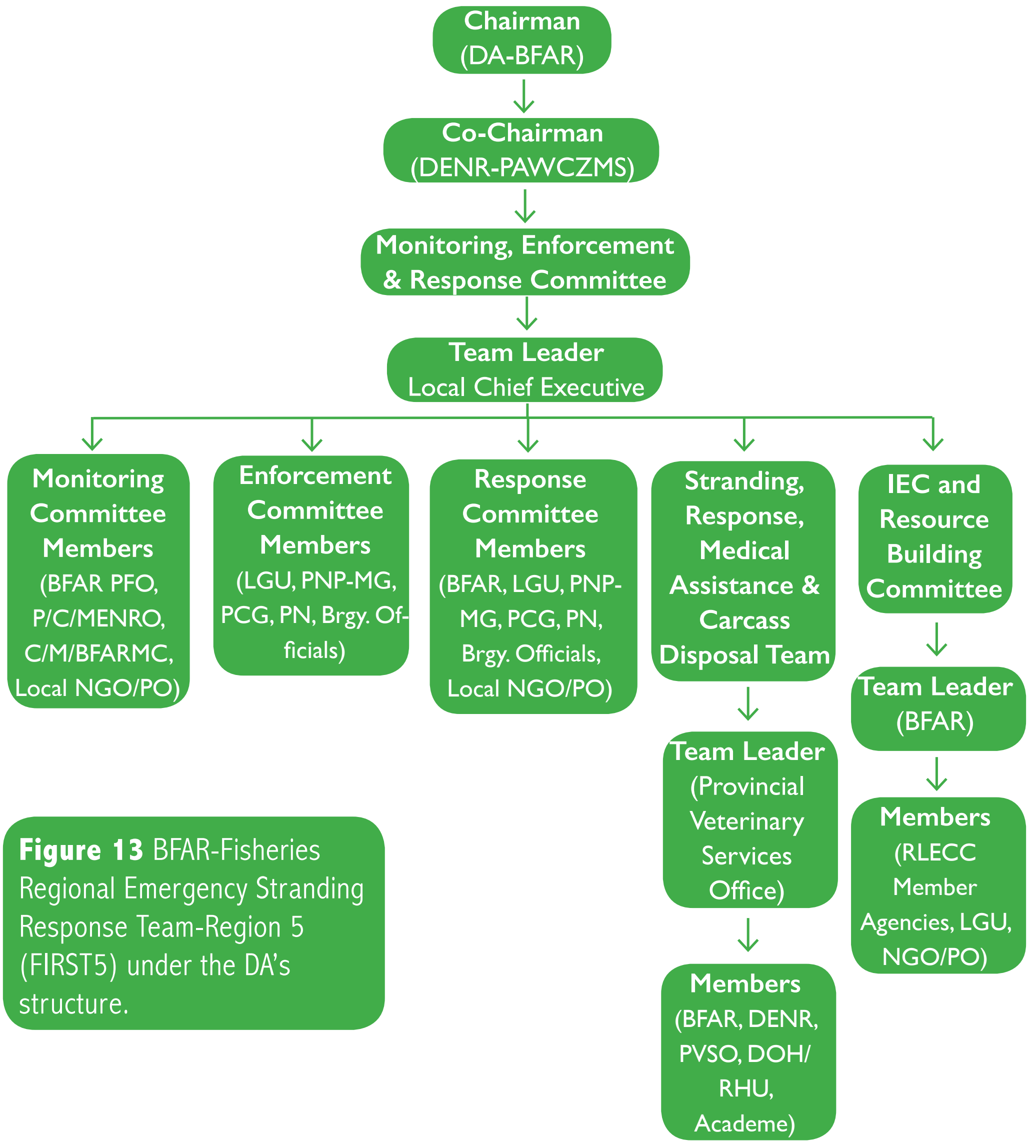


Figure 13 BFAR-Fisheries Regional Emergency Stranding Response Team-Region 5 (FIRST5) under the DA's structure.

Response networks have likewise been created by provincial governments through the creation of an Executive Order (EO). Some examples are:

- La Union Baywaytch. The La Union Baywatch was established through Provincial Executive Order 011 series of 2009, providing for the revival and strengthening of the La Union Baywatch with corresponding amendments for more effective implementation.
- Batangas Environment Response Team (BERT). BERT was established through Provincial EO 2011-02.
- Bohol Rescue Unit for Marine Wildlife (BRUMW). BRUMW was initially created through an EO in 2000 to respond to marine mammal strandings. It was later amended in 2012 to include other marine wildlife such as sharks and rays.

Non-formal groups are networks initiated by the government agencies with non-government organizations, private corporations, individuals, and others, through a Memorandum of Agreement or other instruments. Some examples include:

- Mindanao Marine Wildlife Watch was founded by the Department of Tourism (DOT-R10) in 1996 for LGUs in the provinces of Misamis Oriental and Camiguin specific for the conservation and management of whale sharks.
- Palawan Marine Wildlife Rescue Society was created in 1997 to respond to marine mammals and marine turtles and expanded in 2002 to include whale sharks and other marine wildlife.
- Cebu Marine Animal Stranding Network (CEMARNET) was established in 2010 by a MOA and brings together government, NGOs, and members of the private sector willing to respond to stranding events.

CHAPTER 3: STRANDING THEORIES, PATTERNS, AND RESCUE BASICS

This chapter provides information that the user needs to know to be able to respond to a shark and ray incident report.

TYPES OF STRANDINGS

STRANDING

A stranding event is the occurrence of a dead or live shark, ray or skate on the beach or in shallow water. An animal may be healthy, wounded, weak, or dead. It is also called beaching. The animal is considered to be located outside of its normal habitat and even if alive, is unable to return to its natural habitat without assistance.

Typical stranding of whale shark have been reported when a healthy animal is caught unaware of an imminent low tide and thus become stranded in the shallows. Weak, dying, or dead animals have been washed ashore usually carried by the current. When in the shallows or on the beach, the animal will asphyxiate as they can only respire in the water. It is important to note that the whale shark and most other stranded sharks discussed here have pelagic habitats and are not used to shallow waters nor resting at the bottom. Getting stuck and unable to move will greatly impair respiration.

The weight of large animals such as whale sharks and megamouths, will compress the internal organs and will cause further injuries, as they do not have a bony skeleton or ribs to support their bodies. Hence, stranded animals always have collapsed bodies. Exposure to the sun and air will dehydrate and overheat the animal very quickly. The skin is very susceptible to abrasions especially out of the water when dryness occurs.

Not much is known about other causes of strandings although navigation using the earth's magnetic field has been theorized to play a role in navigation and migration of the animal.

BYCATCH

Bycatch is the accidental entrapment or entanglement of an animal that could be dead or alive. For simplicity, the term 'stranding' is broadly used in this manual to include bycatch.

Almost half of whale shark reports in the Philippines involve entrapment in fish corrals or entanglement in nets. This situation causes panic and stress to the animal. The entanglement worsens as the animal attempts to escape. The stress and constriction reduces the animal's ability to respire and weakens it which leads to its death. Injuries are also common from laceration and crushing of tissue from the gear.

Strandings almost always involve only one animal considering that the species encountered do not school but form aggregations in specific habitats. Although a mass stranding of more than 200 individuals of mobulid rays was reported in the Gaza Strip in 2013, the cause remains unknown. These incidents are probably related to factors that causes fish mass die-offs.

STRANDING CODES AND BODY CONDITIONS

Stranding Codes describe the stranding scenario in order to respond appropriately and quickly. To date, there are no known international standards for responding to stranding events of whale sharks, manta rays, or any other elasmobranch species. The numerical codes (Codes 1 to 5) in this manual are based on the marine mammal stranding codes (Geraci and Lounsbury, 2005) with some modifications to fit sharks and rays. Code 6 was added to include a common situation in the Philippines wherein the animal has been tampered with and only certain body parts remained. The codes and their descriptions are:

CODE 1: ALIVE
Vital signs are present. Animal is moving and reacts to stimuli, no matter how weak.

CODE 2: CARCASS IN GOOD CONDITION (FRESH)
Animal appears freshly dead with organs and body parts intact. Normal appearance, usually with little scavenger damage; fresh odor; minimal drying of skin, carcass not bloated; muscles firm and well-defined; surface features distinct.

CODE 3: CARCASS DECOMPOSED, BUT ORGANS BASICALLY INTACT (FAIR)
Carcass intact; bloating evident and skin cracked and sloughing; possible scavenger damage; characteristic mild odor; mucous membranes dry; eyes sunken or missing.

CODE 4: CARCASS IN ADVANCED DECOMPOSITION; ORGANS NOT INTACT (SEVERE)
Carcass may be intact, but collapsed; skin sloughing; often with severe scavenger damage; strong odor; muscles nearly liquefied and easily torn; viscera often identifiable but friable, easily torn, and difficult to dissect.

CODE 5: CARTILAGINOUS REMAINS WITH DRIED TISSUES
Skin may be draped over cartilaginous remains; any remaining tissues are desiccated.

CODE 6: DESTROYED
Remnants of the animal damaged or destroyed due to human disturbance, e.g., butchered or burned.

RESPONDING TO SHARK AND RAY REPORTS

When a report is received about a whale shark, ray, or skate, it is usually an emergency case, be it dead or alive. It is best to be prepared and organized to carry out a response operation. This manual will help you through the procedures to be undertaken with the following objectives:

1. To provide rapid and effective action that will best serve the well-being of the shark or ray;
2. To gain maximum scientific information from the incident;
3. To prevent the public from harming the shark and ray;
4. To help protect the public from injury and contamination; and
5. To utilize the incident for education and raise awareness on shark and ray conservation.

It is very important to coordinate the response with local authorities particularly the barangay officials, the municipal government, and the nearest DA-BFAR offices.

RESPONSE TEAM COMPOSITION AND FUNCTIONS

The response team must have a minimum of four members, ideally five or more, performing different functions. Each member will have assignments prior to arrival at the stranding/rescue site for coordinated action. Each member assumes a specific role within the team, such as the team leader, crowd controller, data collector, and documenter. Additional manpower may be sourced from the local community or crowd as needed with guidance from the team leader.

The roles of the responding team members are as follows:

1. **Team Leader.** The team leader acts as the overall coordinator of the team. S/he decides on actions to be taken depending on the need of the situation. S/he shall coordinate with local officials or community leaders, government authorities, and experts for technical or logistical requirements. S/he is responsible for introducing the team members. It is proper to show an identification card for each of the members. S/he is also responsible for thanking everybody who helped and participated in the stranding response/rescue, and acts as the information officer attending to the media if needed. The team leader will write the report.

2. **Crowd Controller.** The crowd controller is in charge of cordoning the periphery of the area, isolating the animal from the crowd to provide working space for the response team, thereby minimizing stress to the animal if alive. However, the crowd controller must not alienate the by-standers, as they can be prompted as additional manpower if needed. S/he is also in charge of giving information to the crowd on the species, conservation status, and the team's response action. Policies and operations related to the protection of the animal will also need to be clarified.

3. **Data Collector/s.** It is best to have two people handling the animal. The data collector/s is/are directly involved in handling the animal. S/he must check and note the vital signs, biometrics, and other relevant data. The equipment and materials to be used are checked by the data collector for completeness.

4. **Documenter.** The documenter is responsible for recording data obtained by the data collector, and for taking photos and videos. S/he must ensure that all data sheets are filled out completely. The use of a waterproof digital

camera is recommended. It is important to maintain communication at all times using a mobile phone. Extra batteries and credits (also referred to as "load") in the mobile phone are a must.

For animal handling and documentation:

- Rope (at least 50m long)
- Stranding Response Data Sheet
- Slate board and pencil or ballpoint pens for waterproof data collection
- Elasmobranch identification field guide
- Tape measure or transect line (at least 25m)
- Gloves
- Bucket
- Water dipper
- Spade
- Blanket
- Knife
- Vials/containers for tissue samples
- Dissecting kit
- Ethyl alcohol (at least 70%)
- Snorkeling gear (face mask, snorkel, fins, wet suit)
- SCUBA gear (optional)
- Underwater camera
- Waterproof flashlight
- Sharks and Rays Response Manual

The team leader may also expand the team composition to include a veterinarian and a security team to assist in crowd control. S/he must also involve local officials and relevant government agency representatives. For instance, local officials and members of PNP, PCG, and/or Bantay Dagat can assist the crowd controller in securing the stranding area, while representatives from the local Agricultural Office (MAO or CAO) and Environment and Natural Resources Office (ENRO) can assist the documenter and data collectors.

STRANDING RESPONSE KIT

Time is of the essence when responding to a stranding report, especially if the animal is still alive. Depending on the stranding scenario, team members may also be exposed to sunlight or submerged in water for extended periods of time. It is best to always have a Stranding Response Kit packed and ready, to shorten the response time and to make the response more comfortable and safe for the responding team. The items in the kit may vary depending on the team's working budget, but essentially, it should include materials for the actual response. A list of materials that should be considered when preparing a kit can be found in this chapter. A list of personal materials for each member is also presented.

PRE-RESPONSE PROCEDURE

Upon receiving the report, gather as much stranding information as possible (e.g., stranding code, animal's condition, exact location, accessibility of the site, local weather conditions, informant's name, and contact details). Call the informant or the first responder directly to verify the report. Verification of the stranding report can also be done through a reliable partner in the area such as local officials. Based on the received information, assess the situation and determine the code status. Make a plan of action for carrying out the appropriate stranding response.

If the site is not accessible to the team, coordination can be done over the phone with the site point person (e.g., informant, first responder, local Bantay Dagat, barangay official). It is possible that the response operations could be as short as a few hours or last a few days. It is best to be prepared for the different scenarios.

Give instructions to the first responder on what to do to secure the animal and how to give proper care while he/she waits for the response team to arrive. While waiting for the response team, the first responders should not tie the animal.

Team member's personal kit:
- Hat
- Sunscreen
- Towel
- Toiletries
- Change of clothes
- Extra cash
- Drinking water
- Food
- First aid kit
- Mobile phone
- ID
- Life Jacket
- Wetsuit

Simultaneously, report the stranding incident to the nearest DA-BFAR office and coordinate with other appropriate government agencies. It is strongly advised that a list of emergency numbers be created and disseminated to facilitate the operations every time there is a stranding.

It is important to maintain communications during the response. Ensure that your mobile phone's battery is sufficiently charged and that it has enough phone credits (load) to last the duration of the response.

Upon arrival on the site, the crowd controller will cordon off the animal and the work area to secure the site. The crowd should be moved away from the animal, providing enough space for the response team to do their tasks. There should be an open access to the sea without anyone blocking the way. The crowd should be prevented from making loud noises, restricting the members of response team from implementing their operation, touching or riding the animal, or getting parts of the animal for mementos and even for food. The crowd controller will need to explain to the community what is going on.

The succeeding chapters present steps on dealing with the different coding incidents.

CHAPTER 4: CODE 1 INCIDENT:
Response Procedures for Live Shark and Ray Reports

STEP-BY-STEP RESPONSE

This chapter provides guidelines to follow when responding to a live stranding of sharks and rays. Sharks and rays are very delicate animals and could easily perish if care is not given when handling them. Time is of the essence especially if the animal is out of the water as its condition will quickly deteriorate. Some sharks are more vulnerable to stress than others and are even susceptible to capture stress causing mortalities.

When dealing with live sharks and rays, the following risks should be considered when an animal is immobilized, hyperactive, and stressed (Marshall, 2004):

- Injury from pressure on the internal organs when out of the water
- Injury to the delicate skin
- Stimulation of sensitive sensory organs
- Increased energy expenditure from hyperactivity
- Impaired respiration and compromised systemic oxygenation
- Build-up of metabolites and blood acids

For a Code 1 response, the immediate release of the animal should be the priority. This will address the problems associated with the risks mentioned above as the animal's condition worsens as the release gets delayed. Data collection and documentation, if time permits, should be carried out swiftly.

A shark and ray should be immediately placed in the water to allow respiration to take place. It should be facing the open sea. The risks mentioned should be reduced mainly by minimizing hyperactivity through proper restraint and handling.

STEP 1. ASSESS THE ANIMAL AND ENVIRONMENT

Observe the animal in its condition which could be motionless on the beach, thrashing in the shallows, or entangled in fishing gear. Note the condition of the environment such as the tide and waves, weather, and the characteristics of the shoreline (rocky, sandy, seagrass, or coral reef). These factors might be important in the cause of stranding or capture and will be important in planning the release of the animal or its retrieval. Note the fishing gear that is implicated in the capture.

Based on field experiences, the following scenarios are often encountered:

1. An animal is beached on shore or stranded in shallow waters
2. An animal is trapped in a fish corral or other fixed structures
3. An animal is entangled in a fishing net
4. An animal is caught or found with a hook and line

For scenarios involving fishing gear, it is best to contact the owners of the gears prior to executing the response which may result to the gear being damaged. The crowd controller is assigned to do this task.

STEP 2. CHECK VITAL SIGNS

Check the wellness of the animal quickly using the following parameters.

Respiration

Observe and count the opening and closing of the shark's gill slits which actively pumps water through the gills if submerged (50-60 breaths per minute could be a basis for the rate). Increased respiration is a sign of lack of oxygen (Stoskopf, 1993). This will be difficult to determine if the animal is above water. If the gills are not moving in the water, the animal could be weak or dead.

Movement

Caudal fins moving from side to side can be a gauge of alertness. Muscle contractions are often observed in response to stimuli. Signs of distress include sustained erratic and jerky body movements whilst swimming. The animal may also thrash around in panic.

Non-movement, even with stimulation, may indicate that the animal is weak or dead.

Body color and condition

Uniform color (particularly in non-patterned species) across the body, erect fins, and full-bodied appearance around abdomen are normal fitness indicators. Discoloration, patchiness in color, lesions, drooping/damaged fins, thinning around abdomen is an indication that something is wrong. Hypo-oxygenation could cause sharks to turn blotchy (Stoskopf, 1993). Reddening of the skin on the ventral side and body rigidity is a sign of toxic metabolites building-up.

Injuries

Cuts, abrasions, lesions on the body and fins should be noted. Some of these scratches may have been inflicted during stranding in the shallows.

Classification of Live Animals

The shark condition classification scheme is based on the conditions upon release of fished sharks and rays in the Atlantic Canada waters (Corke, 2012).

ALIVE - NOT INJURED

All of the following characteristics should apply:

- Quick movements and/or response to being handled.
- Frequent gill movement.
- Fish is not bleeding or is bleeding slowly and not from the gills. Blood may be seen around mouth and/or jaw.
- Hook is visible (e.g., mouth hooked) and has not been swallowed or hooked in from the gills.
- Jaw is intact and appears functional. Injury is limited to hook puncture and/or small extraction wound, with some bleeding possible from the wound.
- If gear is wrapped around the fish, it is not inhibiting or it is removed with minimal damage; appendages remain functional after removal of gear.

ALIVE - INJURED

At least one of the following characteristics applies:

- Fish is moving and/or reacts to being handled.
- Movement.
- Fish is hooked by the gills or hook is not visible and has obviously been swallowed by the fish.
- Blood is flowing freely and continuously from any wound on the fish and shows no sign of slowing down or stopping.
- Jaw is damaged, but still useable.
- Injuries are present, but not immediately life-threatening, e.g., fins may be frayed, damaged or torn, but are still useable.
- If wounds are present on the body - though muscle may be visible - they are not deep enough to expose internal organs.

ALIVE - WEAK

Fish is alive, but not moving with weak gill movement. It is presumed to have at least one of the following lethal injuries:

- Bleeding from a torn or severed gill arch. Fish are unlikely to survive if gills are bleeding, even though it may look alive at the moment of release.
- Multiple fins missing.
- Serious damage to eyes or head.
- Jaw broken, unuseable or missing to the point where the fish will be unable to swim, hunt or feed.
- Deep wounds with internal organs visible.
- Amount of bleeding may be used to qualify whether a fish is moribund.

Decisions on What to Do

Based on the vital signs assessment, the following decision on what to do with the animal is indicated:

- If the animal is ALIVE-NOT INJURED and ALIVE-INJURED, the only option is to release it.
- If the animal is assessed ALIVE- WEAK, there is no other option but to leave it until it dies. No euthanasia protocols are required nor recommended.
- If the animal is dead (in rigor or is lifeless), the carcass needs to be retrieved for data and specimen collection (Codes 2-6) and disposal.
- If the animal is alive for release, the succeeding steps needs to be taken.

STEP 3. RESTRAIN THE ANIMAL

Retraint is the act of limiting the movement of a live animal to prevent further injury. This is especially important if the stranding occurred in a shallow area. Under restraint, collection of data from the animal becomes more manageable. The following procedures on proper handling should serve as a guide to ensure a safe environment and manageable restraint on the animal, given different stranding scenarios. Restraint is necessary to be able to move the animal, acclimatize it, and prepare it for release. This process should be done as quickly and calmly as possible.

On the beach or in shallow water

- Limit the number of handlers to only what is necessary. In single stranding, one person may do. Too many people handling one animal can add to the stress
- It is important to bring the animal back to normal buoyancy to stimulate swimming behavior.
- Use a stretcher to lift the animal to the water if it is small enough. For the stretcher, use a wooden pole and vinyl sheets (tarpaulin material). It is possible to use old streamers, blankets, or other soft materials you can find that is strong enough to hold the weight of the animal. Make sure the animal is in a horizontal position (Fig 14). For rays, use a rigid round-shaped stretcher built like a trampoline to move the animal.
- If animal is too large and cannot be lifted, use a net made of soft knot-less nylon to prevent abrasions (Smith et al., 2004).
- Approach the animal from the side with care.
- Avoid loud noises and abrupt movement.
- For whale sharks, always be careful of the caudal part of its body (remember the tail moves sideways).
- For rays, always be mindful of the whip-like tail.

Figure 14 If small enough, a stretcher is the best way to move the animal. This should not be attempted for large animals.

Never tie the animal with a rope by the tail or any other part of the animal. To drag a large animal using this method will cause it further injury which will worsen its condition.

In deep water

Working at a depth can be difficult without proper swimming skill, swimming gear, and water vessel. Therefore, safety of the responders should not be underestimated.

- Approach the animal with a non-motorized vessel. Should it be unavoidable, the engine must be turned off at least 10 meters away from the animal or the enclosure.
- Use of SCUBA or snorkeling gear is recommended. As an added precaution, buddy system should be strictly followed.
- Limit the number of handlers in the water. Other members should be on the lookout for their safety in case the situation becomes dangerous.
- In the event of rough sea condition, tow the animal to calmer waters to facilitate ease of handling.

It is possible to induce a trance-like state to the shark called tonic immobility by holding the animal upside down for a few minutes (Smith et al., 2004). This is only possible if the animal is small enough but should be used with caution because the process may cause osmotic imbalance, and consequently affect its ability to maintain buoyancy and other metabolic processes.

STEP 4. ACCLIMATIZE THE ANIMAL

Acclimatization is the process wherein the animal is stabilized in the water in preparation for release. The animal needs to be acclimatized to make the situation less stressful to the animal and to make it more manageable for the team. Data collection should be conducted during this step. Form EB01, Shark and Ray Stranding Data Sheet should be used for documentation (Annex 1).

During this step, it is important to monitor the respiration rate, animal movement, and body coloration, and swimming behavior. The risks should be reduced by:

- Using a stretcher to support the animal's body weight when lifting to move it from the beach to shallow waters (at least waist-deep)
- Floating the animal in the water (may necessitate waiting for the high tide) which facilitates respiration
- Massaging the musculature by flexing the caudal peduncle and stroking the dorsal part of the animal. This will reduce metabolic build-up and stimulate better circulation
- Avoiding use of metallic objects and equipment with electric currents as these are easily picked up by the animal's sensors
- Preventing injury to the skin by clearing area of sharp rocks
- Using gloves during the handling as not to give the animal any infection especially if the mucous layer is damaged

FIRST AID TIPS

- Do not transport the animal to another location.
- If a large animal is on the beach due to low tide, it is best to wait for the tide to come in before moving the animal.
- If there is a delay moving to the water, make sure that the animal is shaded and wet all the time.
- No treatment of the animal is necessary which includes the use of medications, vitamins, or antibiotics.
- Whale sharks, manta rays, and other sharks and rays have no known communicable diseases to humans.

STEP 5. RELEASE THE ANIMAL

The only option for any live shark and ray is to release it (ALIVE-INJURED and ALIVE-NOT INJURED). In no instance shall rehabilitation or euthanasia be allowed. There are no benefits from any type of treatment to the animal, such as wound treatment or providing vitamins and antibiotics, and better if avoided. For ALIVE-WEAK condition, the animal is left to die without assistance.

After a short acclimatization process and data collection, release the animal without delay. The following are the procedures recommended for the release. Note that the situation varies greatly and it will be up to the response team to decide on the best method for release given the unique situation they are in. When dealing with fishing gear, it is best to inform the owner of the gear first and allow him/her to participate in the process, especially if the gear needs to be cut. As rescues are emergencies and if the owner of the gear can not be found, proceed with the rescue but make sure that the whole process is documented and the gear returned to the owner.

In shallow water

- The animal should have been moved to the water if found beached.
- Move the animal facing the open sea.
- If the water is high enough, release the animal from the stretcher to facilitate the release. The objective is to let the animal swim on its own in deep enough water.
- It is possible to guide the animal to swim towards deeper water. For whale sharks, avoid touching the pectoral fins as this tends to stress the animal (Fig. 15).
- If the animal is not able to swim on its own, assist the animal in swimming towards open sea by carefully pushing it forward.
- When guiding the animal, never swim above it as this will cause the animal to dive and hit the bottom.
- Stay clear of the caudal part and the pectoral fins to limit injuries to the responders and to ensure that the animal's mobility is not impeded.

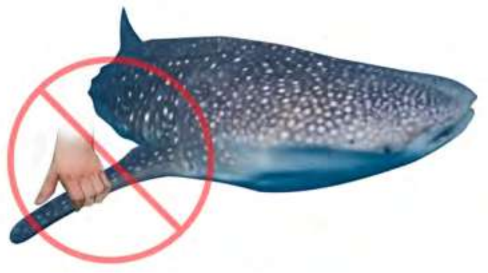


Figure 15 Keep the pectoral fins free during the release.

Trapped in fish corral

Due to the confined space of enclosed fixed gears such as a fish corral, the number of rescuers approaching the animal should be limited to a maximum of four. The rest of the rescuers and extended team can be instructed to remove obstructions along the animal's path and/or to widen the way to the designated exit point.

- To release the animal, have at least two responders approach the animal carefully without the use of SCUBA gear (Fig. 16).
- For whale sharks, the responders can position themselves on both sides of the animal's head region but avoiding its pectoral fins.
- Slowly and gently hold the animal by its lower jaw and guide it out of the enclosure (Fig. 17).
- For manta rays, the responders should try to herd the animal without touching it by stretching pieces of cloth to delineate the way out of the enclosure. However, if this proves unsuccessful after repeated attempts, responders may guide the animal by gently grabbing its mouth. This option should be a last resort because the mouth area is most sensitive and fragile and extra care should be taken, when doing so.

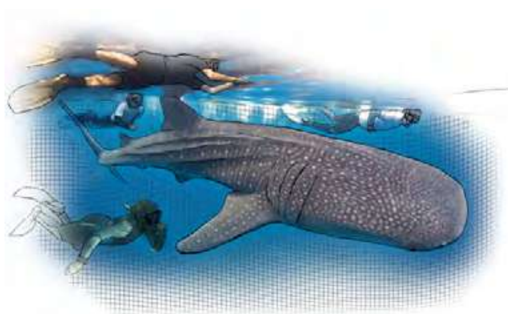


Figure 16 Approach the animal without SCUBA gear.

Figure 17 Guide the whale shark out of the enclosure with gloves on.

•SCUBA gears may only be used after three failed attempts. By this time, responders may be exhausted and the animal stressed out. This option is considered only so that efforts to release the animal may be continued while avoiding added stress and ensuring the safety of the responders. Give the animal time to rest before repeating the steps in using SCUBA gear.

• Sharks and manta rays at times, mistake bubbles from SCUBA gears for shoals of food and thus, may be coaxed into following it out of the enclosure. However, in some cases, bubbles have been observed to stress the animal even more so the responders have to decide for themselves whether SCUBA gears will be useful for their particular situation or not.

Entangled in fishing net

- If the distance of the animal is too far from shallow water, the net can be cut to facilitate the release.
- If close enough to land, the animal may be brought closer to the shore so that its release will not endanger the lives of the responders.
- The animal should be brought close to the shore head first to ensure proper breathing. Do not tow the animal to shore backwards or tail first.
- Try to preserve the net as best as you can to lessen the damage to the fisherman's livelihood. However, if this is not possible, cut the net off of the animal.

Caught or found with a hook and line

Due to the perilous nature inherent to removing a hook that is often stuck in or around the mouth of a shark, taking accurate measurements and collecting tissue samples may be bypassed. The procedures below must be followed:

- Carefully try to remove the hook by cutting off the barb/hook
- If shallowly embedded, pull the hook free.
- Should the removal of the hook be too complicated, such as deeply embedded or too close to sensitive part of the body or the safety of the responders is threatened, choose to leave the hook and cut the line as close to the hook as possible.

STEP 6. MONITORING AFTER RELEASE

Stay at the release site at least an hour after release just in case a re-stranding occurs. The help of local residents at the site and in adjacent barangays may be enjoined in the monitoring of the animal after the animal's release. They must also be warned of the possibility of a re-stranding event so that they can report the incident immediately to the response team or to the local authorities.

If a re-stranding occurs within hours of the release, assist the animal to maintain its natural position. However, give the animal a rest period before attempting a second release.

If a re-stranding occurs days after the release, consider it as a separate or new stranding and respond accordingly. Confirm whether it is the same individual by comparing measurements and photographs from the earlier strandings.

If the animal dies in the course of the stranding response, procedures on carcass disposal should be followed. Additional tissue samples may also be collected and a necropsy undertaken by DA personnel and DA-certified persons only.

STEP 7. PREPARE A STRANDING REPORT

Standard forms need to be filled up completely after each stranding response. Instructions on how to fill out the data sheets can be seen in the chapter on data collection and reporting. Forms EB01 and EB02 are found in Annexes 2-3.

PUBLIC EDUCATION AND AWARENESS RAISING

Throughout the response operations, make it a point to educate the community on the work that is being done, the importance of the rescue of the animal, and the conservation issues relevant to the locality and the species involved. Having a captive audience is the best opportunity to raise awareness on sharks and rays. Debrief and acknowledge the assistance provided by those who were present in the area and helped in the response activity. Share as much information on the stranding response with the people who helped and the rest of the community. Doing so will help establish vigilance and active support from the members of community in case another incident happens.

Disclaimer

Some parts of the succeeding chapters of this manual are highly technical and specialized. Necropsy, internal examination, and tissue/specimen collection require the supervision of a DA-BFAR-NFRDI certified responder knowledgeable in sharks and rays biology. If none are available, it is strongly recommended that the abovementioned offices be informed to provide the appropriate action.

CHAPTER 5: CODES 2-6 INCIDENTS:
Response Procedures for Dead Shark and Ray Reports

This chapter discusses the procedures on dealing with dead sharks and rays. The animal may be already dead when reported and must be categorized from Codes 2-6. The animal could have died during the rescue or rehabilitation operation. It is necessary to examine the animal closely before declaring the animal dead. All the vital signs should be absent. The animal is in rigor and lifeless and shows absolutely no response to handling.

Compared to the quick data collection from Code 1 where release is prioritized, the time with a dead animal is unlimited. Therefore, it is important to get as much information and samples under such conditions.

The main purpose of a necropsy is to determine the cause/s of death through the examination of the body and internal organs as well as through tissue analysis. It also provides an opportunity to collect samples for other research useful to determine the animal's life history and help document possible human-related causes of death. Necropsy needs to be done by a trained individual. Interpretation of the gross and laboratory findings should only be done by qualified professionals such as a wildlife veterinarian or a fish pathologist.

In some cases, the species may only be confirmed through DNA analysis extracted from tissue samples collected. The complete skull including teeth could also confirm the species. It is best not to damage the skeleton, particularly the skull and jaws, when doing the necropsy as these are fragile in sharks and rays as they are made of cartilage instead of bone.

In handling animals classified under Codes 2-4, discretion is left to the response team whether a necropsy can be done or not. It is easier to do on fresh specimens (Code 2) than decaying ones (Code 3 and 4). For obvious reasons, necropsy cannot be conducted on Code 5 or 6 cases, but whatever data is available must be collected.

The necropsy will most likely be done under field conditions, especially if there is no access to a laboratory. Whenever possible, transport the carcass to a facility where the external and internal examinations can be performed more thoroughly.

The equipment and materials needed are listed on the next page. Remember to always use gloves or even full protective clothing throughout the entire procedure.

TRANSPORT MATERIALS
- Ice coolers or ice chest
- Leak-proof, break-proof containers
- Absorptive packing materials
- Sealing tape

SPECIMEN CONTAINERS AND SAMPLING EQUIPMENT
- Rigid plastic containers with tight fitting lids (approximately 1 liter)
- Small vials, tissue cassettes, or tags to identify specific samples
- Plastic bags with closure tops (Zip-Lock)
- Parafilm or sealing tape
- Aluminum foil
- Sterile syringes and needles
- Labeling tape or tags, water proof labeling pens, and pencil

NECROPSY EQUIPMENT
- Sharp knife (including sharpening stone or steel)
- Scissors (small and large)
- Forceps
- String
- Hack saw or bone saw
- Scalpels and razor blades
- Plastic ruler or measuring tape

EXTERNAL EXAMINATION

Before dissecting the animal, make sure to observe its external appearance. Markings on the body can give the examiner a clue on the probable cause of mortality. Make sure that enough photographs are taken and included in the report. Some pointers to keep in mind are:

- Describe the appearance of the carcass. Is it bloated? Does it show signs of fishing gear marks? Is the flesh still intact, damaged, or in advanced decomposition?
- Take note of the presence of lesions on the body (e.g., location, shape and texture, severity, color, and odor if any) or any parasite attached. Collect the parasites (if any) as needed.
- Measure the different parts and sections of the carcass. Refer to Annex 1 for a complete guide.
- Distinguish between marks and wounds acquired by the carcass before and after death.
- Record information on Form EB01 found in Annex 2.

INTERNAL EXAMINATION

Incisions have to be made to see the internal organs of the animal. Use protective clothing both on hand and body for safety. Sufficient working space should be secured especially when dealing with large stranded animals. Describe, measure, and record all findings on the necropsy form, EB03 on Annex 4.

1. Collect skin and muscle tissue samples at the base of the first dorsal fin. Preserve in 95% Ethanol. If unavailable, 70% Ethanol will do for a short period of time. This is easily found at a local drugstore (e.g., Casino brand alcohol).

Store at -5 to -20°C until analysis. Complete drying under the sun or using a fruit dehydrator is another option. Label all samples taken correctly.

2. Turn the animal on ventral side up (Fig. 18). Observe the area between the pelvic fins, describing any lesions and collect parasites, if present.

Figure 18 A stranded whale shark on ventral position ready for necropsy. Photo credit: M Santos

3. In males, observe, describe, and measure the claspers - two finger-like structures located medial to the pelvic fins. Claspers of mature males appear large and are covered by cauliflower-like formation on its skin (Fig. 19). Manipulate the claspers to assess the degree of calcification has occurred, the presence of which is an indication of sexual maturity.

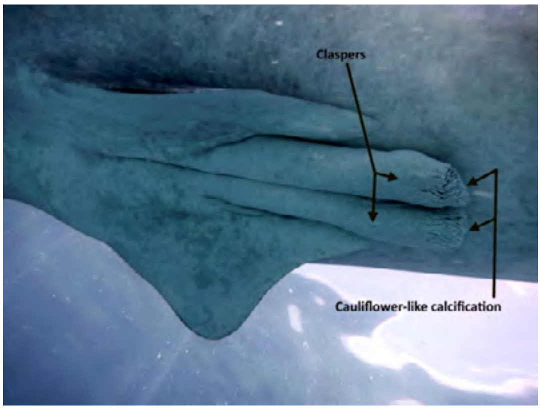


Figure 19 Claspers of a mature male whale shark. Photo credit: Physalus-LAMAVE

4. Make an incision through the skin and connective tissue along the midline following the longitudinal axis of the animal. Start below the lower jaws, continuing between the pectoral fins and ending caudally just before the pelvic fins.

5. Make two more incisions perpendicular to the longitudinal body axis, the first one below the lower jaw and the second one just before the pelvic fin.

6. Fold the skin and tissue sideways to expose the internal muscle layers and observe any lesions, unusual formations, and parasites. If present, describe, measure, collect, and preserve samples.

7. Make another incision, this time through the muscle layer along the midline of the body and fold (similar to the procedure used on the skin) to expose the internal organs. Observe and describe the organs in the abdominal cavity.

8. Move the liver (large light brown organ which occupies most of the cavity) aside to access the stomach (J-shaped organ). Make an incision on the side of the stomach wall and carefully collect its contents. Strain into a container (Fig. 20). Preserve and store these stomach content samples in 95% Ethanol. If unavailable, 70% Ethanol, which is easy to find at local drugstores, will do for a short period then store at -5 to -20°C until analysis.

Figure 20 Collecting stomach contents using a fine-mesh strainer. Photo credit: M Santos

9. The urogenital system is located below the stomach and the rest of the digestive system. Remove or move the organs to the side to expose the dorsal wall of the abdominal cavity. The kidneys look like ribbons attached to the back wall of the cavity along its midline. Collect samples as needed.

10. Locate and describe the ovary and testis found in the cranial portion of the cavity along the midline. Both organs are very small and undeveloped in immature animals. The uterus appears distended and thickened in gravid females.

After all measurements and specimens have been collected and recorded, proceed to carcass disposal.

CARCASS DISPOSAL

The carcass of the animal may be disposed in two ways: (a) burying and (b) disposal at sea. In both instances, the responding team should work with the LGU officials/staff in identifying an appropriate burial site for the animal. There are some burial facilities for large marine vertebrates located in Dagupan, Pangasinan; Sta. Lucia, Puerto Princesa, Palawan; Southeast Asian Fisheries Development Center (SEAFDEC) office, Iloilo; and the BFAR office in Bicol. The Team Leader should incorporate a summary of the disposal procedure into the brief but complete stranding report. Details on report-writing and data collection are found in the next chapter.

ON LAND

When burying the carcass, the site should be unreachable by the highest high tide mark and preferably far from residential areas to avoid scavenging by domestic animals. Depending on the size, availability of the equipment, and other circumstances, the carcass can be buried whole or cut into pieces for ease of disposal. Ideally, the grave should be at least three meters deep.

AT SEA

For disposal at sea, the site should be away from reef areas and water use zones. Wrap the carcass with a net to make towing the animal offshore manageable. Weigh it down with rocks secured by using hemp (abaca) before throwing overboard or towing to keep it sunk. Make sure that the wrapping material is made of biodegradable material. Tow and dispose the animal offshore at about a 100m depth or more.

IMPORTANT
To date, only one gravid female whale shark specimen has been documented in the world and none for the megamouth shark. If one encounters a stranding case with gravid females, it will be an important find. Immediately coordinate with DA-BFAR-NFRDI for proper documentation. Necropsy may be continued by opening the uterus to expose the pups and the egg cases. Describe and measure each pup and associated egg case. Pups may be kept as voucher specimens but should be fixed in 10% formalin for 2-3 days before final preservation in ethanol. To facilitate fixing in formalin, cut one or two slits along the pup's midline.

WHAT NOT TO DO WHEN DISPOSING OF SHARKS AND RAYS

Burning is not an eco-friendly method because it requires fuel such as gasoline. Furthermore, in most cases, it does not dispose of the carcass completely, especially when dealing with large specimens.

Slaughtering for food consumption. Stranded animals are usually sick, infected with bacteria, virus, parasites, and laden with heavy metals. Therefore, it is not advisable to eat them. It is also illegal under Philippine laws if it is a protected species.

Using explosives. The use of explosives for large animals can be detrimental in so many ways, including damage to property and risks to human safety. Thus, it should be avoided at all costs.

CHAPTER 6: DATA COLLECTION AND REPORTING

Data collection is an important part in any stranding response. This is especially true in the Philippines where not all species of sharks and rays have been verified. It is also very useful in assessing environmental and socio-economic parameters (e.g., aquatic pollution, fisheries, and non-compliance to guidelines by tourism sector) that could be threats to threatened shark and ray populations in the Philippines, especially if there is a trend. Documentation also helps. The basic data form for a response (EB01) can be found in Annex 2.

GENERAL INFORMATION

Interview the person who reported the incident and/or the person who initially saw the animal, in case they are different individuals. Record the name, address and contact information, time of stranding or capture, exact location (gear location, beach, sitio, barangay, municipality, etc.), sea condition when the animal was first seen (especially if the condition is often different from the time the response team arrives on site), condition of the animal when first seen, and the number of animals found. Fill up the Environmental Condition box, Stranding Code box, and Animal Information box found in the stranding form EB01. Use the species identification sheet in Annex 1 and Figure 4 to determine the species of the animal.

External examination ideally requires two data collectors and one documenter. Photo-documentation, morphometrics or body measurements, tissue sampling, and tagging (if available) should be taken. All numerical data should be accompanied with appropriate unit of measure.

PHOTO-DOCUMENTATION

Proper photo-documentation is essential for species identification. Body form, special markings, colorations, and body features are important to note especially if the species cannot be identified while doing the response. The best way is to position the camera perpendicular to the part or whole body of the animal being photographed, be it the ventral, lateral, or dorsal sides (Form EB01, Annex 2), to avoid distortion of image perspective that might lead to misidentification of the individual. Photograph the claspers or its absence to document the animal's sex.

IDENTIFYING INDIVIDUALS THROUGH PHOTOGRAPHS

Individual whale sharks can be identified through their unique spot and line patterns using photo-identification technique. This technique is one of the most effective and popular method of recording natural markings on an animal that will identify it as a unique individual. Whale sharks are born with unique body patterns that are retained throughout their lives and are used to distinguish individuals. Similarly, spot patterns on their ventral side are also used to identify individual manta rays. The method allows gathering of photos to be used in a library for cross-matching matrices, allowing the study of movement patterns, site fidelity, annual aggregation size, and other parameters (Meekan et. al., 2008). This method should be done for both live and dead animals.

Record the white lines and spots along the flanks of the animal using either still or video cameras. Photographs are taken perpendicular to the spot pattern area which is just above the pectoral fin and immediately behind the gills (Fig. 21). Photograph this area on the left side of the whale shark making sure that multiple shots are taken.

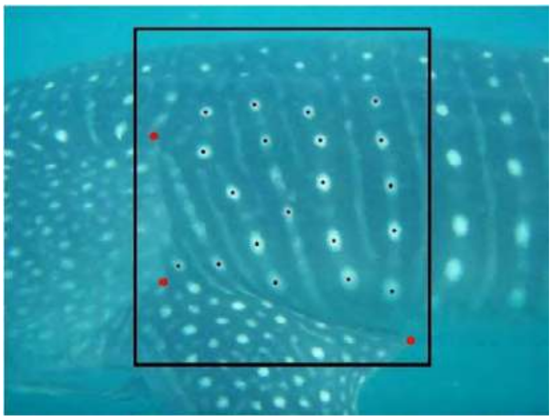


Figure 21 Photo-ID of the left side of a whale shark taken perpendicular to the spot pattern area just above the pectoral fin and immediately behind the gills. Photo credit: E Aca

Photo-identification of beached animals is nearly impossible even if the skin is still intact due to the body distortion or uneven contour of the body because the body collapses on land. Nevertheless, photographs should still be taken for possible identification by comparing it with other photos in a database.

For manta rays, each individual has a unique spot pattern on their ventral surface that can be used to permanently identify individuals. Once an individual is identified, its movements can be tracked down through sighting reports. The area of interest for photo identification is located on the ventral side of the animal (Fig. 22). Photograph perpendicularly the entire underside in one frame. This can be done by SCUBA diving or snorkeling underneath the animal or if the animal is dead, by laying the animal on its dorsal side.

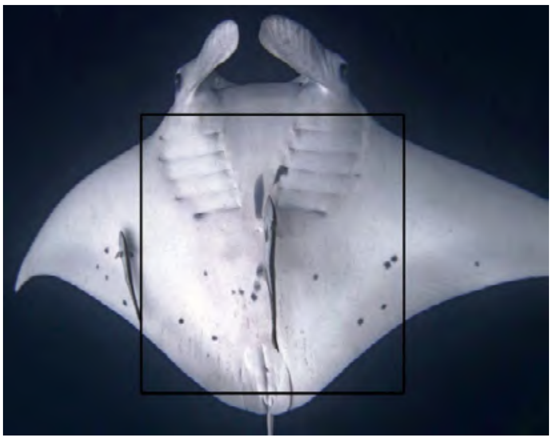


Figure 22 Ventral area for photo-identification of rays. Photo credit: Physalus-LAMAVE.

Scars, especially propeller marks or fin nicks, should also be documented as these at times are enough to identify certain individuals.

Photographs may be submitted to online global databases created and managed by ECOCEAN (www.whaleshark.org) and MantaMatcher (www.mantamatcher.org). Response groups through their team leader may submit photos directly to these databases. Reports could also be made to the listed local agencies involved but copies of the submitted photos should also be attached to the Stranding Response Report (Form EB02) which will be sent to the DA-BFAR-NFRDI for data-banking. Use a field photo ID card with every photograph taken. This practice is to ensure that you do not mix up photographs from one response to another given that you have accumulated several documentations. A sample is provided below.

FIELD PHOTO-ID CARD

Field No.________________________________

Species________________________________

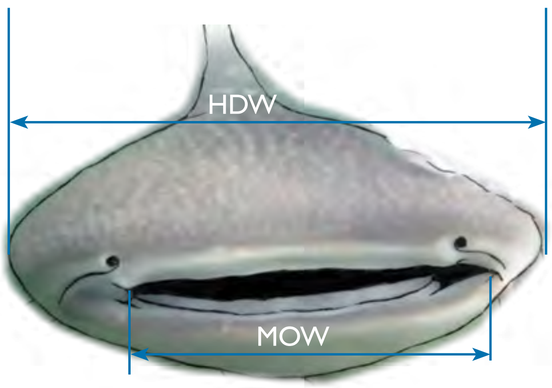
Date (Stranding and Necropsy, if different) ________________

Location of Stranding __________________________

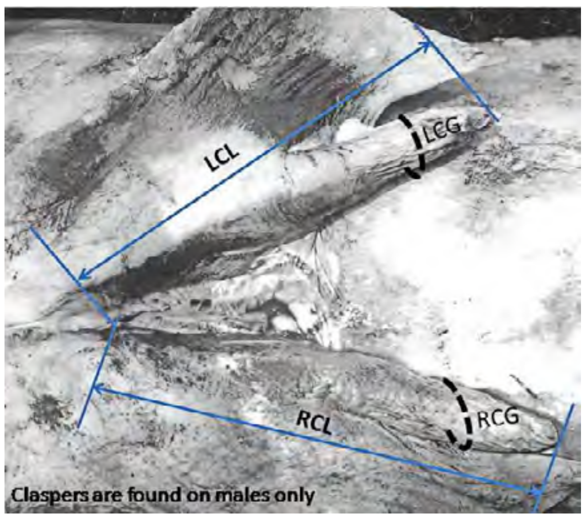
BODY MEASUREMENTS

Figure 23 illustrates body features to be measured for sharks while Table 2 provides descriptions of each part to be measured. Features in bold letters (Table 2) are ideal measurements taken for live stranding or Code 1. If this is not possible, doing so causes more stress to the animal, the most important ones would be the total length and dorsal fin measurements. Similarly, Figure 24 defines the features of rays or skates for measurement and Table 3 identifies these features. The most important information to measure for rays or skates is disc length, disc width, and cranial width. For dead animals, that is, under Codes 2-6, collect all the measurements indicated in the form.

All measurements are taken in a straight line parallel to the body axis and measure to the center of apertures. In the event that a pregnant animal strands, fill out separate form for each pup collected.



Head front view



Pelvic fins with claspers in males

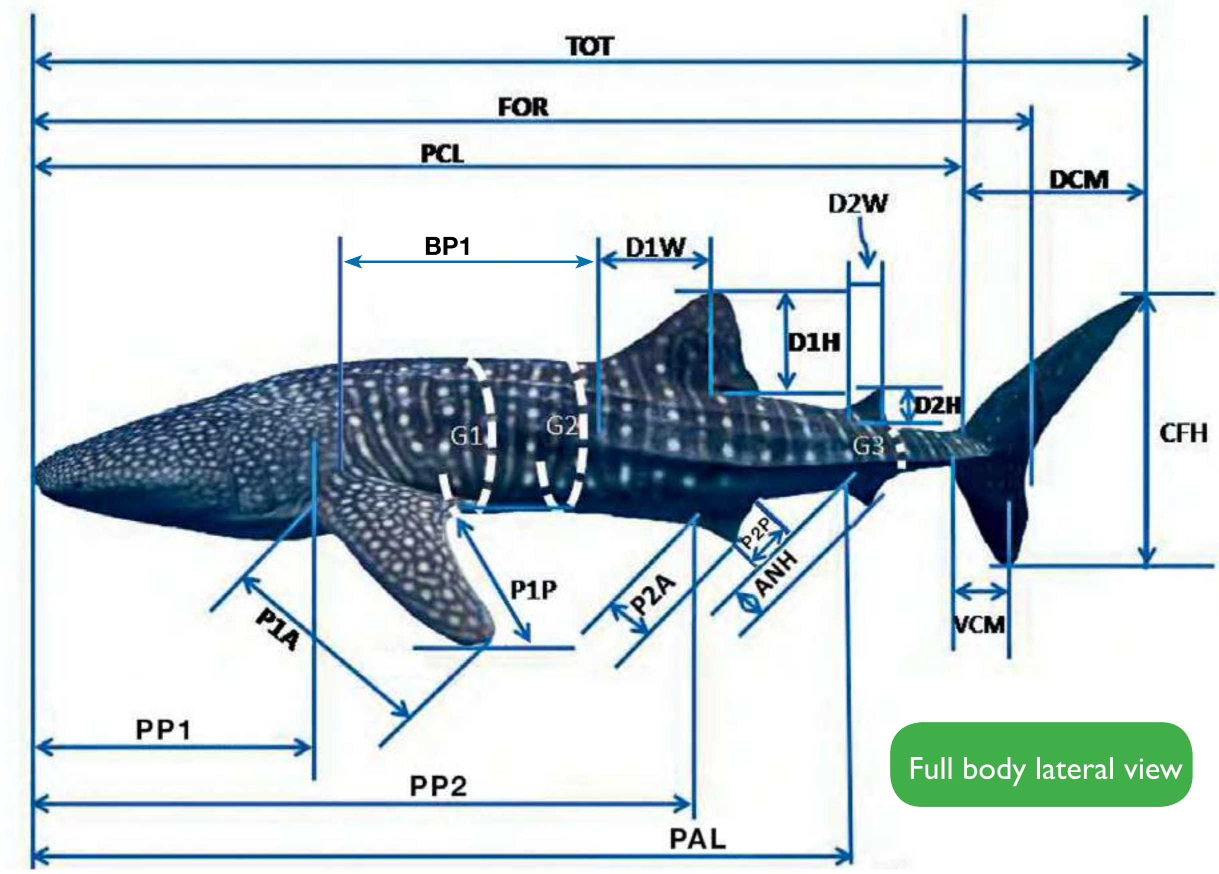


Figure 23 Body measurements for sharks. Refer to Table 2 on the next page for the description.

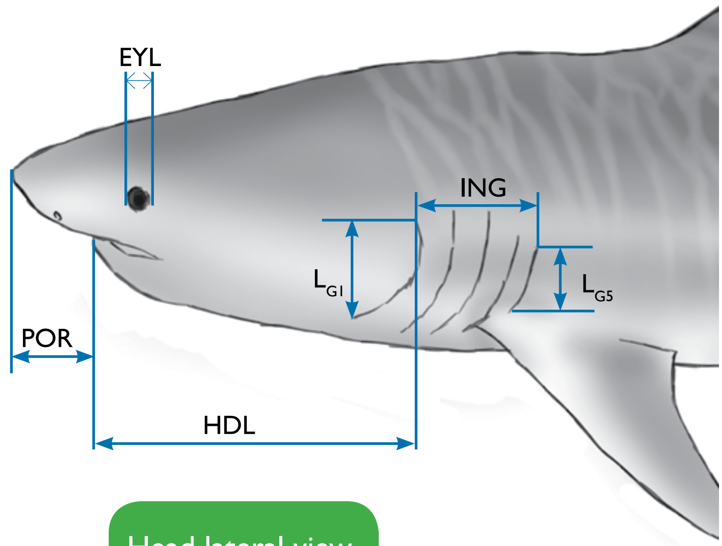


Table 2. Important body measurements for sharks. SL = straight line. Features in bold font are essential measurements to be taken.

Body feature	Description
TOT = Total body length	From the center of the upper jaw to the tip of the upper caudal fin lobe (SL)
FOR = Fork length	From the center of the upper jaw to center of the tail or fork
PCL = Pre-caudal fin length	From the center of the upper jaw to pre-caudal fin notch (SL)
BP1 = 5th gill to start of 1st dorsal fin distance	From the top corner of the 5th gill to be cranial margin of the 1st dorsal fin (SL)
D1H = 1st dorsal fin height	From the base to the highest point of the first dorsal fin perpendicular to the body axis (SL)
L_{G1} = 1st gill length (left)	From the ventral corner to the dorsal corner of the 1st gill (SL)
L_{G5} = 5th gill length (left)	From the ventral corner to the dorsal corner of the 5st gill (SL)
G1 = Girth at axilla	Circumference of the shark body just behind the pectoral fins
G2 = Girth maximum	Circumference of the shark body at its maximum width
G3 = Girth at anus	Circumference of the shark body just behind the anal fin
HDL = Head length	From the center of the upper jaw to the dorsal margin of the 5th gill (SL)
ING = Inter-gill length	Distance between the dorsal margin of the 1st gill and the 5th gill (SL)
HDW = Head width	Distance between the eye (SL, above the head)
EYL = Eye length	Horizontal diameter of the eye
MOW = Mouth width	Distance between the corners of the mouth (SL)
P1A = Pectoral fin anterior margin	From the cranial insertion of the pectoral fin to the tip of the pectoral fin (SL)
P1P = Pectoral fin posterior margin length	From the caudal medial margin of the pectoral fin to the tip of the pectoral fin (SL)
P2A = Pelvic fin anterior margin	From the cranial insertion of the pelvic fin to the tip of the fin (SL)
P2P = Pelvic fin posterior margin length	From the caudal medial insertion of the pelvic fin to the most caudal (SL)
D1W = First dorsal fin base width	From the cranial to the caudal margin of the dorsal fin at its maximum width (SL)
D2H = Second dorsal fin height	From the base to the highest point of the second dorsal fin perpendicular to the body axis (SL)
D2W = Second dorsal fin base width	From the cranial to the caudal margin of the second dorsal fin at its maximum width (SL)
ANH = Anal fin height	From the cranial insertion of the anal fin to the tip of the fin (SL)
DCM = Dorsal caudal fin margin length	Pre-caudal fin notch (dorsal side) to the tip of the upper caudal fin lobe (SL)
VCM = Ventral caudal fin margin length	Pre-caudal fin notch (ventral side) to the tip of the lower caudal fin lobe (SL)
CFH = Caudal fin height	Distance between the tip of the upper and lower lobes of the caudal fin (SL)
LCL = Left clasper length	Length of the medial margin of the left clasper from the cloaca to the posterior tip (SL)
LCG = Left clasper girth	Maximum circumference of the left clasper
RCL = Right clasper length	Length of the medial margin of the right clasper from the cloaca to the posterior tip (SL)
RCG = Right clasper girth	Maximum circumference of the right clasper
POR = Pre-oral length	From tip of snout to upper mouth line
PP1 = Pre-pectoral length	From tip of snout to cranial insertion of pectoral fin (SL)
PP2 = Pre-pelvic length	From tip of snout to cranial insertion of pelvic fin (SL)
PAL = Pre-anal length	From tip of snout to cranial insertion of anal fin (SL)

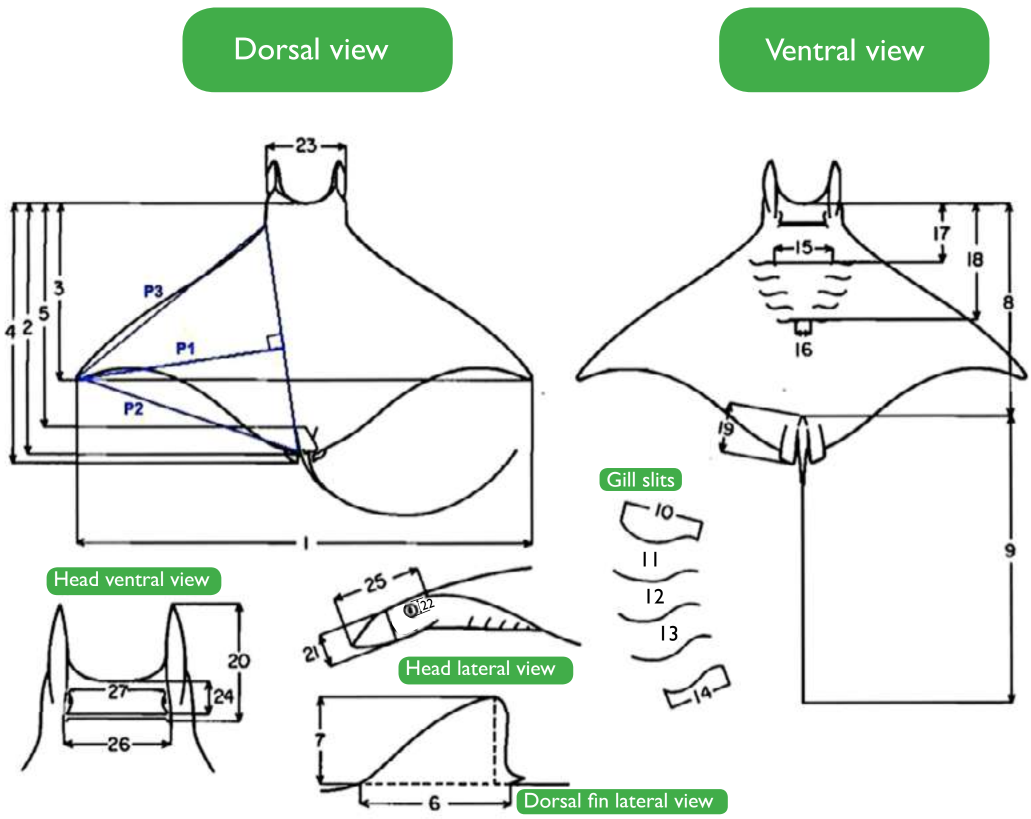


Figure 24 Body measurements for rays. Refer to Table 3 for the description (Notarbartolo-di-Sciara, 1987)

Table 3. Important body measurements for rays. All taken in a straight line. Features in bold font are essential measurements to be taken.

Body Features	Number in Figure 25	Body Features	Number in Figure 25
Disc width (DW)	1	Distance between 5th gill slits	16
Disc length (DL)	2	Distance between rostrum to first gill slits	17
Anterior projection length	3	Distance between rostrum to 5th gill slits	18
Rostrum to pelvic fin length	4	Pelvic fin length	19
Pre-dorsal fin length	5	Cephalic fin length	20
Dorsal fin base width	6	Cephalic fin width	21
Dorsal fin height	7	Diameter of eye	22
Pre-cloacal distance	8	Cranial width	23
Tail length	9	Distance between the rostrum and the base of the cephalic fin base	24
First gill slit length (left)	10	Head length	25
2nd gill slit length (left)	11	Mouth width	26
3rd gill slit length (left)	12	Internasal distance	27
4th gill slit length (left)	13	Mid pectoral fin length	P1
5th gill slit length (left)	14	Posterior pectoral fin length	P2
Distance between first gill slits	15	Anterior pectoral fin length	P3

SPECIMEN COLLECTION AND PRESERVATION

Only BFAR personnel or BFAR-certified persons are allowed to collect tissue samples from protected species for court litigation, diagnosis, and/or research purposes. The following are the recommended minimum requirements for tissue collection:

- Skin (Code 1, animal still alive) – Get skin tissue from the first dorsal fin of the shark or on the lower lobe of the wing for rays for DNA analysis (Fig. 25). The ideal sample size is 1 x 1 x 1 cm or 1 x 1 cm taking the thickness of the skin. Use a sharp, clean pair of scissors.

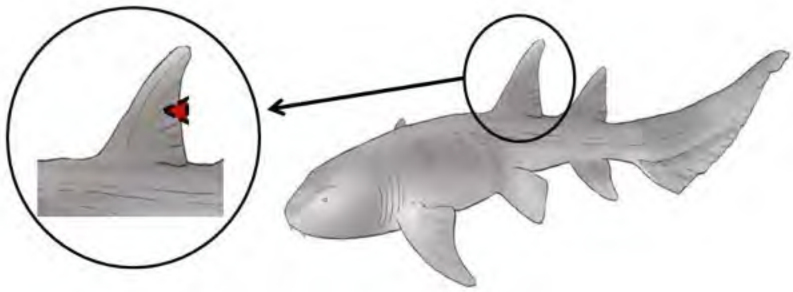


Figure 25 Clipping of the first dorsal fin in sharks (top) and the lower wing lobe in rays (bottom) for DNA analysis. Note the red triangle.

If done correctly, the animal will hardly react to the procedure. The tissue needs to be preserved in 75% or 95% Ethanol solution or completely dried before storage. Properly label each sample collected.

- Skin and muscle tissues (Codes 2-6) - For collecting skin and muscle tissue of whale sharks, collect from the dorsal area of the body, below the first dorsal fin. For rays, skin and muscle tissue can be collected by clipping the tip of its fins, the tip of the lobe near the pectoral fin insertion, or slicing a piece from near the base of its tail. The ideal sample size is similar to that for skin collection.
- Liver and kidney tissues (Codes 2-4) - for toxicologic examination, a minimum of 25 grams per organ sampled per test is required by laboratories for processing.
- Ovary and testes (Codes 2-4) - for life history studies.
- External and internal parasites (Codes 1-6) - for pathology and parasitology.

Other specimens from the stranded animal such as stomach content, jaws and teeth, and/or pups may also be collected. The Team Leader should incorporate a summary of the tissue collection process as well as a list of tissues collected in the stranding report for immediate submission to the proper agencies.

All tissue samples and other specimens collected must be properly labeled, consistent with the information written on the Stranding Data Sheet (EB02). Labels should be legibly written using a pencil on parchment paper and should be placed inside the dry sample container to avoid loss. The same may also be done using a pen and any paper for labeling on the outside of the container for wet samples. Typically, labels must contain the following information:

- Date of Collection. Do not use numbers to represent months to avoid confusion (e.g., 2014/June/30 or 30Jun2014)
- Field Number (e.g., MNRA001; MRG065 - use initials of collector)
- Scientific Name (if known) or common name or local name
- Locality (Sitio, Brgy., Municipality/City, Province, Philippines)
- Type of tissue (e.g., skin, muscle, kidney)
- Name/s of collector/s

Initial preservation of tissue samples may be done by soaking samples in 75% ethyl alcohol or in any non-flavored alcoholic beverage containing a minimum proof of 80 (e.g., vodka). Final preservation should be in 95% ethyl alcohol (Daly-Engel et al., 2012; Pinhal et al., 2008). Ethanol, while easily accessible in the Philippines, is flammable and tissue samples may thus be difficult to transport to the designated repository unless decanted (liquid drained). Drying is the last option if none of the mentioned are available.

Preserved tissue samples may be stored at cool temperatures or at room temperature for a limited amount of time. It is best to store in a refrigerator or freezer to prevent evaporation of the preservative. Kochzius et al. (2010) prescribes refrigeration at 4°C or freezing at -20°C. Always label your specimens with a field photo ID card when taking its picture. Sample bottles should be labeled directly on the bottle or with a water resistant sticker which will include the field number, date of death, date of collection, species, organ/tissue, preservative used.

Tissue samples for genetic analysis, teeth, and any parasites collected from the animal should be sent to DA-BFAR/NFRDI through the regional offices while other preserved specimens (e.g., stomach, kidney) can be deposited with research institutions recognized by BFAR as partners (e.g., SU–IEMS).

The manual covers only the collection of the samples and tissues in the field, including how to preserve them. Analysis will have to be done by a partner organization. For recommended institutions involved in elasmobranch research, contact the DA offices.

TAGGING

If tags are available, tagging may also be undertaken but only by BFAR personnel and BFAR-certified persons. Tagging is a useful tool for researchers in monitoring animal movement and measure environmental parameters. The most successful monitoring tool is the satellite tag (Fig. 26). Though more expensive than the conventional tags or photo-identification, it allows researchers to observe horizontal and vertical movement pattern over shorter time scales.

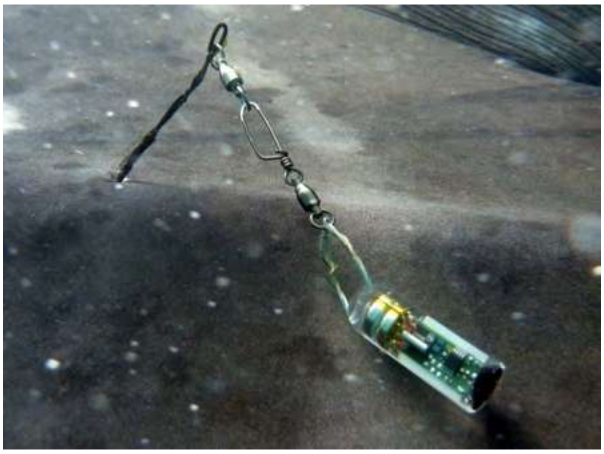


Figure 26 A satellite tag attached to a whale shark. Photo credit: Physalus-LAMAVE

In the Philippines, tagging has been done on whale sharks. During a stranding or capture incident, there is an opportunity to tag the animal. In this situation, tag attachments can be better controlled compared to attaching tags on free-ranging sharks (Bruce, 2011).

Caution should be practiced, however, and tagging procedures should follow scientifically accepted methods and technical equipment. It must also be carried out with expert assistance and only after securing a Fishery Special Permit from DA-BFAR.

WRITE AND SUBMIT A REPORT

The forms should be attached to a narrative stranding incident report using Form EB02, making sure all other relevant information, not covered by Form EB01, are included. Include the photographs taken as well. If necropsy has been conducted, include Form EB03. Submit the completed forms to the agencies and offices listed below. The report can be submitted in hard copy or electronically, making sure that you secure a copy for your own records. The recommended offices to which the reports shall be submitted are listed below. A list of the National Office addresses is found in Annex 5.

- DA-BFAR-NFRDI National Office
- Regional offices of the DA
- PCSD (for Palawan)
- Mayor's Office
- Barangay Captain

Online reporting may be done to NGOs and academe such as the:
- Marine Wildlife Watch of the Philippines Facebook site (https://www.facebook.com/marinewildlifewatchofthephilippines) or E-mail to info@mwwphilippines.org
- SU-IEMS webpage (http://su.edu.ph/iems/projects/cetacean/stranding.shtml) E-mail to iems.su@gmail.com
- Large Marine Vertebrate Research Institute Philippines webpage (http://www.lamave.org) or E-mail to lamave.project@gmail.com

The information will be useful in collating stranding information in the Philippines through a database that will be established by the DA with the help of relevant NGOs and academic institutions.

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ANNEXES

1. Identification Guide to Selected Shark and Ray Species
2. Form EB01 – Shark and Ray Stranding Data Sheet
3. Form EB02 – Shark and Ray Incident Report Form
4. Form EB03 – Shark and Ray Necropsy Form
5. Government Offices Contact Information
6. Decision Flow Chart for a Shark and Ray Incident Response

IDENTIFICATION GUIDE TO SELECTED SHARK AND RAY SPECIES

CR - critically endangered
EN - endangered
VU - vulnerable
NT - near threatened
DD - data deficient

Sawfishes (Pristidae)
Blade-like snout with large, transverse teeth on each side; bodies elongate and sub-cylindrical to compressed; pectoral fins distinctly detached from the head; gill openings located ventrally; eyes and spiracles located dorsally (unlike similar saw sharks)

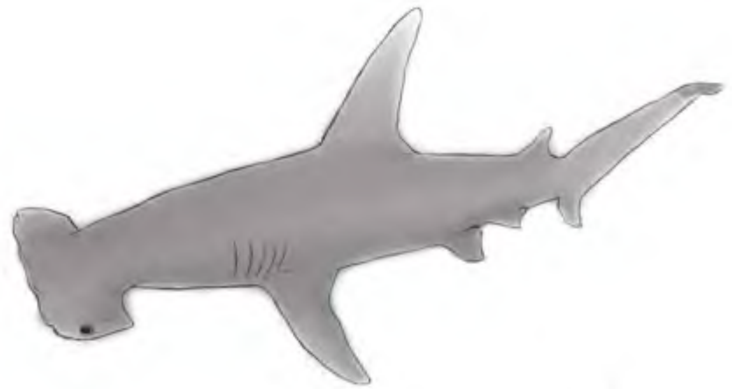
Knifetooth sawfish **EN**
Anoxypristis cuspidata
Total length: 4.7m
Body moderately slender; no teeth on the basal quarter of the rostrum ("saw"); lower lobe of caudal fin more than half the length of upper lobe; pectoral fins short-based

Green sawfish **CR**
Pristis zijsron
Total length: 5m
Body robust; 24-28 pairs of unevenly-spaced teeth on the saw starting near rostral base; lower caudal fin lobe feeble; pectoral fins broad-based

Largetooth/freshwater sawfish **CR**
Pristis pristis
Total length: 7m
Body slender; 18-23 evenly-spaced teeth on the saw starting near rostral base; lower caudal fin lobe feeble; pectoral fins broad-based

Hammerhead Sharks (Sphyrnidae)

Characterized by a unique head shape with eyes located at the tips of laterally expanded blades which resemble a hammer; head width <40% of total length; mouths located ventrally and extending well beyond eyes; bodies fusiform; five pairs of gill slits; circular eyes with a nictitating membrane; dorsal fins spineless; 1st dorsal fin much larger than the 2nd; anal fin present; caudal fin not crescent-shaped



Scalloped hammerhead shark **EN**

Sphyrna lewini

Total length: 3.5m

Front margin of the head curved forward anteriorly and with a median indentation; straight posterior margins to the pelvic fins; low 2nd dorsal fin

Great hammerhead shark **EN**

Sphyrna mokarran

Total length: 5m

Front margin of head nearly straight (except in small juveniles) but with a median indentation; concave posterior margins to the pelvic fins; 1st dorsal fin very tall and falcate; 2nd dorsal fin relatively tall (greater than 3rd gill slit length)

Smooth hammerhead shark **VU**

Sphyrna zygaena

Total length: 5m

Front border of head curved forward anteriorly but with no median indentation

Requiem Sharks (Carcharhinidae)

Small to large sharks with fusiform bodies; mouths located ventrally and extending well past eyes; five pairs of gill slits; circular eyes with nictitating membranes; both dorsal fins with spines; 1st dorsal fin much larger than the 2nd (except in Triaenodon, Glyphis, Negaprion, and Lamiopsis)

Gray reef shark **NT**

Carcharhinus amblyrhynchos

Total length: 2.55m

Bronze to grey in color; 1st dorsal fin origin over the pectoral fin free rear tips; interdorsal ridge usually absent; caudal fin with prominent broad, black posterior margin that is less distinct in large specimens

Oceanic whitetip shark **VU**

Carcharhinus longimanus

Total length: 3.5m

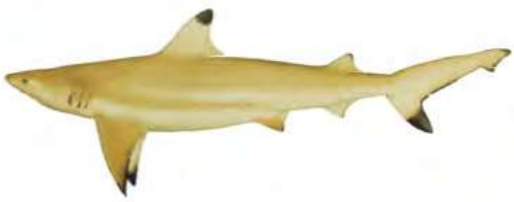
Greatly enlarged first dorsal fin (tapering only slightly towards the apex); pectoral fins each with broadly rounded tips; 1st dorsal, pectoral, and caudal fins with mottled tips (usually absent in specimens below 1.3m); interdorsal ridge present; broadly triangular and serrated upper teeth

Blacktip reef shark **NT**

Carcharhinus melanopterus

Total length: 2m

Snout short and bluntly rounded; dorsal surface yellowish brown to greyish; interdorsal ridge absent; 1st dorsal and lower caudal fins with very distinct black tips and all other fins with relatively smaller black tips



Tiger shark **NT**
Galeocerdo cuvier
Total length: 6m
Head broad and blunt; teeth heavily serrated and cockscomb-shaped; color pattern of dark, vertical, flank bars which is usually absent in specimens longer than 3 meters

Whitetip reef shark **NT**
Triaenodon obesus
Total length: 2m Total length: 2m
First dorsal and upper caudal fins with distinct white tips; 2nd dorsal fin large (1/2 to 3/4 of 1st dorsal fin height); teeth small and smooth-edged with one or more large basal cusplets on either side of the cusp

Manta Rays (Mobulidae)

Pectoral fins form large, rhomboidal wing-like disc; tail slender and whiplike; cephalic lobes prominent; mouth broad and terminal with no teeth on upper jaw.

Giant manta ray **VU**
Manta birostris
Disc width: 6.7m
Grow up to 7 m from tip to tip of wings; no black spots between the 2 rows of gill slits; dark mouth; dark trailing edge on the underside of pectoral wings; black blotch on last pair of gill slits span whole length of slit; T-shaped black and white shoulder patch; remnant stinging spine at base of tail.

Reef manta ray **VU**
Manta alfredi
Disc width: 5.5m
Spots between 2 rows of gill slits, stomach, and wing area on predominantly white underside; light-colored mouth; small black pattern/blotch found on the posterolateral aspect of the last gill slit that is limited to only a fraction of the gill length; Y-shaped black and white shoulder patch; no remnant stinging spine.

Mobula Rays (Mobulidae)
Have prominent fleshy extensions of the pectoral fins known as cephalic lobes; lozenge-shaped disc is much broader than long; head is broad, protruding anteriorly beyond eye level; eyes and spiracles located laterally; mouth very broad located subterminally

Longfin devilray **NT**
Mobula eregoodootenkee
Disc width: 1m
Brownish-grey back, white below with semicircular dark blotch along anterior pectoral-fin margins; disc broad and short; head narrow and long, prominent cephalic lobes, length from fin tip to mouth corner more than 16% of DW; dorsal fin entirely dark; quadrangular tail base, no spine or white tip on dorsal fin; subterminal mouth, teeth usually in both jaws.

Spinetail mobula **NT**
Mobula japanica
Disc width: 3.1m
Bluishblack back, with two concetric patches in shoulders of juveniles, fading in adults; white below, with dark patches in adults; disc broad and short; head narrow and short, prominent cephalic fins or lobes, length from fin tip to mouth corner less than 16% of DW; anterior margin of snout slightly concave; pectoral fins with slightly curved tips, anterior margins straight or slightly convex; dorsal fin tip white; tail long, subequal to or longer than disc width, with a strong spine; mouth subterminal, inside of mouth black; teeth small, tooth height greater than crown width.

Shortfin devilray **DD**

Mobula kuhlii

Disc width: 1.2m

Dark brown-blue back, white below with dark patch along anterior pectoral-fin margins; disc broad and short; head narrow and short, prominent cephalic fins or lobes, length from fin tip to mouth corner less than 16% of DW (or about 12-14% DW); anterior margin of snout slightly concave; pectoral fins with slightly curved tips, anterior margins not undulated, slightly convex; dorsal fin with a white spot at apex; quadrangular tail base; tail shorter than disc, with no spine; subterminal mouth, teeth transversely elongated, lozenge-shaped, with fine rugosities on crown.

Smoothtail mobula **NT**

Mobula thurstoni

Disc width: 2.2m

Dark blue to black back, white below with dark patch along anterior pectoral-fin margins; disc broad and short; head narrow and short, short head bearing short cephalic fins, length from fin tip to mouth corner less than 16% of DW (or about 12-14% DW); anterior margin of snout slightly concave; pectoral fins with silvery slightly curved tips, anterior margins undulated (double bend to the front margins), distinctively concave; dorsal fin with a white spot at apex; quadrangular tail base; tail shorter than disc, with no spine; subterminal mouth, teeth hexagonal with large rugosities on crown.

Sicklefin devilray **DD**

Mobula tarapacana

Disc width: 3.2m

greyish-black back, white below with darker posteror pectoral-fin margins; disc narrower and strongly falcate; head narrow and long, prominent but relatively short cephalic lobes, length from fin tip to mouth corner less than 16% of DW; spiracles slitlike; dorsal fin plain; tail much shorter than disc, without spine on tail base; no spine or white tip on dorsal fin; subterminal mouth, teeth usually in both jaws.

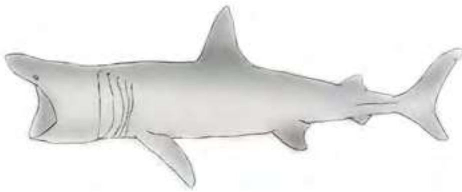
Other Elasmobranch

Great white shark **VU**

Carcharodon carcharias
Total length: 7.2m
Body fusiform and stout; dorsal fins without spines; minute second dorsal fin and anal fin; crescent-shaped caudal fin; large eyes lack nictitating membranes; snout conical; mouth extends well past eyes, with serrated triangular teeth

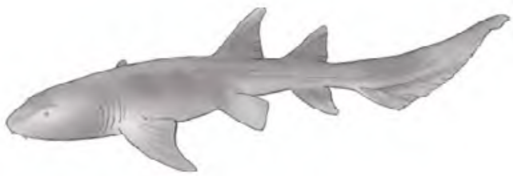
Basking shark **VU**

Cetorhinus maximus
Total length: 15m
Body fusiform and stout; mouth located ventrally and extending well past eyes; 5 very long gill slits that almost encircle the head; crescent-shaped caudal fin. Considered vagrant species in the Philippines but possible to occur



Tawny nurse shark **VU**

Nebrius ferrugineus
Total length: 3.2m
Sandy to greyish brown in color; eyes small; nasal barbels present; 4th and 5th gill slits close together; dorsal fins large and angular with 1st slightly larger than 2nd; pectoral fins falcate; anal fin similar in size and shape to second dorsal fin; caudal fin relatively long with distinct sub-terminal lobe and weak ventral lobe



Whale shark **VU**

Rhincodon typus
Total length: 16m
Fusiform body; 3 conspicuous longitudinal ridges along dorsal aspect; caudal fin semi-lunate; head broadly flattened with a large terminal mouth; marked pattern of light spots and stripes on the dorsal surface

White-spotted giant guitarfish VU

Rhynchobatus australiae

Total length: 1.87m

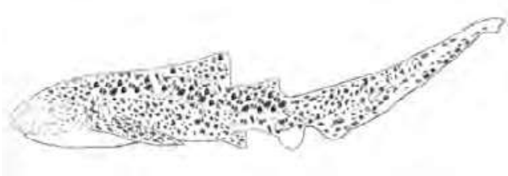
Shark-like; tails long, stout; pectoral disc small; snout and anteriolateral edge of prepectoral head broadly angular and wedge-shaped; pectoral and pelvic fins low and angular; caudal fin distinctly asymetrical; 2 large falcate, subequal dorsal fins present and widely separated; dorsal surface yellowish, brownish, grey-brown, or greenish with small to large white spots and sometimes dark blotches

Leopard shark/Zebra shark VU

Stegostoma fasciatum

Total length: 2.35m

Body moderately stout; prominent ridges on dorsal and flanks; broad head; snout bluntly rounded; 4th and 5th gill slits overlapping; 1st dorsal fin larger than 2nd dorsal fin; pectoral fins large and broadly rounded; caudal fin almost same size as rest of body; yellowish brown coloration peppered with numerous, dark brown spots in most; juveniles less than 70 cm long are dark with white bars and spots

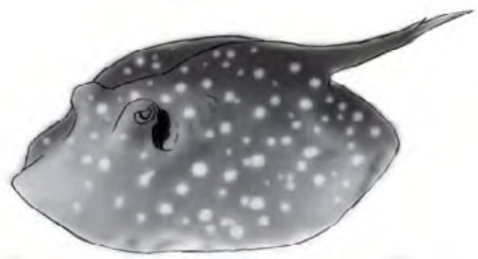


Blue-spotted ribbontail stingray NT

Taeniura lymma

Disc width: 0.35m

Width about 0.8% times of total length; smooth, oval disc with blue spots on the dorsal surface and blue stripes along the tail; tail rather broad-based, depressed, and relatively short (about 1.5 times disc width when undamaged)



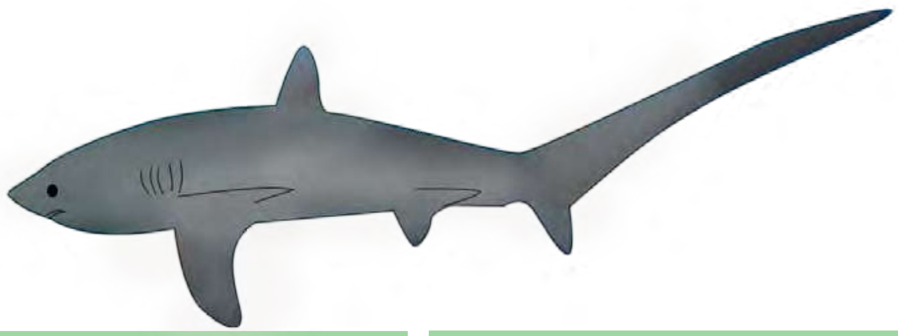
Megamouth shark DD

Megachasma pelagios

Size: 4.25 to 5.5m

Large cylindrical body, gray dorsally and white ventrally; large long head with darks spotting on the lower jaw; huge terminal mouth extending behind eyes.

Thresher Sharks (Alopiidae)
Have greatly elongate upper caudal fin lobe, the length of which is almost one-half of total length; 2 spineless dorsal fins; an anal fin; 5 gill slits, third to fifth gill openings over origin of pectoral fin.



Pelagic thresher shark VU
Alopias pelagicus
Total length: 3.9m
Dark blue back and sides, white underside, **no white patch over pectoral fin bases**; a straight, broadtipped pectoral fins, very narrow caudal tip, upper caudal fin lobe very long and strap-like, almost equal to length of rest of shark, lower caudal fin lobe short but strong, and terminal lobe very small; fusiform body, narrow head, broadly convex forehead, moderately large eyes, esp. in juveniles.

Common thresher shark VU
Alopias vulpinus
Total length: 7.6m
Dark blue-grey back and underside of snout, lighter sides, white patch extends from the abdomen over the pectoral-fin bases, white dots and patches sometimes present on pectoral-, pelvic-, and caudalfin tips, blackish pectoral, pelvic, and dorsal fins; narrow-tipped pectoral fins, 2nd dorsal origin well behind rear tip of pelvic fin, narrow-tipped caudal fin, caudal fin lobe very long and strap-like, about as long as or longer than length of rest of shark; lower caudal fin lobe short but well developed; fusiform body, relatively small eyes.

Big-eye thresher shark VU
Alopias superciliosus
Total length: 4.88m
Purplish gray back and cream or light colored undersides, not expanded over pectoral-fin bases, dusky posterior edges of pectoral and pelvic fins and sometimes 1st dorsal fin; 1st dorsal fin further back than in other threshers, curved broad-tipped pectoral fins, broad caudal tip, upper caudal fin lobe very long and straplike almost or quite equal to length of rest of shark, lower caudal fin lobe short but well developed; fusiform body, very large eyes (extending onto the dorsal head surface), and indented forehead.

EB01 SHARK AND RAY STRANDING DATA SHEET

Date of response: __________________ Time of response: ___________

Name of Data Collector: ____

Office/Agency: _____________________ Contact No.:________________

Locality: ______________________

____

GPS coordinates (if available):

Long.:_____________________

Lat.:_______________________

STRANDING INFORMATION

Date of stranding: __________________ Time of stranding: ___________

Name of person who reported the stranding: _________________________

Contact No.:____

Condition of the animal *(Please check appropriate box)*	
Code 1 – Alive	
Code 2 – Freshly Dead	
Code 3 – Decomposed, with organs intact	
Code 4 – Advanced Decomposition	
Code 5 – Skeletal/Cartilaginous Remains	
Code 6 – Destroyed (e.g., slaughtered, burned)	

Environmental conditions			
Sea state:	☐ calm	☐ moderate	☐ rough
Weather:	☐ sunny	☐ cloudy	☐ rainy
Beach type:			
☐ mangrove	☐ rocky	☐ sandy	☐ reef
☐ other (please specify):			

Stranding condition: ☐ free-swimming ☐ beached ☐ trapped, gear _______ ☐ entangled, fishing gear _______ ☐hooked

Species identification (please check appropriate box): ☐ shark ☐ ray ☐skate ☐ unknown

Local name: ______________ Common name: __________________ Genus: _______________ Species: _____________

Sex: ☐ male ☐ female* ☐ unknown **If female, were there any*: ☐ eggs ☐ embryos Est. weight (kg):______________

No. of animals stranded: ☐ one ☐ more: _____ fill up morphometrics, etc. for as many as possible

Distinct markings present (please draw on illustration at back)

☐ scars ☐ wounds ☐ tags ☐ other (e.g., finned):____________

Morphometric Data (in cm): LIVE STRANDING	
Total length (TOT)	
Fork length (FOR)	
Pre-caudal length (PCL)	
Head length (HDL)	
Mouth width (MOW)	
Eye length (EYL)	
Pectoral fin anterior margin (P1A)	
Pelvic fin anterior margin (P2A)	
First dorsal fin height (D1H)	
Second dorsal fin height (D2H)	
Anal fin height (ANH)	
Dorsal caudal fin margin (DCM)	
Clasper length (LCL and RCL, for males)	
Disc width (DW; rays only) 1	
Disc length (DL; rays only) 2	

Photo-documentation *(please check appropriate box)*		
LATERAL VIEW	DORSAL VIEW	VENTRAL VIEW
☐ whole	☐ whole	☐ whole
☐ head	☐ head	☐ head
☐ **whale shark photo-ID**: left side between last gill slit and 1st dorsal fin		☐ pectoral fins
Tissue/Specimen Collection Checklist:		
☐ Skin	☐ Muscle	☐ Liver
☐ Ovary and testes	☐ Parasites	☐ Other:
Animal's disposition		
☐ Released	☐ Buried	☐ Other:
☐ Tagged: location on body:_____________ I.D. No.:__________		
Location of disposal site (if applicable):		

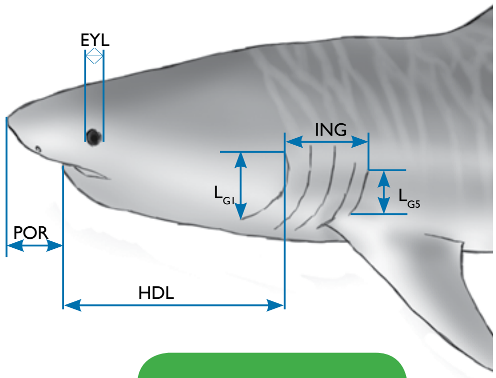
Necropsy conducted? ☐ yes ☐ no

Name and contact details of the person supervising necropsy:

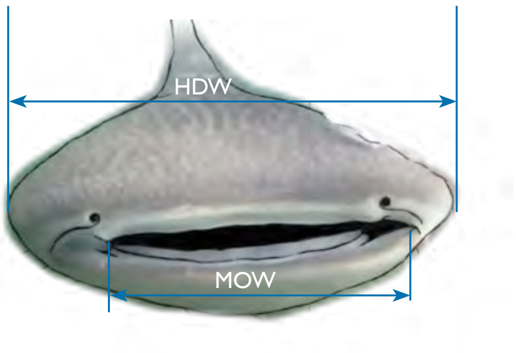
____

For complete shark body measurements, fill-out the table below.

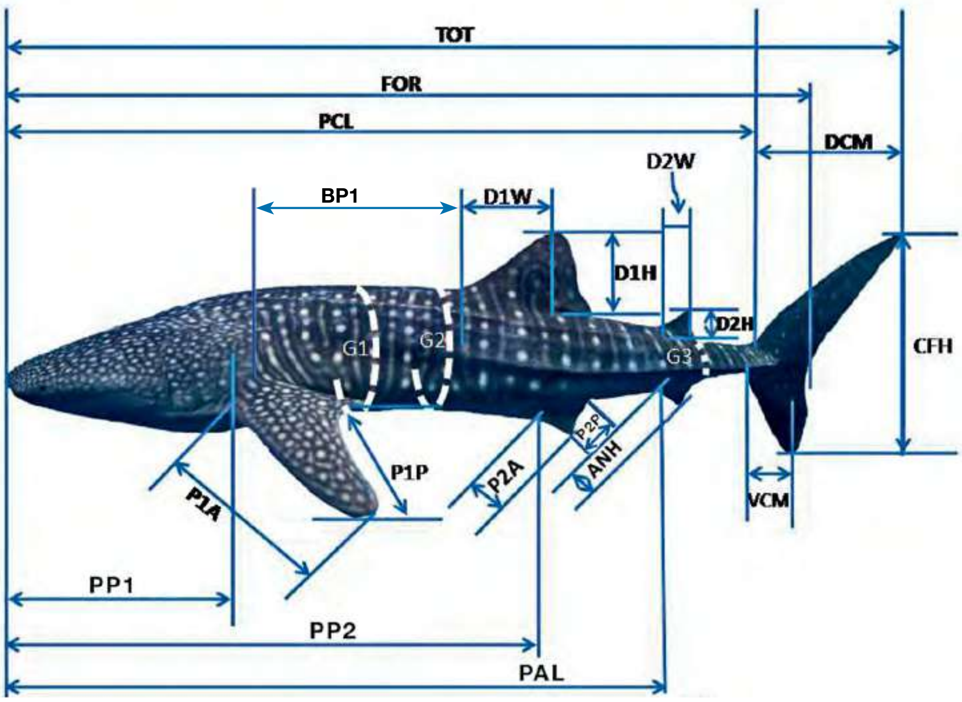
Body features	In centimeters
BP1 = 5th gill to start of 1st dorsal fin distance	
L_{G1} = 1st gill length (left)	
L_{G5} = 5th gill length (left)	
G1 = Girth at axilla	
G2 = Girth maximum	
G3 = Girth at anus	
ING = Inter-gill length	
HDW = Head width	
P1P = Pectoral fin posterior margin length	
P2P = Pelvic fin posterior margin length	
D1W = First dorsal fin base width	
D2W = Second dorsal fin base width	
VCM = Ventral caudal fin margin length	
CFH = Caudal fin height	
LCG = Left clasper girth	
RCG = Right clasper girth	
PP1 = Pre-pectoral length	
PP2 = Pre-pelvic length	
PAL = Pre-anal length	

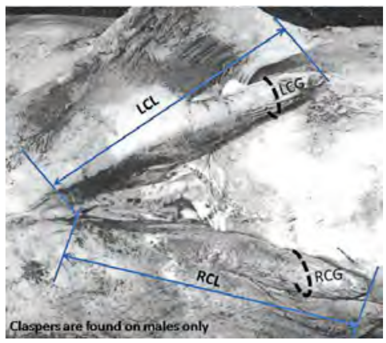


Head lateral view



Head front view





Pelvic fins with claspers in males

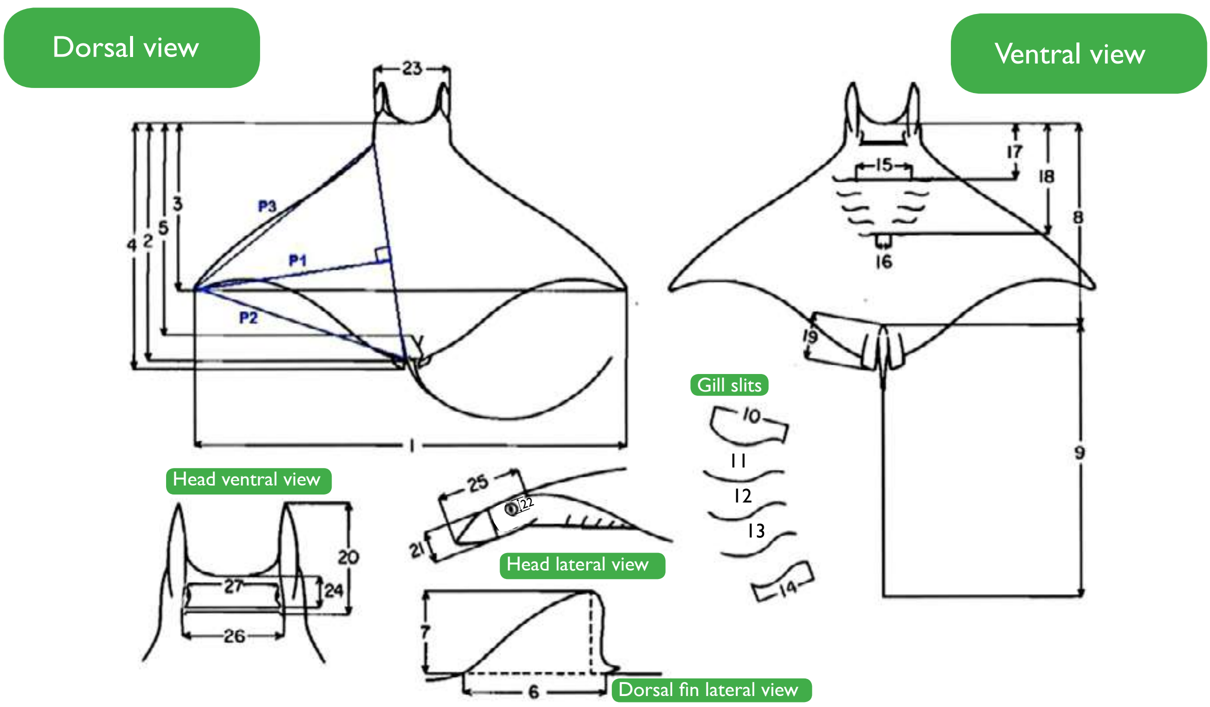
Full body lateral view

For rays: Apply shark measurements when possible.

Cephalic fin present? ☐ yes ☐ no

Mouth terminal? ☐ yes ☐ no

Patterns on ventral side of body present? ☐ yes ☐ no If yes, please draw:



For complete ray body measurements, fill-out the table below.

Body features	In centimeters	Body features	In centimeters
Anterior projection = 3		Rostrum to first gill slits = 17	
Rostrum to pelvic fin = 4		Rostrum to 5th gill slits = 18	
Pre-dorsal length = 5		Pelvic fin length = 19	
Dorsal fin base = 6		Cephalic fin length = 20	
Dorsal fin height =7		Cephalic fin width = 21	
Pre-cloacal distance = 8		Diameter of eye = 22	
Tail length = 9		Cranial width = 23	
First gill slit length (left) = 10		Distance b/w rostrum and base of cephalic fin = 24	
2nd gill slit length (left)= 11		Head length = 25	
3rd gill slit length (left)= 12		Mouth width = 26	
4th gill slit length (left) = 13		Internasal distance = 27	
5th gill slit length (left) = 14		Mid pectoral fin length = P1	
Distance between first gill slits = 15		Posterior pectoral fin length = P2	
Distance between 5th gill slits = 16		Anterior pectoral fin length = P3	

EB02 SHARK AND RAY STRANDING DATA SHEET

<table>
<tr><td colspan="6">Part 1. Source of Stranding Information</td></tr>
<tr><td>Stage</td><td>Date</td><td>Time</td><td>Name of Informant or Data Collector</td><td>Contact Details</td><td>Address</td></tr>
<tr><td>Initial Report</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>During Response</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Part 2. Stranding Account</td></tr>
<tr><td colspan="6">Stranding location: (e.g., Sitio, Barangay, Municipality, City, Province)</td></tr>
<tr><td colspan="3">Species identification (scientific name and/or common name or local name)</td><td>Sex:
Male</td><td>Female</td><td>Not Determined</td></tr>
<tr><td colspan="6">Brief and concise summary of the stranding event. Include who were the first responders (e.g., fishermen, residents, Bantay Dagat):</td></tr>
<tr><td colspan="6">Response team members:</td></tr>
<tr><td colspan="3">Report prepared by:</td><td colspan="3">Date accomplished:</td></tr>
<tr><td colspan="3">Photographs taken attached</td><td colspan="3">EB01 or EB03 attached</td></tr>
</table>

EB03 SHARK AND RAY NECROPSY FORM

Date of Necropsy: ________________ Time of necropsy: ________________ Necropsy Site: ______________

Name of person supervising necropsy: ____

Office/Agency: ____________________ Contact No.:______________ Email: ____________________________

STRANDING INFORMATION

Date of stranding: _______________ Time of stranding: __________________ Stranding Site: ______________

Date of Death: __________________ Time of Death: ____

Name of person who reported the stranding: _____________________ Contact No.:_____________________

Death Circumstances: ____

____

____

Species identification (please check appropriate box): ☐ shark ☐ ray ☐ skate ☐ unknown

Local name: ______________ Common name: __________________ Scientific name: ___________________

Sex: ☐ male ☐ female* ☐ unknown *If female, were there any: ☐ eggs ☐ embryos Est. weight (kg.):________

Stranding condition: ☐ floating ☐ trapped ☐ entangled ☐ beached ☐ Fishing gear (if trapped):_____________

Distinct markings present (please draw on illustration at back)

☐ scars ☐ wounds ☐ tags ☐ other (e.g., finned):_____________ Location on the body: ________________

Tag type (brand-model) : _____________________ Location on the body: _____________________________

Tag I.D. No.___________________ Tag contact information: ____

Remarks: ____

____

____

Condition of the animal *(Please circle the appropriate box)*				
Code 2 Freshly Dead	Code 3 Decomposed, with organs intact	Code 4 Advanced Decomposition	Code 5 Skeletal/Cartilaginous Remains	Code 6 Destroyed (e.g., slaughtered)

Photo-documentation *(please check appropriate box)*		
LATERAL VIEW ☐ whole ☐ head	DORSAL VIEW ☐ whole ☐ head	VENTRAL VIEW ☐ whole ☐ head
☐ dorsal fin	☐ pectoral fins (L – R)	☐ genitals
☐ tag	☐ scars	☐ wounds
☐ **manta ray photo-ID** : wide angle shot of the full ventral side of the body		☐ spiracle (small hole behind eye)
☐ **whale shark photo-ID**: left and right side of the body between last gill slit and 1st dorsal fin		☐ parasites (external)

Internal Measurements and Samples (indicate units used)

Liver (weight) ______________ Liver, right (L×W×D) ___________ Liver, left (L×W×D) _____________

Stomach, full (weight) ________ Stomach, empty(weight) _________ Stomach, content (weight) _____

Spiral valve (L×W×D) ________ Heart (weight) ______________ Heart (L×W×D) ______________

Kidney (weight): L _________ R ________ Kidney (L×W×D): L __________ R _________________

Claspers weight: L______ R______ Calcification: L ____ R____ Sperm in epididymis? _________

Pregnant? ____ Uterine condition _________________________ Vaginal mucus? _______________

Gonads (weight): R______ L_______ dimensions (L×W×D) R___________ L _______________

Pups: number M_____ F______ Length (shark)/Disc Width (ray) ___________ weights ______________

Please collect body measurements for each pup

Organ	Parasite	Sample	Description
Mouth			
Spiracle			
Eye			
Gills			
Gill rakers			
Fins			
Claspers			
Cloaca opening			
Brain			
Inner ear (L/R)			
Esophagus			
Stomach			
Spiral valve			
Rectum			
Liver			
Gall bladder			
Spleen			
Bile duct			
Pancreas			

Organ	Parasite	Sample	Description
Kidney			
Kidney duct			
Uterus			
Gonads			
Hearth			
Muscle			
Blood			
Vertebra			
Skin			
Stomach content (describe condition and quality)			
Parasite: insert number if present; NO if absent; NE if not examined Sample: indicate quantity, preservative and vial number Description: NR if normal; NE if not examined; If not normal, please describe			
Bold indicate minimum sample collection. Please collect at least $1cm^3$ of skin and store in 95% ethanol			

DIAGNOSIS

CAUSE OF DEATH

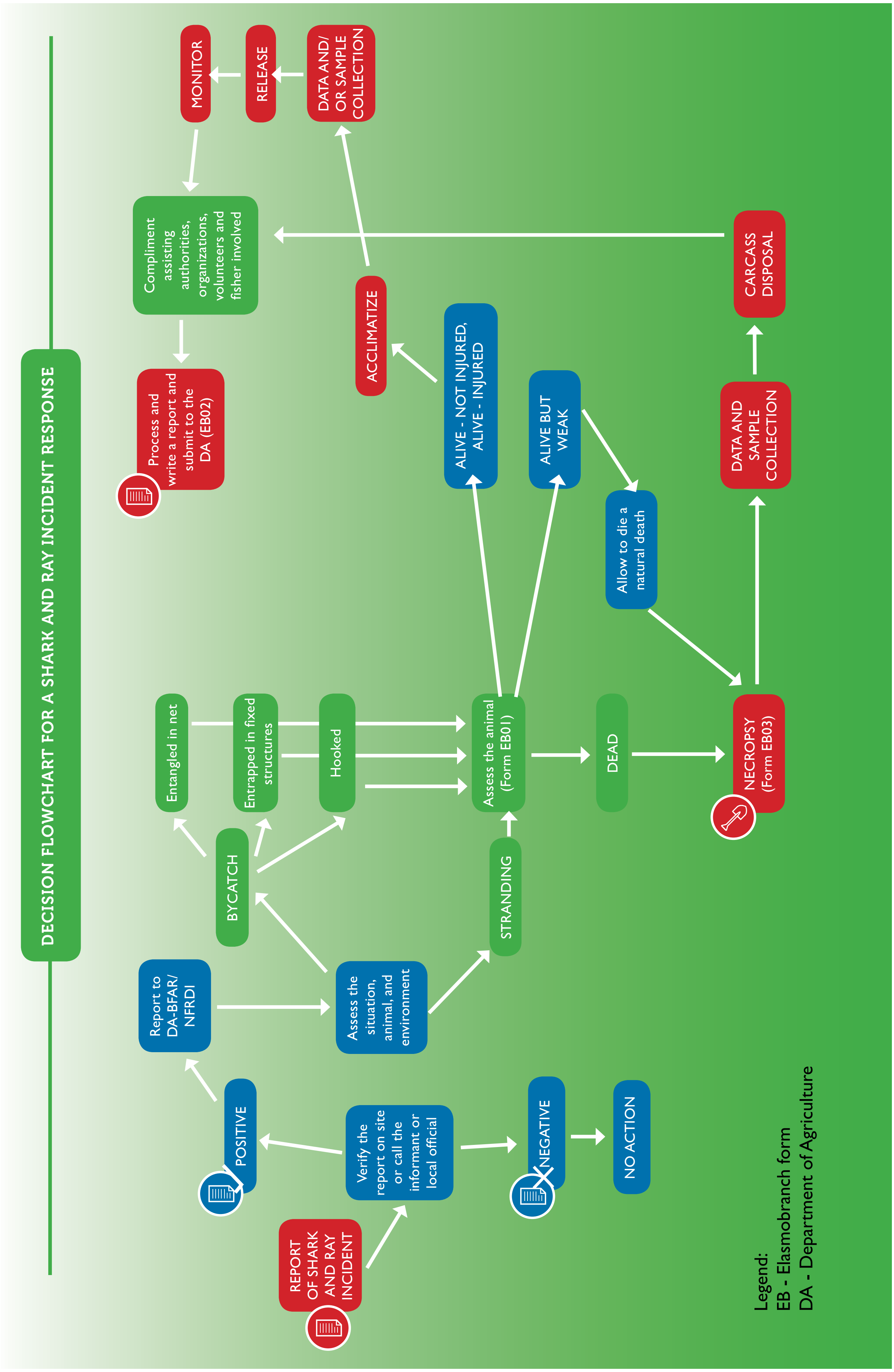
Examined by: ____

Contact details ____

Government Offices Contact Details

OFFICE OF THE DIRECTOR
Bureau of Fisheries and Aquatic Resources
Department of Agriculture
3rd Floor, Philippine Coconut Authority (PCA) Building
Elliptical Road, Diliman
Quezon City, Metro Manila
Telephone Number: (02)9299597; (02)9298074
Website: www.bfar.da.gov.ph
Email: info@bfar.da.gov.ph

OFFICE OF THE INTERIM DEPUTY DIRECTOR
National Fisheries Research and Development Institute
Bureau of Fisheries and Aquatic Resources
Department of Agriculture
Corporate 101 Building
Mother Ignacia Avenue
Brgy. South Triangle
Quezon City, Metro Manila
Telephone Number: (02)3523596
Website: www.nfrdi.da.gov.ph
Email: info@nfrdi.da.gov.ph and nfrdi.misu@gmail.com


DECISION FLOWCHART FOR A SHARK AND RAY INCIDENT RESPONSE
REPORT OF SHARK AND RAY INCIDENT
Verify the report on site or call the informant or local official
POSITIVE
NEGATIVE
NO ACTION
Report to DA-BFAR/ NFRDI
Assess the situation, animal, and environment
BYCATCH
STRANDING
Entangled in net
Entrapped in fixed structures
Hooked
Assess the animal (Form EB01)
DEAD
NECROPSY (Form EB03)
DATA AND SAMPLE COLLECTION
CARCASS DISPOSAL
ALIVE - NOT INJURED, ALIVE - INJURED
ALIVE BUT WEAK
Allow to die a natural death
ACCLIMATIZE
DATA AND/ OR SAMPLE COLLECTION
RELEASE
MONITOR
Compliment assisting authorities, organizations, volunteers and fisher involved
Process and write a report and submit to the DA (EB02)
Legend:
EB - Elasmobranch form
DA - Department of Agriculture