

PATING KA BA?

An Identification Guide to Sharks, Batoids and Chimaeras of the Philippines



giz

Supported by:
Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

based on a decision of the German Bundestag



MARINE
WILDLIFE
WATCH
OF THE
PHILIPPINES



Bureau of Fisheries and Aquatic Resources -
National Fisheries Research and Development Institute
101 Mother Ignacia Ave., Brgy. South Triangle, Quezon
City, Metro Manila, Philippines
Tel: +63 (2) 352 3596
E-mail: nfrdi.misu@gmail.com

Marine Wildlife Watch of the Philippines
G/F, Spanish Bay Tower, Bonifacio Ridge, 1st Ave., Fort
Bonifacio Global City, Taguig City 1634, Philippines
Tel: +63 (2) 812-3196
+63 (2) 812-3198
Fax: +63 (2) 812-3197
Email: info@mwwphilippines.org

ISBN 978-971-8722-33-6

Philippine Copyright © 2014 by BFAR-NFRDI

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of materials in this information product for resale or other commercial purposes is prohibited.

Recommended Entry:

Alava, MNR, JPA Gaudiano, JT Utzurum, EE Capuli, MTR Aquino, MMA Luchavez-Maypa, and MD Santos. 2014. *Pating Ka Ba? An Identification Guide to Sharks, Batoids and Chimaeras of the Philippines*. Department of Agriculture Bureau of Fisheries and Aquatic Resources - National Fisheries Research and Development Institute and the Marine Wildlife Watch of the Philippines. 200 pages.

Cover Design: MNR Alava, HS Ennace and MV Encomienda.
Book Design: MNR Alava, MD Santos and MV Encomienda.
Photo Editors: R Atanacio and MV Encomienda. Layout
Artist: MV Encomienda.

PATING KA BA?
An Identification Guide to
Sharks, Batoids and Chimaeras
of the Philippines

Moonyeen Nida R. Alava
Joe Pres A. Gaudiano
Jean Asuncion T. Utzurrum
E. Emily C. Capuli
Ma. Theresa R. Aquino
M-May A. Luchavez-Maypa
Mudjekeewis D. Santos

ABOUT THE AUTHORS & CONTRIBUTORS

Ms. Moonyeen Nida R. Alava (M.Sc.), an independent Elasmobranch Specialist to the Marine Wildlife Watch of the Philippines under the DENR-GIZ ACCCoast Project, designed the 1998-2001 WWF Elasmobranch Biodiversity and Conservation Project and co-authored the 2005 Checklist of Philippine Cartilaginous Fishes. She worked with various institutions to include Silliman University, CI-Philippines and the Global Marine Species Assessment - Coral Triangle advocating for marine threatened species conservation. She is currently based in Quezon City. Email: mnralava@gmail.com.

Mr. Joe Pres A. Gaudiano (B.Sc.) has more than 15 years of intensive involvement in Philippine elasmobranch biodiversity studies, initially as a Research Assistant of the 1998-2001 WWF Elasmobranch Biodiversity and Conservation Project in Silliman University and later as Project Manager in various project-based field researches in WWF- Philippines. He is currently an independent researcher on marine resources management and is based in Quezon City. Email: adon_jpag@yahoo.com.

Ms. Jean Asuncion T. Utzurrum (B.Sc.), Research Assistant to MMWP's Marine Wildlife Conservation Management Project with focus on knowledge product development on whale sharks and elasmobranchs, is currently a graduate student specializing on ray fisheries at the Silliman University – Institute of Environmental and Marine Sciences, Bantayan, Dumaguete City, 6200 Philippines. Email: jeanutz@gmail.com.

Ms. Estelita Emily Capuli (M.Sc.), a Research Associate of the FishBase Information and Research Group, Inc., with more than 20 years of experience with FishBase, continues to update the checklists of the Philippines and the Indo-Pacific region, encodes taxonomic and species (biological and spatial) information, and is responsible for the synchronization of FishBase and the Catalog of Fishes with the help of Dr. Nicolas Bailly and Dr. William N. Eschmeyer. Email: e.capuli@fin.ph.

Dr. Theresa R. Aquino (D.V.M.), an independent consultant to the Tubbataha Reefs Natural Park on marine threatened species and habitat conservation and management research, is also a Board Member of the Marine Wildlife Watch of the Philippines. Email: dugongdoc@gmail.com.

Ms. M-May Luchavez-Maypa (B.Sc.) was the Project Manager of the 1998-2001 WWF Elasmobranch Biodiversity and Conservation Project in Silliman University instrumental in acquiring valuable material from local fish markets and landing sites as well as in establishing a data baseline of sharks, rays and chimaeras. She is currently based in Dumaguete City. Email: maymaypa@yahoo.com.

Dr. Mudjekeewis D. Santos (Ph.D.), cited for his research and development work on genetics, biotechnology and resource assessment of Philippine aquatic species that includes chondrichthyan fishes, is currently the Scientist 1 of the Bureau of Fisheries and Aquatic Resources - National Fisheries Research and Development Institute, 101 Mother Ignacia St., Quezon City 1100. Email: mudjiesantos@gmail.com.

ACKNOWLEDGEMENT

Numerous individuals and institutions have helped in the compilation and development of this book. In particular, the authors acknowledge the support of lead institutions in the 1998-2001 Elasmobranch Biodiversity and Conservation Project, namely, World Wide Fund for Nature (WWF)-Philippines and WWF-USA, Silliman University Institute of Environmental and Marine Sciences (SU-IEMS), and the Bureau of Fisheries and Aquatic Resources (BFAR), for having supported the first dedicated project that effectively established a collection of specimens from fish landing and market sites and a data baseline of sharks, batoids and chimaeras deposited at the Dr. Angel C. Alcala Environment and Marine Science Laboratories in Dumaguete, Negros Oriental and the Philippine National Museum in Manila.

The authors also wish to thank Dr. Peter S. Last and Dr. John D. Stevens of the Commonwealth Scientific Industrial Research Organisation (CSIRO) Marine Research (Hobart, Australia) and Dr. Leonard Joseph Victor Compagno of the Shark Research Center, South African Museum (Cape Town, South Africa), for providing significant support and resources in the conduct of taxonomic and biological workshops and training sessions for the 1998-2001 Elasmobranch Project Team and partners and the validation of voucher specimens in the collection; Dr. Gavin J.P. Naylor of the Florida State University and Dr. William White of CSIRO for providing helpful comments on selected species; and Ms. Andy Oliver, formerly of WWF-USA, for assisting in an early draft of this document.

Much of the work after the WWF-SU Elasmobranch Project were done independently by the authors in various capacities, with support of a number of colleagues and friends. We are grateful for the technical and administrative support of the leaders and staff of the following institutions, namely: the National Fisheries Research and Development Institute (NFRDI), Director Melchor Tayamen, Mr. Noel Barut, Mr. Joseph Rayos, Ms. Aron Alcantara, and Mr. John de la Peña; BFAR Fisheries Regulatory and Quarantine Division (FRQD), Atty. Annaliza Vitug and Mr. Edwyn Alesna; BFAR Region 6, Mr. May Guanco and Ms. Sheryl Mesa; the Marine Wildlife Watch of the Philippines, Director Arnel Andrew S.P. Yaptinchay and Ms. Ichie Albea; the SU-IEMS, Dr. Janet Estacion, Dr. Hilconida P. Calumpung, Ms. Clarissa T. Reboton, Ms. Crystelle Dayot, Ms. Pablina Cadiz, Ms. Jacinta Lucanas, Mr. Angelico Jose Tiongson and former project staff member Mr. Brian R. Uypitching; the Tubbataha Management Office, Protected Area Superintendent Angelique M. Songco, Mr. Rowell C. Alarcon, Mr. Segundo F. Conales Jr., and Mr. Roy P. Magbanua; the FishBase Information and Research Group (FIN), Dr. Nicolas Bailly, Executive Director Mary Ann P. Bimbao, Ms. Rachel C. Atanacio, Ms. Joann R. Glorioso, Mr. Rodolfo B. Reyes, and Ms. Ma. Josephine France Rius-Barile.

We also received additional field photos from colleagues from partner institutions. We are particularly grateful to the project leaders and field staff of the National Stock Assessment Program in the regions, particularly from Aparri, Cebu, General Santos, Negros-Panay, Quezon, Mariveles, and Zamboanga. We also thank Mr. Alessandro Ponzo of LaMaVe/Physalus.org for the *Mobula* photos; Mr. Steve de Neef for the underwater whale shark and pelagic thresher shark photos; and the Friends of Tubbataha, particularly Mr. Heinz Rebmann, Ms. Kayla Ledesma, Seidenhai, Ms. Lene and Mr. Claus Topp for the underwater photos of Tubbataha sharks and rays; and Ms. Carlie Devine of CSIRO for enhanced images of selected photos. In the absence of representative images, we also acknowledge Food and Agriculture Organization of the United Nations (UN-FAO) for the use of illustrations and line drawings representing families and/or species. We also thank Ms. Jenica Dizon and Ms. Hannah Fatima P. Ebro for assistance in the initial artwork and layout design studies, Mr. Harold Emnace for technical advice and assistance on final product, Ms. Anna Oposa and Ms. Michelle Encomienda for proofreading of selected pages.

Most importantly, we also acknowledge the DENR-GIZ ACCCoast Small Grants Program for supporting the development of this book under the Marine Wildlife Watch of the Philippines, particularly: the DENR Biodiversity Management Bureau (BMB), Director Theresa Mundita S. Lim, Asst. Director Jacobo Meimban, Dr. Vincent Hilomen, Mr. Carlo Custodio, Ms. Lynette Laroya, and Ms. Angelita Meniado; and the GIZ ACCCoast Project Team, Chief Adviser Mr. Patrick Schwab, Mr. Terence Dacles, Ms. Florence Morales, Ms. Reina Villanueva, Ms. Dorotea Caayao and Ms. Shella Estecomín for making project resources available. The project is part of the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety.

FOREWORD

Sharks and their relatives, the rays, skates and chimaeras, were previously considered to be of low economic value to large-scale commercial fisheries. In recent years, sharks have gained commercial importance to large-scale commercial and artisanal fisheries. They are increasingly targeted for their meat, skin, cartilage, teeth, jaws, liver/liver oil, and even other internal organs. Demand for sharks and sharks products in the past 30-40 years has resulted in an increasing number of species threatened with extinction due to a combination of factors from over-exploitation, degradation of important habitats (*i.e.*, nursery and breeding grounds) from development and pollution compounded by the effects of a changing climate.

Consequently, there is now increasing concern about the rise of shark catches and the impact this has for some shark species populations. There is a need to balance fishing efforts and resource exploitation with conservation and management measures to attain sustainability of our marine fishery resources.

As reported in the Philippine National Plan of Action for the Conservation and Management of Sharks (NPOA-Sharks), most if not all of possibly 160 or more cartilaginous fish species reported to occur in our waters factor either in directed/targeted catch or incidental by-catch of commercial and/or municipal fisheries. Yet, there is limited reporting record on each of these species nationwide, particularly in terms of species-specific catch and effort, landing volume and trade data. There is also a serious lack of information on the biological parameters of shark species, on the identification of most species, and on the capacity to manage the resource as a whole. Such limitation on our knowledge of sharks and of the practices employed in shark fisheries in many of our fishing grounds is hindering us in providing appropriate management measures on the ground.

To improve knowledge on the state of shark stocks and facilitate the collection of the necessary information, adequate resources and support system are required for research and management.

Sharks and its relatives are characterized by K-selected life history traits such as slow growth, late sexual maturity, low fecundity, low natural mortality, and long life resulting in low rates of population increase. Due to these character traits and many other complex spatial structures such as size/sex segregation and seasonal migration, sharks often have a low stock-to-recruitment relationship and long stock recovery times when overfished. Thus, these fishes are highly vulnerable to overexploitation.

This book "*Pating Ka Ba? An Identification Guide to Sharks, Batoids and Chimaeras of the Philippines*" is long overdue. There is a need to improve the management of directed fisheries of sharks and its relatives, as well as certain multispecies fisheries in which they constitute as by-catch. This identification guide is a useful reference to enhance our understanding on these species and our capacity to manage them.



Atty. Asis G. Perez

Director

Bureau of Fisheries and Aquatic Resources

TABLE OF CONTENTS

Title Page	i
About the Authors & Contributors	ii
Acknowledgments	iii
Foreword	iv
Table of Contents	v
1 INTRODUCTION	1
What is a fish?	1
How are fishes classified?	1
What are the two types of fishes?	3
What are cartilaginous fishes?	4
What are true sharks?	4
What are batoids?	5
What are chimaeras?	5
Why this book?	6
How to use this book	7
2 TERMINOLOGIES AND MEASUREMENTS	9
Shark terminology and measurements	9
Batoid terminology and measurements	10
Chimaera terminology and measurements	11
3 KEY TO THE ORDERS OF CARTILAGINOUS FISHES	13
4 TRUE SHARKS (SUPERORDERS GALEOMORPHII & SQUALOMORPHII)	17
GALEOMORPH SHARKS	17
Carcharhiniformes (Ground Sharks)	18
Key to Families of the Order Carcharhiniformes	19
Carcharhinidae (Requiem Sharks)	21
Hemigaleidae (Weasel Sharks)	41
Proscylliidae (Finback Catsharks)	44
Pseudotriakidae (False Catsharks)	46
Scyliorhinidae (Catsharks)	48
Sphyrnidae Sharks (Hammerheads)	54
Triakidae (Houndsharks)	59
Heterodontiformes (Bullhead Sharks)	62
Heterodontidae (Bullhead Sharks)	62
Lamniformes (Mackerel Sharks)	64
Key to Families of the Order Lamniformes	66

TABLE OF CONTENTS

Alopiidae (Thresher Sharks)	68
Cetorhinidae (Basking Sharks)	72
Lamnidae (Mackerel Sharks)	73
Megachasmidae (Megamouth Sharks)	76
Pseudocarchariidae (Crocodile Sharks)	78
Orectolobiformes (Carpet Sharks)	79
Key to Families of the Order Orectolobiformes	80
Ginglymostomatidae (Nurse Sharks)	82
Hemiscylliidae (Longtailed Carpetsharks)	84
Orectolobidae (Wobbegongs)	87
Parascylliidae (Collared Carpetsharks)	88
Rhincodontidae (Whale Sharks)	90
Stegostomatidae (Zebra Sharks)	92
SQUALOMORPH SHARKS	94
Hexanchiformes (Cow and Frilled Sharks)	95
Hexanchidae (Sixgill and Sevengill Sharks)	95
Pristiophoriformes (Saw Sharks)	99
Pristiophoridae (Saw Sharks)	99
Squaliformes (Dogfish Sharks)	100
Key to the Families of Squaliformes	100
Centrophoridae (Gulper Sharks)	103
Dalatiidae (Kitefin Sharks)	107
Echinorhinidae (Bramble Sharks)	111
Etmopteridae (Lantern Sharks)	112
Squalidae (Dogfish Sharks)	115
Squatiniiformes (Angel Sharks)	116
Squatinae (Angel Sharks)	116
5 BATOIDS	117
Key to Suborders of Order Rajiformes	119
Myliobatoidei (Stingrays)	122
Key to the Families of Suborder Myliobatoidei	124
Dasyatidae (Whiptail Stingrays)	126
Gymnuridae (Butterfly Rays)	138
Hexatrygonidae (Sixgill Stingrays)	141
Mobulidae (Devil Rays)	143
Myliobatidae (Eagle Rays)	151

TABLE OF CONTENTS

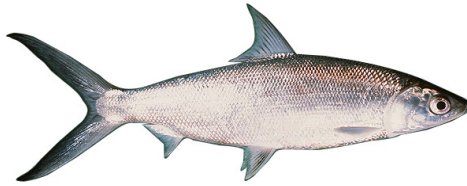
Plesiobatididae (Giant Stingarees)	153
Rhinopteridae (Cownose Rays)	155
Platyrrhinoidei (Fanrays and Thornbacks)	157
Platyrrhinidae (Fanrays and Thornbacks)	157
Pristoidei (Sawfishes)	158
Pristidae (Modern Sawfishes)	158
Rajoidei (Skates)	162
Key to Families of the Suborder Rajoidei	163
Anacanthobatidae (Smooth Skates)	164
Arhynchobatidae (Softnose Skates)	166
Rajidae (Hardnose Skates)	167
Rhinobatoidae (Guitarfishes)	169
Rhinobatidae (Guitarfishes)	169
Rhinoidei (Shark Rays)	171
Rhinidae (Shark Rays)	171
Rhynchobatoidei (Wedgefishes)	173
Rhynchobatidae (Wedgefishes)	173
Torpedinoidei (Electric Rays)	175
Keys to Families of Torpedinoidei	176
Narcinidae (Numbfishes)	177
Narkidae (Sleeper Rays)	179
Torpedinidae (Torpedo Rays)	180
6 CHIMAERAS	181
Chimaeriformes (Chimaeras)	181
Chimaeridae (Shortnose Chimaeras)	181
Glossary	183
Annexes	186
Annex 1. Philippine Cartilaginous Fish Species in the IUCN Red List, 2014	186
Annex 2. Cartilaginous Fish Species in the CITES Appendices (cites.org)	189
Bibliography	190

1 INTRODUCTION

WHAT IS A FISH?

To most people, this may sound like a simple question that needs no answer. Most fish are readily recognizable as fish.

Fishes are the most numerous and diverse of the major groups of animals with backbones (also referred to as vertebrates). Currently, FishBase, a global information on fishes, records nearly 33,000 species (www.fishbase.org) described so far. This number excludes those that may have been discovered but not described yet (the so-called “new” to science). Fishes survive and dominate the marine and freshwater environments of the world through a variety of morphological, physiological and behavioural adaptations. It is the physical and chemical characteristics of water in these environments that influence the functional design of a fish.



*A typical fish.
Photo by: JE Randall (FishBase).*

So, what is a fish? The term fish is a convenient term used to refer to a diverse group of animals living in aquatic environments generally characterized by the presence of vertebrae protecting the spinal cord, gills (instead of lungs) to breathe underwater, paired fins that aid in locomotion, scales covering their bodies, and, yes, a brain protected by a braincase and a head region with eyes, teeth, and other sensory organs. For a more technical description of a fish, reading ichthyology books is advised.

A typical fish is shown above. And yes, once you see one, you have probably seen most (but perhaps not all).

HOW ARE FISHES CLASSIFIED?

With these many fishes in the world, the challenge is how they are classified. Classification is a means of cataloguing living organisms, plants and animals alike, based on similarities in external and internal structure. The system was used to group superficially similar organisms (*i.e.*, Linnean classification), but with the advent of evolutionary science, it has been modified to reflect the evolutionary history and relationships of organisms (or phylogenetic classification) within a group in a hierarchical sense.

What is presented here follows the Linnean hierarchical system that classifies organisms into seven main ranks defined by the international nomenclature codes: kingdom, phylum, class, order, family, genus, and species. Ranks between the seven main ones are made by adding prefixes

Classification for the whale shark.

RANK	SCIENTIFIC NAME	COMMON NAME
Kingdom	Animalia	Animals
Phylum	Chordata	Animals with a notochord
Subphylum	Craniata (Vertebrata)	Chordates with cranium (and backbones)
Class	Chondrichthyes Huxley, 1880	Cartilaginous fishes
Order	Order Orectolobiformes Compagno, 1973	Carpet sharks
Family	Rhincodontidae	Whale sharks
Genus	<i>Rhincodon</i> Smith, 1829.	Whale sharks
Species	<i>Rhincodon typus</i> (Smith, 1828)	Whale sharks

such as “super-“, “sub“, or “infra-“. Ranks are somewhat arbitrary, but hope to encapsulate the diversity contained within a group. Each rank, from kingdom down to genus level, is assigned a single scientific name often followed by the name of the person who originally described it and the year it was first described.

At the species level, the scientific name follows the binomial system of classification consisting of two *italicised* words: the first is the name of the genus and starts with a capital letter and the second is the unique species name and is not capitalized. The scientific name of the species is often followed by the name of the scientific authority (*i.e.*, person who originally described the species) and the year it was first described. Species sometimes get moved from one genus to another. If the species is subsequently placed in a newer genus the scientific authority is put in parentheses (*i.e.*, *Rhincodon typus* (Smith, 1828) from *Rhiniodon typus* Smith, 1828).

Species names are unique and thus are used in preference to common names which vary from place to place. Efforts are now being initiated for the use of a standard common name for each species to improve data collection.

Some species may have more than one scientific name (*i.e.*, synonyms) but only one of these (usually the oldest) is valid. The older name takes precedence over the newer name, which then becomes invalid (or referred to as a junior synonym). The naming of fish follow the standards set by the International Commission on Zoological Nomenclature.

The information used in classifying fishes comes largely from detailed taxonomic studies, particularly the careful descriptions of species based on at least four of the basic methods such as: morphometric measurements, any standard measurements that can be made on a fish, such as total length, standard length, tail length, disc width, body depth, may be expressed as ratios to the total or standard length; meristic traits, include anything on a fish which can be counted, such as fin rays and spines, lateral line pores; anatomical characteristics, refers to body shape, positions of fins, presence or absence of special features such as claspers in males; color patterns which are usually species specific but may change with age, the time of day, or the environment in which the fish is found.

With the advent of newer technology to further describe the species and/or its relationships with other fishes, other tools such as biochemical, molecular and genetic analysis are used. The classification of cartilaginous fishes, for example, has undergone some major revisions in recent years brought about by newer systematic paradigms supported by the use and application of newer technology.

Taxonomy is a dynamic field, continually changing to keep up with new discoveries about species and newer ideas on the interrelationships of these species. It is difficult to keep up with systematic changes and the reworking of taxonomic groups. This constant change in names as applied to fishes is one of the most frustrating aspects for anyone who is not a taxonomist. For purposes of this book, and unless stated otherwise, scientific names as presented in the Checklist of Philippine Chondrichthyes by Compagno *et al.* (2005) is followed.

WHAT ARE THE TWO TYPES OF FISHES?



*A bony fish (left photo: bangus) and a cartilaginous fish (right photo: whale shark).
Photos by: JE Randall /FishBase (left); S. De Neef (right).*

Fishes are generally divided into two major groups based on the type of skeleton they have: Class Osteichthyes and Class Chondrichthyes. Osteichthyans have a skeleton made of bone and thus are referred to as “bony fishes”. Bony fishes are also collectively called as “teleost” which is shortened version for Teleostomi. Chondrichthyans have a cartilaginous skeleton without true bones (except perhaps in ancestral forms) and thus are referred to as “cartilaginous fishes”.

Additional differences between bony fishes and cartilaginous fishes are often cited in terms of: types and origin of scales; skull elements and numbers; attachment of the upper jaw to the skull; the presence or absence of pharyngeal jaws (or secondary set of jaws), gill cover, ribs; location of mouth and nostrils, to name a few. A comparative summary of the two fish types is shown in the table above.

SKELETAL PARTS	BONY FISHES	CARTILAGINOUS FISHES
Skeleton	‘Ossified’ or calcified	Cartilage (flexible connective tissue)
Skull & skull parts	63 bones, with sutures	10 cartilaginous elements; no sutures
Secondary set of jaws	Yes (pharyngeal jaws)	No
Teeth	Attached to jaws	Continually replaced and embedded in gums
Gill Plate	Yes (operculum)	None (gills exposed and visible)
Ribs	pleural ribs	None
Scales	“ctenoid or cycloid”	Tooth like scales (or dermal denticles)
Mouths and nostrils	Side of head	Underside of head
Pelvic claspers in males	Absent	Present
Swim bladder	Present	Absent

Comparative features of bony fishes and cartilaginous fishes.

WHAT ARE CARTILAGINOUS FISHES?

Cartilaginous fishes (Class Chondrichthyes) belong to an ancient group of fishes that evolved for over 400 million years. Living representatives are grouped into two main subclasses, namely, the Subclass Elasmobranchii (sharks, skates and rays) and the Subclass Holocephali (chimaeras).

The classification of Subclass Elasmobranchii is still a subject of continuous debate but they are generally divided into two superorders, namely, Galeomorphii and Squalomorphii.

- Superorder Galeomorphii includes four orders, the Heterodontiformes (bullhead sharks), Lamniformes (mackerel sharks), Orectolobiformes (carpet sharks), and Carcharhiniformes (ground sharks). Members of this group are also referred to as galeomorph, galea or galean sharks.
- Superorder Squalomorphii includes five orders the Hexanchiformes (cow and frilled sharks), Squaliformes (dogfish sharks), Squatiniformes (angel sharks), Pristiophoriformes (sawsharks), and Rajiformes (batoids)*. Members of this group are also referred to as squalomorph sharks.

Based on external characteristics, Subclass Elasmobranchii are traditionally segregated into two groups, namely, as true sharks and batoids (also collectively referred to as “elasmobranchs”).

The Subclass Holocephalii is represented by only one surviving group which is the order Chimaeriformes, also known as the modern chimaeras.

WHAT ARE TRUE SHARKS?

The “**true**” sharks are generally characterized with a fusiform body shape (*i.e.*, spindle-like shape that is wide in the middle and tapers at both ends) and five to seven gill openings located at the sides of the head (or laterally positioned). Some shark taxonomists sometimes refer to true sharks as “non-batoids” (or the flat sharks). The true sharks have 1-2 dorsal fins (with or without spines), usually an anal fin (although absent in some species), and most have a well-developed caudal fin for swimming. Features important for identifying sharks are color, body shape, fin size and position, and tooth shape and number.

Shark sizes may range from 20 cm (*e.g.*, dwarf lantern sharks) to 20 m (*e.g.*, whale sharks). Some species are planktivores (*e.g.*, megamouth sharks, whale shark) while most are carnivores, predatory and at the top of the food chain (*e.g.*, great white, mako shark). About 70% of sharks bear live young (also known as viviparity, a reproductive method to care for their brood inside the female’s body resembling that of mammal, *e.g.* lemon sharks), while the rest lay eggs protected by horny cases (also known as oviparity, *e.g.*, bamboo sharks).

Globally, more than 30 families are represented by close to 500 living species of sharks worldwide. In the Philippines, about 26 families are represented by at least 95 shark species.

* Previously, extant (=living) elasmobranchs were subdivided into two major groups, Selachii (sharks) and Batoidea (rays), but phylectic studies suggest that the batoids are best included as a large and diverse order of ‘flat sharks’ (Rajiformes) within the Squalomorphii. The batoids (Order Rajiformes) have been diversely allocated with respect to the previous taxonomic organizations. For practical reasons, batoids are discussed separately in this book (*i.e.*, Chapter 5).

WHAT ARE BATOIDS?

Batoids are the skates and rays generally characterized with a disc-like body which is dorso-ventrally (*i.e.*, top-bottom) flattened and five to six gill openings located underside of head (or ventrally positioned). They differ from “true” sharks in having greatly enlarged often wing-like pectoral fins (thus the reference to the group as “winged sharks”) attached to the head in front of the gill openings. Their pectoral fins and body together often form a large structure which is referred to as the “disc”. They have one or two dorsal fins (occasionally none) without fin-spines, a thin often whip-like tail, and no anal fin. Features important for identifying batoids are color, disc and tail shape, structure of oro-nasal (*i.e.*, mouth-nose) region, dorsal fin position, and the distribution and shape of dermal thorns and denticles.

Batoid sizes may range from 25 cm to 10 m (*e.g.*, manta ray). As with true sharks, some pelagic species are planktivores, others predatory, feeding largely on invertebrates or small fishes, but many are scavengers. Skates are oviparous while rays bear live young, some with placental-like connection between female and embryo. Skates and rays are of considerable commercial importance for food. Since most are found nearshore, they factor in a number of nearshore fisheries operations and are thus threatened by over-exploitation.

Batoids belong to the Order Rajiformes which is further divided into seven suborders, namely, Pristoidei (sawfishes), Rhinoidei (shark rays), Rhynchobatoidei (wedgfishes), Rhinobatoidei (guitarfishes), Platyrrhinoidei (fanrays and thornbacks), and Rajoidei (skates), and Myliobatoidei (stingrays).

Globally, over 20 batoid families are represented by more than 600 living species; most are marine species, a few live in freshwater environment. In the Philippines, about 17 families are represented by at least 67 batoid species.

WHAT ARE CHIMAERAS?

Chimaeras are also known as ratfishes, ghostfishes, spookfishes, elephantfishes, or silversharks. They belong to the Subclass Holocephalii and are characterized by a large head, scale-less skin, a long sharp spine on the leading edge of the first dorsal fin, and, often a whip-like tail. Chimaeras are thought to have evolved from an ancient shark group. They differ from elasmobranchs (*i.e.*, true sharks and batoids) in having the upper jaw fused to the skull, only one external gill opening (compared with five to seven in elasmobranchs) with a gill cover or operculum similar to that of bony fishes, and a largely naked or scale-less skin. They have additional claspers on the head and in front of the pelvic fins of adult males, and their teeth are fused into beak-like plates.

They live close to the bottom and feed on molluscs and other invertebrates. The tail is long and thin and they move by sweeping movements of the large pectoral fins. There is an erectile spine in front of the dorsal fin, sometimes poisonous. There is no stomach (that is, the gut is simplified and the ‘stomach’ is merged with the intestine), and the mouth is a small aperture surrounded by lips, giving the head a parrot-like appearance. Features important for identifying chimaeras are head shape, fin positions and shape, relative sizes of the first dorsal fin and spine, tooth plate structure and color. Chimaerids are oviparous and feed mainly on bottom-dwelling invertebrates.

The Subclass Holocephalii has at least 43 species belonging to three families (*i.e.*, Family Callorhynchidae or elephant fishes, Family Rhinochimaeridae or longnose chimaeras, and Family Chimaeridae or shortnose chimaeras).

Globally, three families are represented by more than 40 or more living species of chimaeras, mainly in deepwater on continental slopes. In the Philippines, only one family is known and is represented by at least three species.

WHY THIS BOOK?

In 2005, Compagno *et al.* listed about 163 cartilaginous fish species known to occur in the Philippines: 60% of which is confirmed and validated from voucher specimens or photos; 15% is based on reports of known distribution of the species that covers Philippine waters; and 26% is still undescribed, possibly new to science and/or new records to the country. A rapid search of the Philippine chondrichthyofaunal list in FishBase shows about 180 species recorded in the country.

In the Philippine National Plan of Action for the Conservation of Sharks (NPOA-Sharks)[†], a summary list of true sharks landed in fish ports and/or sold in fish markets in the regions show a total number of 99 species. (*Note though that the NPOA-Sharks list is only for true sharks. Information on batoids and chimaeras was not included.*) This second list is largely based on partial regional reports of field personnel of the National Stock Assessment Program (NSAP) as well as opportunistic reports of NGO partners. At least 15 species in this list is not in the Compagno *et al.* 2005 checklist, suggesting the possibility that more species may be present. Two species were reported to be confirmed based on photo-documentation validated by the shark experts, as such a valid addition to the Philippines checklist. The rest, however, still needs further evidence to confirm occurrence in the regions.

In a number of cases, only local names were used, while some were identified to the family or genus level only. A couple of names do not seem to occur in the Philippines while others were misspellings, a coined name from one species to a genera of another, a possible misidentification or use of names that is no longer valid (*e.g.*, species' synonym). At least one entry that was reviewed did not mention the species name only the state it was in: *i.e.*, "sharks (chopped)".

Challenges abound when trying to identify cartilaginous fishes in landing and market sites, as seen in this experience, such as misidentification of species, recording synonyms instead of valid names, misspellings, general inconsistencies and absence of standards in terms of recording and reporting. With the ongoing debate on the taxonomy of certain shark and batoid species and groups – *i.e.*, with species name shifting possibly from one genera and/or families due to newer and more relevant information using newer and more sophisticated methods – it is very easy to make mistakes. Proper documentation is recommended to reduce these mistakes.

Since most of the sharks, batoids and chimaeras are encountered on land (*i.e.*, as landed catch or by-catch) rather than in water, the aim of this book is thus to improve local knowledge and skills in the identification of cartilaginous fishes particularly landed in fish ports and markets, for use by government personnel and field practitioners, or enumerators involved in doing fisheries monitoring and stock assessment programs. This guide may also be of use to individuals (*e.g.*, students, shark enthusiasts) and institutions (*i.e.*, the academe, local government units, management bodies, others), LGU and partner communities interested to know more about shark biodiversity in general and to identify shark species that may be present in their marine protected areas (MPAs) or monitor/report catches in landing and market sites.

A number of photos used in this guide is of voucher specimens collected in landing and market sites by the project staff of Silliman University–Institute of Environmental and Marine Sciences (formerly Silliman University Marine Laboratory or SUML) and partners during the 1998–2001 WWF Philippines Elasmobranch Biodiversity Project. At least three taxonomic workshops were

conducted in those years to validate the identification of the species in the collection, which consequently made a major contribution in Compagno *et al.* (2005) "Checklist of Philippines Chondrichthyes"[‡]. Since then, specimen and data collections were done independently by various individuals, including the contributors to this book.

A lot more species are still unconfirmed, undocumented and/or undescribed. For purposes of documentation, users of this guide are encouraged to at least take photos of the specimens encountered in the field using the photo lay-out shown here (*i.e.*, one individual per photo, left side and ventral side of the shark/ray/chimaeras, additional photos of other parts such as the head, mouth, teeth, claspers, among others; and provide one number tag per individual, same field number tag for all photos taken of the same individual).

Field personnel of BFAR-NFRDI and NSAP regional offices[§], should follow the collection and documentation processes as required by law when getting vouchers specimens (*e.g.*, whole individuals or parts thereof; tissue samples are useful contributions to NFRDI's aquatic species genetic database). All vouchers should have photos taken (same as above).

The species checklist and identification guide is a work in progress. More species will most likely be added as more dedicated field surveys and taxonomic work are also supported.

HOW TO USE THIS BOOK

Chapter 1 opens with a simple introduction to fishes, moves on to differentiating bony fishes from cartilaginous fishes and discusses general features of the three typical groupings of cartilaginous fishes: sharks, batoids, and chimaeras.

Commonly used terminologies and measurements based on the structural features of sharks, batoids and chimaeras are illustrated in Chapter 2. Technically, these cartilaginous fishes fall under ten orders. A dichotomous key to the ten orders, with a representative photo of a member species for each order, is provided in Chapter 3. General summaries on distinctive features of the order, the family and species are presented in Chapters 4, 5 and 6 for sharks, batoids and chimaeras, respectively. For easier reference, the orders, families, genus and species are arranged in alphabetical order. Keys to families are shown under the order they belong to. In cases where there is only one family representing the order, a key to the family is deemed unnecessary.

Key to species is not provided. A species account with summary description of the distinguishing features of each species is provided for each species confirmed present in the area, with the symbol of a check mark (✓). When a species may be confirmed present but a species account is not provided, a symbol **N** is shown. A question mark (?) indicates that presence of the species in the area is still uncertain. A symbol **U** is shown for undescribed, potentially new species in the collection. A symbol **T** is shown when the taxonomy is still unresolved.

For brevity, a species account is limited to one page to include information only on: scientific name, common name (as used in Food and Agriculture Organization of the United Nations or UN-FAO), alternative common names in English and/or the local language or dialect (when available), photos and/or illustrations of the whole animal (usually showing the left side of the individual) and the head (usually the ventral view), size and the distinguishing features or characters. Unless

‡ http://www.cmar.csiro.au/publications/cmrrreports/CSIRO_mrs243_full.pdf

§ Under Republic Act 9147 (also known as the Philippine Wildlife Act), any type of collection is not allowed without a permit and prior informed consent. It is best to inquire with BFAR-FQRD on the requirements and have the permit when planning and doing any collection.

otherwise indicated, species epithet is as presented in Compagno *et al.* (2005). Synonyms for most species are not presented here, pending review of historical and current records and materials available for each species.

Information on size show maximum total length (TL) recorded for the species, expressed in cm, size at maturity of males and females or both, and sizes at birth. For sharks and chimaeras, the size refers to the longest straight length of a fish, from snout to tip to upper caudal tip or tail tip. For batoids, unless otherwise indicated, the size refers to disc length (DL) or the longest straight length of a fish from snout to tip of disc. In some instances disc width (DW) or the widest distance of the disc. Distributional data, biology and habitat are not discussed within each species account but are mentioned under general information on the order or the family. Such information, and including synonymies of relevance to the Philippine chondrichthyo fauna, is already presented in Compagno *et al.* (2005). Additional information on the species may be accessed individually through FishBase (www.fishbase.org).

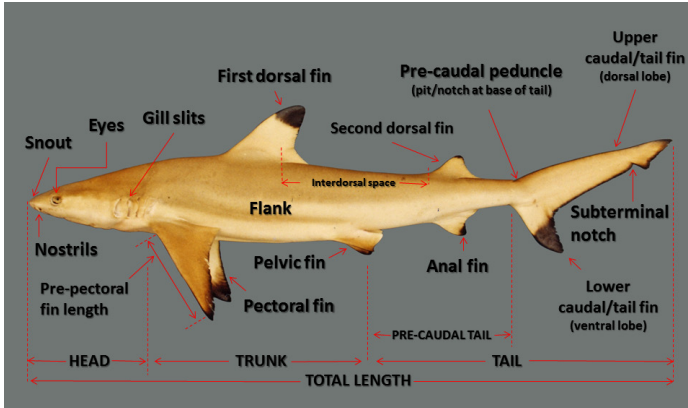
A number of photos used in the species accounts are from the Silliman Elasmobranch Photocatalog (1998-2001) and enhanced for use in this book by the FishBase Information and Research Group (FIN). Additional photos are sourced from various photographers and collaborators who gave permission for their use. When local images are unavailable, illustrations used are from the FAO Species Identification Guide for Fishery Purposes volumes 2 & 3 on batoids (Carpenter and Niem 1998 and 1999). When available, original photos of species in the natural setting are provided, with permission from professional and amateur photographers. Sources of images are fully acknowledged where shown.

Technical terms and measurements used in this book are defined in the Glossary. For species descriptions, primary references used are Compagno 1984, Last & Stevens 1994, Carpenter & Niem 1999 (FAO species identification guide for fishery purposes, volumes 2 and 3), and Last *et al.* 2010. IUCN references were also used to check species distribution and taxonomic notes. The Red List ranking of species reported to occur in the Philippines is shown in Annex 1. Elasmobranch species that are listed in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendices, with notes on Philippine species, are shown in Annex 2. Additional sources are cited in the species accounts as applicable. Partial citation (*i.e.*, authors and year) is used in the species page; full citation is presented in the Bibliography section. The Bibliography section is not exhaustive but includes additional references that were not necessarily cited in any of the species accounts but are found to be useful as supplemental reading materials for certain species and/or groups.

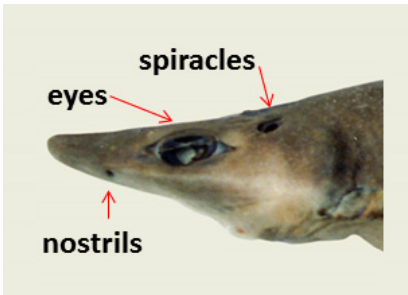
It is important to note that only general characteristics of the species is provided here to facilitate identification of the species. For more details on the diagnostic characters and information on the biology, habitat, distribution and conservation status of the species, further reading is advised.

2 TERMINOLOGIES & MEASUREMENTS

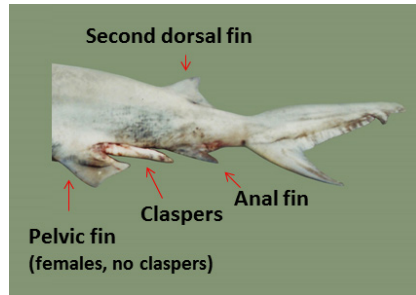
SHARK TERMINOLOGY AND MEASUREMENTS



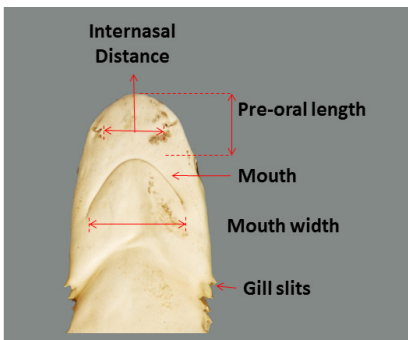
Lateral view of a ground shark.



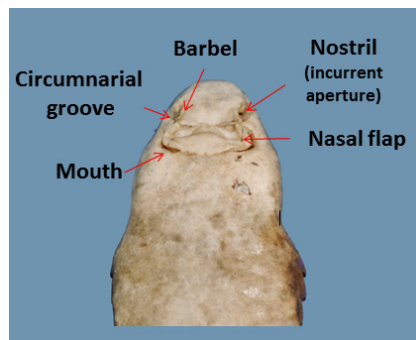
Lateral view of head of a gulper shark, showing spiracles.



Lateral view of tail of a male carcharhinid shark, showing claspers.

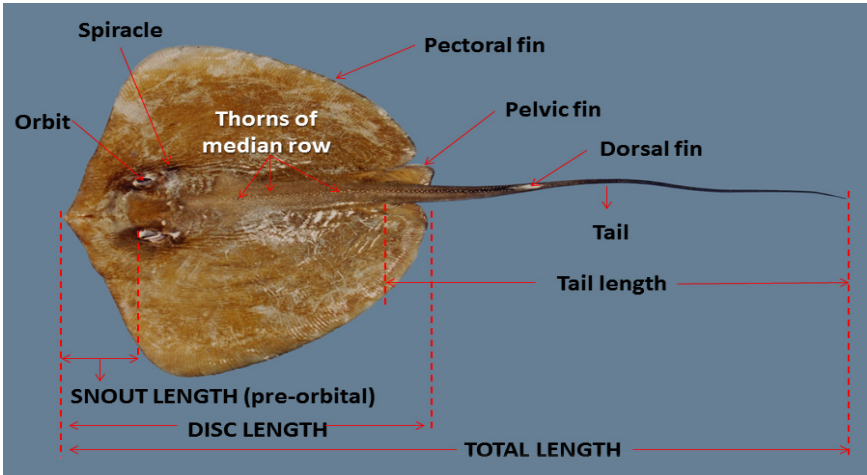


Ventral view of head of a ground shark.

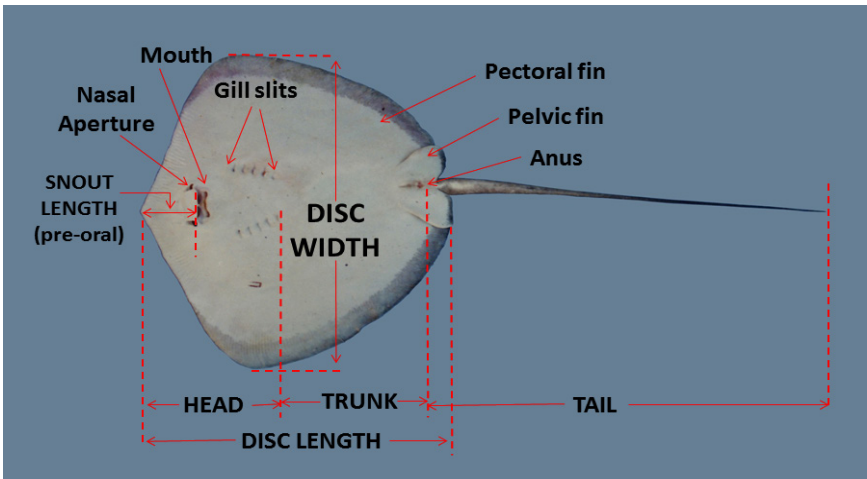


Ventral view of head of a carpet shark.

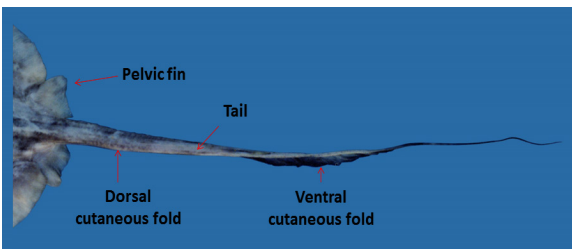
BATOID TERMINOLOGY AND MEASUREMENTS



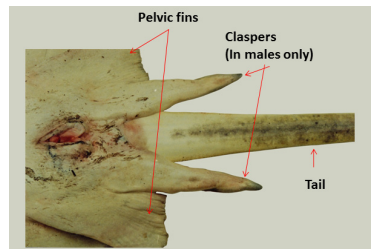
Dorsal view of a dasytid.



Dorsal view of a dasytid.

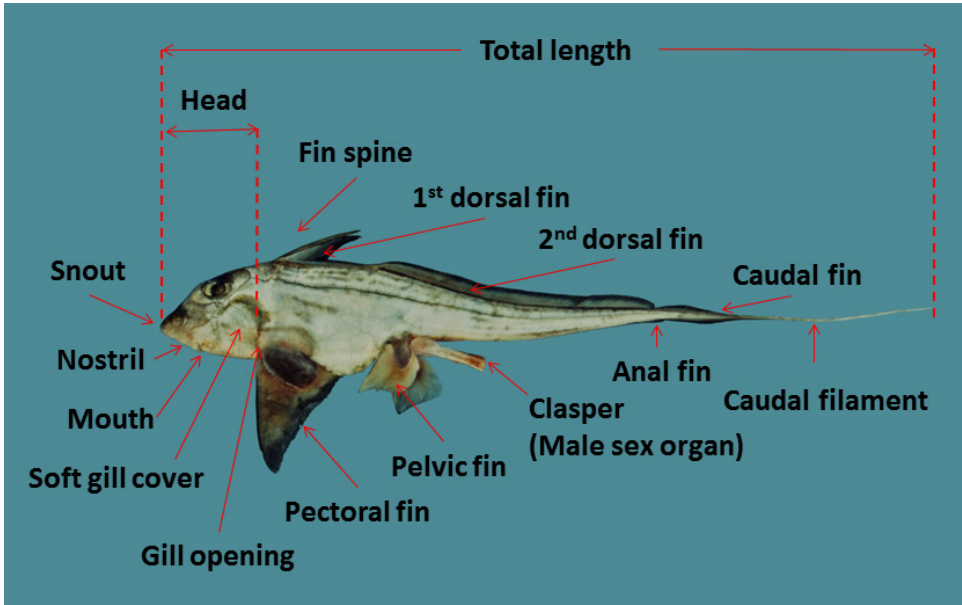


Dorsal view of a tail of a batoid.



Ventral view of base of a batoid tail.


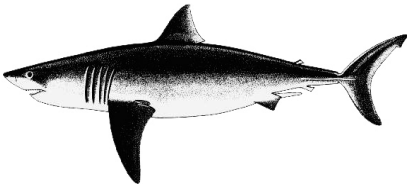


CHIMAERA TERMINOLOGY AND MEASUREMENTS





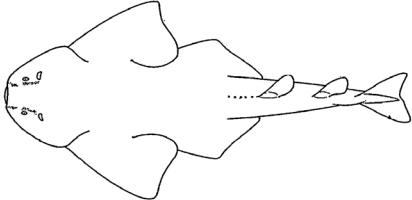
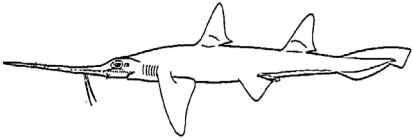


Lateral view of a chimaera.

3 KEY TO THE ORDERS OF CARTILAGINOUS FISHES

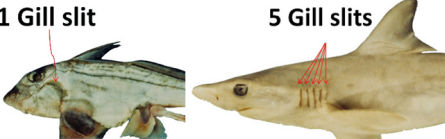
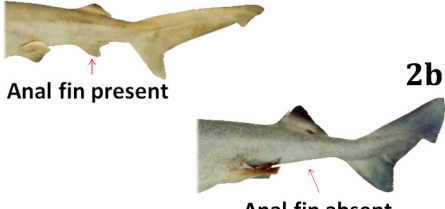
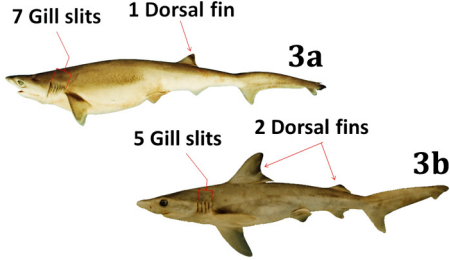
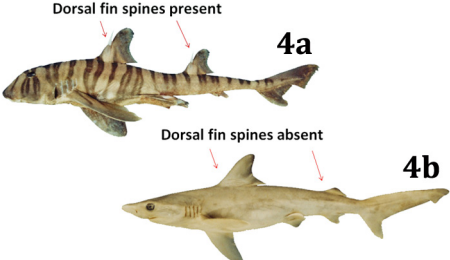
The two main subclasses of cartilaginous fishes are the Subclass Elasmobranchii (composed of two superorders Galeomorphii and Squalomorphii) and the Subclass Holocephali (chimaeras). Superorder Galeomorphii (or galeomorph sharks) includes four orders, namely, the Heterodontiformes (bullhead sharks), Lamniformes (mackerel sharks), Orectolobiformes (carpet sharks), and Carcharhiniformes (ground sharks). Superorder Squalomorphii (or squalomorph sharks) includes five orders the Hexanchiformes (cow and frilled sharks), Squaliformes (dogfish sharks), Squatiniformes (angel sharks), Pristiophoriformes (sawsharks), and Rajiformes (batoids). Subclass Holocephali only has one order Chimaeriformes (chimaeras).

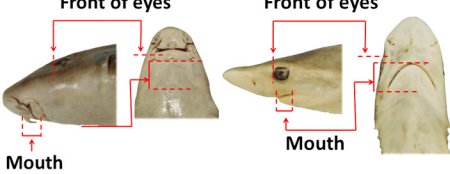
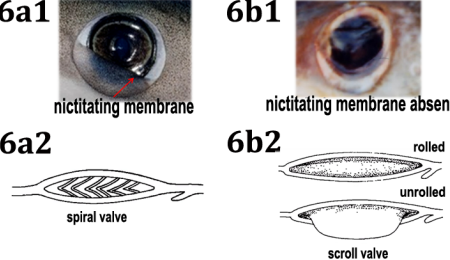
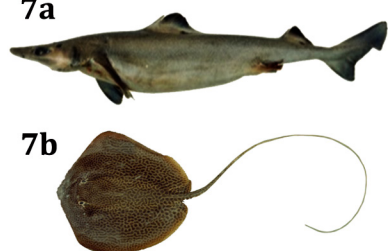
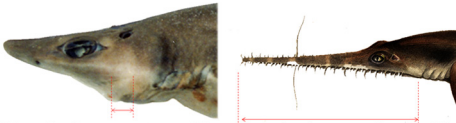
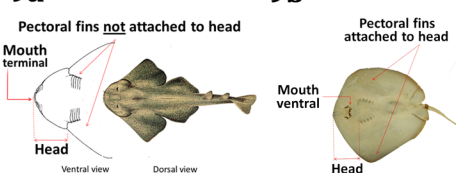
SUBCLASS ELASMOBRANCHII Müller, 1845. Sharklike fishes. Superorder Galeomorphii Compagno, 1973. Galeomorph sharks.	
1. Order Heterodontiformes Garman, 1885. Bullhead sharks.	
2. Order Lamniformes Garman, 1885. Mackerel sharks.	
3. Order Orectolobiformes Compagno, 1973. Carpet sharks.	
4. Order Carcharhiniformes Garman, 1913. Ground sharks.	

Superorder Squalomorphii
Compagno, 1973. Squalomorph sharks and batoids.

<p>5. Order Hexanchiformes Garman, 1913. Cow and frilled sharks.</p>	
<p>6. Order Squaliformes Gill, 1862. Dogfish sharks</p>	
<p>7. Order Squatiniformes Jordan, 1923. Angel sharks.</p>	
<p>8. Order Pristiophoriformes White, 1936. Saw sharks.</p>	
<p>9. Order Rajiformes Müller & Henle, 1841. Batoids.</p>	
<p align="center">SUBCLASS HOLOCEPHALI Müller, 1835. Chimaeroids and their relatives.</p>	
<p>10. Order Chimaeriformes Garman, 1877. Modern chimaeras or silver sharks.</p>	

The dichotomous key is a way of easily identifying the various shark orders represented by species known to occur in the Philippines. A sequence of choices is presented between two statements (known as couplets; *i.e.*, 1a and 1b) based on the general characteristics of the organisms. Check the presence or absence of a character under consideration and move on to next couplet as suggested, until the correct order is shown.

<p>1a. One (1) gill slit CHIMAERIFORMES</p> <p>1b. Five to seven (5-7) gill slits go to 2</p>	<p style="text-align: center;">1a 1b</p> <p>1 Gill slit 5 Gill slits</p> 
<p>2a. Anal fin present go to 3</p> <p>2b. Anal fin absent go to 7</p>	<p style="text-align: center;">2a 2b</p> <p>Anal fin present Anal fin absent</p> 
<p>3a. Six to seven (6-7) gills slits; one (1) dorsal fin HEXANCHIFORMES</p> <p>3b. Five (5) gills slits; two (2) dorsal fins go to 4</p>	<p>7 Gill slits 1 Dorsal fin 3a</p> <p>5 Gill slits 2 Dorsal fins 3b</p> 
<p>4a. Dorsal fin spines present HETERODONTIFORMES</p> <p>4b. Dorsal fin spines absent go to 5</p>	<p>Dorsal fin spines present 4a</p> <p>Dorsal fin spines absent 4b</p> 



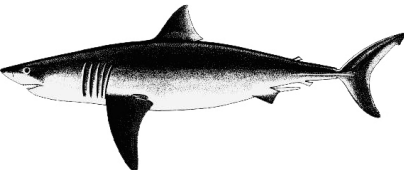

<p>5a. Mouth well in front of eyes ORECTOLOBIFORMES</p> <p>5b. Mouth behind front of eyes go to 6</p>	<p>5a Front of eyes Mouth</p> <p>5b Front of eyes Mouth</p> 
<p>6a. Nictitating eyelids present (6a1); intestinal valve spiral or scroll- like (6a2) CARCHARHINIFORMES</p> <p>6b. Nictitating eyelids absent (6b1); intestinal valve ring-like (6b2) LAMNIFORMES</p>	<p>6a1 nictitating membrane</p> <p>6b1 nictitating membrane absent</p> <p>6a2 spiral valve</p> <p>6b2 rolled unrolled scroll valve</p> 
<p>7a. Body not flattened, not “ray-like” go to 8</p> <p>7b. Body flattened, “ray-like” go to 9</p>	<p>7a</p> <p>7b</p> 
<p>8a. Mouth short, not saw-like SQUALIFORMES</p> <p>8b. Mouth elongated, saw-like PRISTIOPHORIFORMES</p>	<p>8a Mouth short, <u>not</u> saw-like</p> <p>8b Mouth elongated, saw-like</p> 
<p>9a. Mouth terminal, pectoral fins not attached to head SQUATINIFORMES</p> <p>9b. Mouth ventral, pectoral fins attached to head RAJIFORMES</p>	<p>9a Pectoral fins <u>not</u> attached to head Mouth terminal Head Ventral view Dorsal view</p> <p>9b Pectoral fins attached to head Mouth ventral Head</p> 

4 “TRUE” SHARKS

SUPERORDER GALEOMORPHII COMPAGNO, 1973. GALEOMORPH SHARKS.

There are four orders of galeomorph sharks, namely, Carcharhiniformes (ground sharks); Heterodontiformes (bullhead sharks), Lamniformes (mackerel sharks), and Orectolobiformes (carpet sharks)*.

The galeomorph sharks are differentiated from the squalomorph sharks by the presence of an anal fin. Members have five to seven pairs of gill opening, two dorsal fins with or without fin spines, anterior mouth behind or just over front of eyes.

1. Order Carcharhiniformes Garman, 1913. Ground sharks.	
2. Order Heterodontiformes Garman, 1885. Bullhead sharks.	
3. Order Lamniformes Garman, 1885. Mackerel sharks.	
4. Order Orectolobiformes Compagno, 1973. Carpet sharks.	

* See Chapter 3 for the key to the Superorder Galeomorphii.

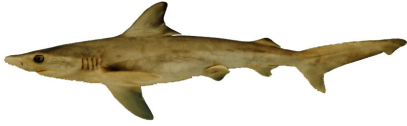




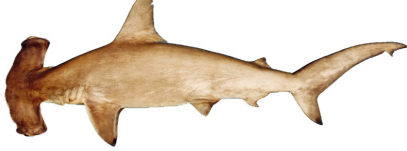

ORDER CARCHARHINIFORMES

GARMAN, 1913. GROUND SHARKS.

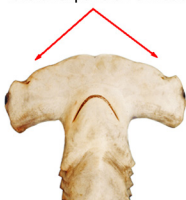


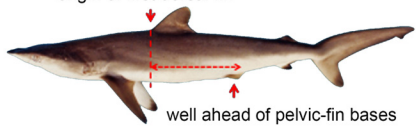

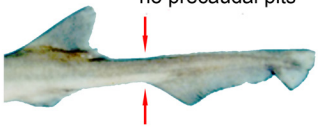
Members of this order are characterized by the presence of an anal fin, five pairs of gill slits, two dorsal fins (except the scyliorhinid *Pentanchus profundiculus* with one dorsal fin), absence of fin spines, mouth behind the eyes, and presence of nictitating eyelids. Inshore and offshore waters. Regularly caught by local artisanal and small-scale commercial fisheries where it occurs. Utilized as a food fish; fins used in the oriental shark fin trade, liver for vitamin oil, and offal for fishmeal. Development usually viviparous with young born fully developed.

Of the eight families in this order, seven are represented in the Philippines. Not recorded thus far is the family Leptochariidae (barbeled houndshark).

FAMILIES OF CARCHARHINIFORMES REPORTED TO OCCUR IN THE PHILIPPINES

<p>1. Family Carcharhinidae Jordan & Evermann, 1896. Requiem sharks.</p>	
<p>2. Family Hemigaleidae Hasse, 1879. Weasel sharks.</p>	
<p>3. Family Proscylliidae Fowler, 1941. Finback catsharks.</p>	
<p>4. Family Pseudotriakidae Gill, 1893. False catsharks.</p>	
<p>5. Family Scyliorhinidae Gill, 1862. Catsharks.</p>	
<p>6. Family Sphyrnidae Gill, 1872. Hammerhead sharks.</p>	
<p>7. Family Triakidae Gray, 1851. Houndsharks.</p>	

KEY TO FAMILIES OF THE ORDER CARCHARHINIFORMES REPORTED TO OCCUR IN THE PHILIPPINES

<p>1a. Head expanded laterally, hammer-shaped Sphyrnidae</p> <p>1b. Head normal, not expanded laterally go to 2</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>lateral expansion of head</p>  <p>Sphyrnidae</p> </div> <div style="text-align: center;"> <p>no lateral expansion of head</p>  </div> </div>
<p>2a. Origin of 1st dorsal fin over or behind pelvic-fin bases Scyliorhinidae</p> <p>2b. Origin of 1st dorsal fin well ahead of pelvic-fin bases go to 3</p>	<div style="text-align: center;"> <p>origin of first dorsal fin</p>  <p>over or behind pelvic-fin bases</p> <p>Scyliorhinidae</p> </div> <div style="text-align: center; margin-top: 20px;"> <p>origin of first dorsal fin</p>  <p>well ahead of pelvic-fin bases</p> </div>
<p>3a. Precaudal pits present go to 4</p> <p>3b. Precaudal pits absent go to 5</p>	<div style="text-align: center;"> <p>upper and lower precaudal pits</p>  </div> <div style="text-align: center; margin-top: 20px;"> <p>no precaudal pits</p>  </div>

4a. Spiracles present and apparent; intestine with a spiral valve, having 4 to 6 turns

..... **Hemigaleidae**

spiracles present

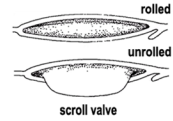
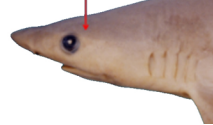


Hemigaleidae

4b. Spiracles usually absent (except in *Galeocерdo*); intestine with a scroll valve

..... **Carcharhinidae**

spiracle absent



Carcharhinidae

5a. First dorsal fin long and formed as a low, rounded keel; spiracles moderately large, nearly or quite as long as eyes)

..... **Pseudotriakidae**

spiracles large (extending below eyes)



1st dorsal fin long



Pseudotriakidae

5b. First dorsal fin short, about 2/3 of caudal fin or less; spiracles much smaller, behind eyes

..... go to 6

spiracles small (behind eyes)



6a. Labial furrows very short or absent, confined to extreme mouth corners; 1st dorsal-fin base closer to pelvic-fin bases than to pectoral-fin bases

..... **Proscylliidae**

1st dorsal-fin base closer to pelvic-fin bases

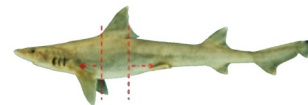


Proscylliidae

6b. Labial furrows long, extending anteriorly on lips; 1st dorsal-fin base either equidistant between pectoral and pelvic-fin bases or closer to pectoral-fin bases

..... **Triakidae**

1st dorsal-fin base closer to pectoral-fin bases



Triakidae

FAMILY CARCHARHINIDAE

JORDAN & EVERMANN, 1896. REQUIEM SHARKS.

Requiem or ground sharks are small to large sharks found globally, attaining total lengths of at least 70-650 cm. Members of this family are characterized by five gill openings (the 5th behind origin of pectoral fin), round eyes with internal nictitating eyelids, no nasoral grooves or barbels, usually no spiracles, short labial furrows, two spineless dorsal fins, caudal fin with strong ventral lobe. Teeth are usually bladelike with one cusp. Development usually viviparous with young born fully developed. Includes several dangerous species, but most prefer to avoid divers.

Of the 54 or more species representing 12 genera in this family, 24 species representing nine genera occur in the Philippines. At least five more are suspected to be present based on historical or distributional records but needs further validation, *i.e.*, the Borneo shark *Carcharhinus borneensis*, Whitecheek shark *C. dussumieri*, Hardnose shark *C. macloti*, and River shark *Glyphis* sp. The Philippine record for the Spadenose shark *Scoliodon laticaudus* is possibly a misidentification and may be now that of the Pacific Spadenose shark *S. macrorhynchos*.*

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

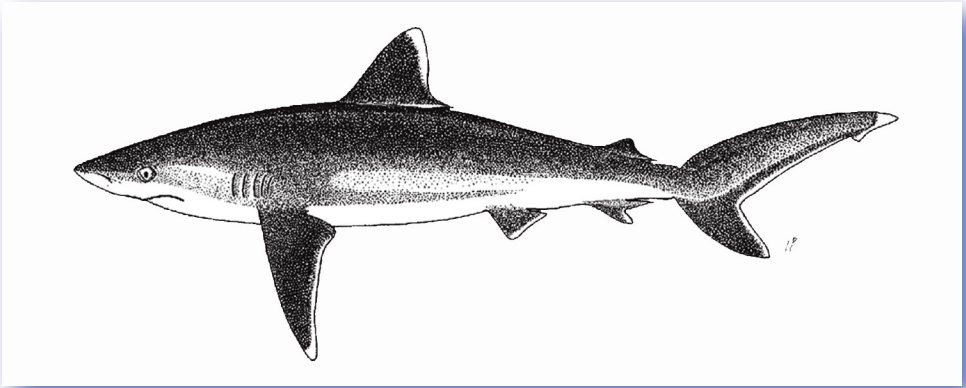
- ✓ *Carcharhinus albimarginatus* (Rüppell, 1837). Silvertip shark.
- ✓ *Carcharhinus altimus* (Springer, 1950). Bignose shark.
- ✓ *Carcharhinus amblyrhynchoides* (Whitley, 1934). Graceful shark.
- ✓ *Carcharhinus amblyrhynchos* (Bleeker, 1856). Gray reef shark.
- ? *Carcharhinus borneensis* (Bleeker, 1858-1859). Borneo shark.
- ✓ *Carcharhinus brevipinna* (Müller & Henle, 1839). Spinner shark.
- ? *Carcharhinus dussumieri* (Valenciennes, 1839). Whitecheek shark.
- ✓ *Carcharhinus falciformis* (Bibron, 1839). Silky shark.
- ✓ *Carcharhinus hemiodon* (Valenciennes, 1839). Pondicherry shark.
- ✓ *Carcharhinus leucas* (Valenciennes, 1839). Bull shark.
- ✓ *Carcharhinus limbatus* (Valenciennes, 1839). Blacktip shark.
- ✓ *Carcharhinus longimanus* (Poey, 1861). Oceanic whitetip shark.
- ? *Carcharhinus macloti* (Müller & Henle, 1839). Hardnose shark.
- ✓ *Carcharhinus melanopterus* (Quoy & Gaimard, 1824). Blacktip reef shark.
- ✓ *Carcharhinus sealei* (Pietschmann, 1913). Blackspot shark.
- ✓ *Carcharhinus sorrah* (Valenciennes, 1839). Spot-tail shark.
- ✓ *Galeocerdo cuvier* (Peron & Lesueur, 1822). Tiger shark.
- ? *Glyphis* sp. River shark.
- ✓ *Loxodon macrorhinus* Müller & Henle, 1838. Sliteye shark.
- ✓ *Negaprion acutidens* (Rüppell, 1837). Sharptooth lemon shark.
- ✓ *Prionace glauca* (Linnaeus, 1758). Blue shark.
- ✓ *Rhizoprionodon acutus* (Rüppell, 1835). Milk shark.
- N *Scoliodon macrorhynchos* (Bleeker, 1852). Pacific spadenose shark.
- ✓ *Triaenodon obesus* (Rüppell, 1837). Whitetip reef shark.

* *Scoliodon* is previously considered to be monotypic but recent morphological and molecular analyses of *Scoliodon* show three distinct species: *S. laticaudus* from the coastal waters of India, Pakistan and Sri Lanka, *S. macrorhynchos* from the Western Central Pacific, and *S. muelleri* from the Bay of Bengal, off western Thailand (White *et al.* 2010).

SILVERTIP SHARK

Carcharhinus albimarginatus (Rüppell, 1837)

Other Names: Silvertip reef shark (English); *pating, iho* (local)



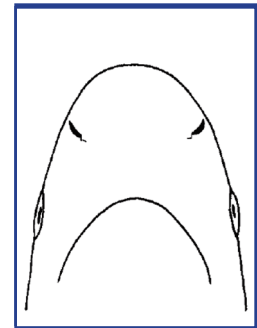
FAO

Size:

To at least 275 cm; males and females mature at about 170 and 195 cm, respectively; born at 70-80 cm.

Distinguishing features:

A medium-size requiem shark with a dark-grey or grey-brown back, with a pale stripe along the flanks, and white undersides; all fins have prominent white tips (= silvertips) and posterior margins; 1st dorsal fin moderately high, apex pointed or narrowly rounded, its origin above pectoral fin rear tips; 2nd dorsal fin moderately high, its origin about opposite that of anal fin, less than $\frac{1}{4}$ height of 1st dorsal fin; interdorsal ridge present; snout rather long and parabolic (when viewed ventrally); labial furrows very short; anterior nasal flaps very low.



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

BIGNOSE SHARK

Carcharhinus altimus (Springer, 1950)

Other Names: *pating* (local)



Photo by: BR Uypitching/Silliman University (BRU 160).

Size:

To at least 285 cm; both sexes mature at about 190 cm and 225 cm, respectively; born at 60-75 cm.

Distinguishing features:

A medium-sized requiem shark with a bronze to grey back, white undersides; 1st dorsal fin moderately tall, moderately rounded at apex, origin almost over the pectoral-fin insertion; a prominent interdorsal ridge; inner corners of pectoral fins blackish; snout rounded and moderately long (viewed ventrally); nasal flaps prominent; labial furrows very short, confined to corners of mouth.



Ventral view of head.
(BRU 160).

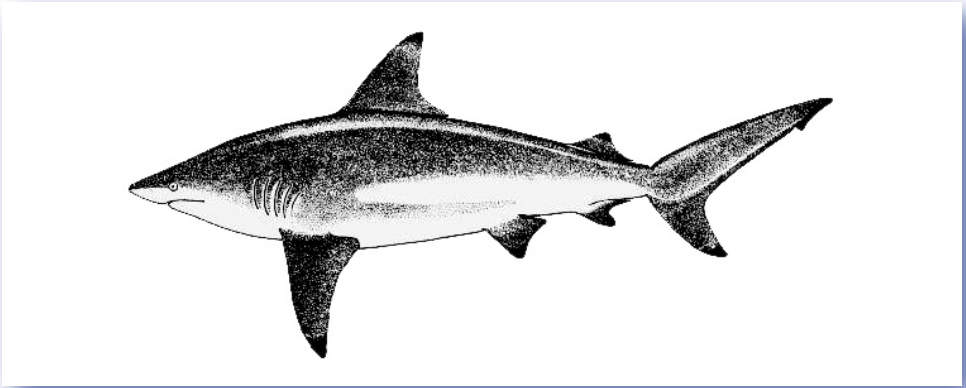
References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

GRACEFUL SHARK

Carcharhinus amblyrhynchoides (Whitley, 1934)

Other Names: Blacktail reef shark (English); *pating* (local)



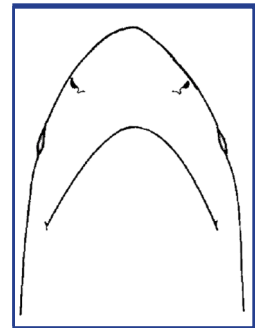
FAO

Size:

To at least 178 cm; both sexes mature at 110-115 cm; born at 50-60 cm.

Distinguishing features:

A medium-sized stout requiem shark with gray or gray-brown back and white or cream undersides; a conspicuous band of white on sides from pelvic fins to first dorsal fin; 1st dorsal fin moderately tall, angular or narrowly rounded; pectoral, dorsal and pelvic fins, and ventral lobe of caudal fin black or dusky-tipped; snout pointed and short (viewed ventrally), its length less than mouth width, 1 to 1.2 times internasal space; nasal flaps very low; labial furrow very short.



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

GRAY REEF SHARK

Carcharhinus amblyrhynchos (Bleeker, 1856)

Other Names: Longnose blacktail shark (English); *pating* (local)



Photo by: Seidenhai.

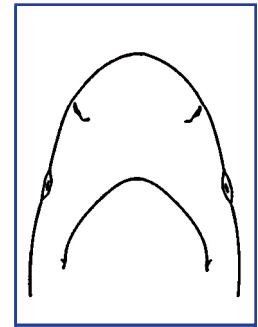
Inset photo by: Lene & Claus Topp.

Size:

To at least 255 cm; commonly about 180 cm; born at 50-60 cm.

Distinguishing features:

A medium-sized requiem shark with dark grey or bronze-grey back and white undersides; 1st dorsal fin never black tipped (in some individuals it may be white); interdorsal ridge usually absent (sometimes weak); distinct wide black posterior caudal fin margin; anterior margins of caudal fin without black edging; snout broadly rounded (viewed ventrally), its length less than mouth width, equal to or greater than internasal space; nasal flaps very low; labial furrow very short.



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

SPINNER SHARK

Carcharhinus brevipinna (Müller & Henle, 1839)

Other Names: *pating* (local)

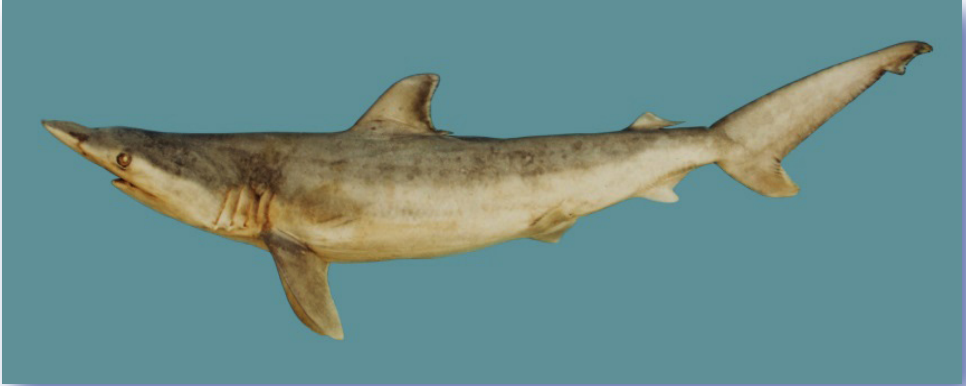


Photo by: JPA Gaudio/Silliman University (JPAG 317)

Size:

To about 300 cm, commonly at 250 cm; both sexes mature at about 190–200 cm; born at 60–81 cm.

Distinguishing features:

A slender-bodied medium to large-sized requiem shark with bronze to grayish back and white undersides; 1st dorsal-fin origin usually above or slightly behind pectoral-fin free rear tips; interdorsal ridge absent; all fins, except pelvics, with conspicuous black tips in individual over 100 cm; snout long and pointed (viewed ventrally); labial folds short, upper pair usually longer and more prominent.



Ventral view of head.
(JPAG 317).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

SILKY SHARK

Carcharhinus falciformis (Bibron, 1839)

Other Names: *pating* (local)



Photo by: JPA Gaudio/ Silliman University (JPAG 133).

Size:

To about 350 cm, commonly at 250 cm; both sexes mature at about 200-210 cm; born at 53-87 cm.

Distinguishing features:

An elongated, slender-bodied, large-sized requiem shark, with dark gray, grayish brown or bluish black back, and white undersides; 1st dorsal-fin origin well behind pectoral-fin free rear tips; interdorsal ridge present; 2nd dorsal-fin low with very long inner margin, 1.6 to 3.0 times its height; snout rather long, narrowly rounded (viewed ventrally); labial folds short.



Ventral view of head.
(JPAG 133).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

PONDICHERRY SHARK

Carcharhinus hemiodon (Müller & Henle, 1839)

Other Names: *pating* (local)



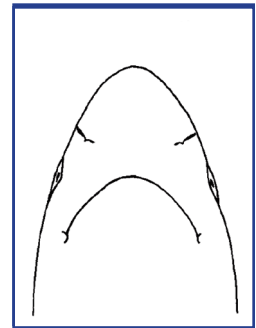
Photo by: JPA Gaudio/ Silliman University (JPAG 282).

Size:

Maximum size uncertain, estimated at 150–200 cm; juveniles at about 60 cm.

Distinguishing features:

A small stout-bodied requiem shark with a grayish back and white undersides; 1st dorsal fin with a narrowly rounded apex, its origin just posterior to pectoral fin base insertions and over inner margins of pectoral fins; 2nd dorsal fin moderately high, with shorter inner margin 1.4 to 1.6 times fin height; snout moderately pointed and parabolic; anterior nasal flaps with a short slender narrow lobe.



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

BULL SHARK***Carcharhinus leucas*** (Valenciennes, 1839)Other Names: *pating* (local)

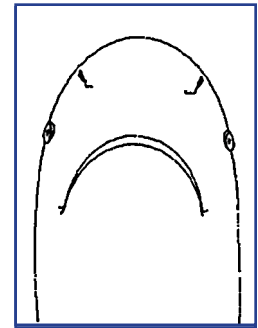
Photo by: JPA Gaudiano/ Silliman University (JPAG 283).

Size:

To at least 400 cm, commonly to 260 cm; males and females mature at 197–226 and 180–230 cm, respectively; born at 55–80 cm.

Distinguishing features:

A large stout requiem shark with a grayish back and white undersides; 1st dorsal fin high and broad with a pointed or slightly rounded apex, its origin a little in advance of insertion of pectoral fins; 2nd dorsal fin much smaller, about $\frac{1}{3}$ the height of 1st, situated over anal fin; interdorsal ridge absent; pectoral fins broad with narrow pointed tips; snout very short and broadly rounded (viewed ventrally), preoral length less than internarial space.



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

BLACKTIP SHARK***Carcharhinus limbatus*** (Valenciennes, 1839)Other Names: *pating* (local)*Photo by: JPA Gaudiano/Silliman University (JPAG 180).***Size:**

To at least 250 cm, commonly to 150 m; males and females mature at 165–180 and 183–194 cm, respectively; born at 40–70 cm.

Distinguishing features:

A moderately slender medium-sized requiem shark with a dark gray, ashy blue or dusky bronze back and white to yellowish white undersides; a dark band along each side of body; pelvic fins tips with black spot (in juveniles, all fin tips black; dorsal, pectoral and lower lobe of caudal fin plain in specimens >130 cm); 1st dorsal fin with a pointed or narrow rounder apex, its origin above or just behind pectoral-fin insertions; 2nd dorsal fin smaller than 1st, about twice the height of 1st; interdorsal ridge absent; snout long and pointed (viewed ventrally).

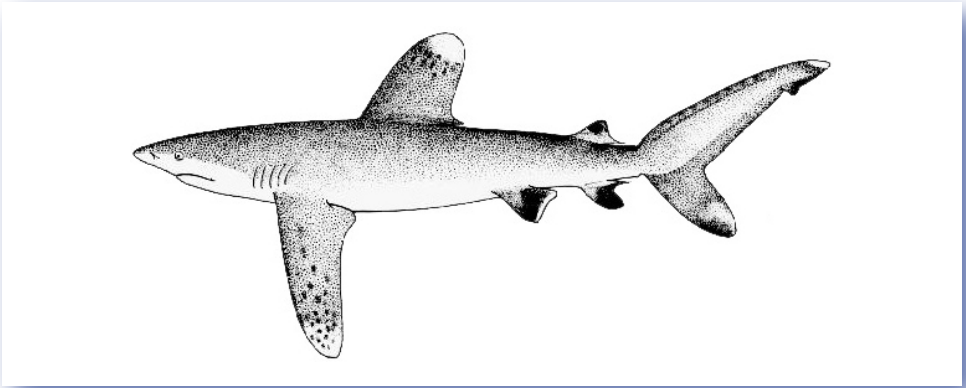
*Ventral view of head. (JPAG 180).***References:**

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

OCEANIC WHITETIP SHARK

Carcharhinus longimanus (Poey, 1861)

Other Names: *pating* (local)



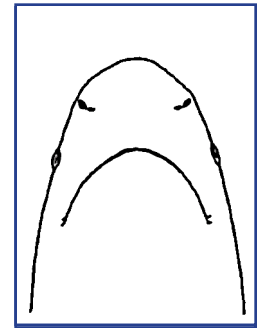
FAO

Size:

To at least 350 cm, commonly to 270 cm or less; born at 60–65 cm.

Distinguishing features:

A large stout requiem shark with a dark gray back with bronze tinge, sometimes brown or bluish, and a white undersides with yellowish tinge; 1st dorsal fin large and pectoral fins very long, each broadly rounded; 1st dorsal fin, pectoral fins and lower lobe of caudal fin often white or with white spots (sometimes absent); ventral surface of pelvic fins, apices of anal and 2nd dorsal fins, and ventral lobe of caudal fin often with black spots; interdorsal ridge present; snout short and bluntly rounded (viewed ventrally).



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

BLACKTIP REEF SHARK

Carcharhinus melanopterus (Quoy & Gaimard, 1824)

Other Names: Blacktip shark, Black-finned shark (English); *pating* (local) *bayanakon*, *lodlod*, *tutongan*, *tutungan* (Bikol); *iho* (Waray); *kaitan tutungan* (Maranao/Samal/Tao Sug); *lumba*, *pantay*, *pating inglesa* (Tagalog); *teburon* (Kuyunon)



Photo by: JPA Gaudiano/ Silliman University (JPAG 127).

Size:

To at least 200 cm, commonly to 160 m; both sexes mature at 95–110 cm; born at 33–50 cm.

Distinguishing features:

A small-medium sized requiem shark relatively slender with greyish to grey-brown back and white undersides; distinct pale stripes along each flank; 1st dorsal fin with a thick black tip (its inner edge sharply defined and often bordered by white area); interdorsal ridge absent; caudal fin lobe with thick black tip (other fins often with smaller black tips); snout very short, broadly rounded (viewed ventrally), preoral length subequal to internarial space.



Ventral view of head.
(JPAG 127).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

BLACKSPOT SHARK

Carcharhinus sealei (Pietschmann, 1913)

Other Names: *pating* (local)

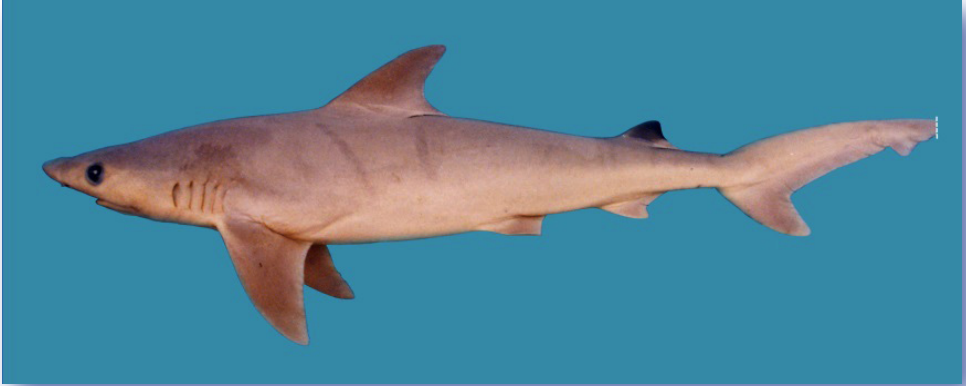


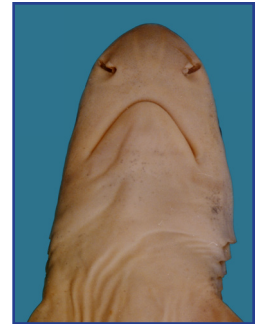
Photo by: JPA Gaudiano/Silliman University (JPAG 215).

Size:

To at least 95 cm; males and females mature at >80 cm and 68–75 cm, respectively; born at 33–45 cm.

Distinguishing features:

A small stout to slender-bodied requiem shark with grayish or gray-brown back, whitish undersides; 1st dorsal fin moderately tall, moderately falcate; low interdorsal ridge usually present; only 2nd dorsal fin with a black tip (covering more than half of fin, often extending onto body); snout rather long, narrowly parabolic (viewed ventrally).



Ventral view of head.
(JPAG 214).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

SPOT-TAIL SHARK

Carcharhinus sorrah (Valenciennes, 1839)

Other Names: Sorrah shark, School shark, Spottail shark (English);
pating (local)

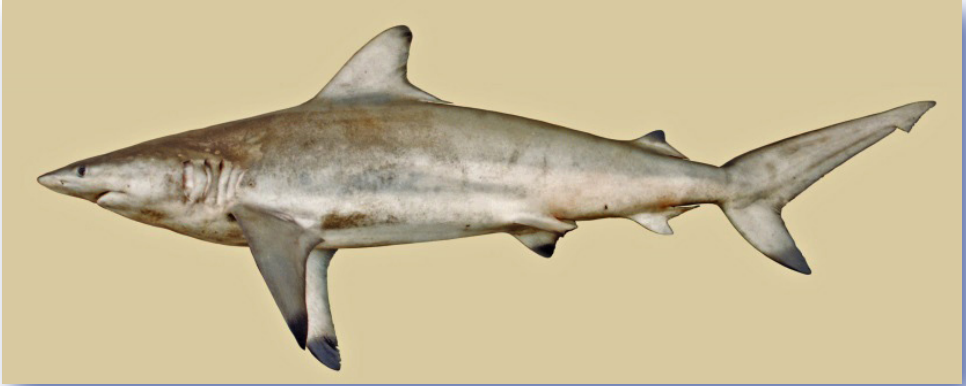


Photo by: JPA Gaudiano/ Silliman University (JPAG 119).

Size:

To at least 160 cm, commonly to 106-150 cm; males and females mature at 90-115 cm and 95-118 cm, respectively; born at 50-60 cm.

Distinguishing features:

A small to medium-sized requiem shark with a slender to moderately stout body, gray to gray-brown back and white undersides, with a golden sheen on the area between the eyes and gills slits; 1st dorsal fin with narrowly rounded apex, its origin usually from anterior to just behind pectoral-fin free rear tips; 2nd dorsal fin very low, inner margin extremely long (2.0 to 2.6 times fin height); 2nd dorsal, pectoral and ventral tip of caudal fin strikingly black-tipped; interdorsal ridge present; snout long and moderately pointed (viewed ventrally).



Ventral view of head.
(JPAG 119).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

TIGER SHARK

Galeocerdo cuvier (Péron & Lesueur, 1822)

Other Names: Spotted shark (English); *pating* (local)

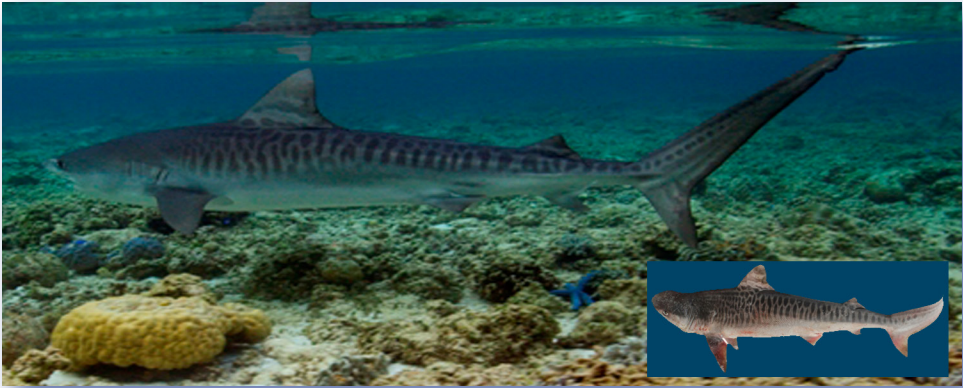


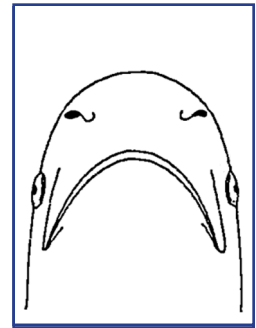
Photo by: Lene & Claus Topp.
Inset photo by: MD Santos /NFRDI.

Size:

To at least 600 cm (one record of 750 cm, male), commonly at 500 cm; males and females mature at 300–305 cm and 250–350 cm, respectively; born at about 51–76 cm.

Distinguishing features:

A very large requiem shark with a gray back, with black vertical tiger-striped bars and spots on sides (less distinct in adults) and white undersides; 2nd dorsal much smaller than 1st; caudal peduncle with a low, rounded, lateral keel; snout very short and bluntly rounded (viewed ventrally); spiracles present, small and slit-like; upper labial furrows very long, subequal to preoral length.



Ventral view of head.
(FAO).

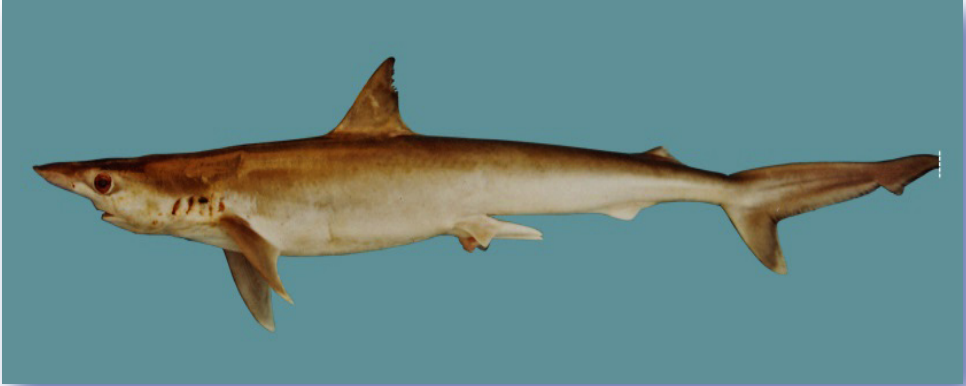
References:

Last *et al.* 2010; Compagno *et al.* 2005; Last & Stevens 1994; Compagno 1998; Schneider 1990; Compagno 1984.

SLITEYE SHARK

Loxodon macrorhinus Müller & Henle, 1838

Other Names: Jordan's blue dogshark, Slender dogshark (English);
pating (local)



Photos by: JPA Gaudiano /Silliman University (JPAG 284).

Size:

To at least 99 cm; males and females mature at about 80–83 and 80–90 cm, respectively; born at 40–55 cm.

Distinguishing features:

A small, very slender requiem shark with gray back and pale undersides; 1st dorsal fin small, 2nd dorsal fin smaller, low and behind larger anal fin; interdorsal ridge rudimentary or absent; 1st dorsal fin caudal and 1st dorsal fins with narrow dark margin, pectoral fins small, narrow and slightly falcate; anal fin with slightly concave posterior margin and long preanal ridges; snout narrow and long, parabolic in shape (viewed ventrally), length greater than mouth width; labial furrows very short; eyes big and narrow with rear notches.



Ventral view of head.
(JPAG 284).

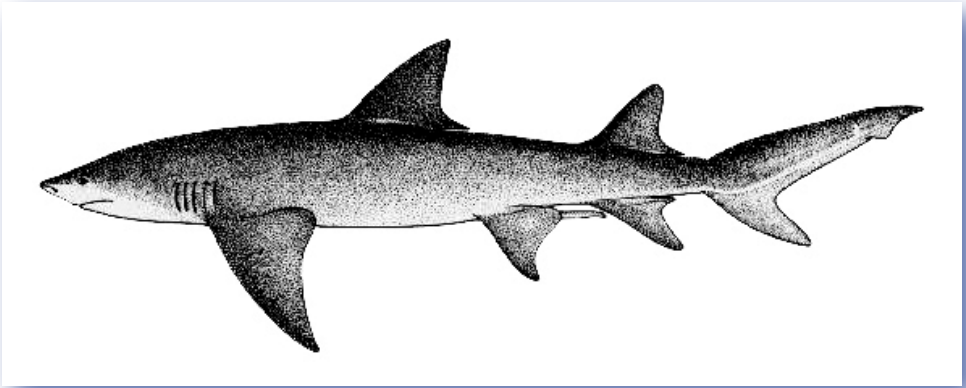
References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

SHARPTOOTH LEMON SHARK

Negaprion acutidens (Rüppell, 1837)

Other Names: *pating* (local), *iho* (Cebuano)



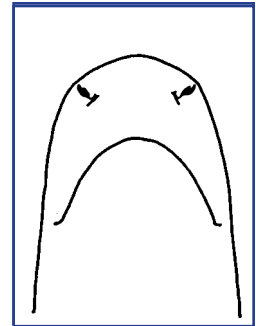
FAO

Size:

To at least 300 cm; matures at about 220 cm; born at 50–70 cm.

Distinguishing features:

A large stocky requiem shark with a yellowish brown body, paler undersides; 2nd dorsal fin nearly as large as the 1st (its base more than $\frac{3}{4}$ of 1st dorsal-fin base); pectoral fins broad and strongly falcate; pelvic fins falcate; no dermal ridge between fins; snout short (shorter than width of mouth), broad, rounded or obtusely wedge-shaped; labial folds short; spiracles usually absent.



Ventral view of head.
(FAO).

References:

Compagno *et al.* 2005; Last & Stevens 1994; Compagno 1998; Compagno 1984.

BLUE SHARK

Prionace glauca (Linnaeus, 1758)

Other Names: Blue whaler, Great blue shark (English); *pating* (local)

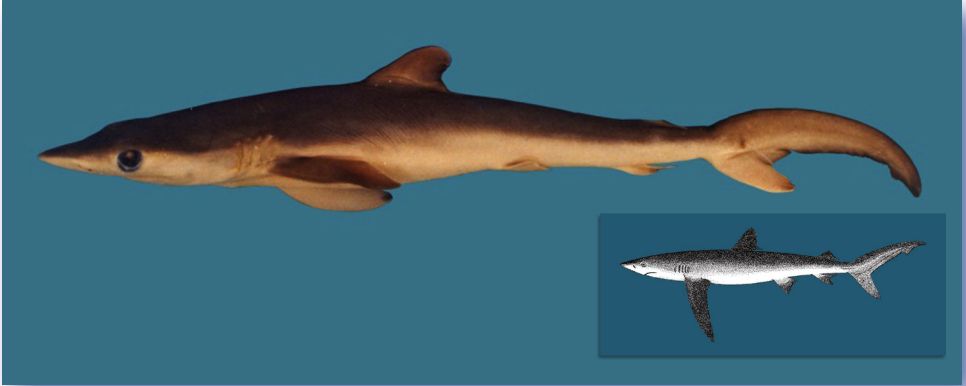


Photo by: BR Uypitching/Silliman University (BRU 117).
(Note: curving of caudal fin an artifact of the specimen.
Inset shows FAO illustration of a typical blue shark).

Size:

To at least 383 cm; both sexes mature at about 210–220 cm (somewhat variable); born at 35–50 cm.

Distinguishing features:

A large, slender-bodied requiem shark with indigo blue back, flanks grading from bright blue to silvery blue, and white undersides; 1st dorsal-fin base closer to pelvic-fin base than pectoral-fin base; pectoral fins very long and scythe-like, dusky; caudal peduncle with weak lateral keels; snout very long and narrowly rounded (viewed ventrally); labial furrows very small.

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.



Ventral view of head.
Photo by: JPA Gaudiano/
Silliman University.
(JPAG 212).

MILK SHARK

Rhizoprionodon acutus (Rüppell, 1835)

Other Names: Longman's dogshark, Fish shark, White-eye shark (English);
pating (local)

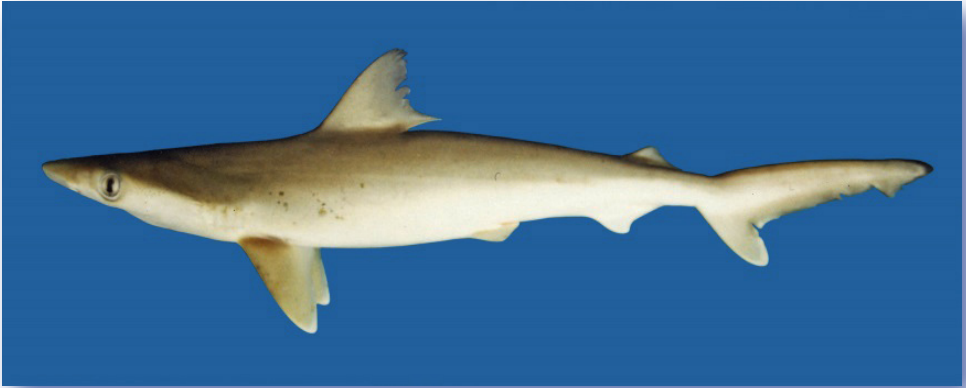


Photo by: JPA Gaudiano/ Silliman University (JPAG 217).

Size:

To about 110 cm (a 178 cm specimen recorded off Africa); males and females mature at about 75–79 and 75–83 cm, respectively; born at 30–40 cm.

Distinguishing features:

A small, moderately slender requiem shark with bronze to grayish back, pale undersides; 2nd dorsal fin smaller than anal fin, its origin about opposite anal-fin insertion; preanal ridges very long, about equal to anal-fin base length; snout long and narrowly rounded (viewed ventrally); upper labial furrows long and prominent; hyomandibular pores alongside mouth corners enlarged in a distinct series, usually more than 16 in total for both sides.



Ventral view of head.
(JPAG 217).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

WHITETIP REEF SHARK

Triaenodon obesus (Rüppell, 1837)

Other Names: Whitetip shark, Blunthead shark (English); *pating* (local)



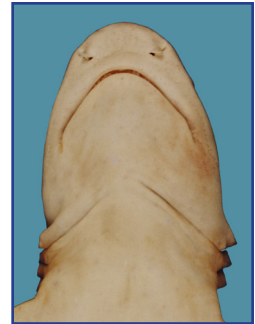
Photo by: JPA Gaudiano/Silliman University (JPAG 137).

Size:

To about 200 cm; males and females mature at 112–118 and 114–122 cm, respectively; born at 52–60 cm.

Distinguishing features:

A medium-sized, moderately slender requiem shark with grayish brown back, usually with a few scattered dark spots, and pale undersides; 1st dorsal and upper caudal fin lobe with distinctive white tips; 1st dorsal fin moderately large, apex narrowly rounded, its origin well behind pectoral-fin free tips; 2nd dorsal fin large, about $\frac{1}{2}$ to $\frac{3}{4}$ height of 1st dorsal fin; interdorsal ridge absent; snout very short, broadly rounded, tip blunt (viewed ventrally); labial furrows very short; anterior nasal flaps with a short, truncate, prominent lobe, formed into a partial tube.



Ventral view of head.
(JPAG 137).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno & Niem 1998; Compagno 1984.

FAMILY HEMIGALEIDAE HASSE, 1879. WEASEL SHARKS.

Weasel sharks are medium to large sharks characterized by having horizontally oval eyes, small spiracles, two moderate-sized spineless dorsal fins and an anal fin, the first dorsal base well ahead of pelvic bases; precaudal pits present; and caudal fin with a strong ventral lobe and lateral undulations on its dorsal margin.

Of the eight or more species in this family, two are found in the Philippines.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Hemigaleus microstoma* Bleeker, 1852. Sicklefin weasel shark.
- ✓ *Hemipristis elongata* (Klunzinger, 1871). Snaggletooth shark.

SICKLEFIN WEASEL SHARK

Hemigaleus microstoma Bleeker, 1852

Other Names: Weasel shark (English); *pating* (local)

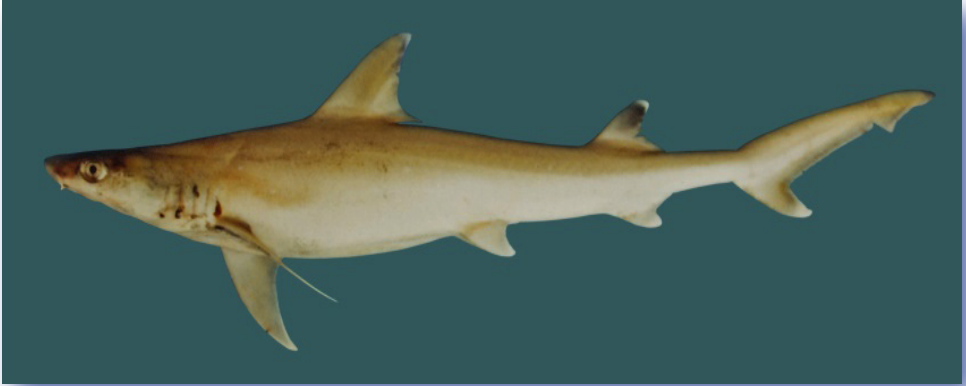


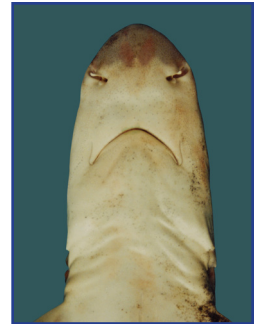
Photo by: JPA Gaudiano/ Silliman University (JPAG 216).

Size:

To at least 114 cm; males and females mature at about 74 and 78 cm, respectively; born at about 45 cm.

Distinguishing features:

A small, slender weasel shark with a light bronze to grayish back and pale undersides; lateral distinct, pronounced dip below 2nd dorsal fin; all fins strongly falcate, light-tipped; 2nd dorsal and upper caudal-fin tips dark (fading in large specimens); snout long, depressed, moderately rounded (viewed ventrally); mouth very short and broadly arched, its length about $\frac{1}{3}$ of width; labial furrows moderately long, and apparent, upper furrows nearly reaching symphysis of lower jaw; spiracles small; gill slits short, less than twice eye length.



Ventral view of head.
(JPAG 216).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno 1998; Compagno 1984.

SNAGGLETOOTH SHARK

Hemipristis elongata (Klunzinger, 1871)

Other Names: Weasel shark (English); *pating* (local)



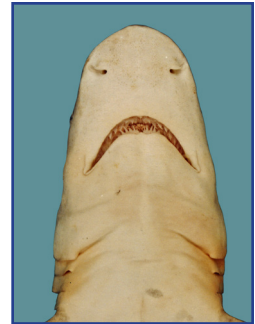
Photo by: JPA Gaudiano/ Silliman University (JPAG 132).

Size:

To at least 240 cm; males and females mature at 110-136 and about 120 cm, respectively; born at 45-52 cm.

Distinguishing features:

A medium-sized moderately slender weasel shark with gray or gray-brown back and lighter undersides; all fins falcate, 2nd dorsal and upper caudal-fin tips with a dark blotch (less distinct in large specimens); snout long, broadly rounded (viewed ventrally); mouth long and semiparabolic, with a truncated lower symphysis, its length about $\frac{2}{3}$ of width; teeth protruding prominently when mouth closed; labial furrows moderately long and apparent, upper furrows reaching behind symphysis of lower jaw; spiracles small; gill slits long, more than twice eye length.



Ventral view of head.
(JPAG 132).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994; Compagno 1998; Compagno 1984.

FAMILY PROSCYLLIIDAE

FOWLER, 1941. FINBACK CATSHARKS.

Finback catsharks are small sharks, the representative species (*i.e.*, the Pygmy ribbontail catshark) is only about 24 cm. Characteristics include two spineless dorsal fins; base of 1st dorsal fin closer to 2nd dorsal fin about as large as 1st; pelvic-fin bases than to pectoral-fin base; caudal fin asymmetrical, without a rippled dorsal margin and ventral lobe but with a strong subterminal notch; vertebral axis of caudal fin little raised above body axis; snout narrowly rounded (viewed ventrally); labial furrows very short or absent, confined to mouth corners.

Of the five or more species in this family, two are found in the Philippines (one is still undescribed, possibly an endemic). Families similar to the finback catsharks are the false catsharks (Family Pseudotriakidae)*, the catsharks (Family Scyliorhinidae), and the houndsharks (Family Triakidae). False catsharks have their 1st dorsal fin low, long and keel-shaped (*i.e.*, as in *Pseudotriakis microdon*) and spiracles as large as eyes. Houndsharks have their 1st dorsal fin over or behind pelvic-fin bases.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Eridacnis radcliffei* Smith, 1913. Pygmy ribbontail catshark.
- U *Eridacnis* sp. 1. Philippine ribbontail catshark.

* The monotypic carcharhiniform genus *Gollum* was initially assigned to a new subfamily Golluminae of the family Proscylliidae (Compagno, 1988) and was later reassigned to the family Pseudotriakidae (Compagno 1999; Compagno *et al.* 2005).

PYGMY RIBBONTAIL CATSHARK

Eridacnis radcliffei Smith, 1913

Other Names: *pating* (local)



Photo by: BR Uypitching/ Silliman University (BRU 064).

Size:

To at least 24 cm.

Distinguishing features:

A small shark (*i.e.*, one of the smallest living sharks) with a slender body, dark brown back, lighter undersides; with blackish markings on dorsal fin and tail bands; base of 1st dorsal fin closer to 2nd dorsal fin about as large as 1st; pelvic-fin bases than to pectoral-fin base; caudal fin asymmetrical, without a rippled dorsal margin and ventral lobe but with a strong subterminal notch; vertebral axis of caudal fin little raised above body axis; snout narrowly rounded (viewed ventrally); labial furrows very short or absent, confined to mouth corners.



Ventral view of head.
(BRU 064).

References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Compagno 1984.

FAMILY PSEUDOTRIAKIDAE GILL, 1893. FALSE CATSHARKS.

False catsharks or gollumsharks are soft-bodied sharks with sizes ranging from the relatively small (*e.g.*, 53.4 to 65.2 cm for the Sulu gollumshark *Gollum suluensis*) to large (*i.e.*, attaining a length of about 295 cm for the false catshark *Pseudotriakis microdon*). False catsharks are characterized by elongated, catlike eyes and nictitating eyelids, large spiracles, a huge, wide, angular mouth that reaches behind eyes, very short labial furrows, numerous small cuspidate teeth in 200 or more rows in each jaw; two large spineless dorsal fins, the first dorsal fin being low, long and keel-like; an anal fin; and a caudal fin with a strong ventral lobe.

Of the three or more species in this family worldwide, at least one is found in the Philippines (*i.e.*, the Gollum shark).

This family used to be represented by a single species, the *Pseudotriakis microdon* (false catshark), characterized by a distinctive long, low and keel-like 1st dorsal fin and spiracles about as large as eyes. *P. microdon*, however, has not been recorded for the Philippines as yet. *Gollum* is now added as the second genus to this family, which currently has two species, possibly three. *Gollum* was initially assigned to a new subfamily Golluminae of the family Proscylliidae and was later reassigned to the family Pseudotriakidae. It presently contains two species: *G. attenuatus*, initially placed in the family Triakidae; and *G. suluensis*, the one pseudotriakid species recorded in the Philippines, which is recently described and possibly an endemic.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Gollum suluensis* Last & Gaudiano 2011. Sulu gollumshark.

SULU GOLLUMSHARK

Gollum suluensis Last & Gaudiano 2011

Other Names: Gollum shark



Photo by: JPA Gaudiano/ Silliman University (JPAG 234).

Size:

To at least 53.4 to 65.2cm.

Distinguishing features:

A slender small-bodied shark with darker-colored back and paler undersides; 1st dorsal fin not long-based and keel-like; interdorsal ridge present; 1st dorsal-fin base well forward of the pelvic-fin base; 2nd dorsal fin taller and more upright than 1st; anal-fin origin well behind 2nd dorsal-fin origin; no precaudal pits; caudal peduncle relatively elongate; dorsal caudal margin short, not undulated but with a raised scaly ridge; enlarged lateral scales of caudal ridge semicircular, horizontally directed; short, bell-shaped head; shorter, broader, flattened snout; spiracles four to ten times smaller than eye length; moderately elongate labial furrows; short anterior nasal flaps.



Ventral view of head.
(JPAG 235).

References:

Last & Gaudiano 2011; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001.

FAMILY SCYLORHINIDAE

GILL, 1862. CATSHARKS.

Catsharks are small sharks, with species represented here having sizes of 30 (*i.e.*, Dwarf sawtail catshark *Galeus schultzi*) to 70 cm (*i.e.*, coral catshark *Atelomycterus marmoratus*). Members of this family are characterized usually by their elongated, catlike eyes with nictitating eyelids, lower eyelid usually with longitudinal fold; subterminal mouths not entirely in front of eyes and have no nasoral grooves and folds around nostrils; five gill openings with the 5th over origin of pectoral fin; and two small, spineless dorsal fins, with 1st dorsal fin originating over pelvic fin bases and 2nd dorsal fin originating over anal fin; anal fin originates in advance of the 2nd dorsal fin origin; caudal fin with its upper lobe not elevated above the body axis, with a strong terminal lobe and subterminal notch but no ventral lobe.

One of the largest families of sharks, it has about 154 or more member species, of which 17 are recorded for the Philippines. Six are confirmed present, only five are provided here with species accounts. One species, described recently (*i.e.*, *Halaelurus maculosus*), is often confused with two others (*i.e.*, *H. cf. boesemani* and *H. cf. buergeri*) and believed to belong to species complexes. Further taxonomic work is needed. Two additional species are still undescribed, potentially new, possibly endemics (*i.e.*, *Cephaloscyllium* sp. 1 and *Galeus* sp. 1). Nominal records of eight other species (*i.e.*, *Apristurus longicephalus*, *A. platyrhynchus*, *Cephaloscyllium fasciatum*, *C. isabellum*, *Galeus eastmani*, *Parmaturus melanobranchus*, *Scyliorhinus garmani* and *S. torazame*) need further validation.

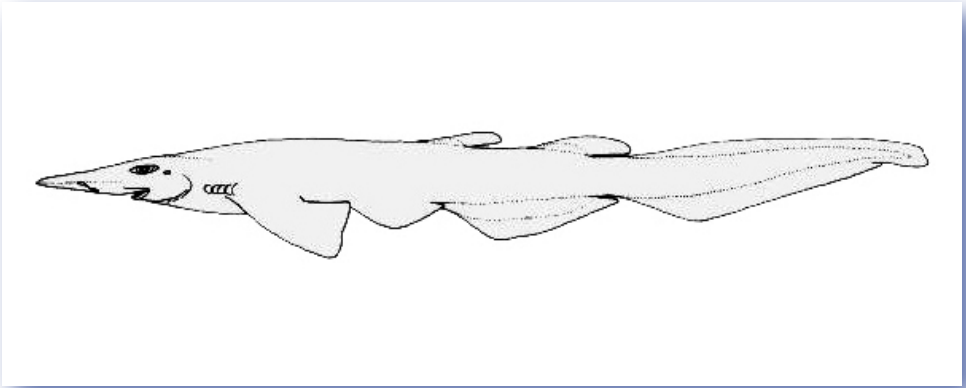
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Apristurus herklotsi* (Fowler, 1934). Longfin catshark.
- ? *Apristurus longicephalus* Nakaya, 1975. Longhead catshark.
- ? *Apristurus platyrhynchus* (Tanaka, 1990). Borneo catshark.
- ✓ *Atelomycterus marmoratus* (Bennett, 1830). Coral catshark.
- ? *Cephaloscyllium fasciatum* Chan, 1966. Reticulated swellshark.
- ? *Cephaloscyllium isabellum* (Bonnaterre, 1788). Draughtsboard shark.
- U *Cephaloscyllium* sp. 1 nov. Philippines swellshark.
- ? *Galeus eastmani* (Jordan & Snyder, 1904). Gecko catshark
- ✓ *Galeus sauteri* (Jordan & Richardson, 1909). Taiwan sawtail catshark.
- ✓ *Galeus schultzi* Springer, 1979. Dwarf sawtail catshark.
- U *Galeus* sp. 1 nov. near *G. nipponensis* Nakaya, 1979.
- T *Halaelurus cf. boesemani* Springer & D'Aubrey, 1972. Speckled catshark.
- T *Halaelurus cf. buergeri* (Müller & Henle, 1838). Blackspotted catshark.
- N *Halaelurus maculosus* White, Last & Stevens, 2007. Indonesian speckled catshark
- ? *Parmaturus melanobranchus* (Chan, 1966). Blackgill catshark.
- ✓ *Pentanchus profundicolus* Smith & Radcliffe, 1912. Onefin catshark.
- ? *Scyliorhinus garmani* (Fowler, 1934). Brownspotted catshark.
- ? *Scyliorhinus torazame* (Tanaka, 1908). Cloudy catshark.

LONGFIN CATSHARK

Apristurus herklotsi (Fowler, 1934)

Other Names: *pating* (local)



FAO

Size:

To at least 48.5 cm TL.

Distinguishing features:

A small shark with head broadly flattened; two dorsal fins, with 1st much smaller than 2nd, about $\frac{1}{2}$ its area or less; origin of 1st dorsal fin in front of pelvic fin insertions; distance between pectoral-and-pelvic fin bases short, rear tips pectoral fins just in front of pelvic fin origins; snout elongated and usually longer than mouth width; labial furrows very long.

References:

Compagno *et al.* 2005; Compagno & Niem 1998; Compagno 1984.

CORAL CATSHARK

Atelomycterus marmoratus (Bennett, 1830)

Other Names: Marbled catshark (English); *iyoy* (Ilokano), *kaitan malo*, *kaitan malu-malu* (Maranao/Samal/Tao Sug), *lahos* (Visayan), *pating* (Tagalog)



Photos by: Silliman University/JPA Gaudio (Top: JPAG 046; Bottom: JPAG 323).

Size:

To at least 70 cm; both sexes mature at about 47–55 cm; born at 10–13 cm.

Distinguishing features:

A small shark covered with numerous light grey and white spots; born with light and dark saddle bars which disappear with age; prominent white strip on side of head through gill slits; snout short and slightly flattened, with a blunt tip (viewed ventrally); labial furrow very long; anterior nasal flaps greatly enlarged. dorsal fins relatively large, subequal in size, angled rearwards, with obvious white tips.



Ventral view of head.
(JPAG 323).

References:

Last *et al.* 2010; Hoewel *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Compagno 1984.

TAIWAN SAWTAIL CATSHARK

Galeus sauteri (Jordan & Richardson, 1909)

Other Names: Blacktip sawtail catshark (English); *pating* (local)



Photo by: JPA Gaudiano/ Silliman University (JPAG 100).

Size:

To at least 45 cm.

Distinguishing features:

A very small shark, one of the smallest. Body color pattern not so apparent; dorsal fins and sometimes upper and lower caudal-fin lobes with prominent black tips; pectoral fins relatively large, width of their posterior margins usually larger than mouth width; subocular ridges obsolete or nearly so; snout more angular and pointed, usually nearly equal to, or about equal to mouth width; eyes larger and lateral on head, length 3.5 to 4.2% of total length; labial furrows more elongated, extending beyond mouth corners.



Ventral view of head.
(JPAG 104).

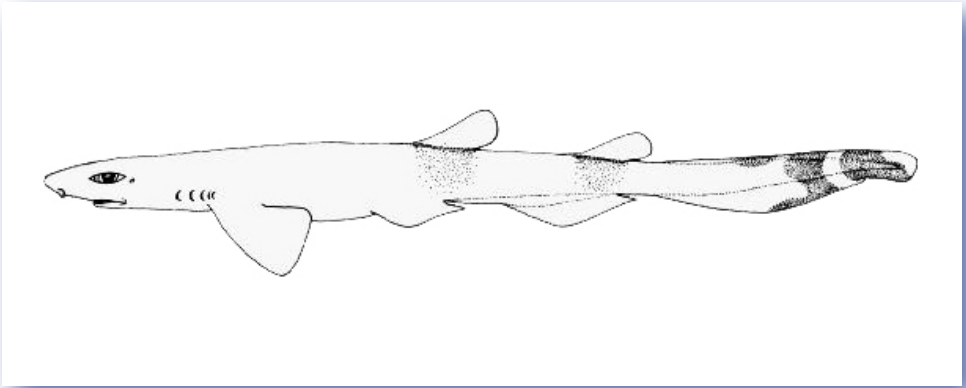
References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Compagno 1984.

DWARF SAWTAIL CATSHARK

Galeus schultzi Springer, 1979

Other Names: *pating* (local)



FAO

Size:

To at least 30 cm.

Distinguishing features:

A very small shark, one of the smallest. Body with obscure dark saddle blotches at first and second dorsal bases, and two bands on the tail; dorsal fins and caudal tip without black terminal marking; pectoral fins relatively large, width of their posterior margins usually larger than mouth width; subocular ridges obsolete or nearly so; snout broadly rounded, usually considerably less than mouth width; eyes larger and lateral on head; labial furrows very short, confined to mouth corners.

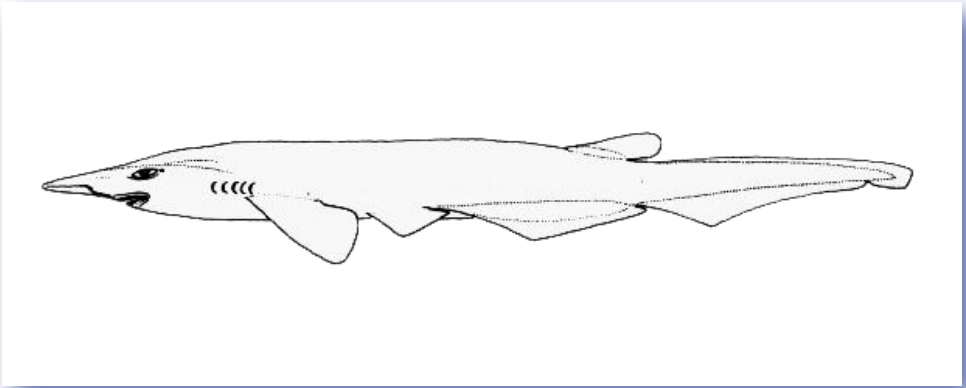
References:

Compagno *et al.* 2005; Compagno & Niem 1998; Compagno 1984.

ONEFIN CATSHARK

Pentanchus profundicolus Smith & Radcliffe, 1912

Other Names: *pating* (local)



FAO

Size:

To at least 51 cm.

Distinguishing features:

A small shark with distinct color pattern; body is uniformly dark brown. This is the only 5-gill shark with one dorsal fin; originating behind center of anal fin base; caudal fin with a distinct subterminal notch; head broadly flattened and spatulate, snout elongated and usually longer than mouth width; labial furrows very long, uppers reaching upper symphysis.

References:

Compagno *et al.* 2005; Nakaya & Seret 2000; Compagno & Niem 1998; Compagno 1984.

FAMILY SPHYRNIDAE

GILL, 1872. HAMMERHEAD SHARKS.

Hammerheads are medium to large-sized sharks easily identified by their characteristic hammer-shaped head. Other characters include much wider set eyes and nasal openings than in other sharks; and absence of spiracles.

Of the eight member species of this family, four are confirmed to be present in the Philippines. The presence of the Bonnethead shark *Sphyrna tiburo* is still uncertain.

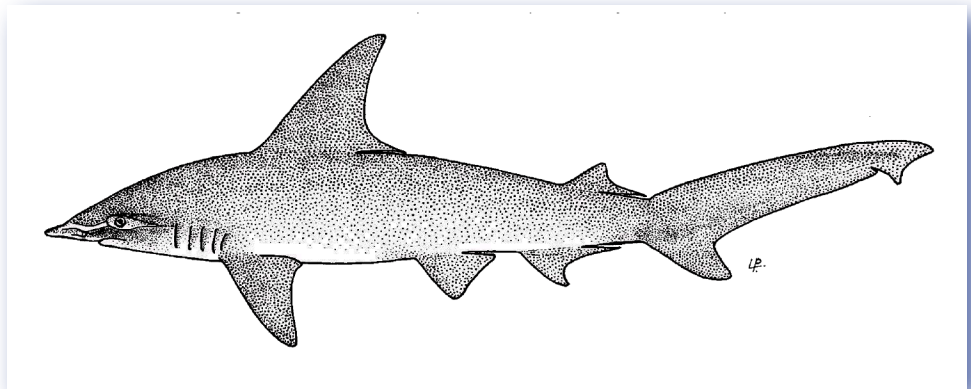
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Eusphyra blochii* (Cuvier, 1816). Winghead shark.
- ✓ *Sphyrna lewini* (Griffith & Smith, 1834). Scalloped hammerhead.
- ✓ *Sphyrna mokarran* (Rüppell, 1837). Great hammerhead.
- ? *Sphyrna tiburo* (Linnaeus, 1758). Bonnethead shark.
- ✓ *Sphyrna zygaena* (Linnaeus, 1758). Smooth hammerhead.

WINGHEAD SHARK

Eusphyra blochii (Cuvier, 1816)

Other Names: Slender hammerhead (English); *pating* (local), *krusan* (Bikol)



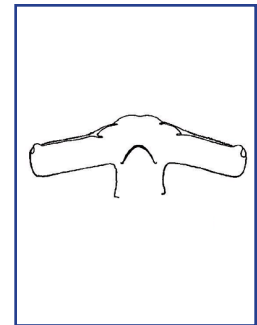
FAO

Size:

To at least 186 cm; males and females mature at about 108 and 120 cm, respectively; born at 32–47 cm.

Distinguishing features:

Gray or grayish brown back, paler undersides; no dark fin markings; a narrow and wing-shaped head, width across head 40–50% of total length; midline of head with a shallow indentation; nostrils enormously expanded, each nearly two times the mouth width; with a series of small bumps along front edges of nostrils; 1st dorsal fin very tall and falcate, origin above or over pectoral-fin insertion; upper precaudal pit forming a narrow longitudinal groove (not crescentic).



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno 1998; Last & Stevens 1994; Compagno 1984.

SCALLOPED HAMMERHEAD

Sphyrna lewini (Griffith & Smith, 1834)

Other Names: Kidney-shaped shark (English); *pating* (local), *krusan* (Bikol)

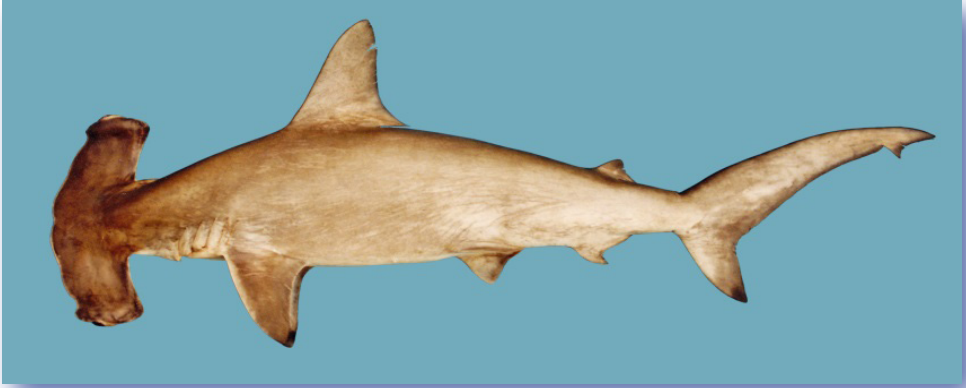


Photo by: JPA Gaudiano/Silliman University (JPAG 124).

Size:

To at least 350 cm, possibly to 420 cm, commonly at 360 m; males mature at 140–180 cm and females at 200–230 cm; born at 40–50 cm.

Distinguishing features:

Olive, bronze or brownish gray back, paler undersides; pectoral fins tipped gray or black (in juveniles, pectoral, lower caudal and 2nd dorsal fin tips dark); head width 24–30% of total length; front margin of head curved anteriorly, with midline and lateral indentations; without small bumps along front edges of nostrils; prenarial grooves well developed; 1st dorsal fin tall, moderately falcate; 2nd dorsal fin small, $< \frac{1}{3}$ height of 1st; upper precaudal pit forming a crescentic groove.



Ventral view of head.
(JPAG 124).

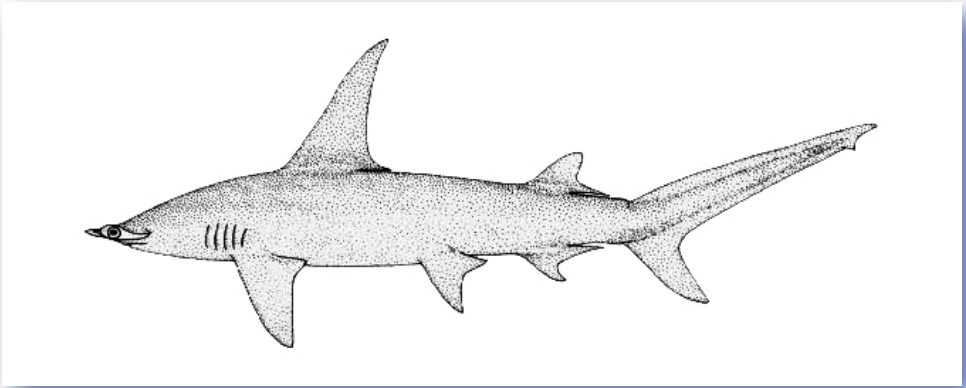
References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno 1998; Last & Stevens 1994; Compagno 1984.

GREAT HAMMERHEAD

Sphyrna mokarran (Rüppell, 1837)

Other Names: *pating* (local), *krusan* (Bikol)



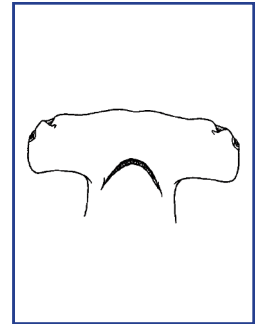
FAO

Size:

To at least 350–500 cm, commonly between 275–335 cm; males and females mature at about 250 and 265 cm, respectively; born at 50–60 cm.

Distinguishing features:

Bronzy to grayish brown back, paler undersides; fins dusky tipped in young; head width is 23–27% of total length; front margin of head nearly straight (except in some juveniles), with midline indentation; without small bumps along front edges of nostrils; prenarial grooves hardly developed; 1st dorsal fin very tall, strongly falcate, with a short inner margins; 2nd dorsal fin about $\frac{1}{3}$ as high as 1st; upper precaudal pit forming a crescentic groove.



Ventral view of head.
(FAO).

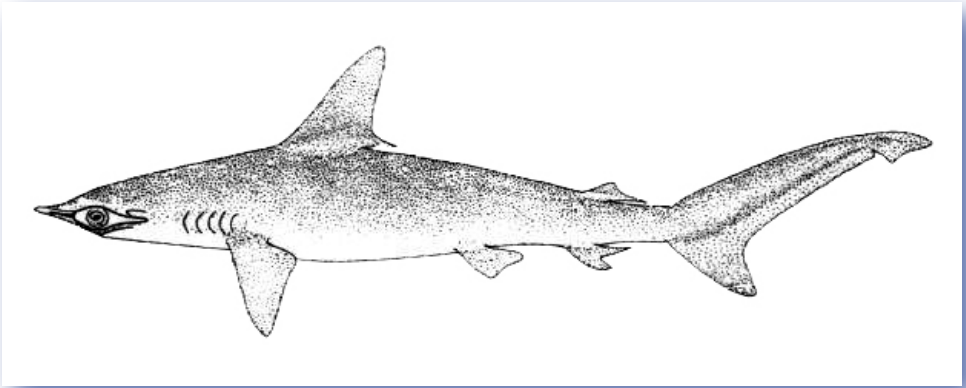
References:

Compagno *et al.* 2005; Compagno 1998; Last & Stevens 1994; Compagno 1984.

SMOOTH HAMMERHEAD

Sphyrna zygaena (Linnaeus, 1758)

Other Names: Common hammerhead (English); *pating* (local), *krusan* (Bikol)



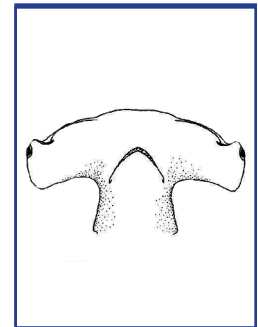
FAO

Size:

To at least 350–500 cm, commonly between 275–335 cm; males and females mature at about 250 and 265 cm, respectively; born at 50–60 cm.

Distinguishing features:

A hammerhead shark with a bronze or brownish gray back, paler undersides; fins nearly plain, dusky or blackish tipped; head width is 26–29% of total length; front margin of head curved anteriorly, with lateral but without midline indentation; without small bumps along front edges of nostrils; prenarial grooves well developed; 1st dorsal fin tall, moderately falcate, origin of 1st dorsal fin over or slightly behind pectoral-fin insertion; 2nd dorsal fin small, <math>< \frac{1}{3}</math> height of 1st; upper precaudal pit forming a crescentic groove.



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno 1998; Last & Stevens 1994; Compagno 1984.

FAMILY TRIAKIDAE

GRAY, 1851. HOUNDSHARKS.

The houndsharks, also referred to as smoothhounds or topes, are small to moderate-sized sharks with horizontally oval eyes, nictitating eyelids, anterior nasal flaps, two large-sized, spineless dorsal fins and an anal fin, the first dorsal base well ahead of pelvic bases.

Of the 47 or more species in this family, nine are reported to occur in the Philippines, two are confirmed present, three are still undescribed which are possible endemics (*e.g.*, Philippine white-spotted smoothhound *Mustelus* cf. *manazo*, Philippine brown smoothhound *M.* sp. 1 and Philippine grey smoothhound *M.* cf. *griseus*), three others may belong to species complexes the taxonomy of which need to be resolved (*i.e.*, Ocellate topeshark *Hemitriakis* sp. near *H. complicofasciata*, Starspotted smooth-hound *Mustelus manazo*, Spotless smooth-hound *M. griseus*) and one species, the Banded houndshark *Triakis scyllium*, still needs further validation.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Hemitriakis leucoperiptera* Herre, 1923. Whitefin tope.
- T *Hemitriakis* sp. near *H. complicofasciata* Takhashi and Nakaya, 2004
Ocellate topeshark.
- ✓ *Iago garricki* Fourmanoir, 1979. Longnosed houndshark.
- T *Mustelus manazo* Bleeker, 1855. Starspotted smooth-hound.
- U *Mustelus* cf. *manazo* Bleeker, 1854. Philippine white-spotted smoothhound.
- T *Mustelus griseus* Pietschmann, 1908. Spotless smooth-hound.
- U *Mustelus* sp 1. Philippine brown smoothhound.
- U *Mustelus* cf. *griseus* Pietschmann, 1908. Philippine grey smoothhound.
- ? *Triakis scyllium* Müller & Henle, 1839. Banded houndshark.

WHITEFIN TOPE

Hemitriakis leucoperiptera Herre, 1923

Other Names: *pating* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 169).

Size:

To at least 96 cm.

Distinguishing features:

A relatively small-sized shark. No dusky bar on underside of snout; young with dark bars on caudal fin but not elsewhere; 1st dorsal fin origin more posterior, over and behind inner margins of pectoral fins; 2nd dorsal fin nearly or quite as large as 1st, about $\frac{2}{3}$ to equal its area; internarial width about 2.5 times the nostril width; eyes dorsolateral, subocular ridges strong.



Ventral view of head.
(JPAG169).

References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

LONGNOSED HOUNDSHARK

Iago garricki Fourmanoir, 1979

Other Names: *pating* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 108).

Size:

To at least 75 cm.

Distinguishing features:

A small shark with its 1st dorsal fin origin far anterior, over pectoral-fin bases; 2nd dorsal fin nearly or quite as large as 1st, about $\frac{2}{3}$ to equal its area; ventral caudal-fin lobe absent to short in adults; eyes lateral, subocular obsolete strong;



Ventral view of head.
(JPAG108).

References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

ORDER HETERODONTIFORMES GARMAN, 1885. BULLHEAD SHARKS.

Members of this order are the only living sharks with two spined dorsal fins and anal fin present. Five pairs of gill slits; eyes without nictitating fold; small spiracles present but small; nostrils connected with mouth by deep groove. They are small species (max 165 cm) with small mouth; anterior teeth small and cuspidate, posterior enlarged and molariform; snout very short and bluntly rounded.

Only one family (Family Heterodontidae Gray, 1851), one genus and nine species are in this Order. Only one species is found in the Philippines.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Heterodontus zebra* (Gray, 1831). Zebra bullhead shark.

ZEBRA BULLHEAD SHARK

Heterodontus zebra (Gray, 1831)

Other Names: Zebra hornshark; Bullhead shark (English); *pating* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 325).
(Note: composite photo; 1st dorsal fin restructured).

Size:

To at least 125 cm; males and females mature at about 84 cm.

Distinguishing features:

A small to medium-sized shark with a large blunt head, with low supra-orbital crest gradually sloping behind eyes cylindrical and slightly compressed body, zebra-pattern of dark, narrow vertical bands on a pale background; dorsal fins preceded with spines; anal fin present; caudal fin with a moderately long dorsal lobe and moderately long ventral lobe, the latter shorter than the dorsal lobe, vertebral axis raised into caudal-fin lobe.



Ventral view of head.
(JPAG325).

References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

ORDER LAMNIFORMES



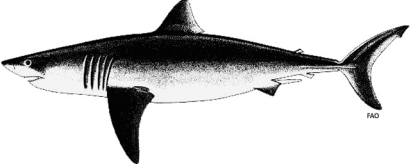
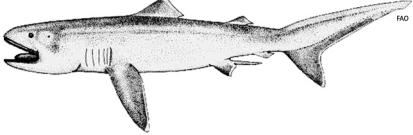

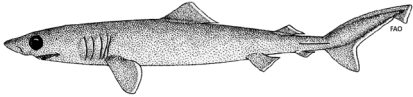
GARMAN, 1885. MACKEREL SHARKS.

Members of this order are characterized by a combination of five gill slits (last two may be above pectoral fin), an anal fin, two spineless dorsal fins, mouth extending well behind eyes, eyes without nictitating membrane, and ring-like intestinal valve. Spiracles usually present, small and behind eyes.


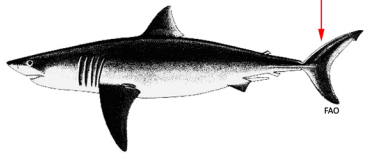
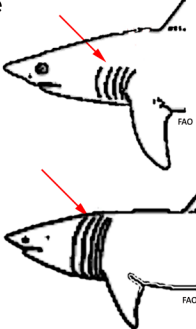
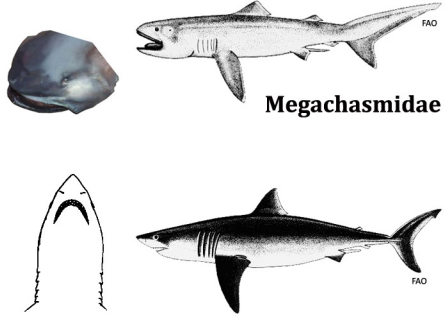
Of the seven families in this order, six are reported to occur in the Philippines: Alopiidae (Thresher sharks), Cetorhinidae (Basking sharks), Lamnidae (Mackerel sharks), Megachasmidae (Megamouth sharks), Odontaspidae (Sand tiger sharks), and Pseudocarchariidae (Crocodile sharks). Only the family Mitsukurinidae or the goblin sharks has not been reported.

For the family Odontaspidae, a family account is not provided. Nominal record for the Indian sand tiger (*Carcharias tricuspidatus* Day, 1878) in the Philippines is noted in Compagno & Niem (1998). It is considered a probable junior synonym of the Sand tiger (also called as the Grey nurse shark) *C. taurus* Rafinesque, 1810, thus, regarded as a doubtful species. *C. taurus*, on the other hand, is also not reported to occur in the Philippines (*i.e.*, not in range map of the species; see Pollard & Smith 1999) and no reference of the species was made in the Compagno *et al.* 2005. It is considered uncertain for now until additional materials confirm presence of the species in Philippine waters.

FAMILIES OF LAMNIFORMES REPORTED TO OCCUR IN THE PHILIPPINES

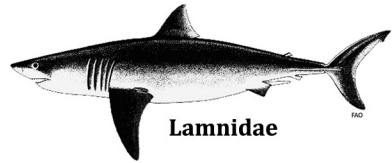
<p>1. Family Alopiidae Bonaparte, 1838. Thresher sharks.</p>	
<p>2. Family Cetorhinidae Gill, 1862. Basking sharks.</p>	
<p>3. Family Lamnidae Müller & Henle, 1838. Mackerel sharks.</p>	
<p>4. Family Megachasmidae Taylor, Compagno & Struhsaker, 1983. Megamouth sharks.</p>	
<p>5. Family Odontaspidae Compagno, 1973. Sand tigers</p>	
<p>6. Family Pseudocarchariidae Compagno, 1973. Crocodile sharks.</p>	

KEY TO THE FAMILIES OF LAMNIFORMES REPORTED TO OCCUR IN THE PHILIPPINES

<p>1a. Upper lobe of caudal fin greatly elongate, caudal fin length about as long as rest of shark Alopiidae</p> <p>1b. Upper lobe of caudal fin not elongate, caudal fin length less than half the length of shark go to 2</p>	<p>upper caudal fin lobe greatly elongated</p>  <p>Alopiidae</p> <p>upper caudal fin lobe not elongate</p> 
<p>2a. Gill openings exceptionally large, extending almost to mid-dorsal of head and ventrally to throat, extending onto dorsal surface of head Cetorhinidae</p> <p>2b. Gill openings medium-sized, do not extend to dorsal surface of head go to 3</p>	<p>Cetorhinidae</p> 
<p>3a. Head large and rounded; mouth terminal, lower jaw extending to snout tip Megachasmidae</p> <p>3b. Head large and angular; mouth sub-terminal, lower jaw does not extend to snout tip go to 4</p>	 <p>Megachasmidae</p>

4a. First dorsal fin large and angular; second dorsal and anal fins minute, >10 times less than 1st dorsal. Caudal peduncle with a distinct keel extending well out on caudal fin; caudal fin lunate

..... **Lamnidae**



Lamnidae

4b. First dorsal fin relatively small and low; dorsal and anal fins second dorsal smaller or subequal to 1st dorsal. Caudal peduncle with low or no keel; caudal fin strongly asymmetrical

..... go to 5



5a. Eyes small; lower precaudal pit absent; no keels on caudal peduncle

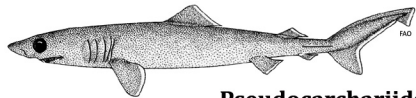
..... **Odontaspidae**



Odontaspidae

5a. Eyes very large; both upper and lower precaudal pits present; a low keel on each side of caudal peduncle

..... **Pseudocarchariidae**



Pseudocarchariidae

FAMILY ALOPIIDAE

BONAPARTE, 1838. THRESHER SHARKS.

Members of this order are characterized with a greatly elongate upper caudal fin lobe, the length of which is almost one-half of the total length and with a subterminal notch, a short but strong lower lobe, and a caudal peduncle with no keels but with precaudal pits. They have two spineless dorsal fins, an anal fin, five pairs of gill openings, with the 3rd to 5th gill openings located behind the pectoral fin origins, two small spiracles located behind eyes that do not have nictitating membranes, a small but arched and elongate mouth that extends well behind eyes, and ring-type intestinal valve.

Thresher sharks are primarily pelagic but are occasionally sighted in shallow, inshore waters. They are ovoviviparous, with their embryos feeding solely on the yolk sac and other ova produced by the mother.

The family is represented by only one genus, *Alopias*. All three species in the genus are also found in the Philippines.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Alopias pelagicus* Nakamura, 1935. Pelagic thresher
- ✓ *Alopias superciliosus* (Lowe, 1839). Bigeye thresher.
- ✓ *Alopias vulpinus* (Bonnaterre, 1788). Common thresher.

PELAGIC THRESHER

Alopias pelagicus Nakamura, 1935

Other Names: *pating* (local)

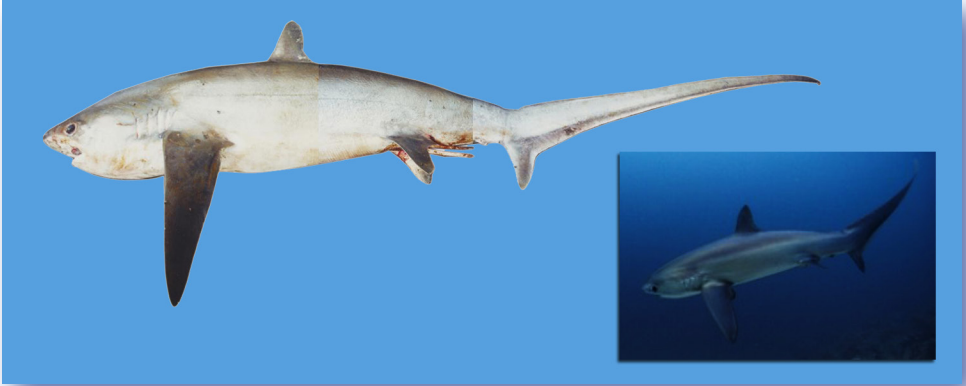


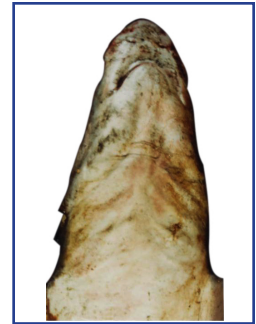
Photo by: JPA Gaudiano/Silliman University (JPAG 275, composite).
Inset photo by: Steve de Neef.

Size:

To at least 390 cm, commonly at 276 cm; males and females mature at 245–270 and 265–290 cm, respectively; born at 130–160 cm.

Distinguishing features:

A small thresher, the smallest of the three species, with a dark blue back and sides, white underside, no white patch over pectoral fin bases; a straight, broad-tipped 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. Often confused with the common thresher, but can be distinguished by the dark color over the bases of its pectoral fins.



Ventral view of head.
(JPAG 275).

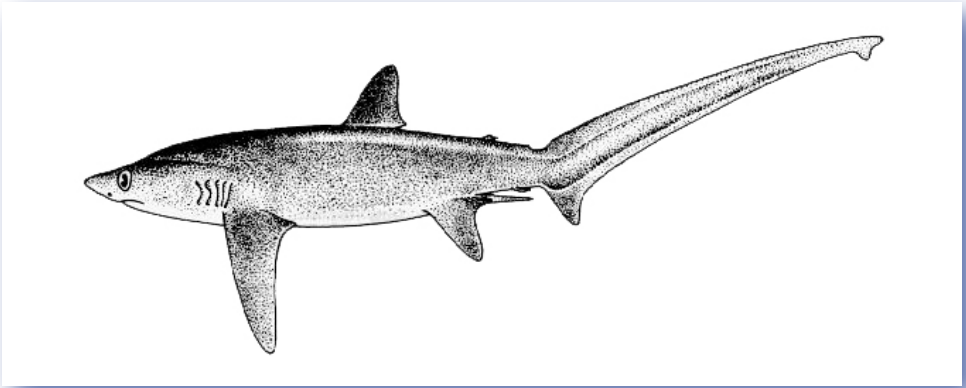
References:

Last *et al.* 2010; Compagno *et al.* 2005; Ebert 2003; Luchavez-Maypa *et al.* 2001; Compagno 1998; Last & Stevens 1994; Compagno 1984.

BIG-EYE THRESHER

Alopias superciliosus (Lowe, 1839)

Other Names: *pating* (local)



FAO

Size:

To at least 488 cm, commonly at 300–400 cm; males and females mature at 270 and 300 cm, respectively; born at less than 100 cm (possibly as small as 65 cm).

Distinguishing features:

A large thresher with 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 strap-like 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.



Dorsal and ventral views of head.
Photos by: JPA Gaudiano/ Silliman
University (JPAG49).

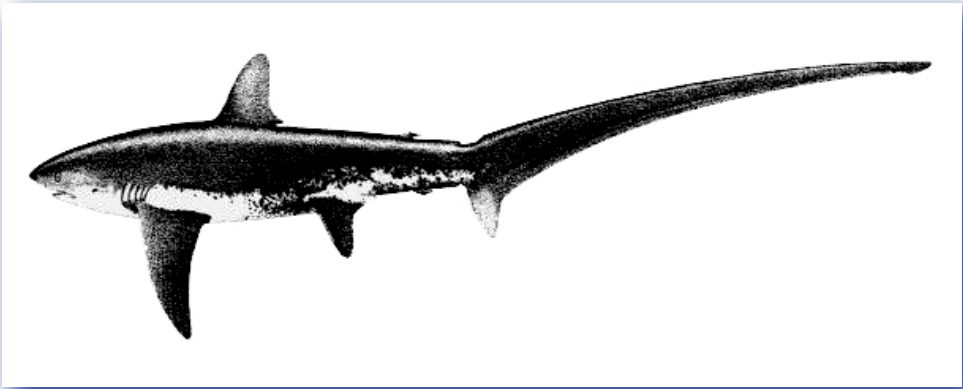
References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno 1998; Last & Stevens 1994; Compagno 1984.

COMMON THRESHER

Alopias vulpinus (Bonnaterre, 1788)

Other Names: *pating* (local)



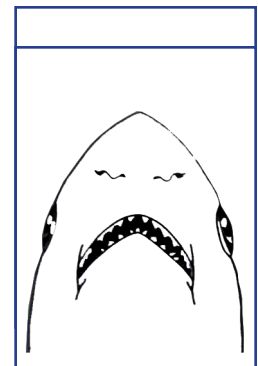
FAO

Size:

To at least 760 cm, commonly at 430–490 cm; males and females mature at 184–226 cm, respectively; apparently larger than *Alopias pelagicus* and *A. superciliosus*.

Distinguishing features:

A large thresher with a 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 caudal- fin 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.



Ventral view of head.
(Last & Stevens 1994).

References:

Smith *et al.* 2008; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

FAMILY CETORHINIDAE

GILL, 1862. BASKING SHARKS.

The family Cetorhinidae is monotypic, represented by only one single species, the basking shark, *Cetorhinus maximus*. It is the world's second largest fish, after the whale shark, reportedly reaching to 1,520 cm. It is characterized by exceptionally large gill openings extending around the top and bottom of its head and with 5th gill opening in front of pectoral fin, elongate gill rakers, greatly enlarged mouth (up to 100 cm in width), and reduced teeth characterizing plankton feeders. The teeth have a single conical cusp, are curved backwards and are the same on both the upper and lower jaws. Its tail is nearly symmetrical with keel on caudal peduncle.

The basking shark is a filter-feeding cold-water pelagic species that is migratory and widely distributed, recently has been confirmed to cross the much-warmer waters at the equator. The occurrence of basking sharks in Philippine waters remains questionable since it is outside the distributional range of the species. The Philippine record is based only on skeletal remains that washed up on the shores of Burias Island, Masbate (Compagno *et al.* 2005).

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Cetorhinus maximus* (Gunnerus, 1765). Basking shark.

FAMILY LAMNIDAE

MÜLLER & HENLE, 1838. MACKEREL SHARKS.

Mackerel sharks are large sharks found globally, attaining total lengths of up to 640 m or more. Some members of this family are man-eaters. They are characterized by having pointed snouts, fusiform bodies, large gill openings, the 5th gill opening located in front of pectoral fin; 1st dorsal fin large, high, erect and angular or somewhat rounded; 2nd dorsal and anal fins extremely small; caudal peduncle with a distinct keel. Teeth are large, long and few in number, blade-like with a single cusp; spiracle sometimes absent. Ovoviviparous, embryos feeding on yolk sac and other ova produced by the mother.

Of the ten or more species in this family, at least two are found in the Philippines, one (*i.e.*, the Longfin mako) is believed to be present but needs further validation.

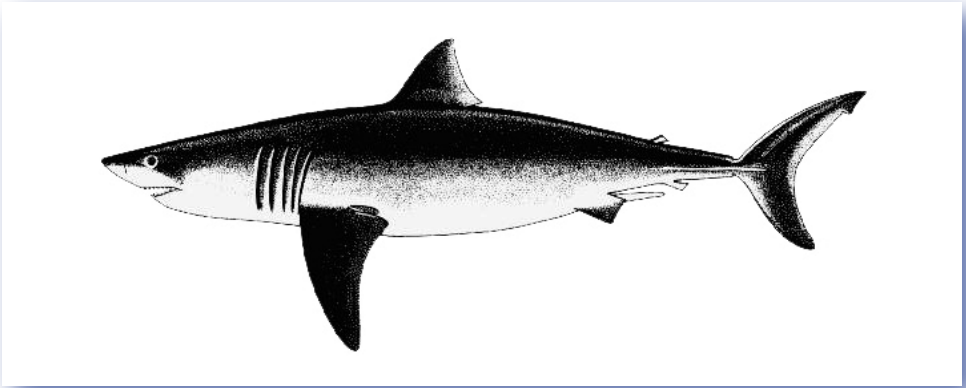
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Carcharodon carcharias* (Linnaeus, 1758). Great white shark.
- ✓ *Isurus oxyrinchus* Rafinesque, 1810. Shortfin mako.
- ? *Isurus paucus* Guitart Manday, 1966. Longfin mako.

GREAT WHITE SHARK

Carcharodon carcharias (Linnaeus, 1758)

Other Names: White shark (English); *pating* (local)



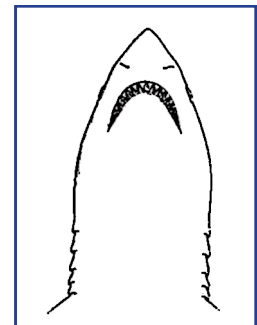
FAO

Size:

To at least 720 cm, commonly between 500–600 cm; males and females mature at about 350 and 400 cm, respectively; born at 130 cm.

Distinguishing features:

A very large shark with stout, fusiform body, dark grey to brown or black above, lighter on sides, and white undersides; fins with dusky margins below, black tips on underside of pectoral fins, usually with a black spot at rear pectoral fin base; 1st dorsal-fin larger than 2nd, origin usually over the pectoral-fin inner margins, anal fin origin posterior to rear end of 2nd dorsal fin base; caudal peduncle depressed, expanded laterally with a prominent keel extending to caudal fin; caudal fin crescentic; eyes conspicuous black; blunt, conical snout and large, triangular, saw-edged teeth.



Ventral view of head.
(FAO).

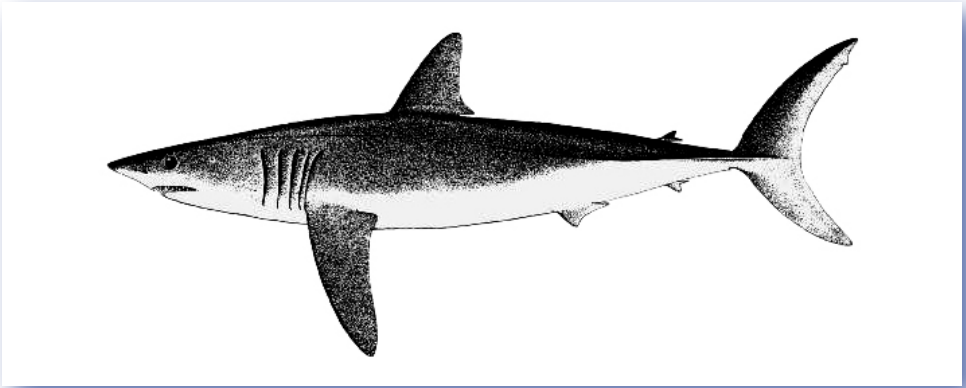
References:

Compagno *et al.* 2005; Compagno 2001; Compagno 1998; Last & Stevens 1994; Compagno 1984.

SHORTFIN MAKO

Isurus oxyrinchus Rafinesque, 1810

Other Names: *pating* (local)



FAO

Size:

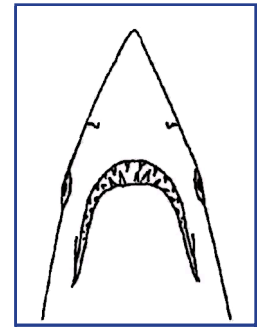
To at least 400 cm, commonly to 270 cm; males and females mature at about 195 and 280 cm, respectively; born at 70 cm.

Distinguishing features:

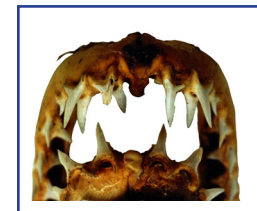
A large shark with a long slender, fusiform body; dark blue back, lighter blue on sides and white belly; 1st dorsal-fin larger than 2nd, origin posterior to pectoral-fin inner margins, anal fin origin below to middle of 2nd dorsal fin base; caudal peduncle depressed, expanded laterally with a prominent keel extending to caudal fin; caudal fin crescentic with lower lobe strongly developed; large black eyes; acutely pointed snout; large, narrow, smooth-edged teeth.

References:

Compagno *et al.* 2005; Compagno 2001; Compagno 1998; Last & Stevens 1994; Bass 1986; Compagno 1984.



Ventral view of head.
(FAO).



Jaws of an *I. oxyrinchus*.
Photo by: JPA Gaudiano/
Silliman University
(JPAG 172).

FAMILY MEGACHASMIDAE TAYLOR, COMPAGNO & STRUHSAKER, 1983. MEGAMOUTH SHARKS.

This family is represented by only one single species, the megamouth shark, *Megachasma pelagios*. Reaching to more than 5 m, the megamouth shark is the world's third largest fish next to the whale shark *Rhincodon typus* (~18 m) and basking shark *Cetorhinus maximus* (~15 m). The species is wide-ranging and is recorded to occur in depths between 15–150 m.

The species was first discovered in 1983 from a specimen caught in 1976 from which a new shark family, genus and species had to be defined. Genus *Megachasma* is derived from the Greek “*megas, megalos*” = great and “*chasma*” = cave, while the species name *pelagios* is also Greek, meaning of the sea. Recent studies suggest that the megamouth shark is the most primitive living species within the order Lamniformes and has independently evolved the filter feeding mode.

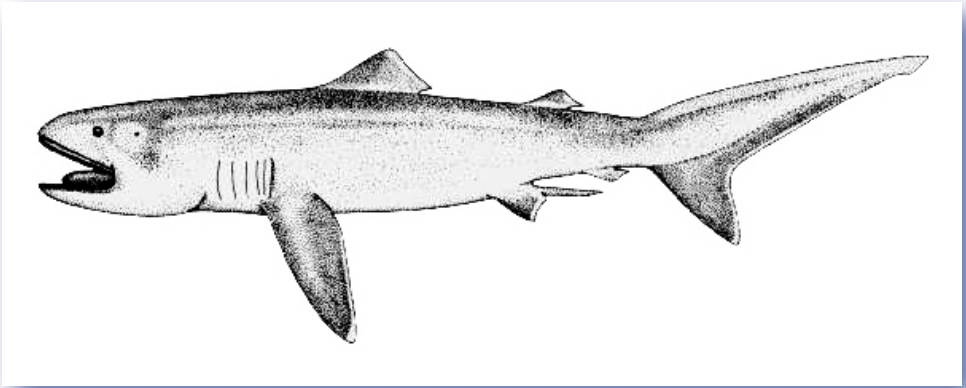
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Megachasma pelagios* Taylor, Compagno & Struhsaker, 1983.
Megamouth shark.

MEGAMOUTH SHARK

Megachasma pelagios Taylor, Compagno & Struhsaker, 1983

Other Names: White shark (English); *pating* (local)



FAO

Size:

To at least 550 cm, one female reported at 709 cm; males and females mature at 400 and 500 cm, respectively.

Distinguishing features:

A large shark with a bulbous head and stout body, tapering posteriorly; blackish brown back, lighter sides, white undersides; dorsal fins low and angular; anal fin small, pectoral fins long and narrow; asymmetrical, non-lunate caudal fin with a short and strong ventral lobe, an upper but no lower pre-caudal pit, caudal peduncle without keels. Snout extremely short and broadly rounded with white band on anterior surface, huge terminal mouth extending behind semicircular eyes, with no nictitating membrane; huge protrusible jaws with small hooked teeth. Gill slits moderately long, not reaching dorsal surface of head, internal gill slits lined with dense rows of papillose gill rakers.

References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno 2001; Nakaya *et al.* 1997; Compagno 1998; Last & Stevens 1994; Compagno 1984.

FAMILY PSEUDOCARCHARIIDAE COMPAGNO, 1973. CROCODILE SHARKS.

There is only one species in this family, *i.e.*, *Pseudocarcharias kamoharai*, characterized by a trunk cylindrical and somewhat compressed, stout. Head very long, snout extremely short but broadly rounded, huge terminal mouth that extends behind the eyes.

The species presence in the Philippines is uncertain but believed to likely occur in benthopelagic habitats along the upper continental slopes of the region.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Pseudocarcharias kamoharai* (Matsubara, 1936). Crocodile shark.

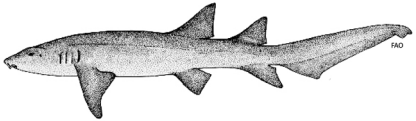





ORDER ORECTOLOBIFORMES

COMPAGNO, 1973. CARPET SHARKS.



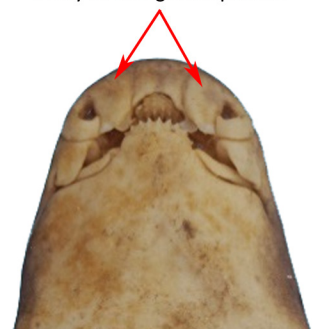
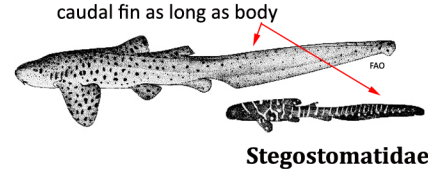

Members of the order Orectolobiformes are characterized by having two spineless dorsal fins of about equal size (except in whale sharks and zebra sharks where the 2nd dorsal fin is much smaller than the 1st). They have a very short mouth confined to being well in front of eyes, specialized nostrils with prominent nasoral grooves and barbels in most, usually large spiracles located below the eye (except in whale sharks which have smaller spiracles). Many species have small gill openings, with 5th slit overlapping the 4th behind the origin of pectoral fin.

There are seven families belonging to this order. Only one (*i.e.*, family Brachaeluridae or the blind sharks) has not been reported present in the Philippines.

FAMILIES OF ORECTOLOBIFORMES REPORTED TO OCCUR IN THE PHILIPPINES

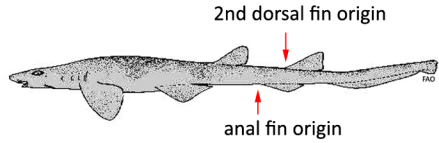
<p>1. Family <i>Ginglymostomatidae</i> Gill, 1862. Nurse sharks.</p>	
<p>2. Family <i>Hemiscylliidae</i> Gill, 1862. Longtailed Carpetsharks.</p>	
<p>3. Family <i>Orectolobidae</i> Gill, 1896. Wobbegongs.</p>	
<p>4. Family <i>Parascylliidae</i> Gill, 1862. Collared carpetsharks.</p>	
<p>5. Family <i>Rhincodontidae</i> Müller & Henle, 1839. Whale sharks.</p>	
<p>6. Family <i>Stegostomatidae</i> Gill, 1862. Zebra sharks.</p>	

KEY TO FAMILIES OF THE ORDER ORECTOLOBIFORMES
REPORTED TO OCCUR IN THE PHILIPPINES

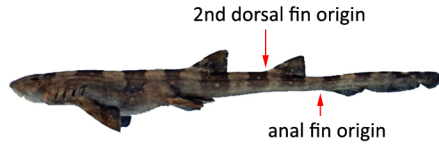
<p>1a. Mouth very broad, terminal; caudal fin high, forked, upper and lower lobes tall; subterminal notch absent Rhincodontidae</p> <p>1b. Mouth smaller, subterminal; caudal fin low; subterminal notch present go to 2</p>	 <p>Rhincodontidae</p> 
<p>2a. Fleshy lobe or groove present on outer margins of nostrils go to 3</p> <p>2b. No fleshy lobe or groove on outer margins of nostrils go to 4</p>	<p>fleshy lobe or groove present</p> 
<p>3a. Caudal fin very long, almost as long as body; ridges present on both sides of the body Stegostomatidae</p> <p>3b. Caudal fin shorter, less than half the length of body; ridges absent on both sides of the body Ginglymostomatidae</p>	<p>caudal fin as long as body</p>  <p>Stegostomatidae</p> <p>caudal fin less than half as long as body</p>  <p>Ginglymostomatidae</p>

4a. Origin of anal fin forward of origin of 2nd dorsal fin; anal fin distinctly separate from caudal fin
 **Parascylliidae**

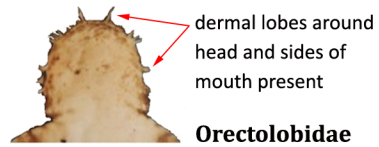
4b. Origin of anal fin well behind origin of 2nd dorsal fin; anal fin adjacent to caudal fin and sometimes barely indistinguishable from it
 go to 5



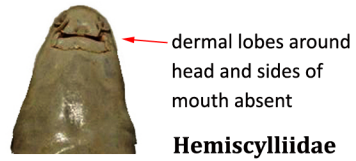
Parascylliidae



5a. Body strongly depressed anteriorly; narrow skin flaps (dermal lobes) present around mouth and sides of head
 **Orectolobidae**



5b. Body more or less cylindrical anteriorly; narrow skin flaps (dermal lobes) present around mouth and sides of head
 **Hemiscylliidae**



FAMILY GINGLYMOSTOMATIDAE

GILL, 1862. NURSE SHARKS.

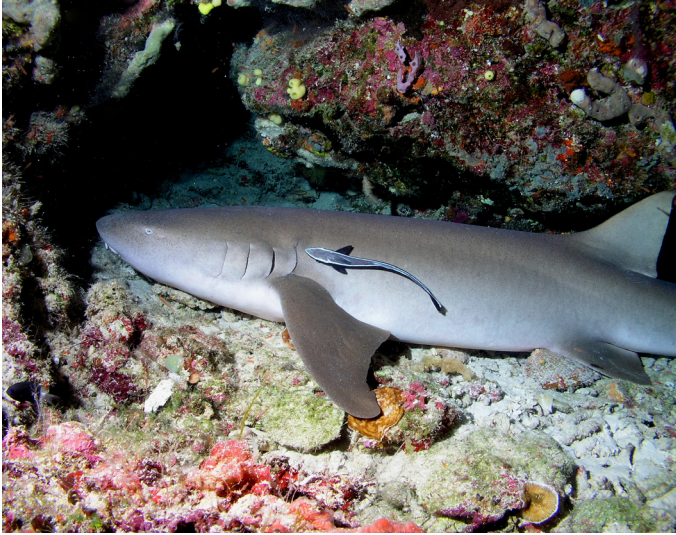


Photo by: Keith Lapous.

The nurse sharks are small to large sharks that go down to depths of at least 70 m. They are characterized by the presence of nasoral grooves, short to long barbels, short, small mouths with large chamber to suck in their prey close to the substrate. They have two spineless dorsal fins and an anal fin, with the 2nd dorsal fin originating well ahead of the anal fin origin, and a short precaudal tail, which is much shorter than its head and body.

This family is comprised of three genera (*i.e.*, *Ginglymostoma*, *Nebrius* and *Pseudoginglymostoma*) represented by a single species each. Only *Nebrius* is reported to occur in the Philippines.

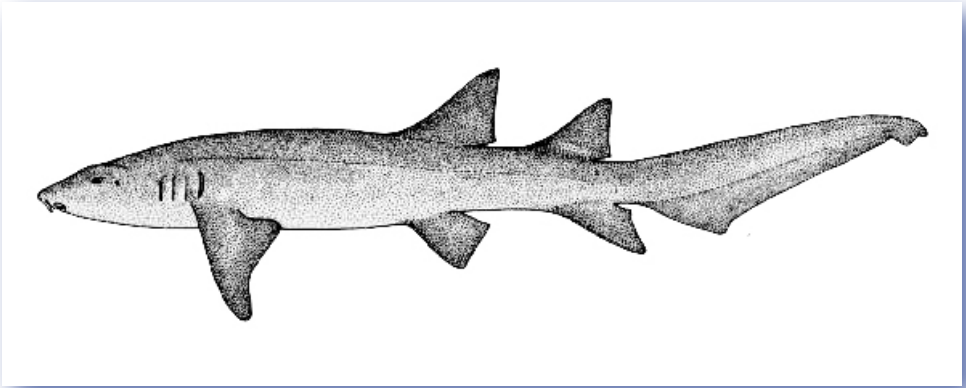
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Nebrius ferrugineus* (Lesson, 1830). Tawny nurse shark.

TAWNY NURSE SHARK

Nebrius ferrugineus (Lesson, 1830)

Other Names: *pating* (local)



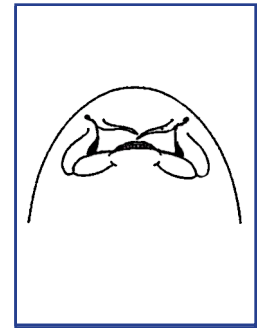
FAO

Size:

To at least 320 cm; males and females mature at about 225 and 230 cm, respectively; born at 40–60 cm.

Distinguishing features:

A large nurse shark with a plain, yellowish to greyish brown body with two spineless similar-sized dorsal fins situated closer to tail, with 1st dorsal fin origin just over the pectoral fin, tips angular, caudal fin elongate, asymmetrical, its length about one third of total length; pectoral fins sickle-shaped; nostrils near tip of snout, with short barbels and nasoral grooves spiracle much smaller than eye.



Ventral view of head.
(FAO).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Compagno 1998; Last & Stevens 1994.

FAMILY HEMISCYLLIIDAE

GILL, 1862. LONGTAILED CARPETSHARKS.

The longtailed carpetsharks, also referred to as bamboo sharks, are small, slender sharks (with a maximum length of about 1 m) characterized by having a precaudal tail which is longer than its head and trunk. They have two spineless dorsal fins, with the 1st dorsal fin originating over or behind pelvic fin bases, a low and rounded anal fin separated by a notch from caudal fin. They have five gill openings, the last two of which are over the pectoral fin base. They have eyes which have no nictitating membranes and very large spiracles located behind and below these eyes. They have subterminal nostrils with short barbels, narrow circumnarial grooves close to the front of a ventral mouth, with labial furrows connected by dermal flap.

This family is comprised of two genera, *i.e.*, *Chiloscyllium* and *Hemiscyllum*, represented by 17 or more species. Only the genus *Chiloscyllium* is reported to occur in the Philippines with at least two species confirmed present. Two more species are suspected to be present but still need further validation. These are inshore bottom sharks of continental waters with their young hatching from round egg cases. Their diet probably includes small bottom fishes and invertebrates. They are sluggish sharks and are considered relatively harmless, spending most of their time resting on the bottom.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Chiloscyllium indicum* (Gmelin, 1788). Slender bambooshark.
- ? *Chiloscyllium griseum* Müller & Henle, 1838. Gray bambooshark.
- ✓ *Chiloscyllium plagiosum* (Bennett, 1830). Whitespotted bambooshark.
- ✓ *Chiloscyllium punctatum* Müller & Henle, 1838. Brownbanded bambooshark.

WHITESPOTTED BAMBOOSHARK***Chiloscyllium plagiosum*** (Bennett, 1830)Other Names: *pating* (local)

Photo by: JPA Gaudiano/Silliman University (JPAG 158).

Inset photo by: PR Last/C Devine/CSIRO.

Size:

To about 95 cm; males mature at 50–63 cm; hatch at 10–13 cm.

Distinguishing features:

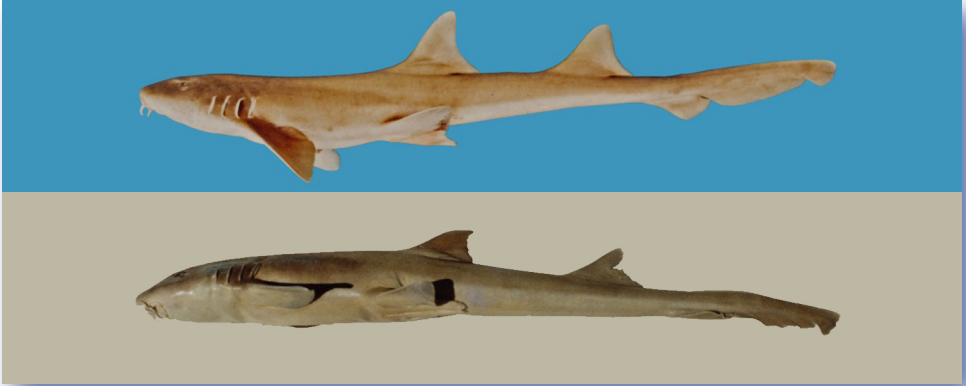
A small slender bambooshark with transverse pale and dark bands and numerous white or bluish spots; body with lateral dermal ridges; dorsal fins about equal in size to pelvic fins and without projecting free rear tips; base of anal-fin much shorter than base of lower caudal-fin lobe; anal-fin origin well behind free rear tip of 2nd dorsal fin.



Ventral view of head.
(JPAG 158).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno 2001; Compagno & Niem 1998; Last & Stevens 1994.

BROWNBANDED BAMBOOSHARK***Chiloscyllium punctatum*** Müller & Henle, 1838Other Names: *pating* (local)

Photos by: PA Gaudiano/Silliman University (JPAG 134) (top photo);
BR Uypitching/Silliman University (BRU 024) (bottom photo)

Size:

To about 121 cm.

Distinguishing features:

A small slender bambooshark usually without color pattern (dark transverse bands may be seen in young); body without lateral dermal ridges; dorsal fins larger than pelvic fins and with projecting free rear tips; base of anal-fin much shorter than base of lower caudal-fin lobe; anal-fin origin well behind free rear tip of 2nd dorsal fin.



Ventral view of head.
(BRU 024).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno 2001; Compagno & Niem 1998; Last & Stevens 1994.

FAMILY ORECTOLOBIDAE

GILL, 1896. WOBBERGONGS.

Wobbegongs are small to large sharks characterized with a depressed body, a very broad and flattened head with unique lateral flaps of skin (*i.e.*, “dermal flaps”), nostrils with long, pointed or branched barbels, a deep groove that leads from nostril to mouth (or circumnarial groove), five gill openings, with the 4th and 5th located behind origin of pectoral fin, over the base, and an anal fin.

These are bottom sharks of warm-temperate to tropical continental waters of the western Pacific, occurring from intertidal, on algal-covered rocky areas and coral reefs, down to at least 110 m. They are nocturnal, resting on the bottom during the day and prowling on its reef habitat at night, presumably feeding on bottom invertebrates and fishes. Ovoviviparous, with large litters of 20 or more young.

This family is comprised of three genera (*i.e.*, *Orectolobus*, *Eucrossorhinus* and *Sutorectus*) represented by 12 or more species. Only the genus *Orectolobus* is represented in the Philippines and possibly by at least one species, *i.e.*, *Orectolobus cf. ornatus* which is still undescribed, possibly an endemic. Nominal records for at least two other species exist (*i.e.*, Japanese wobbegong *O. japonicus* and the Ornate wobbegong *O. ornatus*) but these are possibly confused with the Philippine species*. The Philippine wobbegong is said to be distinct from the Australian and the Japanese species but is believed to be closely related to the recently described Indonesian species, *O. leptolineatus*. The presence of these species needs further confirmation.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Orectolobus japonicus* Regan, 1906. Japanese wobbegong.
- ? *Orectolobus leptolineatus* Last, Pogonoski & White, 2010. Indonesian wobbegong.
- ? *Orectolobus ornatus* (De Vis, 1883). Ornate wobbegong.
- U *Orectolobus cf. ornatus*. Philippine wobbegong.

* The taxonomy of *Orectolobus* in the Indo–West Pacific is confused as several forms have been identified incorrectly as the *O. ornatus* (de Vis, 1883) or *O. maculatus* (Bonnaterre, 1788) both of which are considered as Australian endemics.

FAMILY PARASCYLLIIDAE

GILL, 1862. COLLARED CARPETSHARKS.

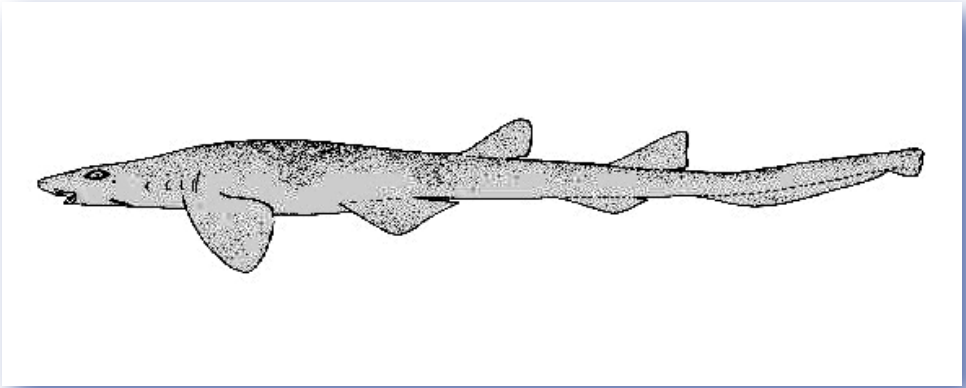
Collared carpetsharks are small (<1 m), slender sharks generally characterized with having a tiny subterminal mouth situated well in front of cat-like eyes, short nasal barbels and very small spiracles. Mouth is connected to the nostrils by narrow nasoral grooves, with smaller fleshy folds skirting the nostrils laterally. They have five gill openings with the 5th overlapping the 4th. They have two spineless dorsal fins with 1st dorsal origin behind pelvic fin bases, anal fin origin well in front of the 2nd dorsal fin origin. Their caudal fin has a distinct upper lobe, with a strong terminal lobe and subterminal notch, but no ventral lobe. Some species have a distinct “collar” marking around the gill region (although in others, the collar may be absent or inconspicuous) and saddle marks, with white or dark spots over the body.

This family is comprised of two genera (*i.e.*, *Cirrhoscyllium* and *Parascyllum*) represented by seven or more species. In the Philippines, only one species is reported to occur, *i.e.*, Barbelthroat carpetshark *Cirrhoscyllium exolitum*.

Superficially similar to the collared carpetsharks are the catsharks (Family Scyliorhinidae). Catsharks, however, have their mouths not entirely in front of eyes and have no nasoral grooves and folds.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Cirrhoscyllium exolitum* Smith & Radcliffe In Smith, 1913.
Barbelthroat carpetshark.

BARBELTHROAT CARPETSHARK***Cirrhoscyllium exolitum*** Smith & Radcliffe in Smith, 1913Other Names: *pating* (local)

FAO

Size:

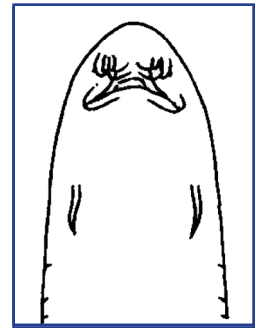
To at least 34 cm.

Distinguishing features:

A small slender shark with six or possibly ten diffuse saddle marks on dorsal surface, saddles above abdomen rounded and continuing above pelvic-fin bases, not C-shaped, head length three times 1st dorsal-fin base. A pair of barbels on throat area; gill region without collar marking.

References:

Compagno *et al.* 2005; Compagno 2001; Compagno & Niem 1998; Goto & Nakaya 1996; Last & Stevens 1994; Compagno *et al.* 1989; Compagno 1984.



Ventral view of head.
(FAO).

FAMILY RHINCODONTIDAE MÜLLER & HENLE, 1839. WHALE SHARKS.

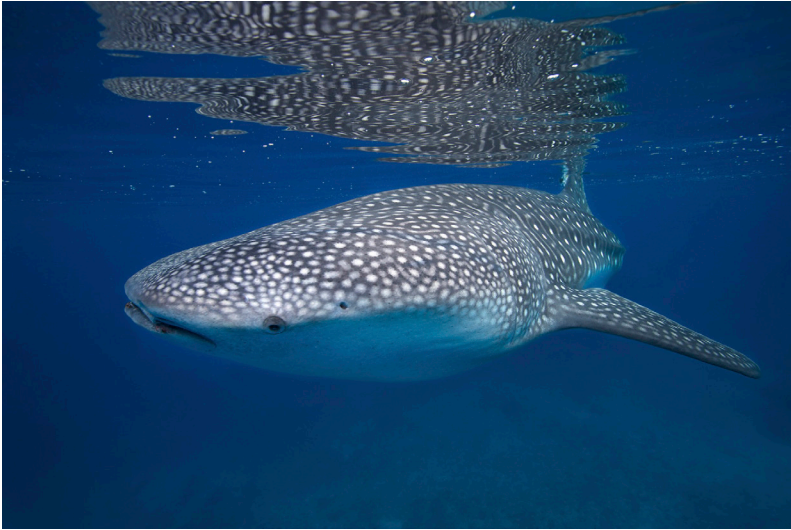


Photo by: Steve de Neef.

This family is represented by only one species, the whale shark, *Rhincodon typus*, the world's largest fish, reportedly reaching to 18–20 m. Whale sharks are highly migratory in tropical and warm temperate seas but are reported to return to the same sites annually primarily to feed.

The species is distinctive for its unique checkerboard body pattern of light spots and vertical and horizontal stripes, prominent ridges on dorsal surface and sides. It has elongated gill rakes, a large terminal mouth and reduced teeth characterizing plankton feeders. The teeth have a single conical cusp, are curved backwards and are the same on both the upper and lower jaws. Its tail is asymmetrical with keel on caudal peduncle.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Rhincodon typus* (Smith, 1828). Whale shark.

WHALE SHARK

Rhincodon typus (Smith, 1828)

Other Names: *pating* (local)



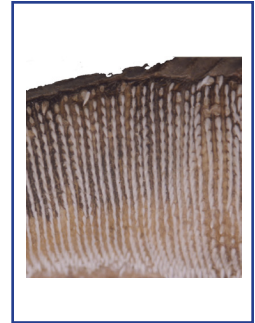
Photo by: Steve de Neef.

Size:

To at least 16 m, reportedly up to 18–20 m; males and females mature at 300–400 cm and >760 cm, respectively; born at about 40–64 cm.

Distinguishing features:

A huge shark with a distinctive color pattern of pale bars and stripes on back and sides of body; nostrils with rudimentary barbels; five exceptionally large gill openings, the fifth behind origin of pectoral fin, over fin base; two spineless dorsal fins, with 1st much larger than 2nd; caudal fin semilunate, caudal peduncle depressed, with strong fleshy keels on sides and prominent ridges on dorsal surface and sides. Head very broad and flattened with very wide almost terminal mouth and reduced teeth about 300 rows per jaw.



Whale shark teeth.
Photo by: Silliman
University (SUML 006).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Chen *et al.* 1999; Compagno 1998; Colman 1997; Last & Stevens 1994; Compagno 1984.

FAMILY STEGOSTOMATIDAE GILL, 1862. ZEBRA SHARKS.



Photo by: Keith Lapous.

This family is monotypic represented by only one species, the zebra shark *Stegostoma fasciatum*, found in coral reefs, a relatively large shark reaching up to 2 m or more.

It is a moderately stout-bodied shark with prominent ridges on side, and distinct for having a banded (in juveniles) or spotted (adult) color pattern and greatly elongated caudal fin, the length of which is about half of its total length. It has short barbels, nasoral grooves, a small anterior mouth, small eyes with no nictitating membrane at sides of head, spiracles about the size of the eyes. It has two spineless dorsal fins, the 1st dorsal much larger than the 2nd. It is oviparous, laying eggs in large, dark brown or purplish-black cases with fine lateral tufts of hairlike fibers. It feeds primarily on molluscs (gastropods and bivalves) but also crabs and shrimps and small bony fishes.

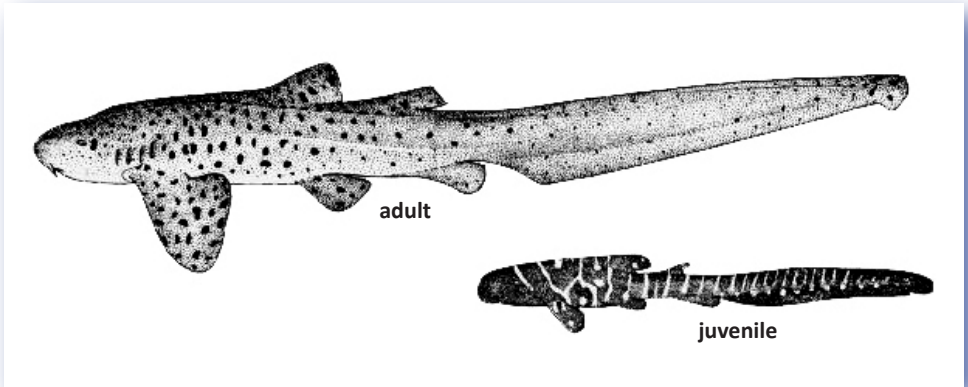
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Stegostoma fasciatum* (Hermann, 1783). Zebra shark.

ZEBRA SHARK

Stegostoma fasciatum (Hermann, 1783)

Other Names: *pating* (local)



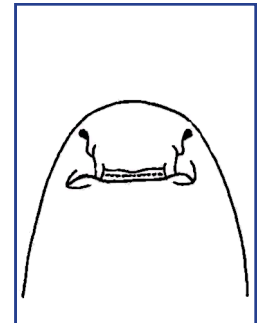
FAO

Size:

To at least 235 cm (reports of 354 cm need validation); males and females mature at about 145–185 and 170 cm, respectively; hatch at about 20–36 cm.

Distinguishing features:

A stout-bodied shark with a very long and low blade-like caudal fin, the length of which is nearly or about half its total length, and with prominent ridges on dorsal surface and sides. Color pattern differs in juveniles and adults: in young below 60–70 cm with dark brown to black with vertical white or yellow bars, spots and reticulations in juveniles; in subadults/adults, dark areas become scattered into dark spots on a yellowish background.



Ventral view of head.
(FAO).

References:



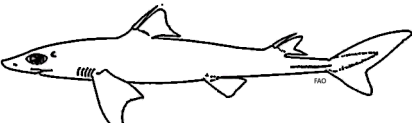
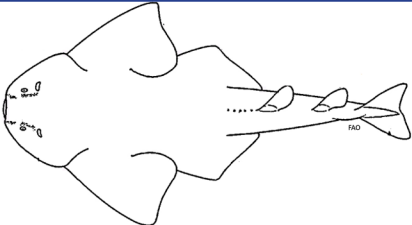
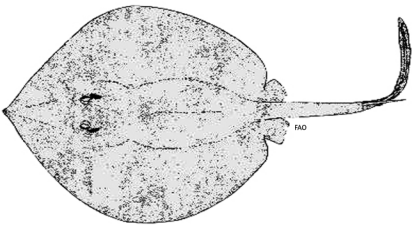
Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Chen *et al.* 1999; Compagno 1998; Last & Stevens 1994; Compagno 1984.

SUPERORDER SQUALOMORPHII

COMPAGNO, 1973. SQUALOMORPH SHARKS AND BATOIDS.

There are five orders of squalomorph sharks, namely, Hexanchiformes (cow and frilled sharks), Pristiophoriformes (sawsharks), Squaliformes (dogfish sharks), Squatiniformes (angel sharks), and Rajiformes (batoids)*. The batoids, although also under the superorder Squalomorphii, are treated under a separate chapter for convenience.

The squalomorph sharks are differentiated from the galeomorph sharks by the absence of an anal fin.

<p>1. Order Hexanchiformes Garman, 1913. Cow and frilled sharks.</p>	
<p>2. Order Pristiophoriformes White, 1936. Saw sharks.</p>	
<p>3. Order Squaliformes Gill, 1862. Dogfish sharks.</p>	
<p>4. Order Squatiniformes Jordan, 1923. Angel sharks.</p>	
<p>5. Order Rajiformes Müller & Henle, 1841. Batoids.</p>	

* See Chapter 4 for the key to the orders of squalomorph sharks and batoids.

ORDER HEXANCHIFORMES GARMAN, 1913. COW AND FRILLED SHARKS.

Members of this order are characterized by six to seven gill openings, one spineless dorsal fin, anal fin; eyes without nictitating fold; a small spiracle well behind eye.

The order is represented globally by six species in two families (*i.e.*, two species of frilled shark of the Family Chlamydoselachidae and four species of sixgill and sevengill sharks of the family Hexanchidae). In the Philippines, only the Family Hexanchidae is represented.

FAMILY HEXANCHIDAE GRAY, 1851. SIXGILL AND SEVENGILL SHARKS.

The members of this family are characterized by six or seven pairs of gill openings. The sixgill sharks belong to the genus *Hexanchus* while the sevengill sharks belong to the genus *Heptranchias* or *Notorynchus*. Only the genera *Hexanchus* (two species) and *Heptranchias* (one species) are represented in the Philippines.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Heptranchias perlo* (Bonnaterre, 1788). Sharpnose sevengill shark.
- ✓ *Hexanchus griseus* (Bonnaterre, 1788). Bluntnose sixgill shark.
- ✓ *Hexanchus nakamurai* Teng, 1962. Bigeyed sixgill shark.

SHARPNOSE SEVENGILL SHARK

Heptanchias perlo (Bonnaterre, 1788)

Other Names: Sharpsnout seven gill shark, Slender sevengill shark (English); *pating* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 086).

Size:

To about 137 cm, commonly around 100 cm; males and females mature at 75 and 100 cm, respectively; born at 25 cm.

Distinguishing features:

A small and slender cowshark with seven gill openings and narrow head (= sharp snout); generally brownish grey back, paler below; one small dorsal fin originating over inner margins of pelvic fins; anal fin smaller than dorsal fin; fin margins light in adults (dark-tipped in juveniles, particularly the dorsal and caudal fins), sometimes with indistinct dark blotches on body; eyes big (fluorescent green in color in live/fresh specimens); mouth ventral; teeth wide, low and comb-shaped.



Ventral view of head.
(JPAG 086).

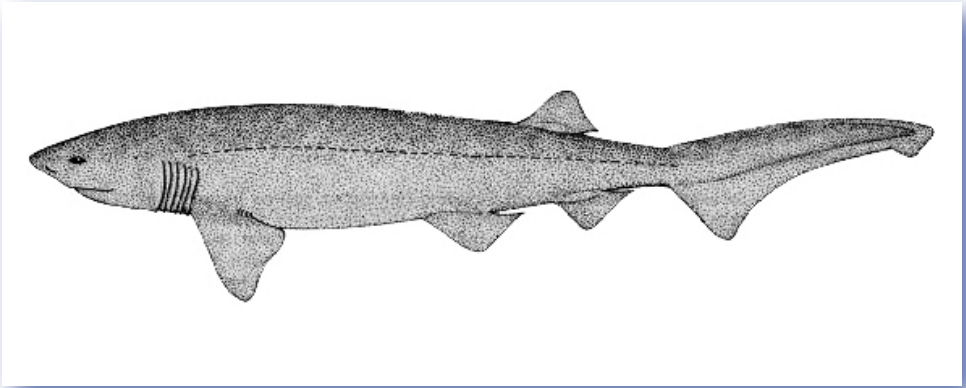
References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Bass *et al.* 1986; Compagno 1984.

BLUNTNOSE SIXGILL SHARK

Hexanchus griseus (Bonnaterre, 1788)

Other Names: Cow shark (English); *pating* (local)



FAO

Size:

To about 482 cm; males and females mature at 315 and 400 cm, respectively; born at 65–70 cm.

Distinguishing features:

A relatively heavy-bodied/stout cowshark with six gill openings and broad head (= broad snout), brown or grey back, paler below, a light stripe along sides of body, and thin white trailing edges on fins; one small dorsal fin originating over inner margins of pelvic fins; caudal peduncle short; anal fin close to size of dorsal fin; eyes big (fluorescent green in color in live/fresh specimens); mouth ventral, lower jaw with six rows of large comb-shaped teeth on each side.



Teeth of *H. griseus*.
(JPAG 175).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Bass *et al.* 1986; Compagno 1984.

BIGEYED SIXGILL SHARK

Hexanchus nakamurai Teng, 1962

Other Names: *pating* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 053).

Size:

To about 180 cm; males and females mature at 123 and 142 cm, respectively; born at 43 cm.

Distinguishing features:

A small and slender cowshark with six gill openings and narrow head, brown or grey back, paler below, and thin white trailing edges on fins; one small dorsal fin originating midway of pelvic fins and anal fin; caudal peduncle long; anal fin much smaller than dorsal fin; eyes big (fluorescent green in color in live/fresh specimens); mouth ventral, lower jaw with five rows of large comb-shaped teeth on each side.



Ventral view of head.
(JPAG 053).

References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Last & Stevens 1994; Bass *et al.* 1986; Compagno 1984.

ORDER PRISTIOPHORIFORMES

WHITE, 1936. SAW SHARKS.

The order is comprised of only one family (Family Pristiophoridae) represented by nine or more species belonging to two genera, distinct from each other in the number of gill openings located on sides of head anterior to the pectoral-fin bases, *i.e.*, *Pristiophorus* (five gill openings) and *Pliotrema* (six gill openings).

Members are characterized by a shark-like body (*i.e.*, body not flattened nor “ray-like”) without lateral ridges, a long, saw-like snout with alternate large and small rostral teeth weakly embedded on each side, unique rostral barbels in front of nostrils, a pair of long barbels one on each side of the snout, and a long precaudal tail about as long as trunk with long lateral folds reaching a strongly asymmetrical caudal fin. They also have two dorsal fins (usually without spines but may sometimes be present as internal rudiments) and no anal fin.

Sawsharks are similar to, and sometimes mistaken as sawfishes (members of the family Pristidae, a family of batoid fishes under the Order Rajiformes) in having a rostral saw. Sawfishes, however, have their pectoral fins expanded anteriorly over the gill openings and fused to the sides of the head, so that the head and pectoral fins form a distinct pectoral disc characteristics of batoids. They have ventral gill openings ventral (as in other batoids) and have no barbels on snout. Additionally, sawfishes are much larger, reaching 6 m or more.

FAMILY PRISTIOPHORIDAE

BLEEKER, 1859. SAW SHARKS.

Only the genus *Pristiophorus* is reported to occur in the Philippines. Members of this genus are characterized with having five pairs gill slits, smooth larger rostral teeth and teeth without prominent transverse ridges on basal ledges.

The genus is represented in the Philippines by two species, namely, the newly described Lana’s sawshark *P. lanae* and the still undescribed species *Pristiophorus* sp. C) which was previously misidentified as the Australian *Pristiophorus cirratus* and confused with *P. japonicus*. No species account is available here.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- U *Pristiophorus* sp. C Compagno & Niem 1998. Philippine sawshark.
- N *Pristiophorus lanae* Ebert & Wilms, 2013. Lana’s sawshark.




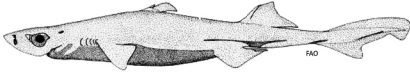

ORDER SQUALIFORMES

GILL, 1862. DOGFISH SHARKS.

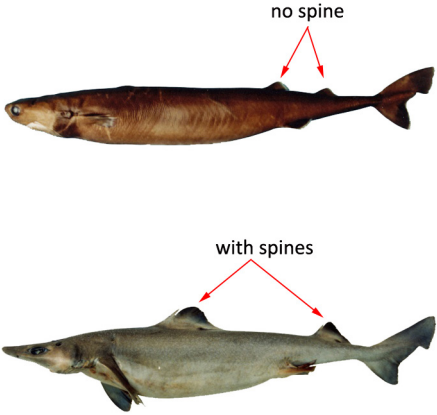
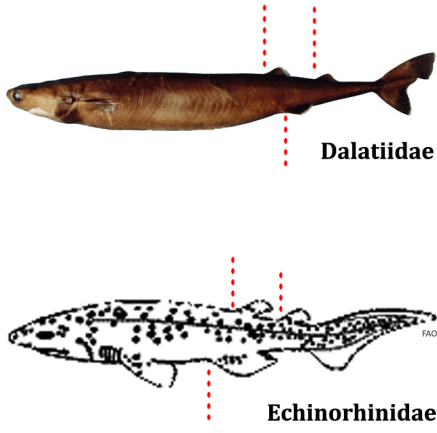
Members of this order are characterized with having two dorsal fins, with or without spines, no anal fin, five gill openings, presence of spiracles behind eyes with no nictitating membrane, body shark-like not flattened nor “ray-like” and mouth short, not saw-like.

Of the seven families in this order, five are represented in the Philippines. Not recorded thus far are representatives of the families Somniosidae (Sleepers) and Oxynotidae (Roughsharks).

FAMILIES OF SQUALIFORMES REPORTED TO OCCUR IN THE PHILIPPINES

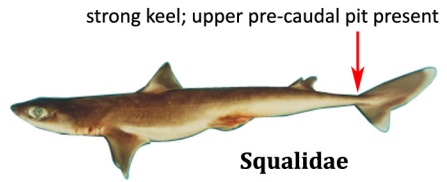
<p>1. Family Centrophoridae Bleeker, 1859. Gulper sharks.</p>	
<p>2. Family Dalatiidae Gray, 1851. Kitefin sharks.</p>	
<p>3. Family Echinorhinidae Gill, 1862. Bramble sharks.</p>	
<p>4. Family Etmopteridae Fowler, 1934. Lantern sharks.</p>	
<p>5. Family Squalidae Blainville, 1816. Dogfish sharks, spurdogs, spiny dogfishes.</p>	

KEY TO THE FAMILIES OF SQUALIFORMES OCCURRING IN THE PHILIPPINES

<p>1a. Second dorsal fin, and usually 1st dorsal fin (except in <i>Squaliolus</i>), without a spine go to 2</p> <p>1b. Spines present on both dorsal fins go to 3</p>	
<p>2a. Dorsal fins far apart, 1st dorsal fin partially or entirely in front of pelvic fin origin; dermal denticles small to moderately large, variable in shape Dalatiidae</p> <p>2b. Dorsal fins close-set, 1st dorsal fin behind pelvic fin origin; dermal denticles large to very large and thorn-like Echinorhinidae</p>	

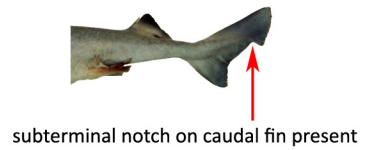
3a. Dorsal fin spines without grooves on sides; caudal peduncle with a strong keel and usually with upper pre-caudal pit; subterminal notch on caudal fin absent

..... **Squalidae**



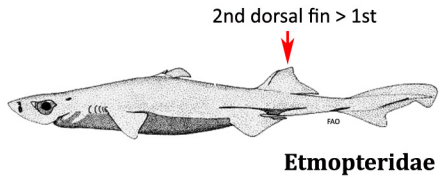
3b. Dorsal fin spines with grooves on sides; caudal peduncle without keel or pre-caudal pit; subterminal notch on caudal fin present

..... go to 4



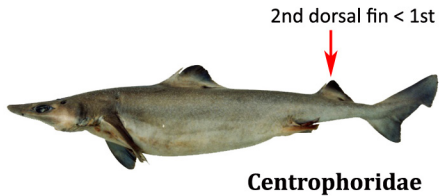
4a. Second dorsal fin as large or noticeably larger than 1st; first dorsal fin not elongated

..... **Etmopteridae**



4b. Second dorsal fin noticeably smaller than first; 1st dorsal fin elongated

..... **Centrophoridae**



FAMILY CENTROPHORIDAE

BLEEKER, 1859. GULPER SHARKS.

Gulper sharks are characterized by having two spined dorsal fins with 1st dorsal fin origin well anterior to pelvic-fin origins, a caudal peduncle without precaudal pits but with lateral keels. They have larger spiracles five gill openings, the 5th is not abruptly larger than 1st to 4th and teeth larger on lower jaw than those on upper jaw.

Of the six or more species belonging to two genera (*Centrophorus* and *Deania*) in this family, at least three species are confirmed present in the Philippines (*i.e.*, the Black gulper shark *C. isodon*, Lowfin gulper shark *Centrophorus lusitanicus* and Arrowhead dogfish *Deania profundorum*). There is considerable taxonomic controversy of the genus *Centrophorus*, some are suspected to be part of species complexes while others are considered as distinct species. Nominal records for at least four species (*i.e.*, *C. granulatus*, *C. moluccensis*, *C. squamosus*, and *Deania calcea*) but which need further confirmation due to confusion in the genera. At least two other species are potentially new, *i.e.*, *C. cf. moluccensis* and *D. cf. rostrata*. Further study is required for the taxonomic resolution of the genera and species.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Centrophorus granulatus* (Bloch & Schneider, 1801). Gulper shark.
[Senior synonym of *Centrophorus acus* Garman, 1906].
- ✓ *Centrophorus isodon* (Zhu, Meng, & Liu, 1981). Black gulper shark.
- ✓ *Centrophorus lusitanicus* Bocage & Capello, 1864. Lowfin gulper shark.
- ? *Centrophorus moluccensis* Bleeker, 1860. Smallfin gulper shark.
- U *Centrophorus cf. moluccensis* Bleeker, 1860. Philippine smallfin gulper shark.
- ? *Centrophorus squamosus* (Bonnaterre, 1788). Leafscale gulper shark.
- ? *Deania calcea* (Lowe, 1839). Birdbeak dogfish.
[Senior synonym of *Deania rostrata*] (Garman, 1906).
- U *Deania cf. rostrata* (Lowe, 1839). Birdbeak dogfish.
- ✓ *Deania profundorum* (Smith & Radcliffe, 1912). Arrowhead dogfish.

BLACK GULPER SHARK

Centrophorus isodon (Zhu, Meng, & Liu, 1981)

Other Names: Blackfin gulper shark, Black gulper shark,
Longnose gulper shark (English); *pating* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 224).

Size:

To about 108 cm.

Distinguishing features:

A small dogfish with a dark body, two large dorsal fins with grooved spines, 2nd dorsal about the same size as the 1st; anterior margins to the 2nd dorsal fin and upper caudal lobe dusky; inner margin of pectoral fins elongated, reaching to about mid base of 1st dorsal fin; relatively small gill slits; very long snout, mouth and tongue black, upper teeth similar to lowers, only slightly smaller, also with a strongly oblique cusp; about 25 arched dermal folds on the “chin” behind the mouth.



Ventral view of head.
(JPAG 224).

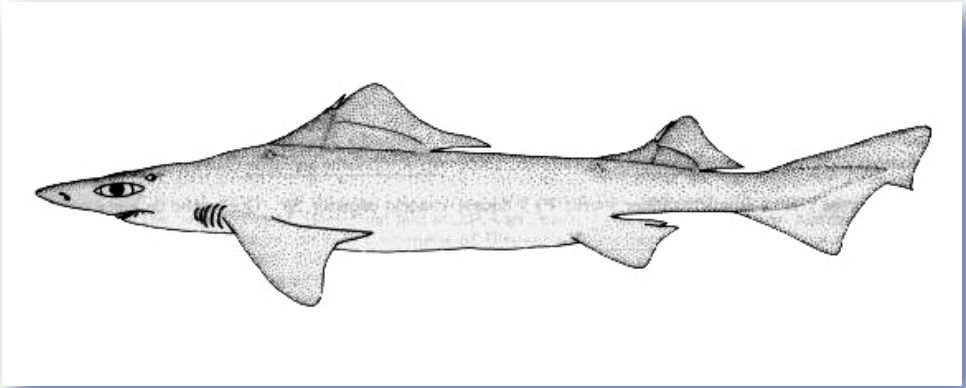
References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998;
Compagno 1984.

LOWFIN GULPER SHARK

Centrophorus lusitanicus Bocage & Capello, 1864

Other Names: Blackfin gulper shark, Black gulper shark,
Longnose gulper shark (English); *pating* (local)



FAO

Size:

To about 160 cm.

Distinguishing features:

A large dogfish with a pearl grey to brown body, two unequally sized dorsal fins with spines, the 1st much larger than the 2nd and distinctively elongated; pectoral rear tips moderately long; denticles low, flat and smooth.

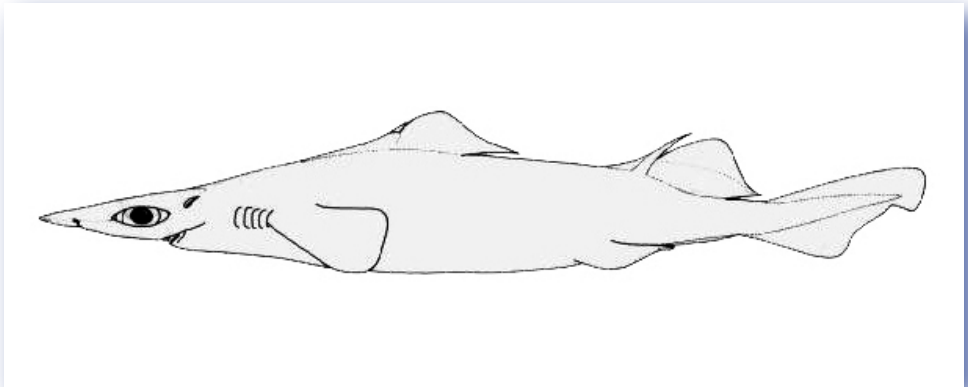
References:

Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Compagno 1984.

ARROWHEAD DOGFISH

Deania profundorum (Smith & Radcliffe, 1912)

Other Names: *pating* (local)



FAO

Size:

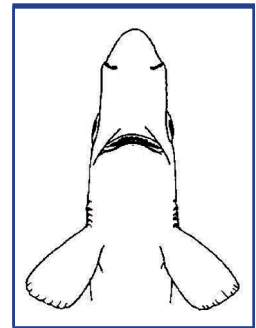
To about 79 cm.

Distinguishing features:

A small brownish grey or dark grey dogfish with long snout, two unequally sized dorsal fins with spines, the 1st long, low and relatively smaller than the 2nd; subcaudal keel on underside of caudal peduncle.

References:

Ebert *et al.* 2009; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Compagno 1984.



Ventral view of head.
(FAO).

FAMILY DALATIIDAE

GRAY, 1851. KITEFIN SHARKS.

Kitefin sharks, also called as sleeper sharks, are small sharks (<2 m) characterized by having cigar-shaped bodies with narrow heads and rounded snouts, two spineless dorsal fins (except in *Squaliolus*). Several species have specialized bioluminescent organs which appear as black dots mainly on ventral surface.

Of the 10 or more species representing six genera in this family, three species representing two genera occur in the Philippines.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Isistius brasiliensis* (Quoy & Gaimard, 1824). Cookie-cutter shark.
- ✓ *Squaliolus aliae* Teng, 1959. Smalleye pygmy shark.
- ✓ *Squaliolus laticaudus* Smith & Radcliffe, 1912. Spined pygmy shark

COOKIE-CUTTER SHARK

Isistius brasiliensis (Quoy & Gaimard, 1824)

Other Names: *pating* (local)



Photo by: BR Uyptiching/Silliman (BRU 140).

Size:

To about 79 cm.

Distinguishing features:

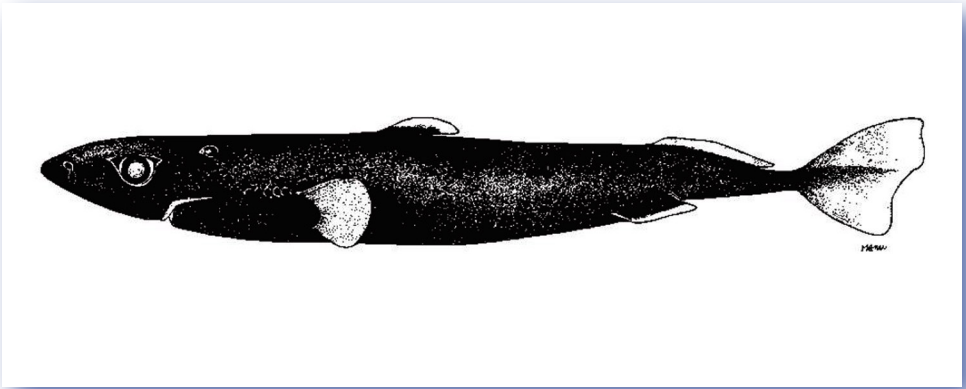
A small cigar-shaped dogfish with a dark brown body and a distinctive dark collar marking around its throat; two almost equally sized spineless dorsal fins close-set far back near tail, 1st dorsal fin base about over pelvic fin origin; pelvic fins larger than dorsal fins; no anal fin; tips of caudal lobe blackish, margins of other fins white; keel on underside of caudal peduncle; bulbous snout and suction lips.



Ventral view of head.
(BRU 140).

References:

Compagno *et al.* 2005; Stevens 2003; Luchavez-Maypa *et al.* 2001; Compagno & Niem 1998; Bass 1986; Compagno 1984.

SMALLEYE PYGMY SHARK***Squaliolus aliae*** Teng, 1959Other Names: *pating* (local)

FAO

Size:

To about 22 cm; males mature at about 15 cm.

Distinguishing features:

A very small cigar-shaped dogfish with a dark brown to black body and pale fin margins pale; two low dorsal fins, 1st dorsal fin base closer to pectoral fins than to pelvic fins, about half the length of 2nd dorsal fin base; dorsal fin spine present on 1st dorsal fin only, sometimes concealed by skin; 2nd dorsal fin long-based and low, about twice the length of the 1st dorsal fin base; caudal fin nearly symmetrical, with subterminal notch.

Often confused with *Squaliolus laticaudus*. *S. aliae* has a smaller eye diameter (about 46–70% of interorbital width), an angular chevron-shaped upper eye margin, and a pair of prominent lateral papillae on upper lip.

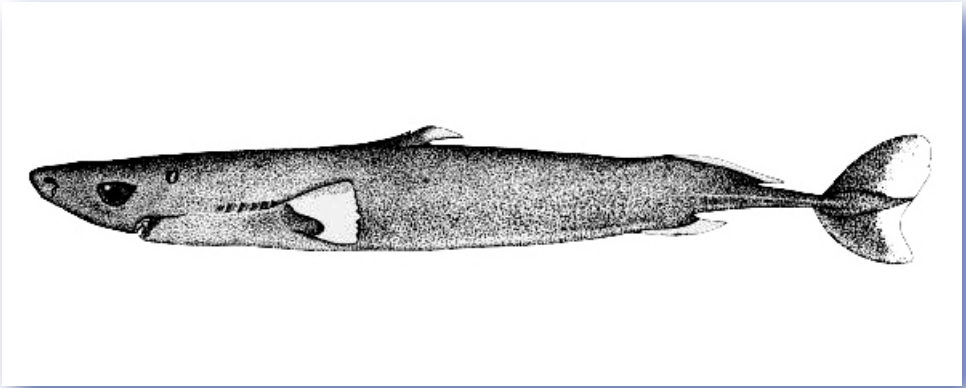
References:

Compagno *et al.* 2005; Compagno & Niem 1998; Last & Stevens 1994; Sasaki & Uyeno 1987; Compagno 1984.

SPINED PYGMY SHARK

Squaliolus laticaudus Smith & Radcliffe, 1912

Other Names: Big-eye dwarf shark (English); *pating* (local)



FAO

Size:

To at least 27.5 cm.

Distinguishing features:

A very small cigar-shaped dogfish with a dark grey to black body, with conspicuously light fin margins; two low dorsal fins, 1st dorsal fin base closer to pectoral fins than to pelvic fins, about half the length of the 2nd dorsal fin base; dorsal fin spine present on 1st dorsal fin only, sometimes concealed by skin; 2nd dorsal fin long-based and low, about twice the length of the 1st dorsal fin base; caudal fin nearly symmetrical, paddle shaped, with subterminal notch.

Often confused with *Squaliolus aliae*. *S. laticaudus* has a larger eye diameter (about 73–86% of interorbital width), a nearly straight upper eye margin, and no papillae on upper lip.

References:

Compagno *et al.* 2005; Compagno & Niem 1998; Sasaki & Uyeno 1987; Compagno 1984; Bass *et al.* 1986.

FAMILY ECHINORHINIDAE GILL, 1862. BRAMBLE SHARKS.

Bramble sharks are large sharks reported to reach up to 3–4 m and characterized by having a short snout and stout body with sparse, large plate-like denticles, small spiracles behind eyes, five gill openings with the 5th gill opening longer than others, two small spineless dorsal fins that are close together, located towards posterior part of body and originating behind pelvic fin origin, no anal fin and a subterminal notch on caudal fin.

Of the two species representing one genus in this family, one species (*i.e.*, *Echinorhinus cookei*) is reported likely to occur in the Philippines due to its presence in closely adjacent areas (Compagno *et al.* 2005) but still unconfirmed to date.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Echinorhinus cookei* Pietschmann, 1928. Prickly shark.

FAMILY ETMOPTERIDAE

FOWLER, 1934. LANTERN SHARKS.

Lantern sharks are small deep water sharks (< 0.9 m) previously grouped under the Family Squalidae with common characters such as absence of anal fin, five gill slits, presence of spiracles, and absence of nictitating membrane in lower eyelid. As a separate and independent family, members are characterized by two dorsal fins with grooved spines, a caudal fin with subterminal notch and teeth with prominent central cusp flanked by one or two smaller cusplets.

Of the 47 species representing five genera in this family, three species representing two genera are reported to occur in the Philippines (*i.e.*, *Centroscyllium* and *Etmopterus*). One species (*i.e.*, *Centroscyllium kamoharai*) is suspected to be distinct from the Japanese form (*i.e.*, *Centroscyllium kamoharai* Abe, 1966). This species may possibly be a new species or part of species complexes in the region and needs taxonomic resolution.

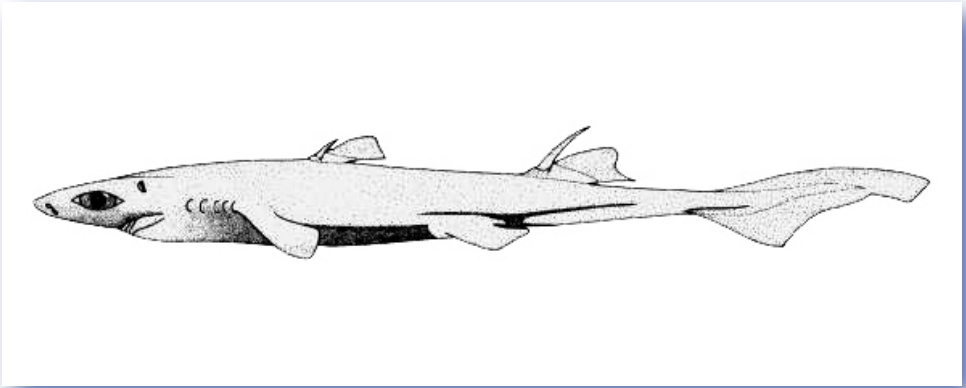
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- U *Centroscyllium cf. kamoharai* Abe, 1966. Bareskin dogfish.
- ✓ *Etmopterus brachyurus* Smith & Radcliffe, 1912. Shorttail lanternshark.
- ✓ *Etmopterus lucifer* Jordan & Snyder, 1902. Blackbelly lanternshark.

SHORTTAIL LANTERNSHARK

Etmopterus brachyurus Smith & Radcliffe, 1912

Other Names: *pating* (local)



FAO

Size:

To at least 50 cm; born at about 15 cm.

Distinguishing features:

A small slender lantern shark with a light brown back, darker brown on sides, merging to black towards belly with greenish sheen, with black longitudinal markings behind pelvic fin (its base inserted in advance of the 2nd dorsal fin spine), caudal peduncle and upper caudal fin, and pale stripe along sides of body between pectoral and pelvic fin; 1st dorsal fin origin about over or slightly behind free rear tip of pectoral fin; dermal denticles present on outer web of 2nd dorsal fin.

The species is often confused with other, similar lanternsharks (*e.g.*, *Etmopterus lucifer*) with linear denticles and long tails.

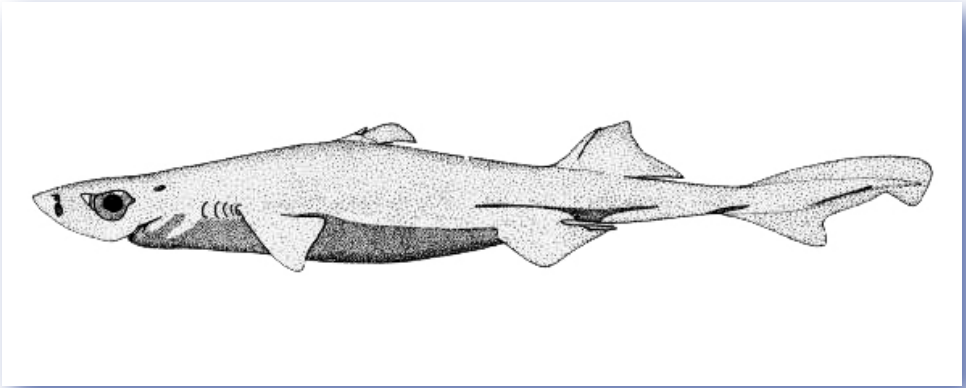
References:

Ebert *et al.* 2011; Gaudio & Alava 2003; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

BLACKBELLY LANTERNSHARK

Etmopterus lucifer Jordan & Snyder, 1902

Other Names: Lucifer shark, Lucifer dogfish (English); *pating* (local)



FAO

Size:

To at least 47 cm; males and females mature at about 30 and 34 cm, respectively; born at about 15 cm.

Distinguishing features:

A small slender lantern shark with a light brown back, darker brown on sides, merging to black towards belly with greenish sheen, with black longitudinal markings behind pelvic fin (its bases inserted under the 2nd dorsal fin spine), caudal peduncle and upper caudal fin, and pale stripe sometimes present along sides of body between pectoral and pelvic fin; 1st fin origin slightly behind free rear tip of pectoral fin; dermal denticles present on outer web of 2nd dorsal fin.

The species is often confused with other, similar lanternsharks (e.g., *Etmopterus brachyurus*) with linear denticles and long tails.

References:

Ebert *et al.* 2011; Compagno & Niem 1998; Last & Stevens 1994; Compagno 1984.

FAMILY SQUALIDAE

BLAINVILLE, 1816. DOGFISH SHARKS.

Common characters of dogfish sharks (also called as spurdogs or spiny dogfishes) include the presence of two dorsal fins with spines that are not grooved, absence of anal fin, five gill openings, presence of spiracles, absence of nictitating membrane in lower eyelid; teeth on lower jaw not much larger than those on upper jaw; upper precaudal pit usually present; caudal peduncle with a pair of lateral keels. Many species are known from deep water.

Of the 29 or more species representing this family, at least two species are confirmed to be present in the Philippines, *i.e.*, the Indonesian greeneye spurdog *Squalus montalbani* (a resurrected species by Last & Motomura 2007) and the Western longnose spurdog *S. nasutus* (a newly described long-snout spurdog of the 'japonicus-group' from the Indian Ocean previously identified as *S. japonicus* by Last *et al.* 2007). Many species are very similar and suspected to be part of species complexes (*e.g.*, con-specific with *S. mitsukurii* or *S. japonicus*) that require further taxonomic resolutions. Further investigation of these groups will likely result in more taxa being recognized (*e.g.*, possibly as new records, new species, or endemics for the Philippines).

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Squalus japonicus* Ishikawa, 1908. Japanese spurdog.
- ? *Squalus megalops* Macleay, 1881. Shortnose spurdog.
- U *Squalus* cf. *megalops* Macleay, 1881. Philippine shortnose spurdog.
- ? *Squalus mitsukurii* Jordan & Snyder, 1903. Shortspine spurdog.
- U *Squalus* cf. *mitsukurii* Jordan & Snyder, 1903. Philippine shortspine dogfish.
- N *Squalus montalbani* Whitley, 1931. Indonesian greeneye spurdog.
- N *Squalus nasutus* Last, Marshall & White, 2007. Western longnose spurdog.
- U *Squalus* sp. 1. Philippine fatspined dogfish.
- U *Squalus* sp. 2. Philippine longnose spurdog.

ORDER SQUATINIFORMES JORDAN, 1923. ANGEL SHARKS.

The order is comprised of only one family (Family Squatinidae) represented by one genus and at least 23 species. Members are characterized by two small spineless dorsal fins behind pelvic fins, five gill openings on sides of head extending on to ventral surface, absence of an anal fin, a flattened ray-like body, a terminal mouth, nostrils with barbels on anterior margins, broad wing-like pectoral fins that are not attached to head, and a hypocercal caudal fin (*i.e.*, lower lobe slightly longer than upper lobe).

Some members attain a maximum length up to 2 m. They feed on a variety of small bony fishes, crustaceans, cephalopods, gastropods and bivalves. They use their highly protrusible, traplike jaws to suddenly snap up prey at high speed. Ovoviviparous, embryos feed solely on yolk.

FAMILY SQUATINIDAE BONAPARTE, 1838. ANGEL SHARKS.

The family is represented by only one genus and at least 23 species. Of the three species reported for the Philippines, one is confirmed present (*i.e.*, the Philippine angelshark *Squatina callieti* although previously misidentified as the Taiwanese angelshark *S. formosa*). The occurrence of the Japanese angelshark *S. japonica* remains questionable pending collection and validation of Philippine materials.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:




- N *Squatina caillieti* Walsh, Ebert and Compagno, 2011. Philippine angel shark.
- ? *Squatina formosa* Shen & Ting, 1972. Taiwan angelshark.
- ? *Squatina japonica* Bleeker, 1858. Japanese angelshark.

5 BATOIDS

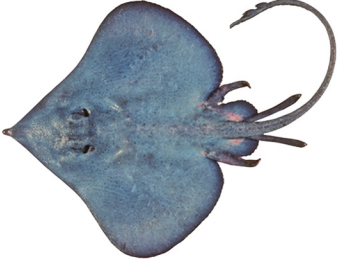
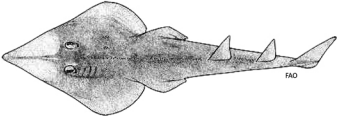
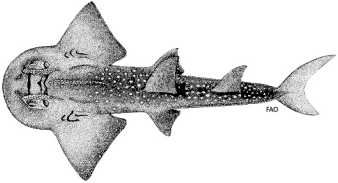

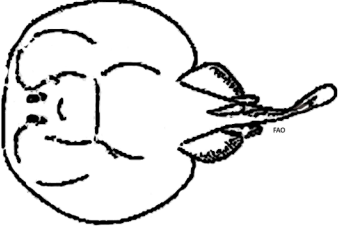
SUPERORDER SQUALOMORPHII COMPAGNO, 1973. SQUALOMORPH SHARKS AND BATOIDS.

As discussed in Chapter 4, Order Rajiformes (batoids) is one of the five orders of squalomorph sharks*, differentiated from the galeomorph sharks by the absence of an anal fin.


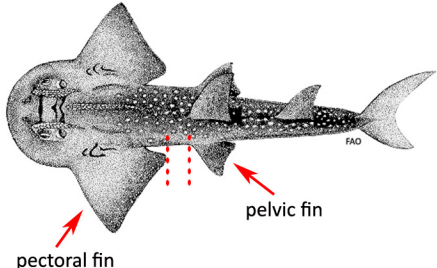
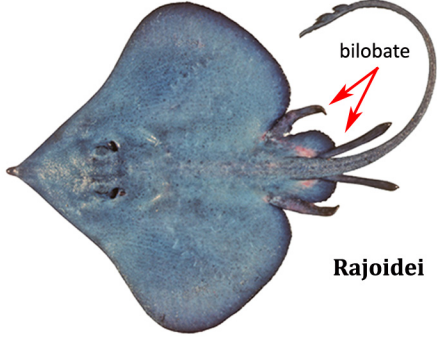
Batoids are differentiated from other squalomorph sharks in having a dorso-ventrally depressed (= flattened) body, a ventral mouth and with pectoral fins attached to head.

<p>1. Suborder Myliobatoidei Fowler, 1941. Stingrays.</p>	
<p>2. Suborder Platyrhinoidei McEachran, Dunn & Miyake, 1996. Fanrays and thornbacks.</p>	
<p>3. Suborder Pristoidei Gill, 1893. Sawfishes.</p>	

* See Chapter 3 for the key to the non-batoid squalomorphs.

<p>4. Suborder Rajoidei Garman, 1913. Skates.</p>	
<p>5. Suborder Rhinobatoidei Garman, 1913. Guitarfishes.</p>	
<p>6. Suborder Rhinoidei McEachran, Dunn & Miyake, 1996. Shark rays.</p>	
<p>7. Suborder Rhynchobatoidei McEachran, Dunn & Miyake, 1996. Wedgefishes.</p>	
<p>8. Suborder Torpedinoidei Gill, 1893. Electric rays.</p>	

KEY TO SUBORDERS OF RAJIFORMES REPORTED TO OCCUR IN THE PHILIPPINES

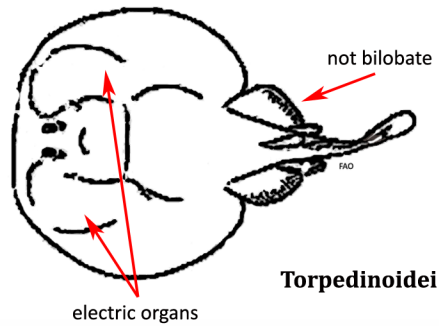
<p>1a. Snout elongated into a long, flat rostral saw with enlarged lateral teeth Pristoidei (Family Pristoidea)</p> <p>1b. Snout short to elongated, not saw-like go to 2</p>	<p>rostral saw</p>  <p>Pristoidei</p>
<p>2a. Free rear tips of pectoral fins anterior to pelvic-fin origins; dorsal fins large and strongly falcate; caudal fin with a strong ventral lobe Rhinoidei (Family Rhinidae)</p> <p>2b. Free rear tips of pectoral fins opposite or posterior to pelvic-fin origins; dorsal fins, when present, rounded or angular, but not strongly falcate; caudal fin without a ventral lobe go to 3</p>	 <p>Rhinoidei</p>
<p>3a. Pelvic fins strongly bilobate, with a narrow anterior lobe and broad posterior lobe; males with curved, hooked alar spines on their discs (skates) Rajoidei (Families Anacanthobatidae, Arhynchobatidae, Rajidae)</p> <p>3b. Pelvic fins not bilobate; males without alar spines on disc go to 4</p>	 <p>Rajoidei</p>

4a. Pectoral disc thick and flabby, with a large kidney-shaped electric organ at the base of the fin radials on each side that is visible through the skin; no denticles or medial thorns on dorsal surface of disc and tail, body entirely naked

..... **Torpedinoidei**
 (Families Narcinidae, Narkinidae, Torpedinidae)

4b. Pectoral disc thick basally, flat peripherally, usually not flabby and without electric organs; denticles and usually median thorns present on dorsal surface of disc and tail, ventral surface variably denticulate or naked

..... go to 5

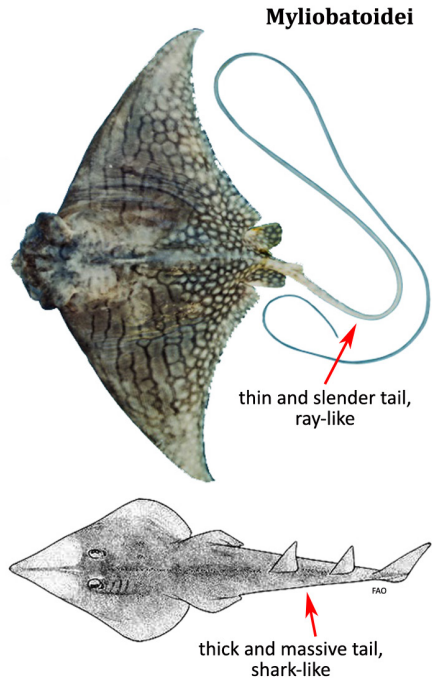


5a. Tail thin and slender, ray-like; with one small to moderate-sized dorsal fin or none; a small caudal fin present and well developed, or variably reduced or absent; usually a stinging spine present on tail (absent in *Urogymnus*, *Aetomylaeus*, and some members of Gymnuridae and Mobulidae)

..... **Myliobatoidei**
 (Families Dasyatidae, Gymnuridae, Hexatrygonidae, Mobulidae, Myliobatidae, Plesiobatididae, Rhinopteridae, Urolophidae)

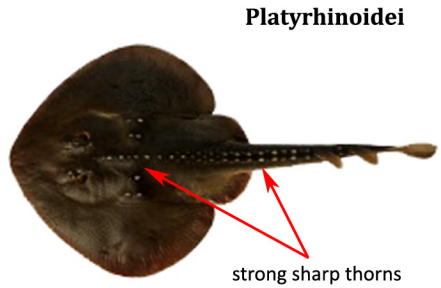
5b. Tail very thick, massive, shark-like; tail length longer than the pectoral disc; two subequal dorsal fins, and a large caudal fin; no sting or stinging spine on tail

..... go to 6



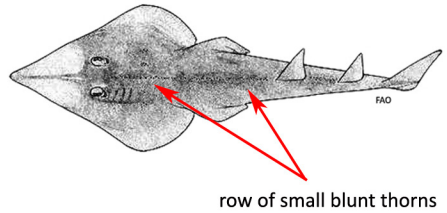
6a. Disc broad, flat and rounded or heart shaped; body flatter, not shark-like; pectoral fins large, originating in front of mouth and reaching to snout tip, with free rear tips ending posterior to pelvic fin origins; dorsal fins small, not falcate; scapular (= shoulder) area of disc and tail with strong sharp thorns

..... **Platyrhinoidei**
(Family Platyrhinoidea)



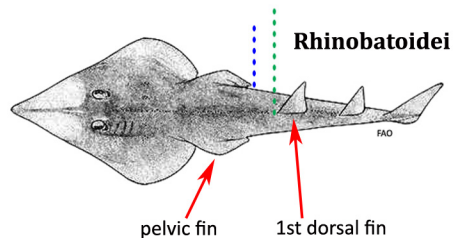
6b. Disc angular or rounded; body thicker, shark-like; pectoral fins small to moderately large, originating in front of mouth but behind nostrils, reaching to snout tip, with free rear tips ending anterior to pelvic fin origins; dorsal fins large, falcate; midback and tail with a row of small blunt thorns

..... go to 7



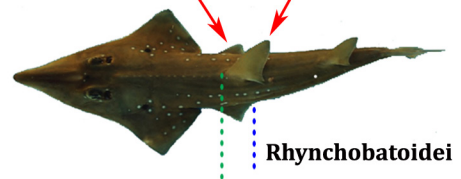
7a. First dorsal fin originating behind rear tips of pelvic fins; posterior margin of tail straight caudal fin lobe small

..... **Rhinobatoidei**
(Family Rhinobatidae)



7b. First dorsal fin originating forward of pelvic fin insertions; posterior margin of tail deeply concave; caudal fin lobe absent

..... **Rhynchobatoidei**
(Family Rhynchobatidae)



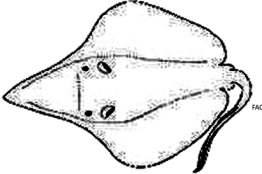
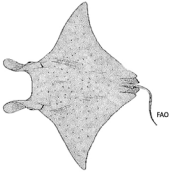





SUBORDER MYLIOBATOIDEI FOWLER, 1941. STINGRAYS.

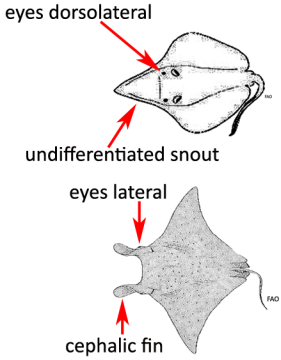
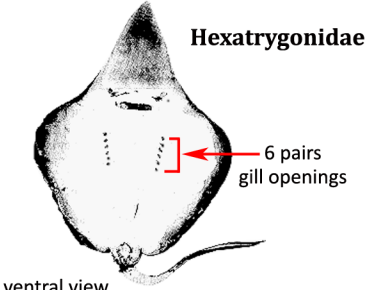
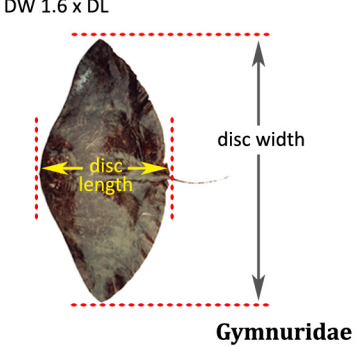
Stingrays are moderately-sized to large batoids, ranging in size of 100 to 1000 cm (58-300 cm DW), generally characterized by having a short to elongated snout; rhomboidal wing-like pectoral disc, thick basally, flat peripherally, usually not flabby and without electric organs; free rear tips of pectoral fins opposite or posterior to pelvic-fin origins; pelvic fins not bilobate; dorsal fins, when present, moderate-sized, rounded or angular, but not strongly falcate; tail more or less attenuated and slender, length longer than the pectoral disc, usually with a stinging spine (absent in *Urogymnus*, *Aetomylaeus*, and some members of Gymnuridae and Mobulidae); a small caudal fin present and well developed, or variably reduced or absent; anal fin absent; enlarged, sharp hooked thorns on snout, orbits, shoulders, and along the mid-dorsal axis of trunk and tail, with body generally covered with tiny denticles, naked in some; males without alar spines on disc; jaws protrusible in most; teeth pavement-like.

The suborder is represented by at least 193 species belonging to 10 families globally. At least 65 species belonging to seven families (*i.e.*, Dasyatidae, Gymnuridae, Hexatrygonidae, Mobulidae, Myliobatidae, Plesiobatididae, and Rhinopteridae) are represented in the Philippines; three families not represented are the families Urolophidae (stingarees or round stingrays), Urotrygonidae (American round stingrays or round rays, two genera of which were formerly placed under Urolophidae) and Potamotrygonidae (river or freshwater stingrays).

FAMILIES OF SUBORDER MYLIOBATOIDEI REPORTED TO OCCUR IN THE PHILIPPINES

<p>1. Family <i>Dasyatidae</i> Jordan, 1888. Whiptail stingrays.</p>	
<p>2. Family <i>Gymnuridae</i> Fowler, 1934. Butterfly rays.</p>	
<p>3. Family <i>Hexatrygonidae</i> Heemstra & Smith, 1980. Sixgill stingrays.</p>	
<p>4. Family <i>Mobulidae</i> Gill, 1893. Devil rays.</p>	
<p>5. Family <i>Myliobatidae</i> Bonaparte, 1838. Eagle rays.</p>	
<p>6. Family <i>Plesiobatididae</i> Nishida, 1990. Giant stingarees.</p>	
<p>7. Family <i>Rhinopteridae</i> Jordan & Evermann, 1896. Cownose rays.</p>	

**KEY TO THE FAMILIES OF SUBORDER MYLIOBATOIDEI
REPORTED TO OCCUR IN THE PHILIPPINES**

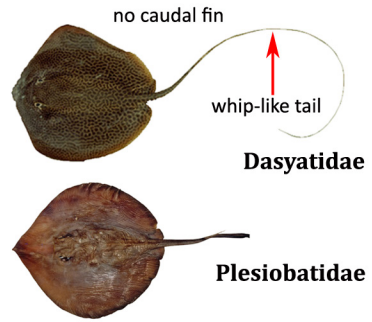
<p>1a. Head not elevated and laterally demarked from disc by a deep notch; eyes dorsolateral on head, well medial from edge of disc; snout not differentiated into separate rostral or cephalic fins; dorsal fin either absent or small and well behind pelvic-fin bases go to 2</p> <p>1b. Head elevated and laterally demarked from disc; eyes lateral on head; anterior part of pectoral fins formed as a separate rostral fin or paired cephalic fins or horns; dorsal fin moderately large, close to or over pelvic-fin bases go to 5</p>	
<p>2a. Six pairs of gill openings; spiracles well separated from eyes Hexatrygonidae</p> <p>2b. Five pairs of gill openings; spiracles close to eyes go to 3</p>	 <p style="text-align: right;">Hexatrygonidae</p> <p style="text-align: right;">6 pairs gill openings</p> <p>ventral view</p> <p style="font-size: small; text-align: right;"><i>Photo by: South African Institute for Aquatic Biodiversity (formerly J.L.B. Smith Institute of Ichthyology)</i></p>
<p>3a. Disc broad and laterally expanded, rhomboidal and at least 1.6 times as wide as long Gymnuridae</p> <p>3b. Disc not greatly expanded, diamond-shaped or rounded, but not rhomboidal, usually less than 1.3 times as wide as long go to 4</p>	 <p>DW 1.6 x DL</p> <p>disc length</p> <p>disc width</p> <p style="text-align: right;">Gymnuridae</p>

4a. Caudal fin absent or reduced to dorsal and ventral longitudinal folds on midline of tail; tail more or less elongated and whip-like.

..... **Dasyatidae**

4b. A small but well-developed caudal fin present; tail relatively short and not whip-like.

..... **Plesiobatidae**

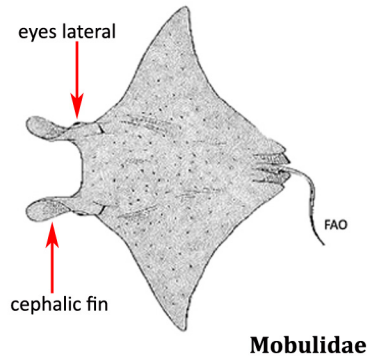


5a. Snout formed into prehensile, elongated, bilobate cephalic fins, laterally based on head; mouth very large, jaws weak and transversely expanded, with very small cuspidate or hexagonal teeth; gills with filter plates

..... **Mobulidae**

5b. Snout formed as a single convex or low bilobate pair of rostral fins; mouth small, jaws very stout and longitudinally expanded with large transversely expanded plate-like teeth that form a powerful crushing and grinding mill for eating shellfish; gills without filter plates

..... go to 6



6a. Rostral fin single and convex; forehead rounded and not expanded anteriorly or medially notched; one medial row of expanded plate-like teeth in each jaw, usually with three rows of smaller hexagonal teeth on each side of them (except *Aetobatus*, in which the lateral teeth are lost)

..... **Myliobatidae**

6b. Rostral fin bilobate and broadly notched medially; forehead expanded anteriorly and forming a ledge over base of rostral fins, its anterior projection with a broad medial notch; three medial rows of expanded plate-like teeth in each jaw, usually with two or three rows of smaller hexagonal teeth on each side of them

..... **Rhinopteridae**



FAMILY DASYATIDAE

JORDAN, 1888. STINGRAYS.

Stingrays are small to very large batoids (with sizes, depending on growth, sex and species, from 40 to 500 cm TL and 18 cm to over 2 m DW). They have discs that are variably depressed, almost circular to rhomboidal in shape, whip-like tails mostly longer than disc length, one to four prominent barbed stinging spines on dorsal surface of tail well behind pelvic fins, no dorsal, anal and caudal fins but with membranous skin folds on the upper and/or lower midlines of their tail behind sting origin. Body usually with denticles, thorns, and tubercles on the dorsal surface of disc and tail. Their heads are raised slightly above the pectoral fins but not demarcated from the rest of disc, eyes on side of head, spiracles well behind eyes, have five pairs of gill openings, ventral mouths armed with numerous small teeth and several lobate papillae on its floor. They can be found in inland, inshore and offshore waters and are viviparous.

Stingrays are represented by at least 88 species belonging to eight genera. At least 10 species are confirmed present in the Philippines (see list on next page). Some of the species in the list possibly belong to species complexes (e.g., Whip stingray *Dasyatis akajei* species complex involving the Philippine red stingray *D. cf. akajei*; the Reticulate whipray *Himantura uarnak* species complex that may also involve the Leopard whipray *H. leoparda* and the Bleeker's variegated whipray *H. undulata*; the Cowtail stingray, *Pastinachus sephen* with the Philippine form *P. cf. sephen*). Taxonomic work is currently ongoing to confirm species and define the species relationships. About three to four species are potentially new, undescribed and possibly endemic (e.g., Adon's mask ray *Neotrygon* sp.).

Some species are junior synonyms of another (e.g., Longtail whipray *H. bleekeri* as a junior synonym of the Whitenose whip ray *H. uarnacoides*) while others may have been misidentified or confused with another and needs further confirmation (e.g., Bennett's cowtail *D. bennetti* for the Whip stingray *D. akajei*; or Sharpnose whipray *H. gerrardi* and the Dwarf whipray *H. walga* for the Scaly whipray *H. imbricata*).

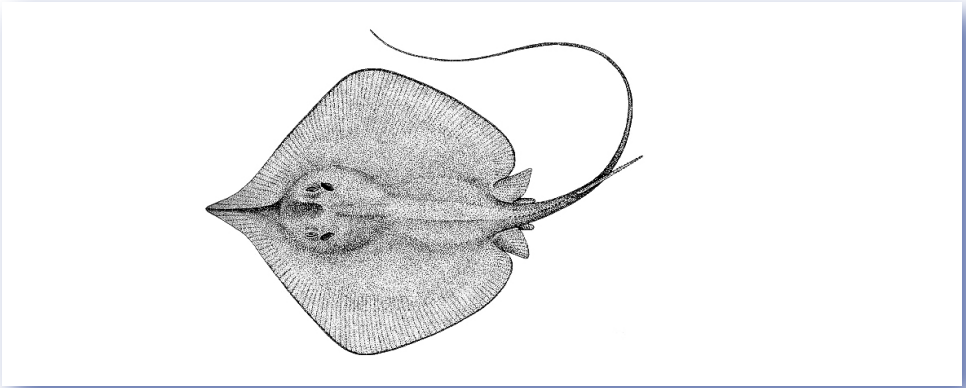
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- T *Dasyatis akajei* (Müller & Henle, 1841). Whip stingray.
- U *Dasyatis* cf. *akajei* (Bürger In Müller & Henle, 1841). Philippine red stingray.
- ? *Dasyatis bennetti* (Müller & Henle, 1841). Bennett's cowtail.
- ✓ *Dasyatis zugei* (Bürger In Müller & Henle, 1841). Pale-edged stingray.
- ✓ *Himantura fai* Jordan & Seale, 1906. Pink whipray.
- ? *Himantura gerrardi* (Gray, 1851). Sharpnose whipray.
- ✓ *Himantura granulata* (Macleay, 1882). Mangrove whipray.
- ? *Himantura imbricata* (Bloch & Schneider, 1801). Scaly whipray.
- ✓ *Himantura jenkinsii* (Annandale, 1909). Golden whipray.
- ? *Himantura leoparda* Manjaji-Matsumoto & Last, 2008. Leopard whipray.
- ✓ *Himantura uarnak* (Gmelin 1789). Reticulate whipray.
- ? *Himantura uarnacoides* (Bleeker, 1852). Whitenose whip ray.
- T *Himantura undulata* (Bleeker, 1852). Leopard whipray.
- U *Himantura* cf. *undulata* (Bleeker, 1852). Leopard whipray.
- ✓ *Himantura walga* (Müller & Henle, 1841). Dwarf whipray.
- ✓ *Neotrygon kuhlii* (Müller & Henle, 1841). Bluespotted stingray.
- U *Neotrygon* sp. Adon's maskray.
- N *Pastinachus atrus* (Macleay, 1883). Eastern cowtail stingray.
- T *Pastinachus sephen* (Forsskål, 1775). Cowtail stingray.
- U *Pastinachus* cf. *sephen* (Forsskål, 1775). Cowtail stingray.
- ✓ *Taeniura lymma* (Forsskål, 1775). Bluespotted ribbontail ray.
- ✓ *Taeniurops meyeri* Müller & Henle, 1841. Round ribbontail ray.
- ✓ *Urogymnus asperrimus* (Bloch & Schneider, 1801). Porcupine ray.

PALE-EDGED STINGRAY

Dasyatis zugei (Müller & Henle, 1841)

Other Names: Sharpnose stingray (English); *pagi* (local)



FAO

Size:

To at least 29 cm DW (75 cm TL); males and females mature at about 16 and 19 cm DW, respectively; born at 7-10 cm DW.

Distinguishing features:

A small stingray with a dark brown back, pale below; disc profile rhomboidal, snout extremely elongate, pointed, anterior margin angular; floor of mouth without oral papillae; tail relatively short, not banded behind sting; ventral skin fold long and narrow (weak), its height less than twice height of tail above deepest portion, terminating before tip of tail; distance from cloaca to stinging spine less than $\frac{1}{2}$ of disc width; a few small thorns along midline of disc and on tail before sting in adults.

References:

Last *et al.* 2010; Compagno *et al.* 2005; Last & Compagno 1999; Nishida & Nakaya 1988.

PINK WHIPRAY

Himantura fai Jordan & Seale, 1906

Other Names: *pagi* (local)



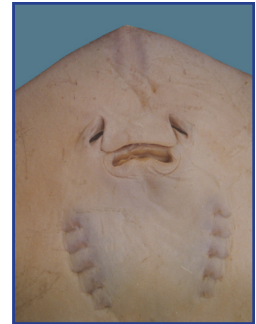
Photo by: BR Uypitching /Silliman University (BRU 083).
(Note: Tail cut off).

Size:

To at least 184 cm DW (500 cm TL); males mature at 108–115 cm DW; embryos of 68 cm DW have been recorded.

Distinguishing features:

A large uniformly tan to greyish pink stingray without obvious patterns of spots or reticulations on disc; disc profile quadrangular; snout very broad, with lobe-like tip; anterior margin straight to slightly convex; floor of mouth with four oral papillae; tail long and whip-like, uniformly dark, not banded, without skin fold; sting situated anteriorly on tail; low flat widely spaced denticles extending from between eyes over disc centre and tail; no enlarged thorn-like denticles on middle of disc and tail. Often confused with *Himantura jenkinsii*.



Ventral view of head.
(BRU 083).

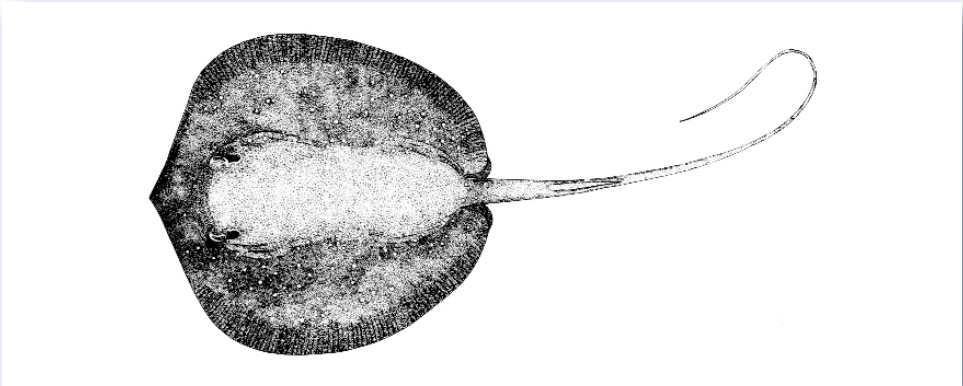
References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999.

MANGROVE WHIPRAY

Himantura granulata (Macleay, 1882)

Other Names: Whitetail whipray, Mangrove whipray, Mangrove ray, Whitetail stingray, Macleay's coachwhip ray (English); *pagi* (local)



FAO

Size:

To at least 141 cm DW (>350 cm TL); males mature at about 55–65 cm DW; born at about 14 cm DW.

Distinguishing features:

A large greyish stingray with small white flecks (often also with dark mucous) on disc and a white tail; disc profile almost circular to oval; disc margins mostly dark with black blotches; snout short and broadly triangular, with lobe-like tip; anterior margin straight to slightly convex; floor of mouth with 4 or 5 oral papillae; tail moderately long and whip-like, not banded, without skin fold; 1–2 stings situated anteriorly on tail; very small denticles laterally on disc; band of flat denticles on central disc (in adults); usually without enlarged thorns on disc and tail.

References:

Last *et al.* 2010; Compagno *et al.* 2005; Last & Compagno 1999; Last & Stevens 1994.

GOLDEN WHIPRAY

Himantura jenkinsii (Annandale, 1909)

Other Names: Rough-back stingray (English); *pagi* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 148).

Size:

To at least 150 cm DW (300 cm TL); males mature at 70–85 cm DW; born at about 23 cm DW.

Distinguishing features:

A large uniformly yellowish brown stingray, rarely with small dark spots on disc near tail base; disc profile rhomboidal; snout short and broad, anterior margin angular; snout with an extended lobe-like tip; floor of mouth with four oral papillae; tail moderately long and whip-like, uniformly dark, not banded, without skin fold; 1-2 stings situated midway on tail; low closely-spaced denticles extending from between eyes over disc centre and tail; row of upright thorns on central disc and tail.



Ventral view of head.
(JPAG 148).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.

RETICULATE WHIPRAY

Himantura uarnak (Gmelin 1789)

Other Names: Marbled stingray, Ring-tailed ray, Whip-tailed ray (English); *katongganon* (Banton); *bitoonan, kilkigan, pangladan, pilisan* (Bikol); *budang* (Kuyunon); *pagi, paging bulik, paging dahunan* (Tagalog); *dahunan* (Visayan)



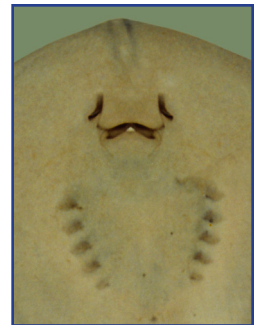
Photo by: BR Uypitching /Silliman University (BRU 083).

Size:

To at least 160 cm DW (450 cm TL); males mature at 82–84 cm DW; born at 21–28 cm DW.

Distinguishing features:

A large stingray with small to fine dark spots (in juveniles) and reticulations (in adults) on a light brown back, pale below; no dark transverse band through eyes; disc profile rhomboidal; snout short and broadly triangular, tip pointed; anterior margin almost straight; floor of mouth with five oral papillae; tail long and whip-like, variably banded (often faint in adults), without skin fold; sting situated anteriorly on tail; broad band of flat denticles on central disc (sparse or absent in small juveniles) from between eyes over disc centre and tail; disc with two heart-shaped thorns (not preceded by row of slightly smaller thorns).



Ventral view of head.
(BRU 083).

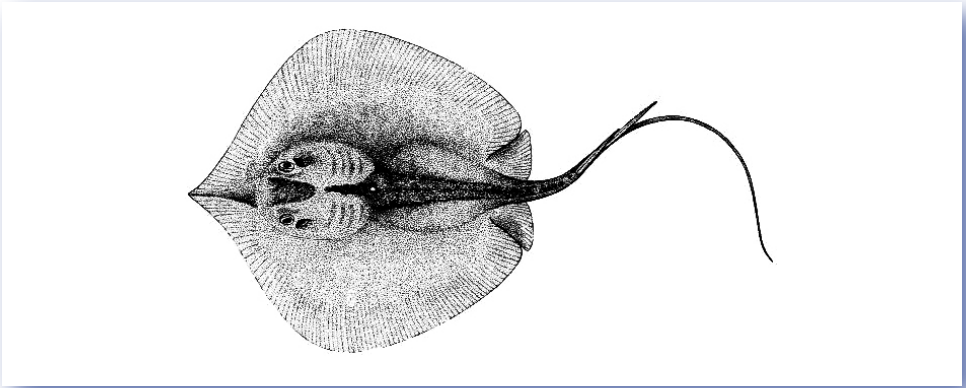
References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.

DWARF WHIPRAY

Himantura walga (Müller & Henle, 1841)

Other Names: Rough-back stingray (English); *pagi* (local)



FAO

Size:

To at least 18cm DW (40 cm).

Distinguishing features:

A small plain greyish brown stingray, yellowish around disc margins, pale below; disc profile almost oval; snout acute, extending into a prominent tip; anterior margin slightly concave; floor of mouth with two oral papillae; tail moderately long and whip-like, uniformly dark, not banded, without skin fold; usually with two stings situated anteriorly on tail; band of low flat denticles on central disc (poorly developed in young); central disc and tail with row of upright thorns. This species is confused with *H. imbricata* and requires further study.

References:

Compagno *et al.* 2005; Last & Compagno 1999.

BLUESPOTTED STINGRAY

Neotrygon kuhlii (Müller & Henle, 1841)

Other Names: Kuhl's stingray, Blue-spotted maskray, Spotted stingray (English); *pagi*, *page*, *pague*, *pasa-pasa*, *dahunan*, *daragon*, *kuyampao* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG002).

Size:

To at least 70 cm TL; males and females mature at about 22 and 11.5 cm TL, respectively; born at about 11-16 cm TL.

Distinguishing features:

A common stingray with a grey-green-brown back, white below, darker around margins; with bright, variably-sized blue spots on disc; disc profile rhomboidal; snout short with black bar through eyes; floor of mouth with two oral papillae; tail not whip-like, with alternating black and white bands; long, low skin fold on ventral surface, pale at base with dark outer margins; generally with two stings on tail behind pelvic fin; a few short thorns confined to a single row midline of disc; usually no thorns on tail before sting. *N. [Dasyatis] kuhlii* is believed to be a species complex and requires further study.



Ventral view of head.
(JPAG002).

References:

Last *et al.* 2010; Last & White 2008; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.

BLUESPOTTED RIBBONTAIL RAY

Taeniura lymma (Forsskål, 1775)

Other Names: Ribbontailed stingray, Blue-spotted stingray, Fantail ray (English); *pagi* (local)

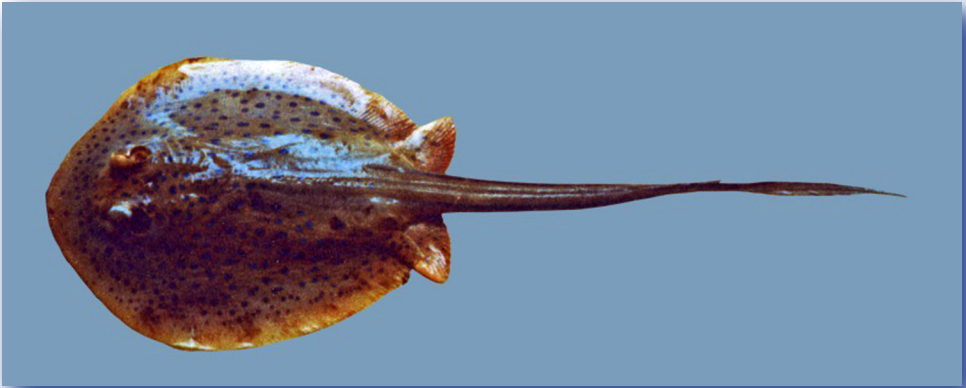


Photo by: JPA Gaudiano/Silliman University (JPAG033).

Size:

To at least 30–35 cm DW (about 70–75 cm TL); males and females mature at 20–22 and 20–24 cm DW, respectively; born at 13–14 cm DW.

Distinguishing features:

A small colorful stingray with large bright blue spots on disc and with blue side-stripes along the tail; disc profile oval, elongated; floor of mouth with two large oral papillae; tail without spots, ventral skin fold on tail relatively deep, extending to tail tip; usually with two stings located near end of tail; central disc smooth to granular (denticles very small); a few short widely-spaced thorns confined to nuchal area, none on tail.



Ventral view of head.
(JPAG033).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.

ROUND RIBBONTAIL RAY

Taeniurops meyeri (Müller & Henle, 1841)

Other Names: Blackblotched stingray, Blackspotted stingray, Bull ray, Fantail stingray, Giant reef ray, Marble ribbontail ray, Round ribbontail ray, Speckle stingray (English); *pagi* (local)



Photo by: JPA Gaudiano/Silliman University (JPAG 330).

Size:

To at least 180 cm DW (330 cm TL); males mature at 100-110 cm DW; born at 30-35 cm DW.

Distinguishing features:

A large stingray with a uniformly light to dark brown back with black and white blotches and mottlings, usually dark on edges, tail fold uniformly black posterior to sting; disc profile circular; floor of mouth with five oral papillae; tail without spots, ventral skin fold on tail relatively deep, extending to tail tip; usually with one large sting; central disc smooth to granular (denticles very small); about four blunt thorns on disc of juveniles (indistinct in adults), none on tail.



Ventral view of head.
(JPAG 330).

References:

Asis *et al.* 2014; Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.

PORCUPINE RAY

Urogymnus asperrimus (Bloch & Schneider, 1801)

Other Names: Roughskin stingaree, Solander's ray, Thorny ray (English);
pagi (local)



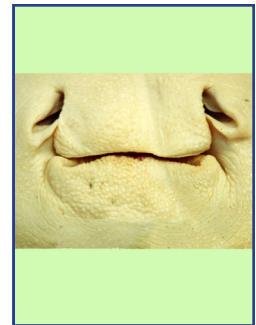
Photo by: JPA Gaudiano/Silliman University (JPAG 170).

Size:

To at least 147 cm DW (about 220 cm TL); males and females mature at 90 and 100 cm DW, respectively.

Distinguishing features:

A large stingray with a uniformly creamy to light brown disc, paler on edges, darker on tail tip; disc profile oval to almost circular; floor of mouth with 3-5 oral papillae; tail without ventral skin fold and stinging spine; upper disc very rough, covered with large, spiny thorns; small, flat, plate-like denticles on central disc and tail.



Ventral view of head.
(JPAG 170).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999.

FAMILY GYMNURIDAE

FOWLER, 1934. BUTTERFLY RAYS.

Butterfly rays are distinct in having an extremely broad and laterally expanded rhomboidal disc, the width of which is about twice its length (at least 1.6 times) and a very thin and short whip-like tail, shorter than $\frac{1}{2}$ disc width, often with white and black stripes. The base of its disc is thick going flat outwards, usually not flabby and without electric organs. Its snout is short, not differentiated into cephalic fins; its head is continuous with outer anterior margin of pectoral disc; eyes dorsolateral on head; spiracles close to eyes; and have five pairs of gill openings that ventrally located. A single small dorsal fin may either be absent or small on tail of some species, well behind pelvic-fin bases, with or without a stinging spine. Its caudal fin may also be absent or variably reduced. Body entirely naked dorsally and ventrally, with fine denticles (no thorns) on medial dorsal surface of disc and tail (males without alar spines on discs). They are inshore species and are aplacental viviparous.

Globally, the family Gymnuridae is represented by at least 14–21 species in one genus (*Gymnura*). Previous studies of the family Gymnuridae have divided it into two genera based on the presence (*i.e.*, *Aetoplatea*) or absence (*i.e.*, *Gymnura*) of a dorsal fin. A recent study, however, supports the amalgamation of all species into a single genus (*i.e.*, *Gymnura*) as dorsal fin development is found to be variable (*e.g.*, *G. australis*) and inconsistent with the two genus hypothesis, thus suggesting that *Aeteoplata* be designated as a junior synonym (Jacobsen 2007; White 2006). At least two species are confirmed present in the Philippines: *i.e.*, *Gymnura poecilura* and *G. zonura*. Two other species are still uncertain (*i.e.*, *Gymnura micrura* and *G. cf. micrura*). Nominal records occur for *G. micrura* in Fowler (1941) and *G. cf. micrura* in Compagno & Last (1999) but these need further confirmation. The taxonomy of *G. cf. micrura* is unresolved and needs additional work.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Gymnura micrura* (Bloch & Schneider, 1801). Smooth butterfly ray.
- U *Gymnura cf. micrura* (Bloch & Schneider, 1801). Smooth butterfly ray.
- ✓ *Gymnura poecilura* (Shaw, 1804). Longtailed butterfly ray.
- ✓ *Gymnura zonura* (Bleeker, 1852). Zonetail butterfly ray

LONGTAILED BUTTERFLY RAY

Gymnura poecilura (Shaw, 1804)

Other Names: *pagi* (local)



Photo by: JPA Gaudiano/ Silliman University (JPAG 362).

Size:

To at least 91.5 cm DW; females mature by 61 cm DW; born at 23.7 to 25.6 cm DW.

Distinguishing features:

A large butterfly ray, uniformly brown or yellowish brown back with scattered light spots; no dorsal fin or rudimentary dorsal fin at base of tail; tail length from cloaca to tip about half as long as snout-vent length; about nine black bands on tail.

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.



Ventral view of head.
(JPAG 362).

ZONETAILED BUTTERFLY RAY

Gymnura zonura (Bleeker, 1852)

Other Names: *pagi* (local)



Photo by: BR Uypitching/ Silliman University (BRU 106).

Size:

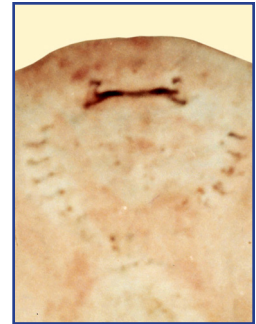
To at least 102.9 cm DW; males mature by 48 cm DW.

Distinguishing features:

A large butterfly ray, brown-backed white-bellied with numerous dark spots or lines interspersed with large round yellowish spots or irregular blotches, sometimes forming lines or ocelli; with small but noticeable dorsal fin at base of tail.

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.



Ventral view of head.
(BRU 106).

FAMILY HEXATRYGONIDAE

HEEMSTRA & SMITH, 1980. SIXGILL STINGRAYS.

The family Hexatrygonidae is provisionally represented globally by only one species (*i.e.*, *Hexatrygon bickelli*) that is also recorded in the Philippines. This species is considered rare, with less than five or ten specimens on record, collected from depths between 350 to 1,120 m. Not much is known on its biology but a female specimen shows it to be ovoviviparous. Various species have been reported in other parts of the world based mostly on snout length and shape but these forms are believed to be variations with growth (Last & Compagno 1999).

The species may be similar to the members of family Plesiobatidae (giant stingarees), Urolophidae (common stingarees), and Dasyatidae (common stingrays). It is distinct in having six pairs of gill openings, a greatly elongated, angular, translucent, thick and prehensile snout that lengthens with age, heart-shaped disc the length of which is greater than its width, nostrils widely set with short anterior nasal flaps expanded into very short curtain fused anterior to mouth, no dorsal fin, and a moderately stout short tail with a barbed stinger well behind the pelvic fin and leaf-shaped caudal fin.

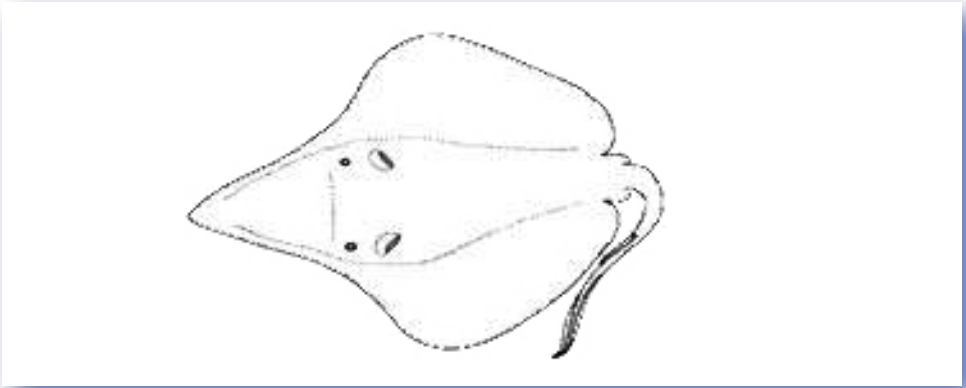
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Hexatrygon bickelli* Heemstra & Smith, 1980. Sixgill stingray.

SIXGILL STINGRAY

Hexatrygon bickelli Heemstra & Smith, 1980

Other Names: none



FAO

Size:

To at least 168 cm; males mature at about 110 cm; born at about 48 cm.

Distinguishing features:

A deep-water six-gill stingray with purplish brown coloration when alive, white below with dusky margins on disc and pelvic fins, underside of tail dark; heart-shaped disc, length greater than width; snout prehensile and very long, >6 times orbit diameter, grows with age, snout base distinct from rest of disc; no dorsal fin, or skin folds on side or undersurface of tail; caudal fin moderately long, base stout, leaf-shaped toward end; barbed sting on tail behind pelvic fin.

References:

Compagno *et al.* 2005; Last & Compagno 1999; Last & Stevens 1994; Smith & Heemstra 1986.

FAMILY MOBULIDAE

GILL, 1893. DEVIL RAYS.

Devil rays, the largest of all rays with disc widths reaching exceeding 9 m, are distinct in having prominent fleshy extensions of the pectoral fins known as cephalic lobes or cephalic fins, projecting forward on each side of the head. Its lozenge-shaped disc is much broader than long, subdivided laterally by notch at eyes into the paired rostral fins and the posterior pectoral disc proper. Its broad head protrudes forward beyond eye level, eyes and spiracles located on sides, and a very broad mouth which is either terminal (*i.e.*, facing forward at end of snout, such in *Manta*) or subterminal (facing downwards, just before end of snout, such in *Mobula*). It has weak jaws with very small teeth that form bands in either one or both jaws. It has five moderately broad to very broad gill openings on underside of front half of pectoral disc, with its internal gill arches forming into large and complex filter plates. It has a filamentous tail with a single moderate-sized dorsal fin near its base, sometimes with a serrated stinging spine, but has no caudal fin. Devil rays are found inshore, offshore and oceanic, and are ovoviviparous.

The family Mobulidae is represented by at least 11 species belonging to two genera, *Manta* and *Mobula*, members of which are often confused with each other and thus needs careful validation. At least seven species are reported in the Philippines, including three new additions (*i.e.*, *Manta alfredi*, *Mobula japanica* and *M. tarapanca*) based on photos as reproduced here.

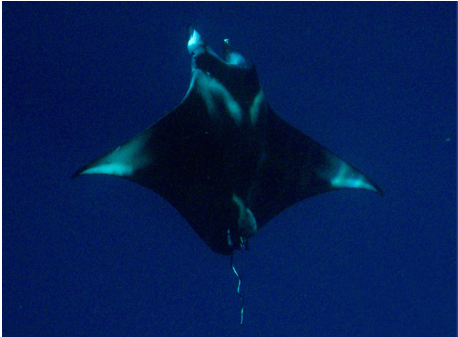
The genus *Manta* was previously considered as monotypic but has been re-evaluated to comprise two species, *M. birostris* and *M. alfredi*. The presence of *M. alfredi* in the Philippines is based on photos taken at the Tubbataha Reefs Natural Park (TRNP), Cagayancillo, Palawan as reported in Aquino *et al.* (2013). There seems to be various color morphs for the two species of manta and an attempt to visually differentiate the two in terms of color patterns, dermal denticles, and dentition is presented based on Marshall *et al.* (2009).

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Manta alfredi* (Krefft, 1868). Alfred manta.
- ✓ *Manta birostris* (Walbaum, 1792). Giant manta.
- ✓ *Mobula eregoodootenkee* (Bleeker, 1859). Longhorned mobula.
- ✓ *Mobula japanica* (Müller & Henle, 1841). Spinetail mobula.
- ✓ *Mobula kuhlii* (Müller & Henle, 1841). Shortfin devil ray.
- ✓ *Mobula tarapacana* (Philippi, 1892). Chilean devil ray.
- ✓ *Mobula thurstoni* (Lloyd, 1908). Smoothtail mobula.

ALFRED MANTA***Manta alfredi*** (Krefft, 1868)

Other Names: Coastal manta ray, Resident manta ray, Inshore manta ray, Prince Alfred's ray, Reef manta ray (English); *pagi-sanga*, *sanga* (local)



Dorsal view. Photo by: Kaila Ledesma.



Ventral view. Photo by: Lene & Claus Topp.

Size:

To at least 550 cm DW; males and females mature at about 280–300 and 300–390 cm DW, respectively; born at 192 cm DW.

Distinguishing features:

A giant ray with a black back, sometimes with white, more rounded or Y-shaped shoulder patch, white below with ventral dark spots located near the posterior end and between the gill slits, grey edging on disc, mouth white or pale colored; disc profile triangular; without a caudal spine near its dorsal fin; tail short and whiplike; upper surface of disc covered with evenly spaced denticles without cusps; small square shaped teeth on the lower jaw, absent from upper jaw.



Ventro-lateral view of head. Photo by: Heinz Rebmann.

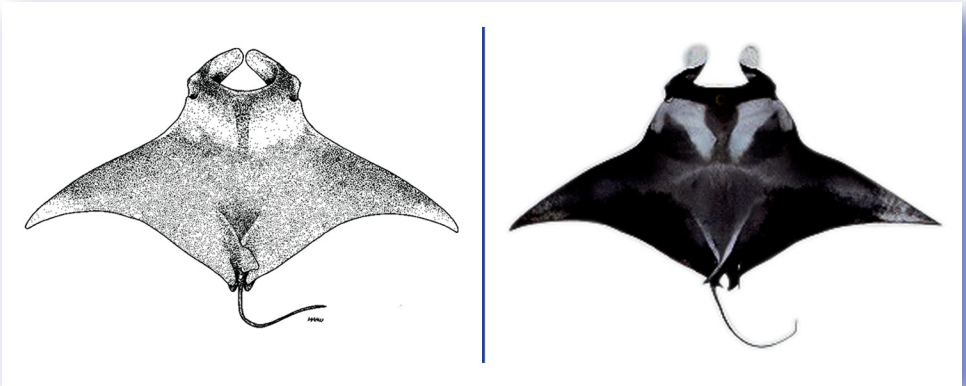
References:

Aquino 2013; Marshall *et al.* 2009; Marshall *et al.* 2008.

GIANT MANTA

Manta birostris (Walbaum, 1792)

Other Names: Giant manta ray, Oceanic manta ray, Pacific manta ray, Pelagic manta ray, Chevron manta ray, Devilfish, Manta ray (English); *pagi-sanga*, *sanga* (local)



FAO

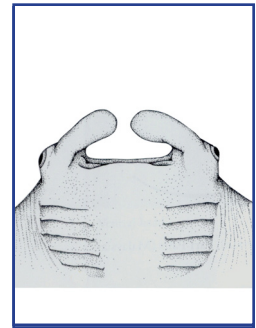
Photo taken from: Last et al. (2010).

Size:

To at least 670 cm DW (possibly to 910 cm DW); males and females mature at about 375 and 380 cm DW, respectively; born at 122–149 cm DW.

Distinguishing features:

A giant ray with a black back, sometimes with white angular or T-shaped shoulder patches, white below with larger ventral dark spots on the abdominal region, grey edging on disc, mouth blackish; disc profile triangular; calcified lump (caudal spine) posterior to dorsal fin; tail whiplike but short; upper surface of disc covered with overlapping multiple-cusped denticles; small square shaped teeth on the lower jaw, enlarged teeth on the upper jaw.



Ventral view of head.
(Last et al. 2010).

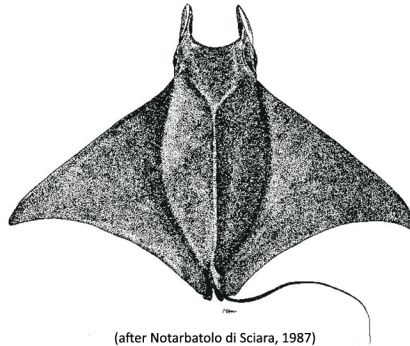
References:

Last et al. 2010; Marshall et al. 2009; Marshall et al. 2008; Luchavez-Maypa et al. 2001; Last & Compagno 1999; Last & Stevens 1994.

LONGHORNED MOBULA

Mobula eregoodootenkee (Bleeker, 1859)

Other Names: Longfin devilray Pygmy devilray, Ox ray, Smaller devilray, Eregoodoo (English); *buntok-talibatab*, *pagi-sanga* (local)



(after Notarbatolo di Sciara, 1987)

FAO

Size:

To at least 100 cm DW.

Distinguishing features:

A small devilray with a 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.

References:

Rayos *et al.* 2013; Compagno *et al.* 2005; Last & Compagno 1999; Last & Stevens 1994; Notarbartolo-Di-Sciara 1987.

SPINETAIL MOBULA

Mobula japonica (Müller & Henle, 1841)

Other Names: Japanese devilray, Spinetail devilray (English);
pasa-pasa, *pagi-sanga*, *sanga* (local)



Dorsal and ventral views of M. japonica. Photos by: A. Ponzo.

Size:

To at least 310 cm DW; males and females mature at 207 and 205 cm DW, respectively; born at 85 cm DW.

Distinguishing features:

A medium to large-sized devilray with a bluish-black back, with two concentric 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.



*Front view of mouth.
Photo by: A. Ponzo.*

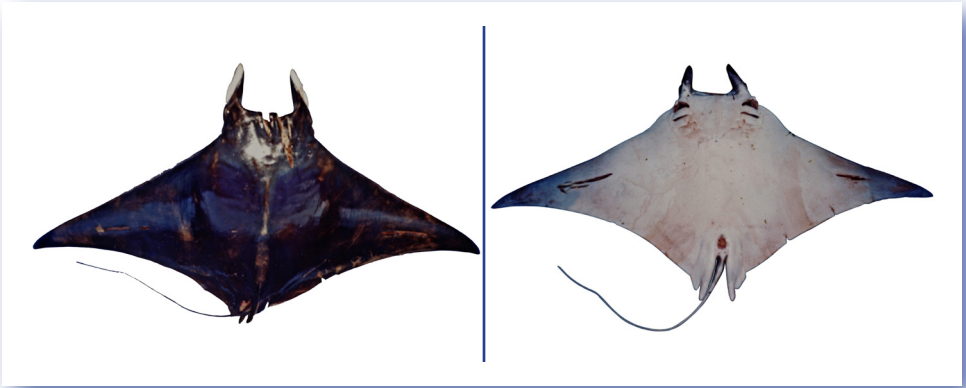
References:

Last & Compagno 1999; Last & Stevens 1994; Notarbartolo-Di-Sciara 1987.

SHORTFIN DEVIL RAY

Mobula kuhlii (Müller & Henle, 1841)

Other Names: Lesser devilray (English); *pagi-sanga, sanga* (local)



Dorsal and ventral views of *M. kuhlii*. Photos by: BR Uypitching/ Silliman University (BRU 031).

Size:

To at least 120 cm DW.

Distinguishing features:

A small devilray with a 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.



Ventral view of head.
(BRU 031).

References:

Compagno *et al.* 2005; Last & Compagno 1999; Luchavez-Maypa *et al.* 2001; Notarbartolo-Di-Sciara 1987.

CHILEAN DEVIL RAY

Mobula tarapacana (Philippi, 1892)

Other Names: Box ray, Devil ray, Greater Guinean mobula, Sicklefim devil ray, Spiny mobula (English); *pagi-sanga* (local)



Dorsal and latero-ventral views of *M. tarapacana*. Photos by: A. Ponzo.

Size:

To at least 328 cm DW (max: 360 cm DW), commonly around 250 cm DW; born at 105 cm DW.

Distinguishing features:

A small to large devilray with a greyish-black back, white below with darker posterior 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.



Ventral view of head.
Photo by: A. Ponzo.

References:

Compagno *et al.* 2005; Last & Compagno 1999; McEachran & Notarbartolo di Sciara 1995; Notarbartolo di Sciara 1987.

SMOOTHTAIL MOBULA

Mobula thurstoni (Lloyd, 1908)

Other Names: Bentfin devilray (English); *pagi-sanga, sanga* (local)



Dorsal view of *M. thurstoni*. Photo by: A. Ponzo.

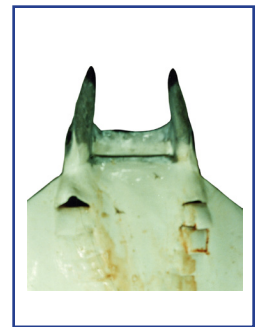
Ventral view of *M. thurstoni*. Photo by: JPA Gaudiano/Silliman University (JPAG 302).

Size:

To at least 220 cm DW.

Distinguishing features:

A moderate-sized devilray with a 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 bent 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.



Ventral view of head.
(JPAG 302).

References:

Compagno et al 2005; Last & Compagno 1999; Luchavez-Maypa *et al.* 2001; Last & Stevens 1994.

FAMILY MYLIOBATIDAE

BONAPARTE, 1838. EAGLE RAYS.

Eagle rays are medium to large, heavy bodied fishes characterized by having a diamond-shaped disc, its width greater than its length, a rounded snout (rather than indented anteriorly) with no paired fleshy lobes, a head that protrudes slightly over the disc, fusing with the pectoral fins just beside or below the eyes. Both eyes and spiracles are on side of head. It has a broad, ventral mouth and powerful jaws with plate-like crushing teeth arranged in one to seven rows, and five gill openings, length about or longer than eye length. It has a small dorsal fin with or without a venomous spine near base of a thin and filamentous tail, which is longer than its disc and has no a caudal fin. Its body has denticles and thorns, around eyes and along midline of disc in some species. These are mainly inshore species and are viviparous.

Members of this family are similar to the members of family Rhinopteridae (Cownose rays). Rhinopterids differ in having an elevated head, with snout notched medially forming a bilobed rostral part of the disc. Myliobatids have a snout that is not notched medially but forms a single rounded or rounded-angular lobe.

Globally, the family Myliobatidae is represented by at least 21 species belonging to three genera. At least one species is confirmed present in the Philippines (*i.e.*, the Ornate eagle ray *Aetomylaeus vespertilio*). Some other species in the list may possibly belong to species complexes, *i.e.*, the Spotted eagle ray *Aetobatus narinari* species complex (comprising of at least four species across its range to include the two Philippines forms *Aetobatus cf. narinari* and *A. cf. guttatus*) and which are found to be distinct from the Ocellated eagle ray *A. ocellatus*, a synonym of the Indian eagle ray *A. guttatus*. Two other species remain uncertain: the mottled eagle ray *Aetomylaeus maculatus* and the Banded eagle ray *A. nichofii*. Nominal records for the Ocellate eagle ray *A. milvus* (Valenciennes, 1841) (in Casto de Elera, 1895; Fowler, 1941; Compagno & Last, 1999) is attributed to be that of a juvenile *A. maculatus* (see Compagno *et al.* 2010). In turn, *A. milvus* is considered most likely a synonym of *A. maculatus* (White 2006). Further investigation is recommended.

In addition to the two species belonging to the spotted eagle ray complex, at least one other species is potentially new, undescribed and possibly endemic (*i.e.*, the Philippine kite ray suspected to be conspecific with the Japanese forms *Myliobatis tobijei*). Initial descriptions are discussed in Compagno *et al.* 2005.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- T *Aetobatus narinari* (Euphrasen, 1790). Spotted eagle ray.
- U *Aetobatus cf. narinari* (Euphrasen, 1790). Spotted eagle ray.
- U *Aetobatus cf. guttatus* (Shaw, 1804). Indian eagle ray.
- ? *Aetomylaeus maculatus* (Gray, 1834). Mottled eagle ray.
- ? *Aetomylaeus nichofii* (Bloch & Schneider, 1801). Banded eagle ray.
- ? *Aetobatus ocellatus* (Kuhl 1823). Ocellated eagle ray.
- ✓ *Aetomylaeus vespertilio* (Bleeker, 1852). Ornate eagle ray.
- ? *Myliobatis tobijei* Bleeker, 1854. Japanese eagle ray.
- U *Myliobatis cf. tobijei* Bleeker, 1854. Philippine kite ray.

ORNATE EAGLE RAY

Aetomylaeus vespertilio (Bleeker, 1852)

Other Names: Reticulate eagle ray (English); *pagi manok* (local)



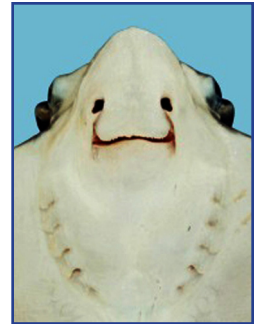
Photo by: JPA Gaudiano/Silliman University (JPAG 324).

Size:

To at least 300 cm DW (possibly to 350 cm DW); males mature by 170 cm DW.

Distinguishing features:

A relatively large but uncommon eagle ray, with a greenish brown back, a network of thin dark transverse lines anteriorly and whitish rings and dark reticulations posteriorly, white undersides; fleshy ridge on side of head not connected to edge of disc; dorsal-fin posterior margin upright, its origin posterior to pelvic-fin insertions; tail long and thin, without spine; edge of nasal curtain near mouth almost straight.



Ventral view of head.
(JPAG 324).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Compagno 1997; Last & Stevens 1994.

FAMILY PLESIOBATIDIDAE

NISHIDA, 1990. GIANT STINGAREES.

Plesiobatids or giant stingarees are distinctively large, with its round pectoral disc reaching to at least 270 cm. Additional distinctive features include an angular snout, greatly elongated nostrils, nasal curtain incompletely united, not reaching the mouth, a dorsal surface uniformly covered with fine denticles, five gill openings, no dorsal fin, a moderately stout short tail with a barbed stinger well behind the pelvic fin, and leaf-shaped caudal fin.

The family (Plesiobatididae) is represented by only one species (*i.e.*, *Plesiobatis daviesi*) which is also recorded in the Philippines. This species is considered to be relatively common, found in depths between 275–680 m. Not much is known on its biology, but possibly viviparous.

Plesiobatids or giant stingarees are similar to other stingarees (family Urolophidae), stingrays (family Dasyatidae), and the Sixgill stingray (family Hexatrygonidae). The urolophids differ in being generally smaller, with adults less than 90 cm in length, having a dorsal surface either naked (for most species) or covered with coarse denticles, a less expanded nostrils, a narrower nasal curtain that reaches the mouth which has oral papillae, and shorter caudal fin usually less than ½ tail length. Dasyatids have a long and whip-like tail, without a caudal fin but with longitudinal fin-folds variably developed or absent. For the monotypic family Hexatrygonidae, apart from having six pairs of gill openings distinctive of the species, adults also has a greatly elongated thick snout and with spiracles located well behind eyes.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Plesiobatis daviesi* (Wallace, 1967). Deepwater stingray.

DEEPWATER STINGRAY

Plesiobatis daviesi (Wallace, 1967)

Other Names: Giant stingaree (English); *pagi* (local)



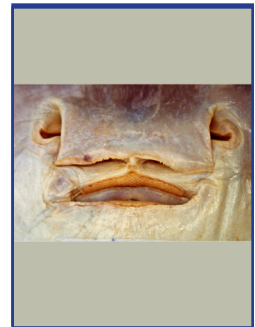
Photo by: MM Luchavez-Maypa/ Silliman University (MMLM 008).

Size:

To at least 270 cm; males and females mature at about 130–172 and 189–200 cm, respectively; born at about 50 cm.

Distinguishing features:

A giant deepwater stingray with a purplish brown to grey body when alive, sometimes with irregular dusky blotches or spots on back, white below with dusky margins on disc, underside of tail dark; snout moderately long, more than six times orbit diameter, broadly angular; rounded disc, upper surface with small granular denticles; no dorsal fin, or skin folds on side or undersurface of tail; tail moderately long, base stout, leaf-shaped caudal fin; barbed sting on tail behind pelvic fin.



Ventral view of head.
(MMLM 008).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Last & Compagno 1999; Last & Stevens 1994; Nishida 1990.

FAMILY RHINOPTERIDAE

JORDAN & EVERMANN, 1896. COWNOSE RAYS.

Members of this family are similar to the members of family Myliobatidae (eagle rays) and Mobulidae (devil rays). Rhinopterids are distinct in having an elevated head, an angular rhomboidal disc subdivided into bilobate rostral and pectoral parts, five gill openings, nostrils not greatly expanded, long anterior nasal flaps medially expanded and fused into a broad, elongated nasal curtain overlapping mouth, plate-like teeth normally in seven to nine rows in either jaws, sometimes higher; a single moderate-sized dorsal fin, a whip-like tail with a barbed sting on dorsal surface near tail base, close behind pelvic fins, and without a caudal fin.

Members of this family are similar to the members of family Myliobatidae (eagle rays). Myliobatids also have an elevated head but its snout is not notched medially rather forms a single rounded or rounded-angular lobe. Rhinopterids are distinct in having an elevated head, with snout notched medially forming a bilobed rostral part of the disc.

The family Rhinopteridae is represented by at least 11 species belonging to one genera, *Rhinoptera*. Only one species (*i.e.*, *Rhinoptera javanica*) is confirmed present in the Philippines.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Rhinoptera javanica* Müller & Henle, 1841. Javanese cownose ray.

JAVANESE COWNOSE RAY

Rhinoptera javanica Müller & Henle, 1841

Other Names: Flapnose ray, Cow-nosed ray (English); *palimanok*, *ogaog*, *banogan*, *pagi* (local)



Photo by: JPA Gaudiano/ Silliman University (JPAG 209).

Size:

To at least 150 cm.

Distinguishing features:

A relatively large stocky cownose ray uniformly dark greyish brown above and white below; disc broad, short and diamond-shaped, rostral margin deeply notched behind eye; head thick and broad; forehead bilobed, with a pair of lobe-like flaps located underneath; whip-like tail; single dorsal fin on tail base; teeth plate-like, upper teeth in seven rows.

References:

Luchavez-Maypa *et al.* 2001; Last & Compagno 1999; Last & Stevens 1994.



Ventral view of head.
(JPAG 209).

SUBORDER PLATYRHINOIDEI
MCEACHRAN, DUNN & MIYAKE, 1996.
FANRAYS AND THORNBACKS.

FAMILY PLATYRHINIDAE
JORDAN, 1923. FANRAYS AND THORNBACKS.

The suborder is represented by one family (Family Platyrrhinidae) with at least three species characterized by having enlarged, sharp hooked thorns on snout, orbits, shoulders, and along the mid-dorsal axis of trunk and tail, with body generally covered with tiny denticles. Its head is large and broad, flat and round, and tail is shark-like with tail length longer than the pectoral disc.

Only one species (*i.e.*, *Platyrrhina sinensis*) is nominally listed in the Philippines by Casto de Elera (1895) but which needs further validation.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Platyrrhina sinensis* (Bloch & Schneider, 1801). Fanray.

SUBORDER PRISTOIDEI GILL, 1893. SAWFISHES.

FAMILY PRISTIDAE BONAPARTE, 1838. MODERN SAWFISHES.

The suborder is represented by one family (Family Pristidae) with at least five species belonging to two genera (*i.e.*, Genus *Anoxypristis* and Genus *Pristis*) collectively referred to as the modern sawfishes. Members are characterized by a long elongated saw-like snout with enlarged lateral teeth.

Sawfishes (Pristidae) may be confused with saw sharks or members of the family Pristiophoridae in having a rostral saw. Major differences, however, occur in that sawfishes have a uniformly-sized teeth along their elongated snouts (as opposed to the alternating large and small teeth in saw sharks), absence of barbels on each side of the rostrum (presence of barbels on rostrum is unique to saw sharks), a broad wing-like pectoral fins attached to head, forming a distinct pectoral disc characteristic of rays (*i.e.*, a “ray-like” body as opposed to a separate head and pectoral fins or “shark-like” body for sawsharks), and five ventrally located gill openings as in other batoids (sawsharks have five to six gill openings at the sides of head). Members of both families, however, are reported to be ovoviviparous, with embryos feeding solely on yolk.

The taxonomy of the family Pristidae is undergoing some modifications. Previously, there were seven species reported globally. However, based on molecular and morphological characters (Faria *et al.* 2013), two of these species (*i.e.*, the Indo-west Pacific Freshwater sawfish *Pristis microdon* Latham, 1794 and the Atlantic Large-tooth sawfish *P. perotteti* Müller & Henle, 1841) are now lumped together with the Common sawfish *Pristis pristis* (Linnaeus, 1758), making it only five species known globally. The Common sawfish and two other species (*i.e.*, the Knifetooth sawfish *Anoxypristis cuspidata* and the Green sawfish *Pristis zijsron*) are reported to occur in the Philippines. One species, the Smalltooth sawfish *Pristis pectinata*, is of uncertain status and needs further validation.

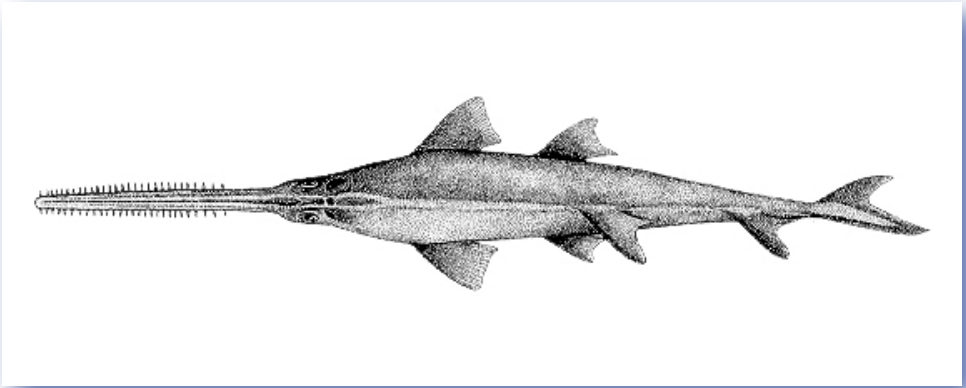
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Anoxypristis cuspidata* (Latham, 1794). Knifetooth sawfish.
- ✓ *Pristis pristis* (Linnaeus, 1758). Common sawfish
- ? *Pristis pectinata* Latham, 1794. Smalltooth sawfish.
- ✓ *Pristis zijsron* Bleeker, 1851. Green sawfish.

KNIFETOOTH SAWFISH

Anoxypristis cuspidata (Latham, 1794)

Other Names: Narrow sawfish, Pointed sawfish (English); *pating* (local)



FAO

Size:

To at least 470 cm, unconfirmed reports to 550-610 cm; pregnant females found at 246-282 cm; born at 43-61 cm.

Distinguishing features:

A moderate-sized sawfish with a gray body, greyish to white below, pale fins; about 18-22 rostral teeth present on each side of saw, absent a quarter down to its base; rostral teeth broad, greatly flattened and triangular slightly closer together near tip than at middle of saw; very narrow nostrils with small nasal flaps; 1st dorsal fin with origin over or slightly posterior to pelvic fin insertions; a secondary caudal keel below the first one on the caudal-fin base; caudal fin with a shallow subterminal notch and a long, prominent ventral lobe.

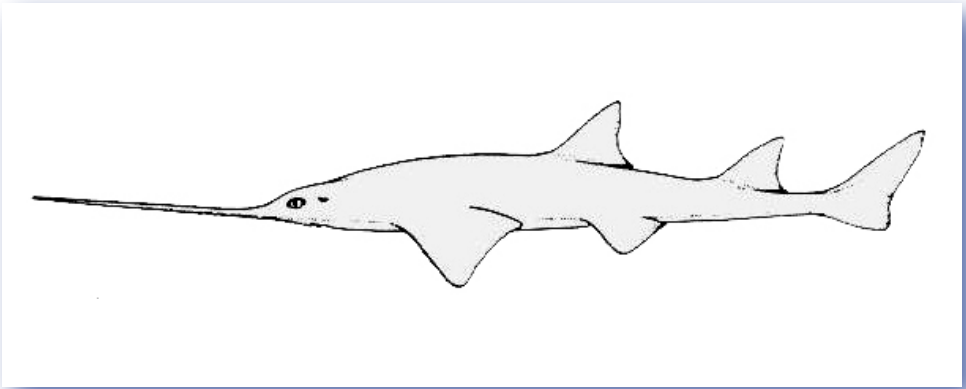
References:

Last *et al.* 2010; Compagno *et al.* 2005; Last & Compagno 1999; Last & Stevens 1994.

COMMON SAWFISH

Pristis pristis (Linnaeus, 1758)

Other Names: Largetooth sawfish, Freshwater sawfish (English); *barabad*, *barasan*, *buntok lagari*; *manglangpit*, *pakangan*, *tag-an* (local)



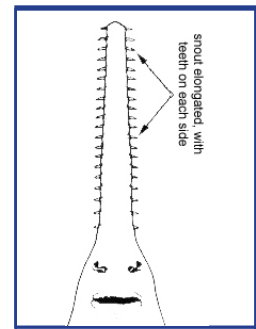
FAO

Size:

To at least 700 cm, commonly about 500 cm; males and females mature between 240–300 cm; born at about 70–90 cm.

Distinguishing features:

A large heavily-bodied sawfish, yellow to gray body, pale below, yellow-brown fin webs; short but massive saw which is broad-based, strongly tapering and with 14-23 very large teeth, present on each side of saw starting close to base; rostral teeth moderately flattened, elongated and peg-like; rostral teeth near tip and at middle of saw a similar distance apart; short, broad and transverse nostrils with broad and large nasal flaps; 1st dorsal fin origin considerably anterior to pelvic fin origin; Pectoral fins high and angular; no secondary caudal keel below the first one on the caudal-fin base; caudal fin without a subterminal notch but with a short, ventral lobe. (Note: The Largetooth sawfish is a euryhaline species, with populations occurring in freshwater marine and estuarine environments at certain life stages).



Underside of head.
(FAO).

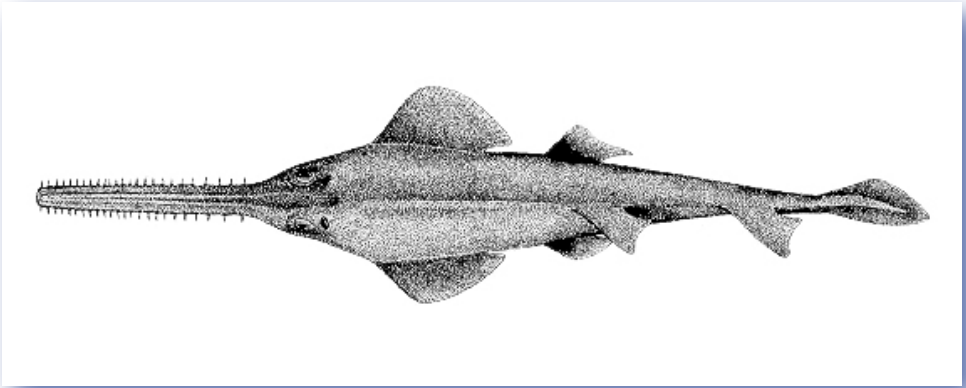
References:

Compagno *et al.* 2005; Last & Compagno 1999; Last & Stevens 1994.

GREEN SAWFISH

Pristis zijsron Bleeker, 1851

Other Names: Common sawfish (English); *pating* (local)



FAO

Size:

To at least 500 cm, reaching to 730 cm; males mature by 430 cm.

Distinguishing features:

A moderate-sized sawfish with a greenish or olive body, pale below; about 23–34 unevenly-spaced teeth but present on each side of saw, starting close to base; rostral teeth slender with a groove along posterior margins; rostral teeth much closer together near tip than at mid-length of saw; short, broad and transverse nostrils with broad and large nasal flaps; 1st dorsal fin origin slightly behind the pelvic fin origin; pectoral fins broad based; no secondary caudal keel below the first one on the caudal-fin base; caudal fin without a subterminal notch but with a ventral lobe.

References:

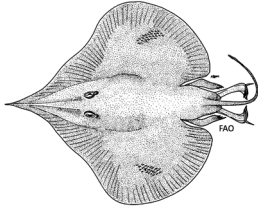
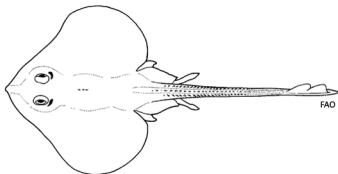
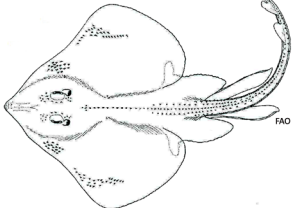
Compagno *et al.* 2005; Last & Compagno 1999.

SUBORDER RAJOIDEI

GARMAN, 1913. SKATES

Members of the Suborder Rajoidei are characterized with the following: a short to elongated snout; a disc quadrangular to rhomboidal in shape; free rear tips of pectoral fins opposite or posterior to pelvic-fin origins; 0-2 rounded or angular but reduced dorsal fins located far posterior on tail; pelvic fins strongly bilobate, with a narrow anterior lobe that is not leg-like and broad posterior lobes conjoined basally; males with curved, hooked alar spines on their discs (skates); a moderately stout tail, variably covered with denticles and thorns and with lateral folds; weak electric organs developed from caudal muscles; reduced caudal fin without a ventral lobe. They have a transversed to arched mouth, with numerous teeth, and five pairs of ventrally-located gill openings. They are oviparous with eggs in a horny capsule with four long tips. Based on fossil records, a reversal to egg-laying from live-bearing was observed in this group.

The suborder is represented by at least 285 species belonging to three families, namely, Anacanthobatidae (smooth skates or legskates), Arhynchobatidae (softnose skates), and Rajidae (hardnose skates).

<p>1. Family Anacanthobatidae von Bonde & Swart, 1923. Smooth skates or leg skates</p>	
<p>2. Family Arhynchobatidae Fowler, 1934. Softnose skates.</p>	
<p>3. Family Rajidae Blainville, 1816. Hardnose skates.</p>	

KEY TO FAMILIES OF THE SUBORDER RAJOIDEI REPORTED TO OCCUR IN THE PHILIPPINES

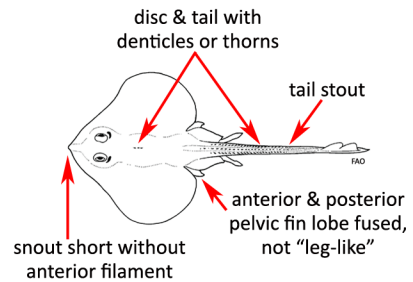
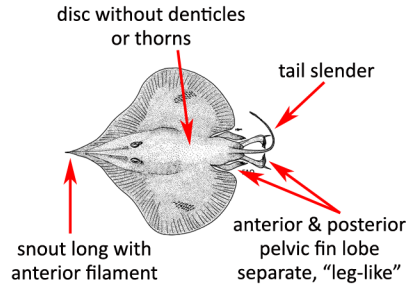
1a. Anterior and posterior pelvic fin lobes completely separate, with the anterior pelvic fin lobe looking “leg-like”, with expanded distal “feet”; disc naked (no denticles or thorns) except for alar spines in males; no dorsal fins; tail very slender, caudal fin long and low; snout long usually with anterior filament or leaf-like appendage

..... **Anacanthobatidae**

1b. Anterior and posterior pelvic fin lobes fused or conjoined at the base, with the anterior pelvic fin lobe not looking “leg-like” and without distal expansion; disc and tail with denticles and thorns; usually two dorsal fins, low and far posterior on tail; tail moderately stout, caudal fin greatly reduced; snout long without a long anterior filament or leaf-like appendage

..... go to 2

Anacanthobatidae



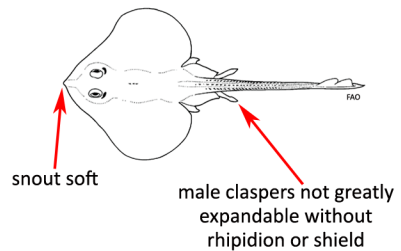
2a. Rostral cartilage reduced, snout soft; clasper glans of adult males not greatly expandable, usually without rhipidion or shield; clasper ventral terminal cartilage spoon-shaped, without a sharp lateral edge and not forming an external clasper shield; clasper dorsal terminal cartilages 2 and 3 arranged in parallel

..... **Arhynchobatidae**

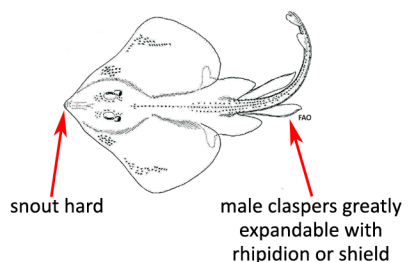
2b. Rostral cartilage stout, snout hard; clasper glans of adult males greatly expandable, with a rhipidion and shield; clasper ventral terminal cartilage not spoon-shaped, with a sharp lateral edge that forms the shield; clasper dorsal terminal cartilages 2 and 3 arranged in series

..... **Rajidae**

Arhynchobatidae



Rajidae



FAMILY ANACANTHOBATIDAE

VON BONDE & SWART, 1924. SMOOTH SKATES.

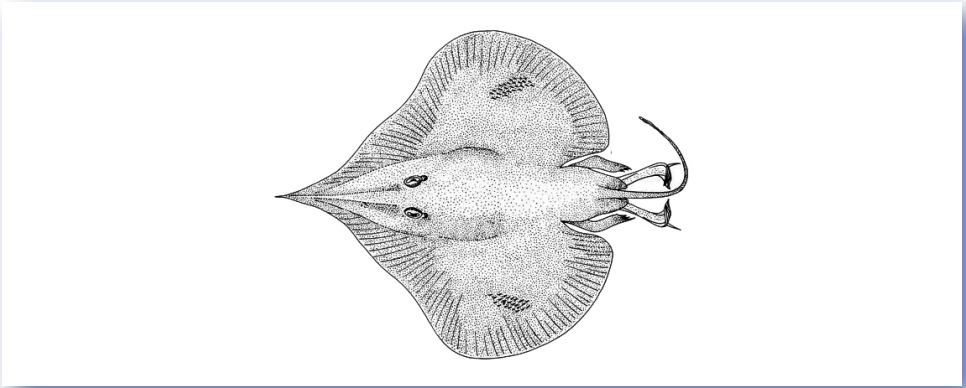
Members of this family are very similar in external form and often regarded as a subfamily of the Rajidae. Smooth skates are characterized in having a smooth or naked body, *i.e.*, disc and tail without dermal denticles (except for alar spines in males), hence their name, from Greek *an* meaning “without”, *acantha* meaning “thorn”, and *bathys* meaning “deep”. Other distinctive features include the following: a large, flat angular or subangular pectoral disc; long and pointed snout, usually with a terminal filament of varying length arising from a small, bluntly rounded protuberance at the tip; five pairs of small, ventral gill slits; expanded nasal flaps not fused medially as nasal curtain; subdivided pelvic fin, anterior lobe formed as slender “legs” with expanded distal “feet”; slender tail, a bit shorter than disc, no dorsal fins, without sting, but with membranous caudal fin.

At least 10 species in two genera are known globally and only one species is confirmed present in the Philippines (*i.e.*, *Sinobatis borneensis* or Borneo legskate). Some authors consider this species as a con-specific with Blackbodied leg skate *S. melanosoma* (Chan, 1965), with which it is often confused. They are bottom dwelling fishes found on the continental slopes of tropical and subtropical waters.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Sinobatis borneensis** (Chan, 1965). Borneo legskate.

* Taxonomic work on the species resulted to a genus change from *Anacanthobatis* to *Sinobatis*.

BORNEO LEGSKATE***Sinobatis borneensis*** (Chan, 1965)Other Names: *pagi* (local)

FAO

Size:

To at least 39.9 cm; males mature at about 26 cm.

Distinguishing features:

A small thin-disc deep-water skate with a pale greyish-brown body, paler underside; snout broad and long with rostral filament; eyes small further away from snout; pelvic anterior lobe leg-like and completely separate from posterior lobe; pelvic posterior lobe fused with slender tail.

References:

Last *et al.* 2010; Compagno *et al.* 2005; Last & Compagno 1999; McEachran & Dunn 1998.

FAMILY ARHYNCHOBATIDAE

FOWLER, 1934. SOFTNOSE SKATES.

Members of this family are very similar in external form and often regarded as a subfamily of the Rajidae. Softnose skates are distinct in having a slender reduced rostral cartilage and flexible or “soft” snout (Rajidae have a firm or “hard” snouts, with a stout rostral cartilage) but without a terminal filament at the tip. Other distinctive features include the following: a large, broad, flat rhomboidal or heart-shaped pectoral disc; with dermal denticles on dorsal surface of disc, snout, orbits, shoulders and tail (but less spinous than Rajidae); relatively shorter snout (as compared with Anacobanthidae); five pairs of small, ventral gill slits; expanded nasal flaps separated medially forming a nasal curtain; pelvic fin lobes fused or conjoined at the base, with the anterior pelvic fin lobe not looking “leg-like” and without expanded distal “feet”; usually two dorsal fins; slender tail, a bit longer than disc, without stinging spine, caudal fin small, rudimentary.

Globally, at least 94 species belonging to nine genera are known. At least two species (*i.e.*, the velvet skate *Insentiraja subtilispinosa* and the Sulu sea skate *Okamejei jensenae*) are confirmed present (but no species account is made available). Shape differences are reported to be evident among populations of the velvet skate across its range and further investigation has been recommended (Last & Compagno 1998). The Sulu sea skate is recently described and was referred to as the Philippine ocellate skate *Okamejei* sp. 1 in Compagno *et al.* (2005), possibly endemic. There are nominal records of four other species but their occurrence in the Philippines remain questionable and need further investigation: Black sand skate *O. boesemani*, Yellow-spotted skate *O. hollandi*, Spiny rasp skate *O. kenojei*, and Bigeye skate *O. meerdervoortii*.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- N *Insentiraja subtilispinosa* (Stehmann, 1989). Velvet skate.
- ? *Okamejei boesemani* (Ishihara, 1987). Black sand skate.
- ? *Okamejei hollandi* (Jordan & Richardson, 1909). Yellow-spotted skate.
- N *Okamejei jensenae* Last & Lim, 2010. Sulu Sea skate.
- ? *Okamejei kenojei* (Müller & Henle, 1841). Spiny rasp skate.
- ? *Okamejei meerdervoortii* (Bleeker, 1860). Bigeye skate.

FAMILY RAJIDAE

BLAINVILLE, 1816. HARDNOSE SKATES.

Hardnose skates are distinct in having a firm or “hard” snouts, with a stout rostral cartilage (Arhynchobatidae have slender reduced rostral cartilage and flexible or “soft” snout) but without a terminal filament at the tip. Other distinctive features include a large, broad, flat rhomboidal or heart-shaped pectoral disc; with dermal denticles on dorsal surface of disc, snout, orbits, shoulders and tail (more heavily spinouse than arhynchibatids; relatively shorter snout (as compared with Anacobanthidae); five pairs of small, ventral gill slits; expanded nasal flaps separated medially forming a nasal curtain; pelvic fin lobes fused or conjoined at the base, with the anterior pelvic fin lobe not looking “leg-like” and without expanded distal “feet”; usually two dorsal fins; slender tail, a bit longer than disc, without stinging spine, caudal fin small, rudimentary.

Globally, at least 168 species belonging to 13 genera are known in this family. At least three species are confirmed present (only one the Ridgeback skate *Dipturus amphispinus*, a newly described species, is provided with a species account) while two more are potentially new, still undescribed, possibly endemics. The genus *Dipturus* is in need of a taxonomic revision (Last *et al.* 2008). The Ridgeback skate *D. amphispinus* is the Philippine longnose skate *Dipturus* sp. 1 referred to in Compagno *et al.* 2005.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Dipturus amphispinus* Last & Alava, 2013. Ridgeback skate.
- N *Dipturus gigas* Ishiyama, 1958. Giant skate.
- N *Dipturus tengu* (Jordan & Fowler, 1903). Goblin skate.
- U *Dipturus* sp. 2. Philippine skate.
- U *Dipturus* sp. 3. Seret’s Philippine skate.

RIDGEBACK SKATE

Dipturus amphispinus Last & Alava, 2013

Other Names: Philippine longsnout skate, Titled thorn skate (English);
pagi (local)

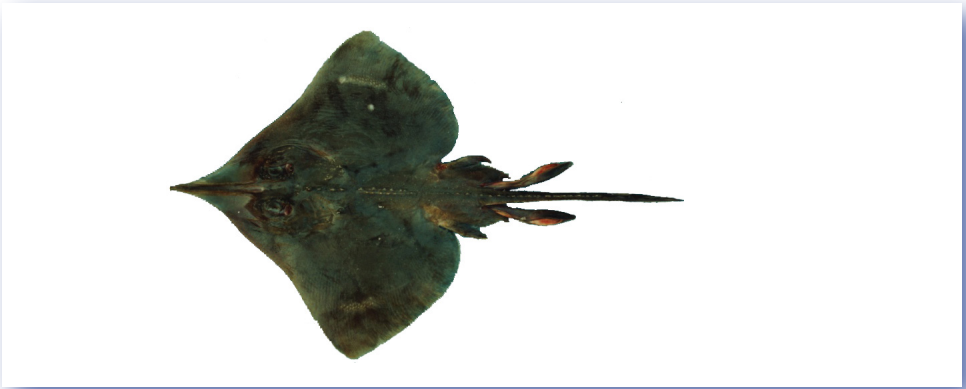


Photo by JPA Gaudiano/Silliman University (JPAG 078).

Size:

Males to at least 66.6 cm; females to at least 88.3 cm.

Distinguishing features:

A small thin-disc skate with a pale greyish-brown body, paler underside; distinct in having two prominent and variably-defined rows of strongly tilted thorns forming a ridge on the median disc (Greek “*amphi*” meaning on both sides or double and the Latin “*spinus*” meaning thorn) and well-developed scapular thorns on each side of the disc; eyes small further away from snout; pelvic anterior lobe leg-like and completely separate from posterior lobe; pelvic posterior lobe fused with slender tail.



Ventral view of head.
(JPAG 078).

References:

Last & Alava 2013; Last *et al.* 2008; Compagno *et al.* 2005; Luchavez-Maypa *et al.* 2001; Last & Compagno 1999.

SUBORDER RHINOBATOIDEI GARMAN, 1913. GUITARFISHES.

FAMILY RHINOBATIDAE MÜLLER & HENLE, 1837. GUITARFISHES.

The suborder is represented by a single family (Rhinobatidae). Members have the body form intermediate between that of shark (*e.g.*, by having shark-like fins) and a skate (with pectoral fins attached to the head). Similar looking families include the wedgefishes (Family Rhynchobatidae) and the shark rays (Family Rhinidae).

Rhinobatids or guitarfishes are small to medium-sized rays with variably-shaped discs from oval to wedge-shaped or shovel-shaped. They have two small dorsal fins with 1st dorsal fin originating behind pelvic fins; moderately large pectoral fins originating in front of nostrils, its free rear tips ending opposite or posterior to pelvic fin origins; a long broad and flattened tail, without a sting, but posterior margin straight; caudal fin with a well-developed upper lobe but without a ventral lobe. Its mid-dorsal line, shoulders, eyes and sometimes on snout with smaller thorns or dermal denticles, mouth with numerous, small blunt teeth, nostrils with or without an internasal flap, and with spiracular folds. They are ovoviviparous with fully developed young at birth. They feed on bottom organisms, including molluscs and crustaceans, but will also take small fishes.

At least 48 species in five genera are known globally. Only one species (*i.e.*, the Giant shovelnose ray *Glaucostegus typus*) is confirmed present in the Philippines. One other species, *i.e.*, the Sharpnose guitarfish *G. granulatus*, an Indian Ocean species, is often confused with *G. typus* and need validation. A third species, *i.e.*, the Halavi guitarfish *G. halavi* is likely a misidentification.

Guitarfishes referred to as *Rhinobatos schlegelii* Müller & Henle comprise a species complex in the Indo-Pacific. The Philippine guitarfish is recently described by Last *et al.* (2014) as *Rhinobatos whitei*. Initially referred to as *Rhinobatos cf. schlegelii* in Compagno *et al.* (2005), this species is now established as not conspecific to *R. schlegelii*. The presence of Taiwan guitarfish *R. formosensis* recorded off Manila Bay needs further validation.

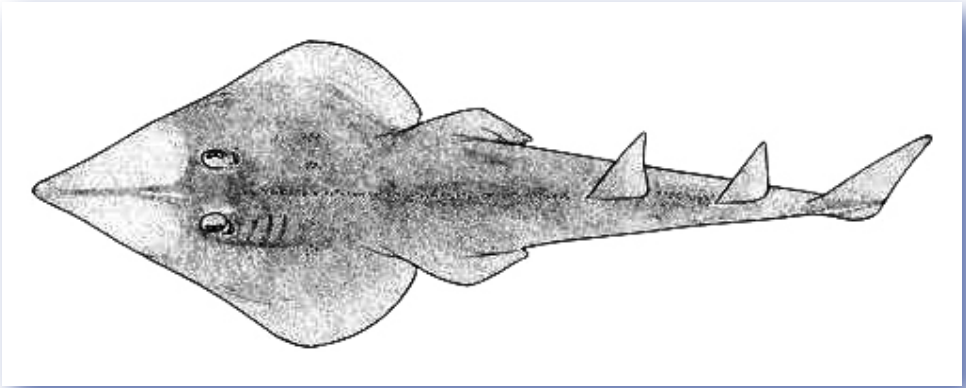
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Glaucostegus granulatus* (Cuvier, 1829). Sharpnose guitarfish.
- ? *Glaucostegus halavi* (Forsskål, 1775). Halavi guitarfish.
- ✓ *Glaucostegus typus* (Bennett, 1830). Giant shovelnose ray.
- ? *Rhinobatos formosensis* Norman, 1926. Taiwan guitarfish.
- ? *Rhinobatos schlegelii* Müller & Henle, 1841. Brown guitarfish.
- N *Rhinobatos whitei* Last, Corrigan and Naylor, 2014. Philippine guitarfish.

GIANT SHOVELNOSE RAY

Glaucostegus typus (Anonymous [Bennett], 1830)

Other Names: Bennet's shovelnose guitarfish, Common shovelnose ray (English); *pating* (local)



FAO

Size:

To at least 270 cm.

Distinguishing features:

A large shovelnose ray with brown to light back and white undersides, without diagonal and transverse bands and without an angular marking behind the eyes; snout pale, narrow-tipped, not expanded into a club-like knob, and more acutely angular, with preoral length 2.6 to 3.3 times mouth width; nostrils diagonal, greatly expanded, width 0.8 to 1.0 times mouth width, 2.2 to 2.4 times internarial space; spiracles with a pair of narrow folds on their posterior margins.

References:

Compagno *et al.* 2005; Last & Compagno 1999; Last & Stevens 1994.

SUBORDER RHINOIDEI MCEACHRAN, DUNN & MIYAKE, 1996. SHARK RAYS.

FAMILY RHINIDAE MÜLLER & HENLE, 1841. SHARK RAYS.

The suborder is represented by one family with one species, the shark ray, *Rhina ancylostoma*. Distinctive features are: two large shark-like dorsal fins (*i.e.*, falcate or sickle-shaped); a broad and rounded snout; a deep indentation separating head from pectoral fin origin on each side; caudal fin with a strong ventral lobe; thick prominent ridges in front of eyes; mid dorsal line and shoulders covered with large triangular thorns, dermal denticles, or spines.

The family is closely associated with the guitarfishes of the genus *Rhynchobatus* (Family Rhynchobatidae). Some authors lump *Rhina* and *Rhynchobatus* into a single family (*i.e.*, family Rhinidae of the order Rhinobatiformes). Morphologically, genus *Rhina* is similar to the genus *Rhynchobatus* in having large shark-like fins. *Rhynchobatus*, however, has a more angular and wedge-shaped snout, rostral ridges and spiracular folds, among others.

Family Rhinobatidae (guitarfishes) is also similar to Rhinidae (sharks rays) but its body is less thick and less shark-like; dorsal fins smaller, with 1st dorsal surface plain without spots or ocelli; pectoral fin origin in front of nostrils, its free rear tips posterior to the pelvic fin origins.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Rhina ancylostoma* Bloch & Schneider, 1801. Shark ray.

SHARK RAY

Rhina ancylostoma Bloch & Schneider, 1801

Other Names: Bowmouth guitarfish, Mud skate (English); *anonan* (local)



Photos by: JAT Utzurum.

Size:

To at least 300 cm; born at 45 cm.

Distinguishing features:

A large and heavily built batoid with a wide and thick body, bluish to brownish grey above and white below; numerous white spots scattered over body, fins and tail; a white-edged black marking above each pectoral fin, and two dark transverse bands atop the head between the eyes; black spots on head and shoulders but no eyespots or ocelli; short, wide, and flattened head with an evenly rounded snout; medium-sized eyes and large spiracles, subterminal mouth forms a W-shaped undulating line; long nostrils transversely oriented with well-developed skin flaps on anterior margins; teeth low and blunt with ridges on the crown, arranged in winding bands of around 47 upper and 50 lower tooth rows.



Ventral view of head.
Photo by: T. Dacles.



Jaw of *R. ancylostoma*.
Photo by: JPA Gaudiano/Silliman University (JPAG 171).

References:

Compagno *et al.* 2005; Last & Compagno 1999.

SUBORDER RHYNCHOBATOIDEI MCEACHRAN, DUNN & MIYAKE, 1996. WEDGEFISHES.

FAMILY RHYNCHOBATIDAE GARMAN, 1913. WEDGEFISHES.

The suborder is represented by a single family, members of which have the body form intermediate between that of a shark (*e.g.*, by having shark-like fins) and a skate (with pectoral fins attached to the head). Wedgefishes have large falcate or sickle-shaped fins, angular and wedge-shaped head but without indentation separating it from pectoral fin origin on each side; mid dorsal line, shoulders, eyes and sometimes on snout with smaller thorns or dermal denticles; and spiracular folds. They are ovoviviparous with their young born fully developed. They feed on bottom organisms, including molluscs and crustaceans, but will also take small fishes.

Rhynchobatids or wedgefishes are similar to the guitarfishes (Family Rhinobatidae), with some authors ascribing them as a subfamily Rhynchobatinae of the family Rhinobatidae. Rhynchobatids are distinct from rhinobatids in having an overlapping pectoral and pelvic fins and a caudal fin with a well-developed ventral lobe, a mouth with numerous, small blunt teeth, nostrils without an internasal flap, and having spiracular folds.

Wedgefishes are also closely associated with the shark rays (Family Rhinidae). Some authors lump genus *Rhynchobatus* and genus *Rhina* into a single family (*i.e.*, family Rhinidae of the order Rhinobatiformes). *Rhina*, however, has a more broad and rounded snout, thick prominent ridges in front of eyes, deep indentations separating head from pectoral fin origins, its mid dorsal line and shoulders are covered with dermal denticles, and has a well-developed caudal fin.

Of the six species known globally, at least one species is confirmed present in the Philippines (*i.e.*, the Whitespotted wedgefish *Rhynchobatus australiae*). Two more species need confirmation: a species close to the Smoothnose wedgefish *R. laevis* (Bloch & Schneider, 1801) which is nominally listed based on its occurrence in the region, and an undescribed species, *i.e.*, the Broadnose wedgefish *Rhynchobatus* sp. 2, which is generally mistaken for the Western Indian Ocean Giant guitarfish *Rhynchobatus djiddensis*.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Rhynchobatus australiae* Whitley, 1939. Whitespotted wedgefish.
- ? *Rhynchobatus laevis* (Bloch & Schneider, 1801). Smoothnose wedgefish.
- U *Rhynchobatus* cf. *laevis* (Bloch & Schneider, 1801). Smoothnose wedgefish.
- U *Rhynchobatus* sp. 2 Last & Compagno (1999). Broadnose wedgefish.

WHITESPOTTED WEDGEFISH

Rhynchobatus australiae Whitley, 1939.

Other Names: Whitespotted guitarfish, Whitespotted shovelnose ray, Giant guitarfish (English)



Photo by: JPA Gaudiano/Silliman University (JPAG 156).

Size:

To at least 187 cm, probably reaching to 200–300 cm; males mature at about 110–131 cm.

Distinguishing features:

A large wedgefish brownish grey above and white below; white spots on sides of body, around two black spots on head; a distinctly shovel-shaped snout, constricted in front of tip; anterior horn of antorbital cartilage short and ending posterior to front edges of nasal capsules; 1st dorsal fin origin well behind pelvic-fin origins, by a distance about 1.5 to 2.5% of total length.



Ventral view of head.
(JPAG 156).

References:

Last *et al.* 2010; Compagno *et al.* 2005; Last & Compagno 1999.

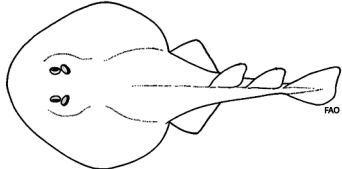
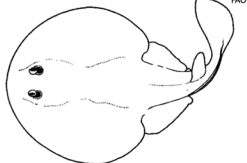
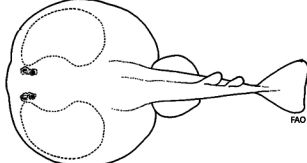
SUBORDER TORPEDINOIDEI

GILL, 1893. ELECTRIC RAYS.

Members of this suborder are characterized with a pair of large kidney-shaped electric organs which were developed from branchial muscles and located on either side of the head behind the eyes and at the base of the fin radials that is visible through the skin. Electric organs are normally used to stun small prey fishes and/or crustaceans but in large specimens can give a severe jolt. Most species are similar in appearance, having a broadly oval or subcircular disc with a reduced rostrum which is, truncate or wedge-shaped. They have small eyes, a small mouth, with or without strong labial cartilage, slender jaws, five gill openings, 0–2 dorsal fins, no anal fin, a stout shark-like tail, without stinging spines; caudal fin large but not shark-like, a soft and loose skin, without dermal denticles or thorns. They are viviparous, with their young hatching inside the uterus and born fully developed. They are benthic and may be found inshore or offshore.

Of the four families in this order, at least three are represented in the Philippines (*i.e.*, the numbfishes of the family Narcinidae, sleeper rays of the family Narkidae and torpedo rays of the family Torpedinidae). Not recorded is the Family Hypnididae (coffin rays) which is known only in Australia.

FAMILIES OF TORPEDINOIDEI OCCURRING IN THE PHILIPPINES

<p>1. Family Narcinidae Gill, 1862. Numbfishes.</p>	
<p>2. Family Narkidae Fowler, 1934. Sleeper Rays.</p>	
<p>3. Family Torpedinidae Bonaparte, 1838. Torpedo rays.</p>	

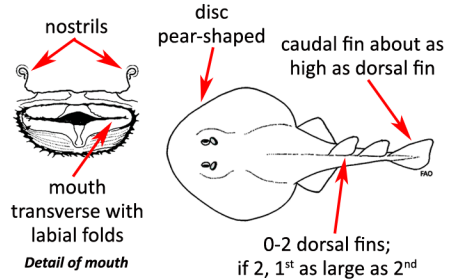
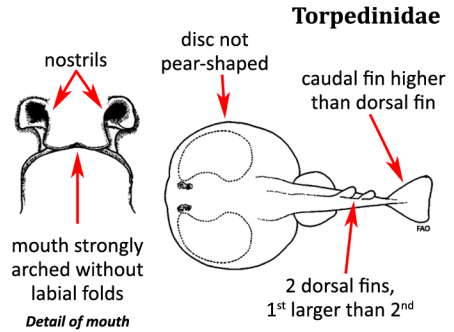
KEY TO FAMILIES OF THE SUBORDER TORPEDINOIDEI
REPORTED TO OCCUR IN THE PHILIPPINES

1a. Mouth broadly arcuate, bowllike, without labial folds and cartilages at ends; two dorsal fins, the 1st much larger than the 2nd; disc truncate anteriorly, transversely elliptical, not pear-shaped; tail not greatly reduced, caudal fin much higher than dorsal fin

..... **Torpedinidae**

1b. Mouth nearly transverse, with strong labial folds and cartilages at corners; 0–2 dorsal fins, when 2 are present, the 1st as large as the 2nd; disc longitudinally pear-shaped; tail greatly reduced, caudal fin about as high as dorsal fin

..... go to 2

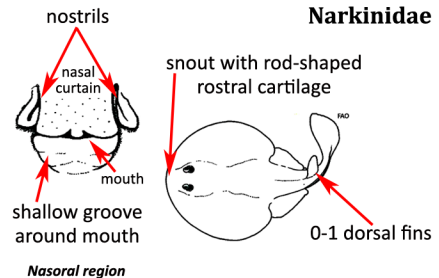
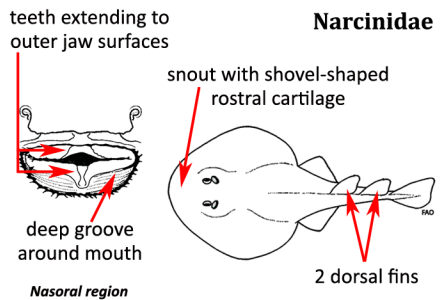


2a. Snout with a broad, stiff, shovel-shaped rostral cartilage, readily felt by palpitation of the snout; a deep groove around mouth; teeth extending onto outer surfaces of upper and lower jaws in most species; two dorsal fins present

..... **Narcinidae**

2b. Snout with a narrow, rod-shaped rostral cartilage; a shallow groove around mouth; teeth not extending onto outer surfaces of upper and lower jaws; with a single fin dorsal fin (*Narke*) or none (*Temera*)

..... **Narkinidae**



FAMILY NARCINIDAE

GILL, 1862. NUMBFISHES.

Numbfishes, as with other members of the subfamily Torpedinoidei (*e.g.*, torpedo rays of the family Torpedinidae and sleeper rays of the family Narkidae), are characterized in having a pair of large kidney-shaped electric organs located at the base of the pectoral fins, on either side of the head. Additional similarities include small eyes, reduced rostrum, small mouth, slender jaws, no anal fin, stout shark-like tail, no stinging spines, and soft, loose and smooth skin.

Numbfishes are distinct in having a combination of characters such as: a less truncated and longer, more rounded snout that is supported by a broad, shovel-shaped rostral cartilage; an oval, rounded to shovel-shaped disc, with length equal or longer than its tail length; a transverse and narrow mouth, with strong labial folds and cartilages at corners and surrounded by a deep groove; two dorsal fins on tail, close together, with the 1st as large as the 2nd and originating partly over or behind the pelvic fin base; a relatively long and broad tail; and a caudal fin about as large as the pelvic fins.

Globally, at least 34 species belonging to three genera are reported. Four species are nominally listed in the Philippines (*i.e.*, the Chinese numbfish *Narcine lingula*, the Darkfinned numbfish *N. maculata*, the Spotted numbfish *N. timlei*, and the Myanmar-Philippine form *Narcine* sp. H). Only one species, the Chinese numbfish *N. lingula*, is confirmed present while the two others (*i.e.*, *N. maculata* and *N. timlei*) are possibly misidentifications and may have been confused with *N. lingula* or with the fourth species which is still undescribed, *Narcine* sp. nov.

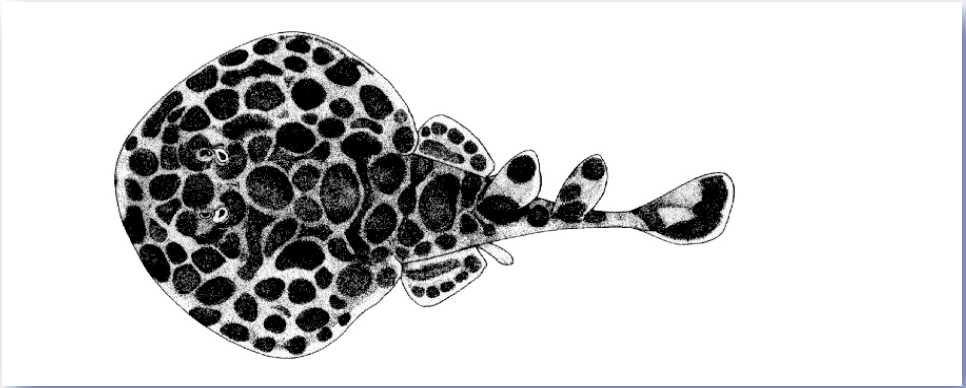
LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Narcine lingula* Richardson, 1846. Chinese numbfish.
- ? *Narcine maculata* (Shaw, 1804). Darkfinned numbfish.
- ? *Narcine timlei* (Bloch & Schneider, 1801). Spotted numbfish
- U *Narcine* sp. nov. H. de Carvalho, 1999. Darkfin numbfish.

CHINESE NUMBFISH

Narcine lingula Richardson, 1846

Other Names: Rough numbfish, Rough electric ray (English); *pating* (local)



FAO

Size:

To at least 33 cm; males and females mature at 24 and 27 cm and 25 cm, respectively.

Distinguishing features:

The Chinese numbfish is characterized by having numerous spots and blotches on back; undersides of pelvic and pectoral fins not dark edged; two similar-sized dorsal fins, 1st dorsal fin begins over posterior ends of pelvic fins; disc subcircular to oval, thick and flabby; eyes not embedded in skin; mouth subequal to or only slightly narrower than width between lateral edges of nostrils exposed part of tooth bands in jaws relatively narrow

References:

Last *et al.* 2010; Compagno *et al.* 2005; de Carvalho and Randall 2003; de Carvalho *et al.* 1999.

FAMILY NARKIDAE

FOWLER, 1934. SLEEPER RAYS.

The sleeper rays used to be classified as a subfamily Narkinae of the family Narkidae. It has been elevated into a family rank. As with other members of the subfamily Torpedinoidei (*e.g.*, numbfishes of the family Narcinidae and torpedo rays of the family Torpedinidae), sleeper rays are characterized in having a pair of large kidney-shaped electric organs located at the base of the pectoral fins, on either side of the head. Additional similarities include small eyes, reduced rostrum, small mouth, slender jaws, no anal fin, stout shark-like tail, no stinging spines, and soft, loose and smooth skin.

Sleeper rays are distinct in having a combination of characters such as: a shorter, broadly rounded snout that is supported by a narrow, rod-shaped rostral cartilage; an oval, rounded to pear-shaped disc, with length slightly longer than its tail length; a transverse straight and very narrow mouth, with strong labial folds and cartilages at corners and surrounded by a shallow groove; 0–1 dorsal fin, when present, the dorsal fin originates over or behind the pelvic fin base; a relatively long and broad tail; and a caudal fin which is much larger than the dorsal fin (when present) but subequal in size to the pelvic fins.

Globally, at least 14 species belonging to five genera are reported. Only two species in two genera (*i.e.*, *Narke* – one single dorsal fin and *Temera* – no dorsal fin) are nominally listed in the Philippines but records are uncertain and needs further validation.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Narke dipterygia* (Bloch & Schneider, 1801). Spottail sleeper ray.
- ? *Temera hardwickii* (Bloch & Schneider, 1801). Finless sleeper ray.

FAMILY TORPEDINIDAE

BONAPARTE, 1838. TORPEDO RAYS.

Torpedo rays, as with numbfishes (family Narcidae) and sleeper rays (family Narkidae), are distinct in having a pair of large kidney-shaped electric organs located on either side of the head. Additional similarities include small eyes, reduced rostrum, small mouth, slender jaws, no anal fin, and stout shark-like tail, no stinging spines, and soft, loose and smooth skin.

Torpedo rays generally differ from numbfishes and sleeper rays in having a combination of characters such as: a more truncated snout; a transversely elliptical disc with its length and width longer than its tail length; a strongly arched mouth but without labial folds, cartilages at ends, nor grooves around it; two dorsal fins on tail, close together, with the 1st much larger than the 2nd and originating partly over the pelvic fin base; a tail shorter than disc; and a caudal fin much larger than the dorsal fins, subequal in size to pelvic fins and usually with lateral skin folds.

Globally, at least 30 species belonging to one genus are reported. In the Philippines one species, the Spotted torpedo *Torpedo marmorata*, is nominally listed but needs to be confirmed. Two potentially new endemic species are reported to occur and need to be described. (*i.e.*, the Philippine spotted torpedo *Torpedo* sp. 1 and the Philippine offshore torpedo *Torpedo* sp. 2). No species account is available for these three species.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ? *Torpedo marmorata* Risso, 1810. Spotted torpedo.
- U *Torpedo* sp. 1. Philippine spotted torpedo.
- U *Torpedo* sp. 2. Philippine offshore torpedo.

6 CHIMAERAS

SUBCLASS HOLOCEPHALII

MÜLLER, 1835

ORDER CHIMAERIFORMES

GARMAN, 1877. MODERN CHIMAERAS OR SILVER SHARKS.

FAMILY CHIMAERIDAE

BONAPARTE, 1831. SHORTNOSE CHIMAERAS.

Chimaeras, also known as ratfishes, ghost sharks or silver sharks, are distinct for the following features: one gill opening on each side of head; prominent, large eyes but without spiracles; short rounded snout; a well-developed lateral line system of mucous canals and sensory pores on head and sides of the body and tail; a small ventral mouth connected to nostrils by a pair of deep grooves; two pairs of beak-like teeth on upper jaw and one pair in the lower jaw protruding from the mouth like a rat's incisors; broad, leaf-shaped pectoral fins, with external fin web supported by fin rays; two dorsal fins, the 1st is triangular and erect with a slender, toxic spine while the 2nd is long and spineless, almost connected to caudal fin lobe; an elongated and tapering tail, with nearly equal sized dorsal and ventral lobes, often with a long terminal filament; anal fin may be present or absent; a naked skin, except for a few dermal denticles on back and along lateral-line canals of some species, on claspers and accessory appendages (= tentaculum) of males. In mature males, tentacula are present on head and pre-pelvic area.

Globally, at least 44 species belonging to six genera and three families (*i.e.*, Family Callorhynchidae or elephant fishes; Family Rhinochimaeridae or longnose chimaeras and Family Chimaeridae or shortnose chimaeras) are known. In the Philippines, only Family Chimaeridae is known to occur, represented by at least three species in two genera, *Chimaera* and *Hydrolagus*. The two genera are differentiated from each other by the presence (*i.e.*, *Chimaera*) or absence (*Hydrolagus*) of an anal fin. The systematics of these groups need further attention. *Hydrolagus deani*, formerly recognized as an endemic Philippine species, is now considered a synonym of the Japanese *H. mitsukurii*. One other species, *Hydrolagus* sp. 1, may be new to science, possibly an endemic, and requires further taxonomic work.

LIST OF SPECIES REPORTED TO OCCUR IN THE PHILIPPINES:

- ✓ *Chimaera phantasma* Jordan & Snyder, 1900. Silver chimaera.
- N *Hydrolagus mitsukurii* (Jordan & Snyder, 1904). Mitsukurii's chimaera.
- U *Hydrolagus* sp.1. Philippines reticulate chimaera

SILVER CHIMAERA***Chimaera phantasma*** Jordan & Snyder, 1900

Other Names: Ghost shark (English)



Photo by: JPA Gaudiano/ Silliman University (JPAG 080).

Size:

To at least 110 cm; males and females mature at 50 cm.

Distinguishing features:

The species has a silver body with poorly defined dark longitudinal stripes along its sides; snout blunt, fleshy and short; 1st dorsal-fin spine long, extending to near or beyond fin apex; 2nd dorsal fin dusky with a darker outer margin; tail whip-like; anal fin present, separated from caudal fin by a narrow notch. It is distinguished from all other members of the genus by a lateral line canal that is undulated along the entire length of the trunk as well as having preopercular and oral lateral line canals originating separately from the infraorbital canal with their origins separated by a distinct space.

Side view of head.
(JPAG 080).Ventral view of head.
(JPAG 080).Side view of head.
(JPAG 080).**References:**

Last *et al.* 2010; Compagno *et al.* 2005; Yano *et al.* 2005; Luchavez-Maypa 2001; Didier 2003; Compagno 1999.

GLOSSARY

acute	sharp or pointed	crescentic	shaped like the new moon (roughly C-shaped)
adpressed	pressed flat against the body	crustaceans	group of invertebrate animals including crabs, shrimps, prawns, lobsters and crayfish
alar thorns	paired patches of thorns on the outer disc of mature male skates	cuspl	a projection on a tooth
angular	forming a distinct angle	cusplet	a small cuspl
anterior	relating to front of or head end part of an object	denticles	a small, tooth-like structure; plate-like scale of a cartilaginous fish
antorbital	the region of the front of the orbit	depressed	flattened dorsoventral from top to bottom (compare with compressed)
barbel	a slender, tentacle-like sensory structure on the head	depth	height of body or head from top to bottom; also distance from sea surface to the bottom
benthic	living on the bottom of the ocean	dermal	relating to the skin
bilobate	having two lobes	dermal flaps	outgrowths of skin
blotch	an enlarged are or patch that is different in colour to adjacent areas	diphycercal	caudal fin shape which is primitively symmetrical or pointed
brackish	waters with a salinity between that of freshwater and saltwater	direct length	shortest distance between two points
buccal	pertaining to the mouth	disc	the combined head, trunk and enlarged pectoral fins of those cartilaginous fishes with depressed bodies (<i>e.g.</i> , stingrays)
bycatch	component of the catch excluding targeted commercial fishes	distal	region, border or point remote from the site of attachment (opposite of proximal)
cartilage	a skeletal material consisting of a matrix of soft, white or translucent chondrin	dorsal	relating to upper part or surface of back
caudal filament	fine, flexible extensions of the caudal fin tip of chimaeras	dorsolateral	positioned or orientated between dorsal and lateral surfaces
caudal fin	the tail fin	dusky	slightly dark or greyish in color
caudal keel	a longitudinal fleshy material ridge alongside of the caudal peduncle	elasmobranchs	a subgroup of cartilaginous or chondrichthyan fishes including sharks, skates and rays
caudal peduncle	the posterior part of the body supporting the caudal fin	electric organ	organ capable of delivering a mild electric shock
cephalic lobe	broad lobe on forehead of some rays	elongate	extended in length in relation to another object or drawn out
chevron	a V-shaped pattern of adjoining lines	embedded	within surrounding tissue
chondrichthyans	group of fishes characterized by a cartilaginous skeleton; includes sharks, skates, rays and chimaeras	endemic	native and restricted to a certain area
chondrin	a horny, gelatinous protein substance that forms the matrix of cartilage	epipelagic	upper part of the oceanic zone from the surface to about 200 m
circumglobal	distributed around the world within a certain latitudinal range	estuaries	partially enclosed body of water along the coast where freshwater from rivers and streams meets and mixes with salt water from the sea
circumnarial	around the nostrils	estuarine	living mainly in estuaries
circumnarial fold	a skin fold around the nostrils. Also called perinasal groove or circumnarial groove.	falcate	curved like a sickle
claspers	modified portions of pelvic fins in male chondrichthyans used for transferring sperm to female during mating	family	a group term for classifying organisms, containing one or more closely related genera
cloaca	a common opening for digestive, urinary and reproductive tracts (also called vent)	fauna	the communities of animals in an area
common name	the informal name for an animal, which often varies from place to place	fertilization	the union of male and female cells to form a new individual
compressed	flattened laterally from side to side (compare with depressed)	filter feeding	filtering food particles from the water by means of the gill rakers
concave	curved inwards (opposite of convex)	fin	an external membranous appendage of a fish used in propelling, steering, or balancing the body in the water
convex	arched, curved outwards (opposite of concave)		
crenulate	margins shaped into small rounded scallops		

fusiform	spindle-shaped, tapering at both ends	median	relating to the middle of an object
genus	a group term for classifying organisms, containing one or more related species	mouth	opening through which food enters the alimentary canal
gestation	the period of development in the uterus from conception until birth	mucous canal	part of the sensory network of the head of chimaeras
gill	organ for breathing or extracting oxygen from water	multicuspid	a tooth or denticle with several cusps
gill chambers	chambers holding the gills to store water for breathing	naked	skin smooth, without denticles or thorns
gill slit (gill opening)	an opening (usually slit-like in cartilaginous fishes) on head that connects the gill chambers to the exterior	nape	region of head above and behind eyes
granulations	fine denticles	narial	see nostrils
hammer-shaped	shaped with paired lateral expansions, like the head of a hammer or mallet	nasal curtain	see internasal flap
head	specialized anterior part of an animal on which the mouth and major sensory organs are located, part other than body and tail	nasoral grooves	furrow connecting mouth to the nostrils
head clasper	small appendage on the forehead of mature male chimaeroid fishes	nasoral region	region around the nostrils and the mouth
holotype	the specimen used in the original description of a species	nictitating eyelid	a transparent, moveable membrane or inner eyelid that protects eye
hyomandibular	refers to both to the hyoidean arch and the mandible or lower jaw; as, the hyomandibular bone or cartilage, a segment of the hyoid arch which connects the lower jaw with the skull in fishes	nomenclature	the systemic naming of animals and plants
hyomandibular pores	line of enlarged pores extending posteriorly from the mouth corners	nostril	external opening of the nasal organs
infraorbital	area below the eye	nuchal	pertaining to the nape
interdorsal	space on dorsal surface between 1 st and 2 nd dorsal fins	obtuse	broadly rounded or having a blunt end
interdorsal ridge	ridge of skin between dorsal fins	oceanic	living in the open ocean
interdorsal space	distance between the dorsal fins	ocellus (pl. ocelli)	en eye-like spot or marketing with a marginal ring
internasal flap	fleshy flap extending between nostrils sometimes partly covering the mouth	ocular	relating to the eye
interorbital space	an are on top of head between eyes	oophagy	method of matrotrophic embryonic nutrition in viviparous species where the embryo feed on unfertilized eggs in the uterus
jaws	part of the mouth supporting the teeth	oral	relating to the mouth
keel	a fleshy ridge; usually relates to a skinfold on the caudal peduncle	orbit	bony cavity in skull where eyeball is housed
labial	pertaining to the lips	papillae	a small fleshy projection
labial furrows	shallow grooves around the lips	pearl thorn	nuchal thorn of stingrays shaped like an embedded pearl
lateral	referring to the sides	pedicel	small stalk, usually of a denticle
lateral ridges	fleshy expansions of sides of the body	peduncle	the narrow part of a fish's body to which the caudal or tail fin is attached
lateral skin fold	fine fold of skin along the side of the body	perinasal groove	a skin fold around the nostrils. Also called circumnarial fold or circumnarial groove.
lateral-line canal	part of the sensory network of chimaeras; appearing as a distinct line	plain	uniformly colored, without a contrast in color pattern
life cycle	the generalized history of a species from birth to death	population	a biological unit that represents the individuals of a species living in a certain area
lip	fleshy outer portion of jaws	pore	small secretory or sensory opening
lip groove	see labial furrows	posterior	relating to hind of or rear end of an object
lobe	a rounded outgrowth	precaudal pit	a transverse or longitudinal notch on a caudal peduncle just anterior to origin of caudal fin in some sharks
longitudinal	lengthwise (opposite of transverse)	predator	feeding on other animals
lunate	shaped like a crescent moon	pre-orbital	before (anterior to) the eye
margin	edge or rim	pre-pelvic clasper	small, retractable appendages on each side just forward of the pelvic fins in mature male chimaeroid fishes
		quadrangular	shaped with four distinct edges or margins
		reticulated	divided into a network
		reticulations	markings in a general form of a net
		rhomboidal	diamond-shaped

rostral cartilage	a gristly structure supporting the snout	substrate	the substance forming the bottom of the sea or ocean
rostral teeth	tooth-like projections on the sides of the snout of sawfishes and saw sharks	subterminal	position near but not at end of an object
rostrum (adj. rostral)	a projecting snout	supraorbital crests	enlarged ridges above the eyes
rounded	margin evenly convex	symphysis (adj. symphysial)	relating to the medial junction of either the upper or lower jaws
saddle	a blotch extending across dorsal surface from one side to another	synonym (adj. synonymous)	each of two or more scientific names of the same ran used to denote the same taxon
school	a close aggregation of fish swimming in association with each other	tail	part of the fish between the cloaca and origin of the caudal fin
scientific name	the formal binomial name of an organism consisting of the genus and species; only one valid scientific name exists per species	taxon	any formal taxonomic unit or category or organisms (genus, species, <i>etc.</i>)
scythe-like	shaped like a scythe; long narrowly curved	taxonomy	the science of classification of plants and animals
serrate	saw-like	teeth	hard outgrowths on jaws, used for biting and masticating food
snout	a part of the head in front of the eyes	teleost	large group containing most bony fishes
species	actually or potentially inter-breeding populations that are reproductively isolated from other populations	tendril	a slender, curling barbel
spine	a sharp projecting point	terminal	located at or forming the end of something
spiracle	a respiratory opening behind the eye in sharks and rays	thorn	large denticles on surface of a ray or skate
spiracular fold	fold of skin present on the hind margin of the spiracular openings in some ray species	tip	the extremity of a part of a fish
spot	a regularly shaped or rounded area of a color different to adjacent areas	tooth rows	horizontal rows of teeth in the jaws
squalene	oil produced from the liver of some sharks	total length	longest length of a fish, from snout to tip to upper caudal tip or tail tip
stellate	star-shaped	transverse	directed crosswise, across width (opposite of longitudinal)
stinging spine	large, serrate bony structure on the tail of some rays	trawl net	fishing net which is dragged behind a boat
stripe	a contrasting longitudinal pattern in the form of a line	tricuspid tooth	tooth with three cusps
subcircular	almost circular	trunk	part of fish between head and tail; between 5 th gill slit and cloaca
subequal	almost equal	ventral	relating to the lower part or surface

ANNEX 1

PHILIPPINE CARTILAGINOUS FISH SPECIES IN THE IUCN RED LIST, 2014

(The IUCN Red List 2014 (IUCN Red List URL, 2014) includes 165 cartilaginous fish species that are reported to occur in the Philippines but excludes species that are not evaluated (NE) as yet. The threat status and ranking is based on the IUCN Red List Categories and Criteria Version 2014.2 (www.iucnredlist.org). The presence of some of these species may need confirmation (please refer to the respective family or species accounts). Additional species may be added as levels of threats to the species become better understood.)

No.	Scientific Name	Common Name	Red List Ranking
1	<i>Aetobatus narinari</i>	Spotted eagle ray	NT
2	<i>Aetomylaeus maculatus</i>	Mottled eagle ray	EN A2d+3d+4d
3	<i>Aetomylaeus nichofii</i>	Banded eagle ray	VU A2d+3d+4d
4	<i>Aetomylaeus vespertilio</i>	Ornate eagle ray	EN A2bd+3d+4d
5	<i>Alopias pelagicus</i>	Pelagic thresher	VU A2d+4d
6	<i>Alopias superciliosus</i>	Bigeye thresher	VU A2bd
7	<i>Alopias vulpinus</i>	Common thresher	VU A2bd+3bd+4bd
8	<i>Anoxypristis cuspidata</i>	Knifetooth sawfish	EN A2cd
9	<i>Apristurus herklotsi</i>	Longfin catshark	DD
10	<i>Apristurus longicephalus</i>	Longhead catshark	DD
11	<i>Apristurus platyrhynchus</i>	Borneo Catshark.	DD
12	<i>Atelomycterus marmoratus</i>	Coral catshark	NT
13	<i>Carcharhinus albimarginatus</i>	Silvertip Shark	NT
14	<i>Carcharhinus altimus</i>	Bignose shark	DD
15	<i>Carcharhinus amblyrhynchoides</i>	Graceful shark	NT
16	<i>Carcharhinus amblyrhynchus</i>	Gray reef shark	NT
17	<i>Carcharhinus borneensis</i>	Borneo shark	EN C2a(ii)
18	<i>Carcharhinus brevipinna</i>	Spinner shark	NT
19	<i>Carcharhinus dussumieri</i>	Whitecheek shark	NT
20	<i>Carcharhinus falciformis</i>	Silky shark	NT
21	<i>Carcharhinus hemiodon</i>	Pondicherry shark	CR A2acd; C2a(i)
22	<i>Carcharhinus leucas</i>	Bull shark	NT
23	<i>Carcharhinus limbatus</i>	Blacktip shark	NT
24	<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	VU A2ad+3d+4ad
25	<i>Carcharhinus macloti</i>	Hardnose shark	NT
26	<i>Carcharhinus melanopterus</i>	Blacktip reef shark	NT
27	<i>Carcharhinus sealei</i>	Blackspot shark	NT
28	<i>Carcharhinus sorrah</i>	Spot-tail shark	NT
29	<i>Carcharias taurus</i>	Sand tiger shark	VU A2ab+3d
30	<i>Carcharodon carcharias</i>	White shark	VU A2cd+3cd
31	<i>Centrophorus granulosus</i>	Gulper shark	VU A2abd+3d+4d
32	<i>Centrophorus isodon</i>	Black gulper shark	DD
33	<i>Centrophorus lusitanicus</i>	Lowfin gulper shark	VU A2bd+4bd
34	<i>Centrophorus moluccensis</i>	Smallfin gulper shark	DD
35	<i>Centrophorus squamosus</i>	Leafscale gulper shark	VU A2bd+3bd+4bd
36	<i>Cephaloscyllium fasciatum</i>	Reticulated swellshark	DD
37	<i>Cephaloscyllium isabellum</i>	Draughtsboard shark	LC
38	<i>Cetorhinus maximus</i>	Basking shark	VU A2ad+3d
39	<i>Chiloscyllium indicum</i>	Slender bambooshark	NT
40	<i>Chiloscyllium griseum</i>	Gray bambooshark	NT
41	<i>Chiloscyllium punctatum</i>	Brownbanded bambooshark	NT
42	<i>Chiloscyllium plagiosum</i>	Whitespotted bambooshark	NT
43	<i>Chimaera phantasma</i>	Silver chimaera	DD
44	<i>Cirrhoscyllium exolitum</i>	Barbelthroat carpetshark	DD
45	<i>Dasyatis akajei</i>	Whip stingray	NT
46	<i>Dasyatis bennetti</i>	Bennett's cowtail	DD
47	<i>Dasyatis zugei</i>	Pale-edged stingray	NT
48	<i>Deania calcea</i>	Birdbeak dogfish	LC

No.	Scientific Name	Common Name	Red List Ranking
49	<i>Deania profundorum</i>	Arrowhead dogfish	LC
50	<i>Dipturus gigas</i>	Giant skate	DD
51	<i>Dipturus tenuis</i>	Goblin skate	DD
52	<i>Echinorhinus cookei</i>	Prickly shark	NT
53	<i>Eridacnis radcliffei</i>	Pygmy ribbontail catshark	LC
54	<i>Etmopterus brachyurus</i>	Shorttail lanternshark	DD
55	<i>Etmopterus lucifer</i>	Blackbelly lanternshark	LC
56	<i>Eusphyra blochii</i>	Winghead shark	NT
57	<i>Galeocerdo cuvier</i>	Tiger shark	NT
58	<i>Galeus eastmani</i>	Gecko catshark	LC
59	<i>Galeus sauteri</i>	Taiwan sawtail catshark	DD
60	<i>Galeus schultzi</i>	Dwarf sawtail catshark	DD
61	<i>Glaucostegus typus</i>	Giant shovelnose ray	VU A2bd+3bd+4bd
62	<i>Glaucostegus granulosus</i>	Sharpnose guitarfish	VU A2bd+3d+4d
63	<i>Glaucostegus halavi</i>	Halavi guitarfish	DD
64	<i>Gymnura micrura</i>	Smooth butterfly ray	DD
65	<i>Gymnura poecilura</i>	Longtail butterfly ray	NT
66	<i>Gymnura zonura</i>	Zonetail butterfly ray	VU A2d+3d+4d
67	<i>Halaaelurus maculosus</i>	Indonesian speckled catshark	LC
68	<i>Hemigaleus microstoma</i>	Sicklefin weasel shark	VU A2d+3d+4d
69	<i>Hemipristis elongata</i>	Snaggletooth shark	VU A2bd+3bd+4bd
70	<i>Hemirhamphus leucoperyptera</i>	Whitfin topeshark	EN B1ab(iii,v); C2a(ii)
71	<i>Heptranchias perlo</i>	Sharpnose sevengill shark	NT
72	<i>Heterodontus zebra</i>	Zebra bullhead shark	LC
73	<i>Hexanchus griseus</i>	Bluntnose sixgill shark	NT
74	<i>Hexanchus nakamurai</i>	Bigeyed sixgill shark	DD
75	<i>Hexatrygon bickelli</i>	Sixgill stingray	LC
76	<i>Himantura fai</i>	Pink whipray	LC
77	<i>Himantura gerrardi</i>	Sharpnose whipray	VU A2bd+3bd
78	<i>Himantura granulata</i>	Mangrove whipray	NT
79	<i>Himantura imbricata</i>	Scaly whipray	DD
80	<i>Himantura jenkinsii</i>	Golden whipray	LC
81	<i>Himantura leoparda</i>	Leopard whipray	VU A2cd+3cd+4cd
82	<i>Himantura uarnacoides</i>	Whitenose whip ray	VU A2bcd+3bcd+4bcd
83	<i>Himantura uarnak</i>	Reticulate whipray	VU A2bd+3bd+4bd
84	<i>Himantura undulata</i>	Bleeker's variegated whipray	VU A2cd+3cd+4cd
85	<i>Himantura walga</i>	Dwarf whipray	NT
86	<i>Hydrolagus mitsukurii</i>	Mitsukurii's chimaera	DD
87	<i>Iago garricki</i>	Longnosed houndshark	LC
88	<i>Insentiraja subtilispinosa</i>	Philippine looseskin skate	LC
89	<i>Isistius brasiliensis</i>	Cookiecutter shark	LC
90	<i>Isurus oxyrinchus</i>	Shortfin mako	VU A2abd+3bd+4abd
91	<i>Isurus paucus</i>	Longfin mako	VU A2bd+3d+4bd
92	<i>Loxodon macrorhinus</i>	Slit-eye shark	LC
93	<i>Manta alfredi</i>	Alfred manta	VU A2abd+3bd+4abd
94	<i>Manta birostris</i>	Giant manta	VU A2abd+3bd+4abd
95	<i>Megachasma pelagios</i>	Megamouth shark	DD
96	<i>Mobula eregoodootenkee</i>	Longhorned mobula	NT
97	<i>Mobula japanica</i>	Spinetail mobula	NT
98	<i>Mobula kuhlii</i>	Shortfin devil ray	DD
99	<i>Mobula tarapacana</i>	Chilean devil ray	DD
100	<i>Mobula thurstoni</i>	Smoothtail mobula	NT
101	<i>Mustelus griseus</i>	Spotless smooth-hound	DD
102	<i>Mustelus manazo</i>	Starspotted smooth-hound	DD
103	<i>Myliobatis tobijei</i>	Japanese eagle ray	DD

No.	Scientific Name	Common Name	Red List Ranking
104	<i>Narcine lingua</i>	Chinese numbfish	DD
105	<i>Narcine maculata</i>	Darkfinned numbfish	DD
106	<i>Narcine timlei</i>	Spotted numbfish	DD
107	<i>Narke dipterygia</i>	Spottail sleeper ray	DD
108	<i>Nebrius ferrugineus</i>	Tawny nurse shark	VU A2abcd+3cd+4abcd
109	<i>Negaprion acutidens</i>	Sharptooth lemon shark	VU A2abcd+3bcd+4abcd
110	<i>Neotrygon kuhlii</i>	Bluespotted stingray	DD
111	<i>Okamejei boesemani</i>	Black sand skate	DD
112	<i>Okamejei hollandi</i>	Yellow-spotted skate	DD
113	<i>Okamejei kenoei</i>	Spiny rasp skate	DD
114	<i>Okamejei meerdervoortii</i>	Eastern cowtail stingray	DD
115	<i>Orectolobus japonicus</i>	Japanese wobbegong	DD
116	<i>Orectolobus ornatus</i>	Ornate wobbegong	NT
117	<i>Parmaturus melanobranchus</i>	Blackgill catshark	DD
118	<i>Pastinachus sephen</i>	Cowtail stingray	DD
119	<i>Pentanchus profundicolus</i>	Onefin catshark	DD
120	<i>Platyrrhina sinensis</i>	Fanray	VU A4bcd
121	<i>Plesiobatis daviesi</i>	Deepwater stingray	LC
122	<i>Prionace glauca</i>	Blue shark	NT
123	<i>Pristiophorus japonicus</i>	Japanese sawshark	DD
124	<i>Pristis pectinata</i>	Smalltooth sawfish	CR A2cd
125	<i>Pristis pristis</i>	Largetooth Sawfish	CR A2cd
126	<i>Pristis zijsron</i>	Green sawfish	CR A2cd
127	<i>Pseudocarcharias kamoharai</i>	Crocodile shark	NT
128	<i>Rhina ancylostoma</i>	Shark ray	VU A2bd+3bd+4bd
129	<i>Rhincodon typus</i>	Whale shark	VU A2bd+3d
130	<i>Rhinobatos formosensis</i>	Taiwan guitarfish	VU A2d+3d+4d
131	<i>Rhinobatos schlegelii</i>	Brown guitarfish	DD
132	<i>Rhinoptera javanica</i>	Javanese cownose ray	VU A2d+3cd+4cd
133	<i>Rhizoprionodon acutus</i>	Milk shark	LC
134	<i>Rhynchobatus australiae</i>	Whitespotted wedgefish	VU A2bd+3bd+4bd
135	<i>Rhynchobatus laevis</i>	Smoothnose wedgefish	VU A2bd+3bd+4bd
136	<i>Scoliodon macrorhynchus</i>	Pacific spadenose shark	NE
137	<i>Scyliorhinus garmani</i>	Brownspeckled catshark	DD
138	<i>Scyliorhinus torazame</i>	Cloudy catshark	LC
139	<i>Sinobatis borneensis</i>	Borneo legskate	LC
140	<i>Sphyrna lewini</i>	Scalloped hammerhead	EN A2bd+4bd
141	<i>Sphyrna mokarran</i>	Great hammerhead	EN A2bd+4bd
142	<i>Sphyrna tiburo</i>	Bonnethead shark	LC
143	<i>Sphyrna zygaena</i>	Smooth hammerhead	VU A2bd+3bd+4bd
144	<i>Squaliolus aliae</i>	Smalleye pygmy shark	LC
145	<i>Squaliolus laticaudus</i>	Spined pygmy shark	LC
146	<i>Squalus japonicus</i>	Japanese spurdog	DD
147	<i>Squalus megalops</i>	Shortnose spurdog	DD
148	<i>Squalus mitsukurii</i>	Shortspine spurdog	DD
149	<i>Squalus montalbani</i>	Indonesian greeneye spurdog	VU A2bd+4bd
150	<i>Squalus nasutus</i>	Western longnose spurdog	DD
151	<i>Squatina japonica</i>	Japanese angelshark	VU A2d+4d
152	<i>Stegostoma fasciatum</i>	Zebra shark	VU A2abcd+3cd+4abcd
153	<i>Taeniura lymna</i>	Bluespotted ribbontail ray	NT
154	<i>Taeniurops meyeri</i>	Round ribbontail ray	VU A2ad+3d+4ad
155	<i>Temera hardwickii</i>	Finless sleeper ray	VU A4d
156	<i>Triaenodon obesus</i>	Whitetip reef shark	NT
157	<i>Triakis scyllium</i>	Banded houndshark	LC
158	<i>Urogymnus asperrimus</i>	Porcupine ray	VU A2bd

ANNEX 2

CARTILAGINOUS FISH SPECIES IN THE CITES APPENDICES (CITES.ORG)

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. CITES works by subjecting international trade in specimens of selected species to certain controls.

The species covered by CITES are listed in three Appendices, according to the degree of protection they need. Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances. Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival. Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade. (See list: <http://cites.org/sites/default/files/eng/app/2014/E-Appendices-2014-09-14.pdf>).

All species listed in CITES Appendices are protected under the Republic Act 8550, otherwise known as the Philippine Fisheries Code of 1998.

TAXA/Species Name	Common Name	CITES Appendices	Notes on Philippine Species
CARCHARHINIFORMES			
Carcharhinidae (Requiem sharks)			
<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	Appendix II	Reported to occur
Sphyrnidae (Hammerhead sharks)			
<i>Sphyrna lewini</i>	Scalloped hammerhead	Appendix II	Reported to occur
<i>Sphyrna mokarran</i>	Great hammerhead	Appendix II	Reported to occur
<i>Sphyrna zygaena</i>	Smooth hammerhead	Appendix II	Reported to occur
LAMNIFORMES			
Cetorhinidae (Basking shark)			
<i>Cetorhinus maximus</i>	Basking shark	Appendix II	Reported to occur but may be vagrant
Lamnidae (Mackerel sharks)			
<i>Carcharodon carcharias</i>	White shark	Appendix II	Reported to occur
<i>Lamna nasus</i>	Porbeagle shark	Appendix II	Not reported
ORECTOLOBIFORMES			
Rhincodontidae (Whale shark)			
<i>Rhincodon typus</i>	Whale shark	Appendix II	Reported to occur
PRISTIFORMES			
Pristidae Sawfishes			
<i>Pristidae</i> spp.	sawfishes	Appendix I	Species reported to occur: <i>Pristis pectinata</i> (Smalltooth sawfish), <i>Pristis pristis</i> (Largetooth sawfish), and <i>Pristis zijsron</i> (Green sawfish)
RAJIFORMES			
Mobulidae (Mobulid rays)			
<i>Manta</i> spp.	Mobulid ray	Appendix II	Species reported to occur: <i>Manta alfredi</i> (Alfred manta) and <i>Manta birostris</i> (Giant manta)

BIBLIOGRAPHY

- Alava, M.N.R., E.R.Z. Dolumbal, A.A. Yaptinchay, and R.B. Trono. 2002. Fishery and trade of whale sharks and manta rays in the Bohol Sea, Philippines. Pp. 132-148. In: S.L. Fowler, T.M. Reed and F.A. Dipper (eds). Elasmobranch Biodiversity, Conservation and Management: Proceedings of the International Seminar and Workshop. Sabah, Malaysia, July 1997. Occasional paper of the IUCN Species Survival Commission No. 25.
- Aquino, M.T.R., A.S. Songco and R.C. Alarcon. 2013. Notes on the presence of *Manta alfredi* in the Tubbataha Reefs Natural Park, Cagayancillo, Palawan, Philippines. <http://mandaragat.org/ocs/index.php/pams/pams12/paper/view/320>.
- Asis, A.M.J.M., J.K.M. Lacsamana and M.D. Santos. 2014. Illegal trade of regulated and protected aquatic species in the Philippines detected by DNA barcoding. Mitochondrial DNA. doi: 10.3109/19401736.2014.913138
- Bass, A.J., 1986. Lamnidae. p. 98-100. In: M.M. Smith and P.C. Heemstra (eds.). Smiths' sea fishes. Springer-Verlag, Berlin.
- Bass, A.J., L.J.V. Compagno and P.C. Heemstra. 1986. Squalidae. p. 49-62. In: M.M. Smith and P.C. Heemstra (eds.). Smiths' sea fishes. Springer-Verlag, Berlin.
- Bass, A.J., P.C. Hemstra and L.J.V. Compagno. 1986. Hexanchidae. p. 45-47. In: M.M. Smith and P.C. Heemstra (eds.). Smiths' sea fishes. Springer-Verlag, Berlin.
- Bizzarro, J., W. Smith, W.T. White, and S.V. Valenti. 2009. *Mobula kuhlii*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Bizzarro, J.J. and W.T. White. 2006. *Gymnura poecilura*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Carpenter, K.E. and V.H. Niem. 1998. FAO species identification guide for fisheries purposes. The living marine resources of the Western Central Pacific. Vol. 2. Cephalopods, crustaceans, holothurians and sharks. Rome, FAO:1193-1366.
- Carpenter, K.E. and V.H. Niem. 1999. FAO species identification guide for fisheries purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and Bony fishes part 1 (Elopidae to Linophrynidae). Rome, FAO:1397-1537.
- Chen, C.T., K.W. Liu and S.J. Young. 1999. Preliminary report on Taiwan's whale shark fishery. p. 162-167. In: S.L. Fowler, T. Reid, and F.A. Dipper (eds.). Elasmobranch biodiversity, conservation and management. Proc. Int. Seminar and Workshop in Sabah, Malaysia. IUCN, Gland, Switzerland.
- Clark, T.B., Smith, W.D. & Bizzarro, J.J. 2006. *Mobula tarapacana*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Clark, T.B., Smith, W.D. & Bizzarro, J.J. 2006. *Mobula thurstoni*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Clarke, M., White, W. & Compagno, L.J.V. 2009. *Centrophorus lusitanicus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Colman, J.G. 1997. A review of the biology and ecology of the whale shark. J. Fish Biol. 51(6):1219-1234.
- Compagno, L.J.V., 1984. FAO Species Catalogue. Vol 4: Sharks of the world, Part 1 - Hexanchiformes to Lamniformes. FAO Fisheries Synopsis No. 125, 4 (1): 1-250
- Compagno, L.J.V. 1984. FAO Species Catalogue. Vol 4: Sharks of the world, Part 2 - Carcharhiniformes. FAO Fisheries Synopsis No. 125, 4 (2): 251-633
- Compagno, L.J.V. 1986. Dasyatidae. p. 135-142. In: M.M. Smith and P.C. Heemstra (eds.). Smiths' sea fishes. Springer-Verlag, Berlin.
- Compagno, L.J.V. 1986. Rhinobatidae. p. 128-131. In: M.M. Smith and P.C. Heemstra (eds.). Smiths' sea fishes. Springer-Verlag, Berlin.
- Compagno, L.J.V. 1988. Sharks of the order Carcharhiniformes. Princeton University Press, New Jersey, 486 pp.
- Compagno, L.J.V. 1998. Alopiidae. Thresher sharks. p. 1269-1273. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. 1998. Ginglymostomatidae. Nurse sharks. p. 1260-1261. In: K.E. Carpenter and V.H. Niem (eds.). FAO Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. 1998. Hemigaleidae. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Volume 2. Cephalopods, crustaceans, holothurians and sharks. FAO, Rome.
- Compagno, L.J.V. 1998. Lamnidae. Mackerel sharks, makos, white sharks, porbeagles. p. 1274-1278. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. 1998. Rhinodontidae. Whale sharks. p. 163. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. 1998. Sphyrnidae. Hammerhead and bonnethead sharks. p. 1361-1366. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. 1999. Checklist of living elasmobranchs. p. 471-498. In: W.C. Hamlett (ed.). Sharks, skates, and rays: the biology of elasmobranch fishes. John Hopkins University Press, Maryland.
- Compagno, L.J.V. 2001. Sharks of the world. An annotated and illustrated catalogue of shark species known to date. Vol. 2. Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes). FAO Spec. Cat. Fish. Purp. 1(2):269p. Rome: FAO.
- Compagno, L.J.V. & H. Ishihara H. 2009. *Rhinobatos schlegelii*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>
- Compagno, L.J.V. and P.R. Last. 1997. Plesiobatidae. Giant stingaree. p. 1467-1468. In K.E. Carpenter and V.H. Niem (eds.) FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes. Part 1 (Elopidae to Linophrynidae). FAO, Rome.
- Compagno, L.J.V. and P.R. Last. 1999. Mobulidae. p. 1524-1529. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Volume 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae). FAO, Rome. p. 1524-1529.
- Compagno, L.J.V. and P.R. Last, 1999. Platyrrhinidae. Thornback rays. p. 1431-1432. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Rome, FAO.
- Compagno, L.J.V. and P.R. Last. 1999. Pristidae. Sawfishes. p. 1410-1417. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes. Part 1 (Elopidae to Linophrynidae). FAO, Rome.
- Compagno, L.J.V. and P.R. Last. 1999. Rhinidae (=Rhynchobatidae). Wedgefishes. p. 1418-1422. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes. Part 1 (Elopidae to Linophrynidae). FAO, Rome.

- Compagno, L.J.V. and P.R. Last. 1999. Rhinobatidae. Guitarfishes. p. 1423-1430. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes. Part 1 (Elopidae to Linophryinae). FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Carcharhinidae. Requiem Sharks. p. 1312-1366. In: K.E. Carpenter and V.H. Niem (eds.). FAO Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Hemiscylliidae. Longtail carpetsharks. p. 1249-1259. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Heterodontidae. Bullhead sharks, horn sharks. p. 1238-1240. In: K.E. Carpenter and V.H. Niem (eds.). FAO Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Hexanchidae. Cowsharks, sixgill, and sevengill sharks. p. 1208-1210. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Odontaspidae. Sand tiger sharks. p. 1264-1267. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Orectolobidae. Wobbegongs. p. 1245-1248. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Parascylliidae. Collared carpetsharks. p. 1241-1242. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Proscylliidae. Finback catsharks. p. 1293-1295. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Sclerorhinidae. Catsharks. p. 1279-1292. In: K.E. Carpenter and V.H. Niem (eds.). FAO Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Squalidae. Dogfish sharks. p. 1213-1232. In: K.E. Carpenter and V.H. Niem (eds.). FAO Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Squatinidae. Angelsharks, sand devils. p. 1235-1238. In: K.E. Carpenter and V.H. Niem (eds.). FAO Identification Guide for Fishery Purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V. and V.H. Niem. 1998. Triakidae. Houndsharks, smoothhounds, topes. p. 1297-1304. In: K.E. Carpenter and V.H. Niem (eds.). FAO identification guide for fishery purposes. The Living Marine Resources of the Western Central Pacific. FAO, Rome.
- Compagno, L.J.V., M. Dando and S. Fowler. 2005. Sharks of the World. Harper Collins Publishing Ltd., London, 368 pp.
- Compagno, L.J.V., D.A. Ebert and M.J. Smale, 1989. Guide to the sharks and rays of southern Africa. New Holland (Publ.) Ltd., London. 158 p.
- Compagno, L.J.V., P.R. Last, J.D. Stevens and M.N.R. Alava. 2005. Checklist of Philippine Chondrichthyes. CSIRO Marine Laboratories, Rept. 243. 101 pp.
- Dagit, D.D. 2006. *Chimaera phantasma*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>.
- D'Anastasi, B., Simpfendorfer, C. & van Herwerden, L. 2013. *Anoxypristis cuspidata*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- de Carvalho, M.R. and J.E. Randall. 2003. Numbfishes from the Arabian Sea and surrounding gulfs, with the description of a new species from Oman (Chondrichthyes: Torpediniformes: Narciniidae). Ichthyol. Res. 50(1):59-66.
- de Carvalho, M.R., L.J.V. Compagno and P.R. Last. 1999. Narciniidae. Numbfishes. p. 1433-1442. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes. Part 1 (Elopidae to Linophryinae). FAO, Rome.
- Deakos, M.H., Baker, J.D. and Bejder, L. 2011. Characteristics of a manta ray *Manta alfredi* population off Maui, Hawaii and implications for management. Marine Ecology Progress Series 420: 245-260.
- Didier, D. 2003. Phylogeny and Classification of Extant Holocephali. In: J.C. Carrier, J.A. Musick & M.R. Heithaus (eds.) Biology of Sharks and Their Relatives. pp:115-135. CRC Press, Boca Raton.
- Duffy, C. (Deepsea Chondrichthyan Workshop, November 2003) 2004. *Centrophorus isodon*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Dulvy, N.K. and J.D. Reynolds, 1997. Evolutionary transitions among egg-laying, live-bearing and maternal inputs in sharks and rays. Proc. R. Soc. Lond., Ser. B: Biol. Sci. 264:1309-1315.
- Dulvy, N.K., J.K. Baum, S. Clarke, L.J.V. Compagno, E. Cortés, A. Domingo, S. Fordham, S. Fowler, M.P. Francis, C. Gibson, J. Martínez, J.A. Musick, A. Soldo, J.D. Stevens and S. Valenti, 2008. You can swim but you can't hide: the global status and conservation of oceanic pelagic sharks and rays. Aquat. Conserv.: Mar. Freshw. Ecosyst.
- Ebert, D.A. 2003. Sharks, rays and chimaeras of California. California Natural History Guides No. 71. University of California Press. 284 p.
- Ebert, D.A. and H.A. Wilms. 2013. *Pristiophorus lanuae* sp. nov., a new sawshark species from the Western North Pacific, with comments on the genus *Pristiophorus* Müller & Henle, 1837 (Chondrichthyes: Pristiophoridae). Zootaxa 3752 (1): 086-100. <http://dx.doi.org/10.11646/zootaxa.3752.1.7>.
- Ebert, D.A., L.J.V. Compagno and M.J. De Vries. 2011. A New Lanternshark (Squaliformes: Etmopteridae: *Etmopterus*) from Southern Africa. *Copeia* 2011(3):379-384.
- Ebert, D.A., McCormack, C. & Samaniego, B. 2009. *Deania profundorum*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Fowler, H.W. 1941. The fishes of the groups Elasmobranchii, Holocephali, Isoospondyli, and Ostariophysii obtained by United States Bureau of Fisheries Steamer Albatross in 1907 to 1910, chiefly in the Philippines Islands and adjacent seas. Bulletin of the United States National Museum (100) 13: 1-879.
- Fowler, S.L., R.D. Cavanagh, M. Camhi, G.H. Burgess, G.M. Cailliet, S.V. Fordham, C.A. Simpfendorfer, and J.A. Musick (comps and eds). 2005. Sharks, Rays and Chimaeras: The Status of the Chondrichthyan Fishes. Status Survey pp. x + 461. IUCN/SSC Shark Specialist Group, IUCN, Gland, Switzerland and Cambridge, UK.
- Gaudiano, J.P.A. and M.N.R. Alava. 2003. Resource utilization and exploitation of dogshark resources in Butuan and Gingoog bays, northern Mindanao, Philippines. Unpublished report submitted to WWF-Philippines as part of the Cetacean Fishery Interaction Assessment Project.
- Heemstra, P.C., 1995. Additions and corrections for the 1995 impression. p. v-xv. In M.M. Smith and P.C. Heemstra (eds.) Revised Edition of Smiths' Sea Fishes. Springer-Verlag, Berlin.
- Heupel, M.R. (SSG Australia & Oceania Regional Workshop, March 2003) 2003. *Squaliolus aliae*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Hoewel, A., S. Ommer and T. Ziegler. 2010. "Keeping and breeding of the coral catshark (*Ateomyxerus marmoratus*) at the Aquarium of the Cologne Zoo". Zoologische Garten 79 (6): 243-253.

- International Union for Conservation of Nature (IUCN). 2014. The IUCN Red List of Threatened Species. Version 2014.1 <www.iucnredlist.org>.
- Iwatsuki, Y., K. Miyamoto, K. Nakaya and J. Zhang. 2011. A review of the genus *Platyrrhina* (Chondrichthys: Platyrrhinidae) from the northwestern Pacific, with descriptions of two new species. *Zootaxa* 2738:26-40.
- Kriwet, J., H. Endo and B. Stelbrink. 2010. On the occurrence of the Taiwan angel shark, *Squatina formosa* Shen & Ting, 1972 (Chondrichthyes, Squatinidae) from Japan. *Zoosystematics and Evolution*, 86 (1): 117-124 DOI: [10.1002/zoos.200900016](https://doi.org/10.1002/zoos.200900016)
- Kyne, P.M. & Burgess, G.H. 2006. *Squalioles laticaudus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Kyne, P.M., Carlson, J. & Smith, K. 2013. *Pristis pristis*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Last, P.R. and Alava, M.N.R. 2013. *Dipturus amphispinus* sp. nov., a new longsnout skate (Rajoiidei: Rajidae) from the Philippines. Magnolia Press. <http://www.mapress.com/zootaxa/2013/f/z03752p227.pdf>.
- Last, P.R. and L.J.V. Compagno. 1999. Anacobanthidae. Legskates. p. 1462-1466. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae). FAO, Rome.
- Last, P.R. and L.J.V. Compagno. 1999. Arhynchothidae. Softnose skates. p. 1457-1461. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae). FAO, Rome.
- Last, P.R. and L.J.V. Compagno. 1999. Dasyatidae. Stingrays. p. 1479-1505. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae). FAO, Rome.
- Last, P.R. and L.J.V. Compagno. 1999. Rajidae. Hardnose skates. p. 1452-1456. In: K.E. Carpenter and V.H. Niem (eds.). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae). FAO, Rome.
- Last, P.R. and J.P. Gaudiano, 2011. *Gollum suluensis* sp. nov. (Carcharhiniformes: Pseudotriakidae), a new gollumshark from the southern Philippines. *Zootaxa* 3002:17-30.
- Last, P.R. and A.P.K. Lim. 2010. A new species of skate *Okamejei jenseana* sp. nov. (Rajoiidei: Rajidae) from the seas off Borneo, with a redescription of the Kwangtung Skate, *Dipturus kwangtungensis*. pp. 101-114. In: Last, P.R., W.T. White and J.J. Pogonoski. (eds.). Descriptions of new sharks and rays from Borneo. CSIRO Marine and Atmospheric Research Paper no. 32.
- Last, P.R. and J.D. Stevens. 1994. Sharks and rays of Australia. CSIRO, Australia. 513 p.
- Last, P.R., S. Corrigan and G. Naylor. 2014. *Rhinobatos whitei*, a new shovelnose ray (Batoidea: Rhinobatidae) from the Philippine Archipelago. *Zootaxa* 3872 (1): 031-047.
- Last, P.R., Fahmi and G.J.P. Naylor. 2010. *Pastinachus stellurostris* sp. nov., a new stingray (Elasmobranchii: Myliobatiformes) from Indonesian Borneo. pp. 129-140. In P.R. Last, W.T. White and J.J. Pogonoski (eds). Descriptions of new sharks and rays from Borneo. CSIRO Marine and Atmospheric Research Paper no. 32.
- Last, P.R., B.M. Manjaji and G.K. Yearsley. 2005. *Pastinachus solocirostris* sp. nov., a new species of stingray (Elasmobranchii: Myliobatiformes) from the Indo-Malay Archipelago. *Zootaxa* (1040):1-16.
- Last, P.R., L.J. Marshall and W.T. White. 2007. *Squalus nasutus* sp. Nov., a new long-snout spurdog of the 'japonicus-group' from the Indian Ocean. pp. 83-90. In P.R. Last, W.T. White and J.J. Pogonoski (eds). Descriptions of new dogfishes of the genus *Squalus* (Squaloidea:Squalidae). CSIRO Marine and Atmospheric Research Paper No. 014. 130 pp.
- Last, P.R., J.J. Pogonoski and W.T. White. 2010. A new wobbegong shark, *Orectolobus leptolineatus* sp. nov. (Orectolobiformes: Orectolobidae), from the Western Central Pacific. pp. 1-16. In Last, P.R., White, W.T. & Pogonoski, J.J. (eds.): Descriptions of new sharks and rays from Borneo. CSIRO Marine and Atmospheric Research Paper no. 32.
- Last, P.R., W.T. White, J.N. Caire, Dharmadi, Fahmi, K. Jensen, A.P.F. Lim, B.M. Manjaji-Matsumoto, G.J.P. Naylor, J.J. Pogonoski, J.D. Stevens, G.K. Yearsley. 2010. Sharks and Rays of Borneo. CSIRO Publishing. 298 pp.
- Last, P.R., W.T. White and H. Motomura. 2007. Description of *Squalus chloroculus* sp. nov., a new spurdog from southern Australia, and the resurrection of *S. montalbani* Whitley. pp: 55-69. In: P.R. Last, W.T. White and J.J. Pogonoski (eds). Descriptions of new dogfishes of the genus *Squalus* (Squaloidea: Squalidae). CSIRO Marine and Atmospheric Research Paper No. 014. 130 pp.
- Last, P.R., W.T. White and J.J. Pogonoski. 2007. Descriptions of New Dogfishes of the genus *Squalus* (Squaloidea: Squalidae). CSIRO Marine and Atmospheric Research Paper No. 014.
- Last, P.R., W.T. White, J.J. Pogonoski, and D.C. Gledhill. 2008. New Australian skates (Batoidea: Rajoiidei) - background and methodology. CSIRO Marine and Atmospheric Research Paper, 21: 1-8
- Last, P.R., W.T. White, J.N. Caire, Dharmadi, Fahmi, K. Jensen, A.P.F. Lim, B.M. Manjaji-Matsumoto, G.J.P. Naylor, J.J. Pogonoski, J.D. Stevens, G.K. Yearsley. 2010. Sharks and Rays of Borneo. CSIRO Publishing. 298 pp.
- Luchavez-Maypa, M.-M., J.P.A. Gaudiano, A.B. Ramas-Uypticth, M.N.R. Alava, P.R. Last, J.D. Stevens, and L.J.V. Compagno. 2001. The WWF Elasmobranch Collection: Species Confirmed From Philippine Waters. Terminal Report submitted to the WWF-Philippines Elasmobranch Biodiversity and Conservation Project, 20 June 2001. (Unpublished).
- Manjaji-Matsumoto, B.M and P.R. Last. 2008. *Himantura leoparda* sp. nov., a new whipray (Myliobatoidei: Dasyatidae) from the Indo-Pacific. In: P.R. Last, W.T. White and J.J. Pogonoski. (eds.). Descriptions of new sharks and rays from Borneo. CSIRO Marine and Atmospheric Research Paper no. 32.
- Manjaji, B.M. and W.T. White. 2009. *Himantura uarnak*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Manjaji, B.M., Fahmi and W.T. White. 2009. *Himantura jenkinsii*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Manjaji, B.M., W.T. White and Fahmi 2009. *Himantura fai*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Manjaji, B.M., W.T. White, Fahmi and H. Ishihara. 2009. *Himantura granulata*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Marshall, A.D., L.J.V. Compagno and M.B. Bennett. 2009. Redescription of the genus *Manta* with resurrection of *Manta alfredi* (Kreffit, 1868) (Chondrichthyes; Myliobatoidei; Mobulidae). *Zootaxa* 2301:1-28.
- Marshall, A.D., S.J. Pierce and M.B. Bennett. 2008. Morphological measurements of manta rays (*Manta birostris*) with a description of a foetus from the east coast of Southern Africa. *Zootaxa* 1717: 24-30.
- Marshall, A., T. Kashiwagi, M.B. Bennett, M. Deakos, G. Stevens, F. McGregor, T. Clark, H. Ishihara, and K. Sato. 2011. *Manta alfredi*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Masuda, H., K. Amaoka, C. Araga, T. Uyeno, and T. Yoshino, 1984. The fishes of the Japanese Archipelago. Vol. 1. Tokai University Press, Tokyo, Japan. 437 p. (text).
- McAuley, R. and L.J.V. Compagno. (SSG Australia & Oceania Regional Workshop, March 2003). 2003. *Rhina ancylostoma*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 19 January 2014.

- McCormack, C. and S. Tanaka. 2009. *Etmopterus brachyurus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- McCormack, C. Wang, Y., Ishihara, H., Fahmi, Manjaji, M., Capuli, E. & Orlov, A. 2009. *Sinobatis borneensis*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 05 May 2014.
- McCormack, C., W.T. White, S. Tanaka, K. Nakayno, S. Iglesias, J.P. Gaudio, and P. Cadapan, P. 2009. *Eridacnis radcliffei*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- McCormack, C., Y. Wang, H. Ishihara, Fahmi, M. Manjaji, E. Capuli, and A. Orlov. 2009. *Hexatrygon bickelli*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- McEachran, J.D. and M.R. de Carvalho 2003. Rhinobatidae. Guitarfishes. p. 527-530. In K.E. Carpenter (ed.) FAO species identification guide for fishery purposes. The living marine resources of the Western Central Atlantic. Vol. 1: Introduction, molluscs, crustaceans, hagfishes, sharks, batoid fishes, and chimaeras. Ref No [50184] Key No. [886]
- McEachran, J.D. and K.A. Dunn. 1998. Phylogenetic analysis of skates, a morphologically conservative clade of elasmobranchs (Chondrichthyes: Rajidae). *Copeia* 1998(2):271-290.
- McEachran, J.D. and G. Notarbartolo di Sciara. 1995. Mobulidae. Mantas, diablos. p. 759-764. In: W. Fischer, F. Krupp, W. Schneider, C. Sommer, K.E. Carpenter and V. Niem (eds.). Guia FAO para Identificación de Especies para los Fines de la Pesca. Pacifico Centro-Oriental. 3 Vols. FAO, Rome.
- Nakaya, K. and B. Seret. 2000. Re-description and taxonomy of *Pentanchus profundicolis* Smith & Radcliffe, based on a second specimen from the Philippines (Chondrichthyes, Carcharhiniformes, Scyliorhinidae). *Ichthyological Research* 47(4): 373-378, figs 1-3.
- Nakaya, K., K. Yano, K. Takada, and H. Hiruda. 1997. Morphology of the First Female Megamouth Shark, *Megachasma pelagios* (Elasmobranchii: Megachasmidae). Landed at Fukuoka, Japan. p. 51-62. In Yano, K., J.F. Morissey, Y. Tabumoto, and K. Nakaya. (eds). 1997. Biology of the Megamouth Shark. Tokai University Press, Tokyo, Japan. 201pp.
- Nelson, J.S., 1994. Fishes of the world. Third edition. John Wiley & Sons, Inc., New York. 600 p.
- Nishida, K., 1990. Phylogeny of the suborder Myliobatidoidei. *Mem. Fac. Fish. Hokkaido Univ.* 37(L2) (serial no. 54):1-108.
- Nishida, K. and K. Nakaya. 1988. A new species of the genus *Dasyatis* (Elasmobranchii: Dasyatidae) from southern Japan and lectotype designation of *D. zugei*. *Jap. J. Ichthyol.* 35(2):115-123.
- Notarbartolo-di-Sciara, G. 1987. Myliobatiform rays fished in the southern gulf of California (Baja California Sur, México) (Chondrichthyes: Myliobatiformes). *Memorias del V Simposium de Biología Marina. Universidad Autónoma de Baja California Sur* 109-115.
- Pierce, S.J. & Bennett, M.B. (SSG Australia & Oceania Regional Workshop, March 2003) 2003. *Mobula eregoodootenkee*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Rayos, J.C.C., M.D. Santos and N.C. Barut. 2012. Status of devil ray resources in Bohol Sea, Philippines. *Fish for the People*. 10: 20 - 23.
- Romanov, E.V. and V.V. Zamorov, 1994. On discoveries of the crocodile shark, *Pseudocarcharias kamoharui* (Pseudocarchariidae), in the equatorial Indian ocean. *J. Ichthyol.* 34(4):155-157.
- Sasaki, K. and T. Uyeno. 1987. *Squaliolus aliae*, a dalatiid shark distinct from *S. laticaudus*. *Jap. J. Ichthyol.* 34(3):373-376
- Schneider, W. 1990. FAO species identification sheets for fishery purposes. Field guide to the commercial marine resources of the Gulf of Guinea. Prepared and published with the support of the FAO Regional Office for Africa. Rome: FAO. 268 p.
- Simpfendorfer, C. 2013. *Pristis zijsron*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- Simpfendorfer, C. 2013. *Pristis zijsron*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 19 January 2014.
- Smith, M.M. and P.C. Heemstra. 1986. Hexatrygonidae. p. 142-143. In: M.M. Smith and P.C. Heemstra (eds.). *Smiths' sea fishes*. Springer-Verlag, Berlin.
- Smith, S.E., R.C. Rasmussen, D.A. Ramon, and G.M. Cailliet. 2008. The biology and ecology of thresher sharks (Allopiidae). p. 60-68. In: M.D. Camhi, E.K. Pikitch and E.A. Babcock (eds). *Sharks of the open ocean*. Blackwell Publishing, Oxford, UK, 502 p.
- Sommer, C., W. Schneider and J.-M. Poutiers, 1996. FAO species identification field guide for fishery purposes. The living marine resources of Somalia. FAO, Rome. 376 p.
- Stevens, J. (SSG Australia & Oceania Regional Workshop, March 2003) 2003. *Isistius brasiliensis*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Takahashi, M. and K. Nakaya, 2004. *Hemitriakis complicofasciata*, a new whitfin topshark (Carcharhiniformes: Triakidae) from Japan. *Ichth. Research* 51(3):248-255.
- Taylor, L.R., L.J.V. Compagno, and P.J. Struhsaker. 1983. Megamouth - a new species, genus, and family of lamnoid shark (*Megachasma pelagios*, family Megachasmidae) from the Hawaiian Islands. *Proc. Calif. Acad. Sci.* 43(8):87-110.
- Walsh, J.H. and D.A. Ebert 2007. A review of the systematics of western North Pacific angel shark, genus *Squatina*, with redescrptions of *Squatina formosa*, *S. japonica* and *S. nebulosa* (Chondrichthyes: Squatiniformes, Squatinidae). *Zootaxa* 1551: 31-47.
- Walsh, J.H., D.A. Ebert and L.J.V. Compagno. 2011. *Squatina caillieti* sp. nov., a new species of angel shark (Chondrichthyes: Squatiniformes: Squatinidae) from the Philippine Islands. *Zootaxa* 2759:49-59.
- White, W.T. (SSG Australia & Oceania Regional Workshop, March 2003) 2003. *Hemipristis elongata*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>. Downloaded on 27 August 2013.
- White, W.T. 2006. *Dasyatis zugei*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- White, W.T. & McAuley, R. 2003. *Rhynchobatus australiae*. 2006 IUCN Red List of Threatened Species. <www.iucnredlist.org>. Downloaded on 3 August 2007.
- White, W.T., P.R. Last and J.D. Stevens. 2007. *Halaelurus maculosus* n. sp. and *H. sellus* n. sp., two new species of catshark (Carcharhiniformes: Scyliorhinidae) from the Indo-West Pacific. *Zootaxa* 1639:1-21
- White, W.T., P.R. Last, G.J.P. Naylor, K. Jensen, and J.N. Caira. 2010. Clarification of *Aetobatus ocellatus* (Kuhl, 1823) as a valid species, and a comparison with *Aetobatus narinari* (Euphrasen, 1790) (Rajiformes: Myliobatidae). *CSIRO Marine and Atmospheric Research Paper*, 32: 141-164.
- White, W.T., P.R. Last and G.J.P. Naylor. 2010. *Scoliodon macrorhynchus* (Bleeker, 1852), a second species of spadenose shark from the Western Pacific (Carcharhiniformes: Carcharhinidae). pp. 61-76. In P.R. Last, W.T. White, and J.J. Pogonoski (eds). *Descriptions of new sharks and rays from Borneo*. *CSIRO Marine and Atmospheric Research Paper* no. 32.
- White, W.T., Clark, T.B., Smith, W.D. & Bizzarro, J.J. 2006. *Mobula japonica*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 04 May 2014.
- White, W.T., Manjaji, B.M., Fahmi & Samaniego, B. 2009. *Himantura walga*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. <www.iucnredlist.org>. Downloaded on 27 April 2014.
- Yano, K., A. Ahmad, A.C. Gambang, A.H. Idris, A.R. Solahuddin, and Z. Aznan, 2005. Sharks and rays of Malaysia and Brunei, Darussalam. SEAFDEC-MFRDMD/SP/12. Kuala Terengganu. Sharks and Rays Malaysia and Brunei:557 pp.

PATING KA BA? An Identification Guide to Sharks, Batoids and Chimaeras of the Philippines

This book is the first identification guide on cartilaginous fishes of the Philippines, currently produced based on the recommendations of the Philippine government under the 2009 National Plan of Action for the Conservation and Management of Sharks in the Philippines. This book compiles best available photos of whole or parts of a landed shark, skate, ray or chimaera in landing or market sites primarily collected by the project team from Silliman University Institute of Environmental and Marine Sciences (SU-IEMS) during the 1998-2001 WWF Elasmobranch Biodiversity Project, with contributions from field staff of the Bureau of Fisheries and Aquatic Resources – National Fisheries Research Institute (BFAR-NFRDI) under the National Stock Assessment Project (NSAP) and various partners and volunteers from the diving and conservation community.

This publication is the result of the collaborative effort of the Bureau of Fisheries and Aquatic Resources – National Fisheries Research Institute (NFRDI) and the National Stock Assessment Project (NSAP), Silliman University Institute of Environmental and Marine Sciences (SU-IEMS), FishBase Information and Research Group (FIN) and the Marine Wildlife Watch of the Philippines (MWWP), with support from the Adaptation to Climate Change in Coastal Areas Project (ACCCoast) project of the Department of Environment and Natural Resources - Biodiversity Management Bureau (DENR-BMB) and GIZ-Philippines.

BUREAU OF FISHERIES AND AQUATIC RESOURCES - NATIONAL FISHERIES RESEARCH AND DEVELOPMENT INSTITUTE (BFAR-NFRDI)



The Bureau of Fisheries and Aquatic Resources is the government agency under the Department of Agriculture (<http://www.bfar.da.gov.ph>) responsible for the development, improvement, management and conservation of the country's fisheries and aquatic resources. It was reconstituted as a line bureau by virtue of Republic Act No. 8550 (Philippine Fisheries Code of 1998). The National Fisheries Research and Development Institute (<http://nfrdi.da.gov.ph/>) is the primary research arm of BFAR with a mission to generate scientific information, technologies and knowledge that will respond to the needs of the fisheries industry and fisherfolk and to serve as basis for sustainable fisheries management and policy formulation.

SILLIMAN UNIVERSITY INSTITUTE OF ENVIRONMENTAL AND MARINE SCIENCES (SU-IEMS)



The Silliman University Institute of Environmental and Marine Sciences (<http://su.edu.ph/iems>), formerly known as the Silliman University Marine Laboratory (SUML) and housed in the Dr. Angel C. Alcala Environment and Marine Science Laboratories in Dumaguete, was established as a research facility of the University in 1974. Pioneering research in community-based biodiversity conservation, coastal resource management and marine protected areas, its vision is to become a global leader in environmental and marine research and education.

FISHBASE INFORMATION AND RESEARCH GROUP, INC. (FIN)



The FishBase Information and Research Group, Inc. (<http://www.fin.ph/>) is a domestic non-stock, non-profit, non-governmental organization established in the Philippines in September 2003. FIN has been created and is backed by the FishBase Consortium, a group of nine international Institutes and Organizations that is providing long-term support for FishBase (www.fishbase.org).

MARINE WILDLIFE WATCH OF THE PHILIPPINES (MWWP)



Marine Wildlife Watch of the Philippines (<http://mwwphilippines.org>), a non-profit, non-stock organization that aims to support the conservation and protection of marine wildlife species and their habitats in the Philippines, is involved in various projects and activities that aim for a better appreciation of the marine environment, its ecological processes, and how it affects us all in the local context.

ADAPTATION TO CLIMATE CHANGE IN COASTAL AREAS PROJECT (ACCCOAST)



Represented by:
Federal Ministry for the
Environment, Nature Conservation,
Building and Nuclear Safety

Lead by the Initiative of the German Bundestag



The ACCCoast project (<http://acc coast.bmb.gov.ph/>) is a collaboration of the Department of Environment and Natural Resources - Biodiversity Management Bureau (DENR-BMB) under the Coastal and Marine Division (CMD) and GIZ-Philippines with various partners and stakeholders focused on the protection and rehabilitation of coastal ecosystems for an improved climate change adaptation in the Philippines as a contributor to the Coral Triangle Initiative on Coral Reefs, Fisheries and Food Security. This project is part of the International Climate Initiative (ICI). The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) supports this initiative on the basis of a decision adopted by the German Bundestag. For more information see <http://www.international-climate-initiative.com>.