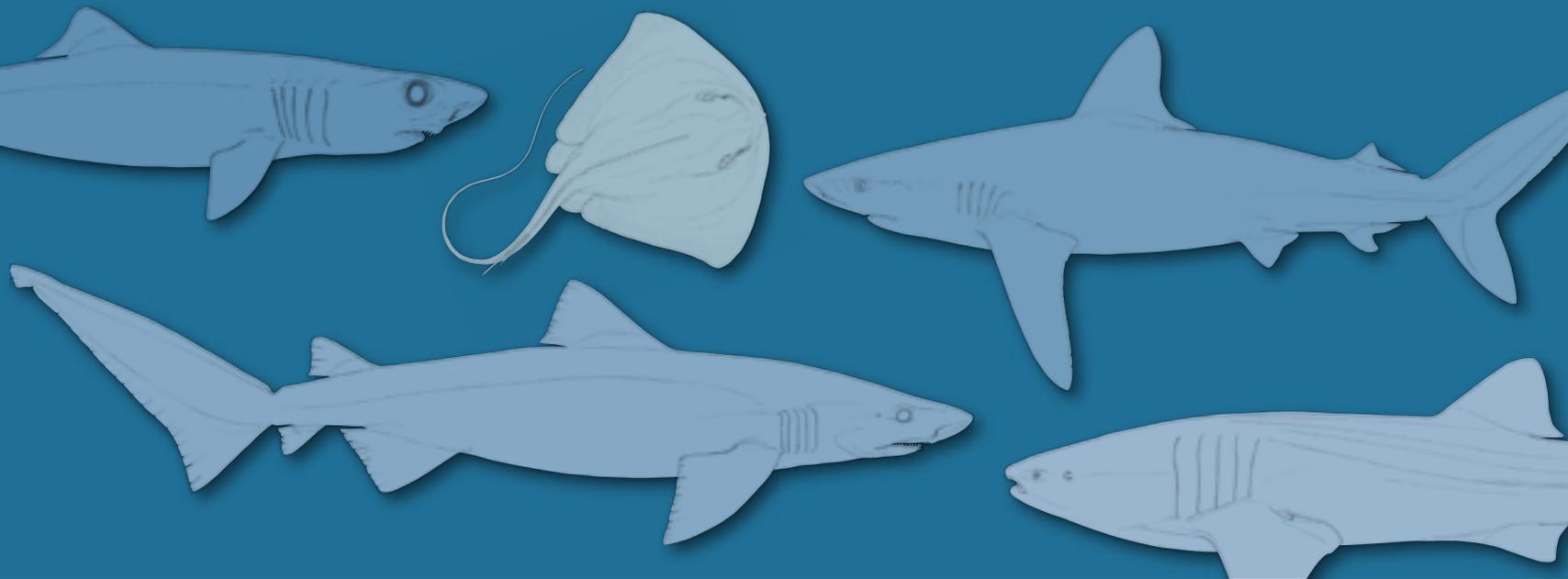




On board guide for the identification of
PELAGIC SHARKS AND RAYS
Western Indian Ocean



INDIAN OCEAN
COMMISSION



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INTRODUCTION

The present field guide is designed to assist in the identification of pelagic sharks and rays of the Western Indian Ocean that are major, moderate, or minor importance to fisheries. It encompasses the offshore, high seas portion of FAO Fishing Area 51.

The Western Indian Ocean pelagic elasmobranch fauna is currently represented by thirty four shark species and seven ray species. This field guide includes full species accounts for all known species, although it is acknowledged that some vagrant species not included here may on occasion be caught. Each species is described, depicted with a colour illustration and photo, and key distinguishing features of similar-looking species occurring in the area are highlighted allowing for easy and accurate identification in the field.

This field guide is intended to help fishery workers collecting catch data in the field in the identification of the sharks and rays they are likely to encounter. It is conceived to be updatable, offering the possibility to add additional species accounts as new information becomes available.

FAO. 2014. On Board Guide for the Identification of Pelagic Sharks and Rays of the Western Indian Ocean.

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Acknowledgements: We would like to thank those individuals who help contribute to this project by providing photographs: Charlene Da Silva (Department Agriculture, Forestry, and Fisheries, South Africa); Ryan Downie (CSIRO); Clinton Duffy (Dept of Conservation, New Zealand); Daniel Fernando (Manta Trust); Malcolm Francis (NIWA, New Zealand); Dean Grubbs (Florida State University); Aaron Henderson (Sultan Qaboos University, Muscat, Oman); Hua Hsun Hsu (National Taiwan Ocean University); Andrea D. Marshall (Marine Megafauna Foundation, Mozambique); Dr Lindsay Marshall (Stick Figure Fish, Australia); Theivasigamani Mohanraaj, Manta Trust; Lisa Natanson (NOAA Fisheries, USA); Simon J. Pierce (Marine Megafauna Foundation, Mozambique); Al Reeve (Sultan Qaboos University, Muscat, Oman); SeaPics; Greg Skomal (Massachusetts Marine Fisheries); Owyn Snodgrass (NOAA Fisheries); Matthias Stehmann (ICHTHYS, Germany); Guy Stevens (Manta Trust, England); Sabine Wintner (KwaZulu-Natal Sharks Board, South Africa); Hong-Ming Yu (AirFish Diving Center, Taiwan).

We also thank Guy Stevens (Manta Trust) for his valuable input and suggestions on identifying Mobulid rays in the field.

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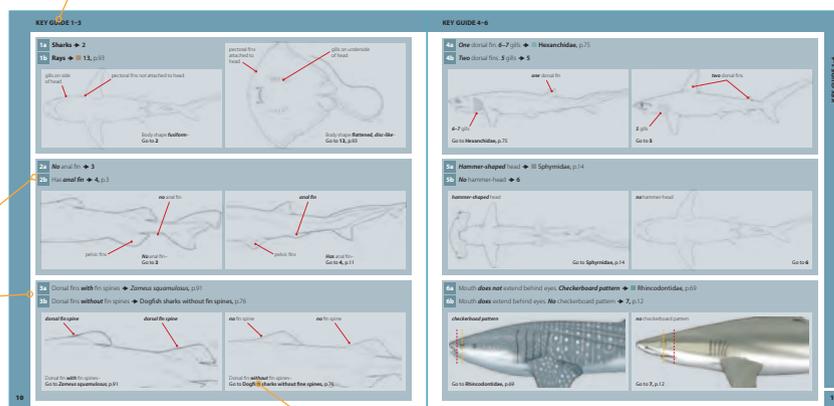
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HOW TO USE THIS GUIDE

The format adopted here is designed to streamline the process of identifying the most common, and some of the less common, pelagic shark and ray species occurring in the Western Indian Ocean. The first thing the user should do when a specimen is caught is go to the **Key Guide** to determine which key characters the specimen has and follow the key to the families, **Sharks pages 10 to 13** and **Rays pages 93 to 94**.

Key guide



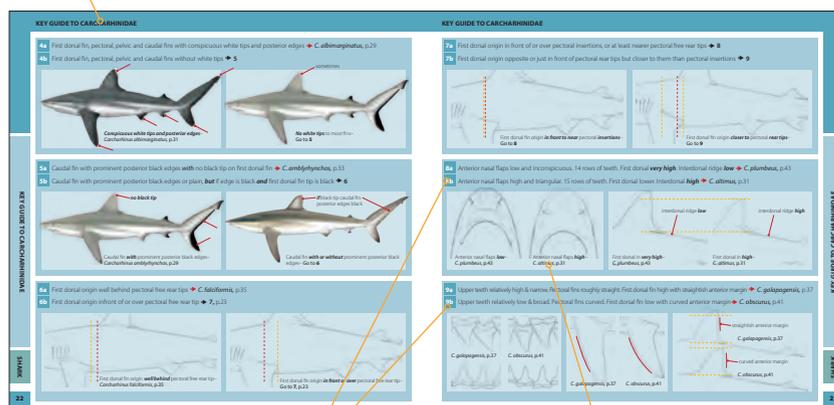
numbered key steps

directions to next step or family guide

Once the **family** of the specimen has been determined, you should then go to the appropriate page for that family. The **species** can then be determined by going through the family key, on that page, and then going to the individual species page with its accompanying page of similar species on the reverse side.

- SPHYRNIDAE page 14
- CARCHARHINIDAE pages 21–23
- LAMNIDAE page 45
- ALOPIIDAE page 55
- ODONTASPIDIDAE page 56
- PSEUDOCARCHARIIDAE page 56
- HEXANCHIDAE page 75
- Dogfish sharks without spines page 76

Family key guide



numbered key steps

directions to next step or species page

Some of the families consist of a single wide-ranging species that are quite distinct from all others in the area, while other families and genera may have several species which look very similar in appearance. Some of the less common or rare species, mostly the dogfish sharks, can be easily separated from most other sharks by following the key.

The shark genera *Alopias*, *Carcharhinus* and *Sphyrna*, and the ray genus *Mobula* can be a little more difficult to separate into species since many of these species are very similar in appearance. However, the shark genera can be identified to species by focusing on particular characteristics, such as general body shape, coloration, the position of the fins, and tooth shape. In the mobulids (devil rays) the shape of the disc, the 'wings', head length, length of the 'horns', and general body coloration, can be used to separate them.

HOW TO USE THIS GUIDE

As explained earlier, on the back of each species page is the similar species guide with detailed information on what particularly to look for to tell it apart from other similar looking species in the region.

It is always possible that a species not reported from this area may be caught from time to time. If you should catch a specimen that you cannot identify, photographs of it should be taken and can be sent to the author for identification (see page 8 on how to take photographs). If it is a small species and can be saved that will help in its identification (see page 9 on saving specimens).

Each family has a different colour code

Main distinctive characters of similar species

BSH *Prionace glauca* Blue Shark

SIMILAR SPECIES
The bright blue coloration and very long, narrowly tapering pectoral fins separates this shark from all other species in the region.

First dorsal fin position	Caudal keels	Ventral view of head
<p>first dorsal fin nearer to pelvic than pectoral fins</p> <p>moderately large second dorsal and anal fins</p> <p>slender head in profile, teeth not prominent</p> <p><i>Prionace glauca</i> Blue Shark</p>	<p>caudal keel not present</p> <p>moderately large anal fin</p>	<p>snout narrow and pointed</p> <p>teeth not prominent</p>
<p>first dorsal fin nearer to pectoral fins</p> <p>very small second dorsal and anal fins</p> <p>head conical in profile, teeth prominent</p> <p><i>Isurus paucus</i> Shortfin Mako</p>	<p>prominent caudal keel</p> <p>small anal fin</p>	<p>snout conical in shape</p> <p>teeth prominent</p>
<p>first dorsal fin nearer to pectoral fins</p> <p>very small second dorsal and anal fins</p> <p>head conical in profile, teeth prominent</p> <p><i>Isurus paucus</i> Longfin Mako</p>	<p>prominent caudal keel</p> <p>small anal fin</p>	<p>snout conical in shape</p> <p>teeth prominent</p>
<p>first dorsal fin nearer to pectoral fins</p> <p>narrow interdorsal ridge</p> <p>second dorsal and anal fins with very long free rear tips</p> <p>slender head in profile, teeth not prominent</p> <p>slender and elongated body, grey to grey-brown</p> <p><i>Carcharhinus falciformis</i> Silky Shark</p>	<p>caudal keel not present</p> <p>moderately large anal fin with very long free rear tip</p>	<p>snout narrowly rounded</p> <p>teeth not prominent</p>

Similar species comparison illustrations

Order: **CARCHARHINIFORMES**

Family and family common name: **Carcharhinidae: Requiem sharks**

Common name in English and French: **Blue Shark / Peau Bleue**

IUCN Red Data List status: **NT** (Near Threatened)

Local legislation: **BSH**

FAO 3-alpha code: **BSH**

Scientific name: ***Prionace glauca*** (Linnaeus, 1758)

Colour illustration with main field marks key features **highlighted**

Species description: **Comparatively large eyes.** **First dorsal fin closer to pelvic fins origin than pectoral fins free rear tip.** **Brilliant to dark blue dorsally.** **No interdorsal ridge.** **Caudal fin with long lower lobe.** **Long and narrow pectoral fins, pointed at tips.** **Abruptly white ventrally.** **Low keel on caudal peduncle.**

Dentition: **Tooth counts: upper jaw 24-31, lower jaw 24-34.**

Description: **Size:** slender; eyes very large; pectoral fins very long, narrow, and pointed at tips; first dorsal fin closer to pelvic fins origin; low keel on caudal peduncle; narrow-lobed caudal fin with a long lower lobe.

Colour: **Coloration is a brilliant to dark blue dorsally, becoming lighter bright blue laterally and abruptly white ventrally.**

Size: **Males mature:** 182-281 cm. **Females mature:** about 200 cm. **Maximum size:** about 390 cm.

Main key feature: **First dorsal fin closer to pelvic fin than pectoral fins**

Species coloration: **5 GILLS**

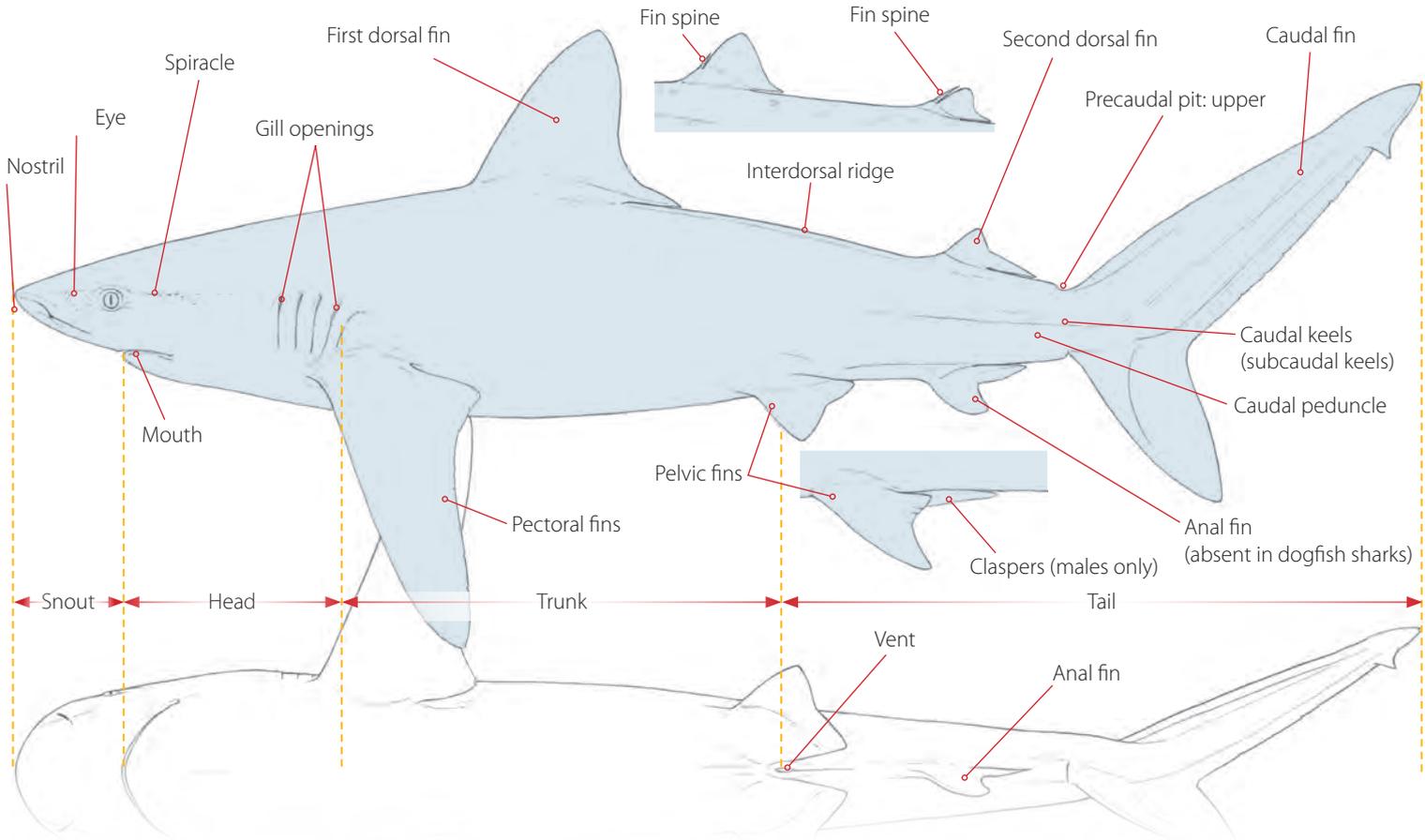
Species size given as total length in sharks: **Anal fin**, **SHARK**

Photo of specimen after capture

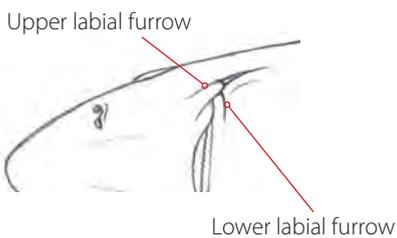
Maximum size of species compared to adult male (~1.8m tall)

EXTERNAL TERMINOLOGY FOR SHARKS

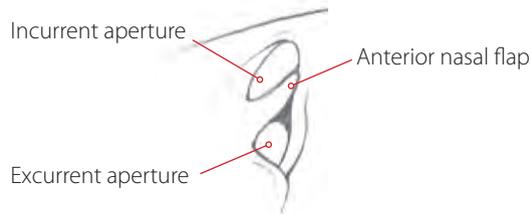
Lateral view



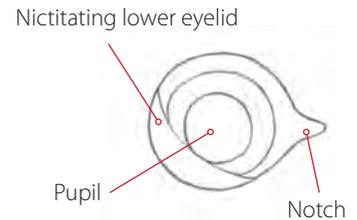
Ventral view



Mouth corner

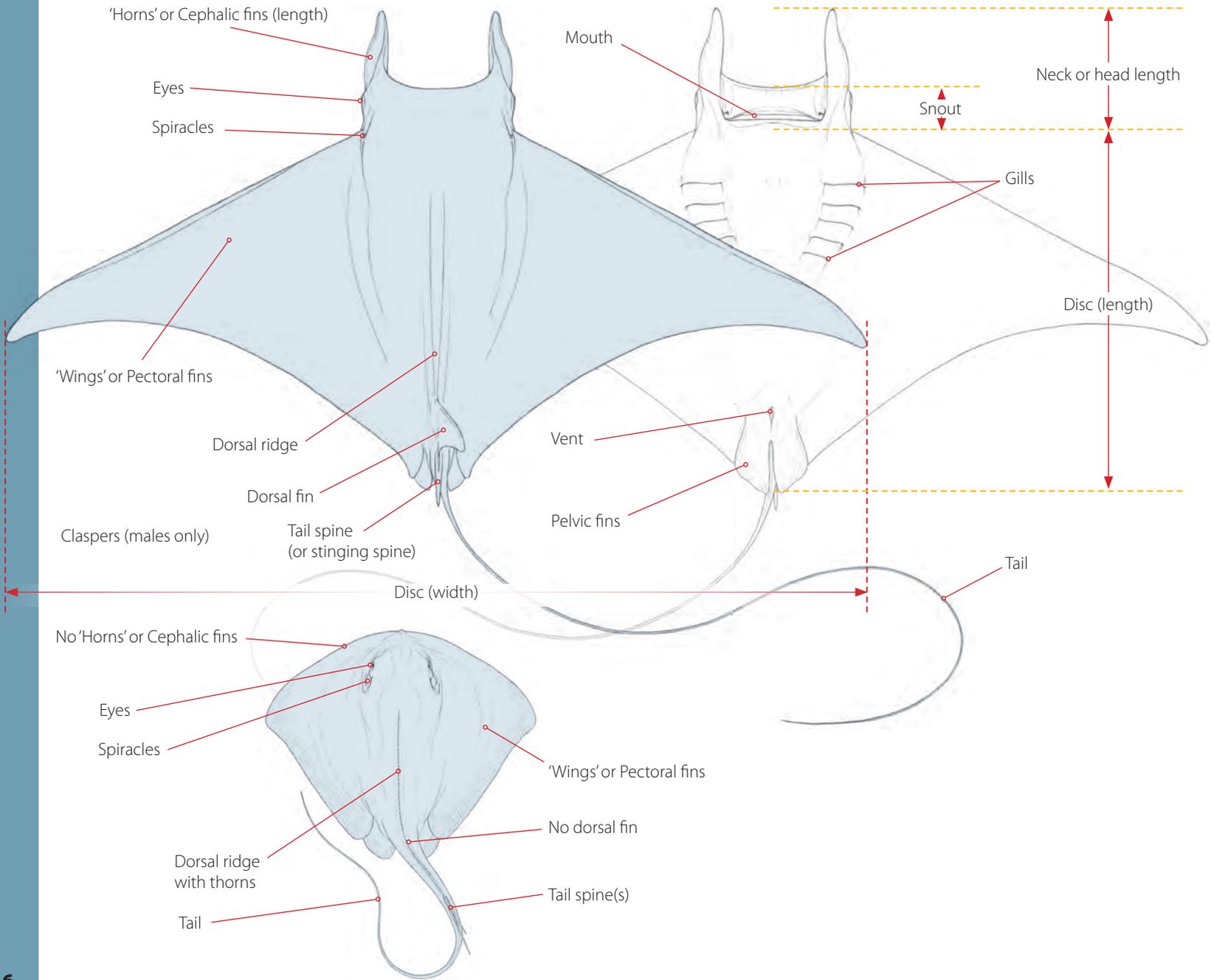


Detail of nostril



Detail of eye

EXTERNAL TERMINOLOGY FOR RAYS



GLOSSARY

Anterior margin: In precaudal fins (see below), the margin (edge) from the fin origin (see below) to its apex (tip).

Caudal keels: A dermal keel on each side of the caudal peduncle that may extend onto the base of the caudal fin, and may, in a few species, extend forward as a body keel to the side of the trunk.

Circumglobal: Occurring around the world.

Circumtropical: Occurring around the tropical regions of the world.

Claspers: The paired copulatory organs present on the pelvic fins of male sharks and rays; used for internal fertilization of eggs.

Cusp: Usually a large, sharp, pointed distal projection of the tooth crown or dermal denticles. Multicuspid refers to the oral teeth or dermal denticles with more than a single cusp. A medial cusp refers to a single, large tooth cusp and lateral cusps or cusplets refers to smaller cusps on each side of a single, larger, medial cusp.

Dermal denticle: A small tooth-like scale found on sharks and rays; some may be rough to the touch on some species, while on other species they may have a softer texture.

Endemic: A species with a restricted geographic distribution.

Free rear tips: The rear portion of a fin (dorsal, pectoral, pelvic, anal) that extends beyond the fin base (the fin's attachment to the body) which is freely moveable; in some species the free rear tips are very elongated and may be useful in species identification.

Head: The distance from the snout tip to the last gill opening.

Inner margin: On the trunk fins (dorsal, pectoral, pelvic, anal), the distance from the posterior end of the fin base (see insertion below) to the free rear tip.

Insertion: The posterior or rear end of the fin base (the fin's attachment to the body) on the trunk fins (dorsal, pectoral, pelvic, anal). See origin below.

Interdorsal ridge: A ridge of skin on the midback of sharks between the dorsal fins; this is an important character for separating genus *Carcharhinus* sharks. The interdorsal ridge may be absent or present (depending on the species), and if present, may be weak (thin) or very prominent.

Labial folds: Skin lobes at the angles of the mouth, usually with labial cartilages inside them. If present, the length of the upper relative to the lower may be useful characteristics in separating some shark species.

Nictitating lower eyelids: Found on ground sharks (order Carcharhiniformes), a moveable lower eyelid that has special posterior eyelid muscles that lift, and in some species, completely close the eye opening.

Origin: The anterior or front end of the fin base (the fin's attachment to the body) on all fins; the caudal fin has an upper and lower origin, but no insertion. See insertion above.

Paired fins: The pectoral and pelvic fins.

Pelagic: Free swimming marine organisms that are not dependent on the bottom.

Posterior margin: In precaudal fins (dorsal, pectoral, pelvic, anal) the margin from the fin apex to the free rear tip (in sharks with a distinct inner margin) or fin insertion (for those without inner margins).

Precaudal fins: All fins (dorsal, pectoral, pelvic, anal) in front of the caudal fin.

Precaudal pit: A depression at the upper and sometimes lower origin of the caudal fins where it joins the caudal peduncle.

Snout: The part of a shark or ray in front of its mouth and eyes, and including its nostrils.

PHOTOGRAPHING, RECORDING, AND SAVING SPECIMENS FOR IDENTIFICATION

By M. Stehmann and D. Ebert

Experience over many years has shown that the identification of sharks and rays can be problematic, especially with similar looking species. Rare species are sometimes encountered and if possible these specimens in addition to being photographed fresh, should be saved and forwarded to experts for possible identification. This can benefit the observers, regional agencies, and scientists (most of whom are interested in these observations), but are not usually at sea.

Taking photographs for easing identification

If possible try and place a ruler or other measuring scale alongside the specimen; if no ruler is available, then some other object to show a size relationship. A handwritten label that includes a number, the date, location, and other relevant capture information, and may include the person's name is desirable. Plain coloured or an artificial background contrasting the specimen's colour is fine.

Sharks

Take photographs in lateral view and in total length, and dorsal and ventral views, if possible with the fins erected and spread. Add close-ups of details that catch your eye, e.g. lateral and ventral view of head to gill openings or to origin of pectoral fins, mouth-nasal region, the jaws with dentition and scale cover detail, individual fins, interdorsal ridge, and colour marks or patterns. Close-ups of the teeth are also helpful, especially for the sharks of the genus *Carcharhinus*.



Lateral view, total length © David A. Ebert



Ventral view, head to gill openings © David A. Ebert



First dorsal fin close-up © David A. Ebert



Upper and lower teeth © Al Reeve



Trunk fin markings © David A. Ebert



Dorsal view, head and pectoral fins © David A. Ebert

Rays

Take photographs in total dorsal and ventral views. Add close-ups of details, such as the dorsal and ventral view of the head, horn length on mobulids, gill openings, dorsal fin, fin spine (if present), and any obvious colour patterns or markings. The colour patterns of fresh mobulids can be very distinct and useful in separating them to species.



Dorsal view, total size © David A. Ebert



Ventral view, total size © David A. Ebert



Dorsal view, head region close-up © David A. Ebert



Dorsal view, tail and spine close-up © David A. Ebert



Ventral view, vent, pelvic fins and claspers close-up © David A. Ebert



Dorsal view, pelvic fins and base of tail © David A. Ebert

Saving and preservation of unknown, rare, or strange specimens and what to do with them

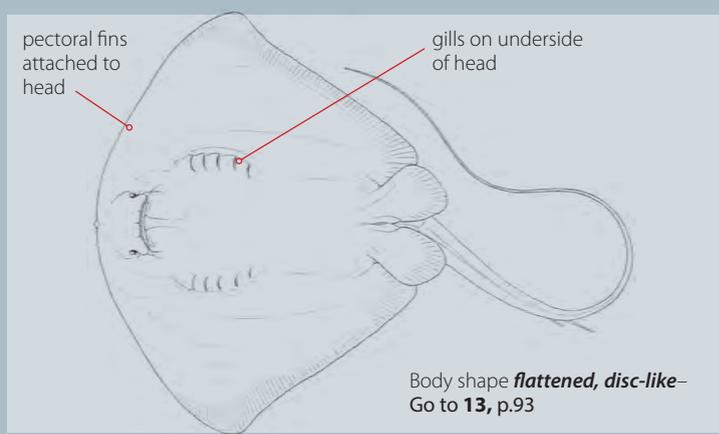
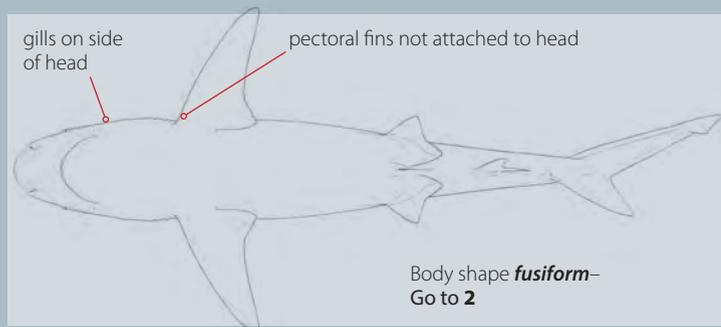
In addition to taking photographs first of the fresh specimen, preserving and forwarding such individuals may be very important for science. These may document, e.g. first geographic records, first records of small young or fully grown adults in a given location, or you may even have found a species so far unknown to science.

At sea, after first photographing it, if possible a photograph or series of digital photographs could be sent to someone (e.g. a scientist) to further check the identification of the specimen and determine whether it should be saved. Once a further determination has been made on its possible identification, and it has been determined the specimen should be saved, it should be preserved by wrapping it in a plastic bag and deep-freezing it. Any associated information (see above) should be included along with the specimen. Use thick, water- and leakage proof plastic bags or box for storage. If it is not possible to send digital photographs from sea, the specimen should then be saved.

Once back in port, the specimen should remain frozen until someone, preferably from a marine or fishery institute, zoological institute, or museum, and knowledgeable about the possible identification of the specimen can further examine it. Once a determination has been made to save it, a tissue sample (~2-5 gm) should be removed and preserved in a vial of 100% ethanol. The entire specimen, assuming it is not too large, should then be preserved first in 10% formalin. A bin set up in a well-ventilated (the liquid and gas are very toxic) facility and using a dilute concentrated formalin 1:9 with water. If possible, using a syringe, some formalin should be injected into the belly cavity, or a small cut can be made through the belly to allow penetration of formalin to the innards to prevent rotting inside the belly cavity. The storage bin can be outside in a secure area, but undercover and out of the outside elements. Once preserved, the specimen can be shipped to a regional expert for further examination and may be deposited into the fish collection of a national or major international museum.

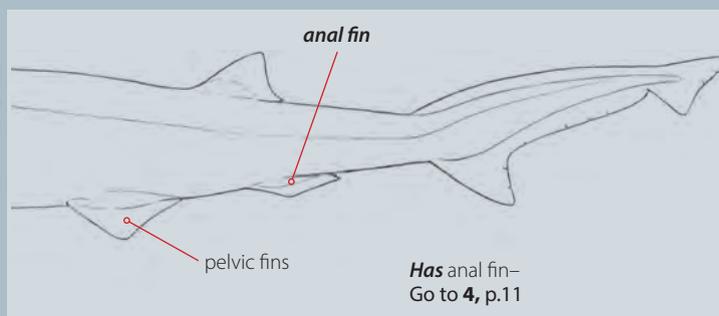
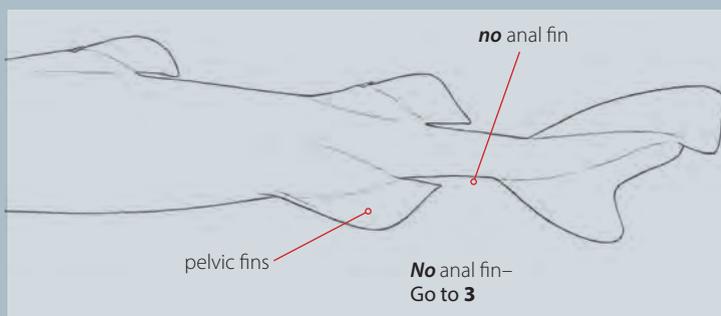
1a Sharks → 2

1b Rays → 13, p.93



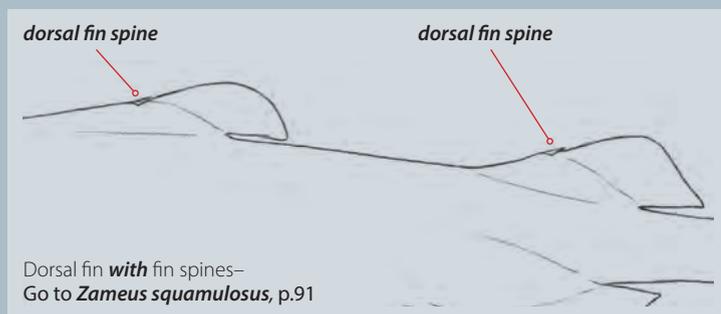
2a No anal fin → 3

2b Has **anal fin** → 4, p.3



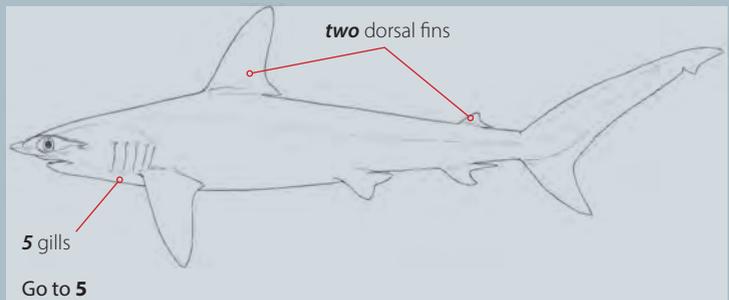
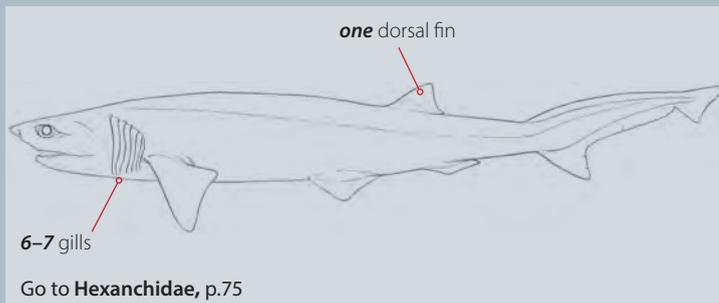
3a Dorsal fins **with** fin spines → *Zameus squamulosus*, p.91

3b Dorsal fins **without** fin spines → Dogfish sharks without fin spines, p.76



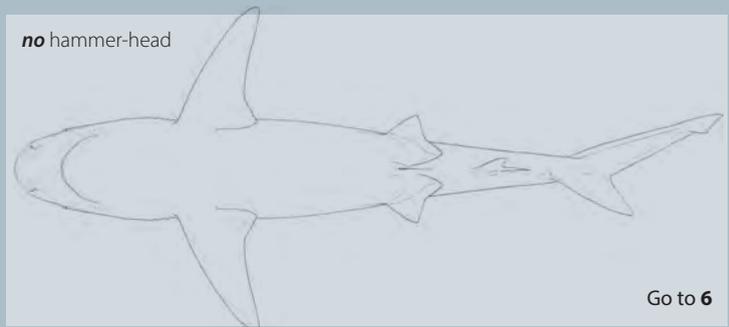
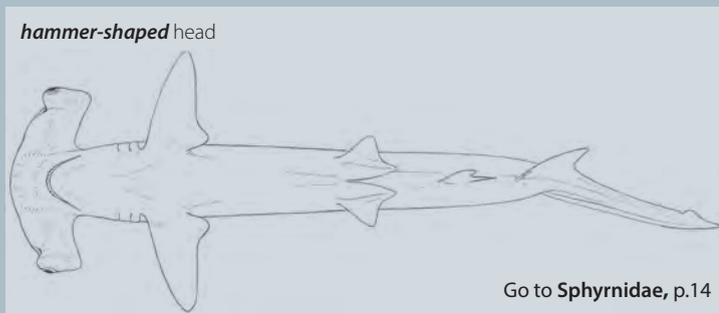
4a **One** dorsal fin. **6-7** gills → **Hexanchidae**, p.75

4b **Two** dorsal fins. **5** gills → **5**



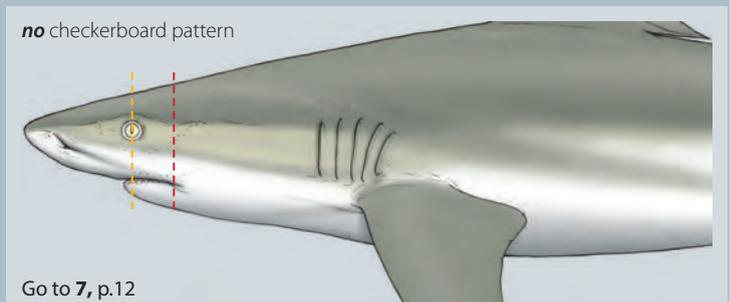
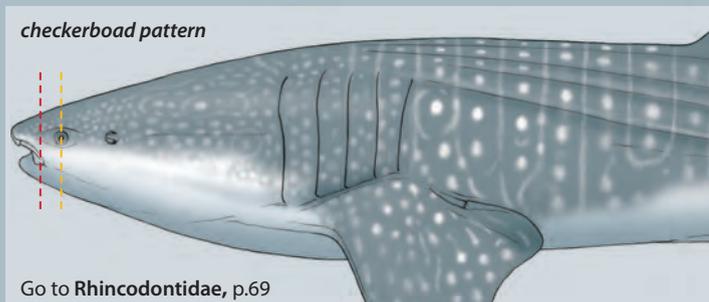
5a **Hammer-shaped** head → **Sphyrnidae**, p.14

5b **No** hammer-head → **6**



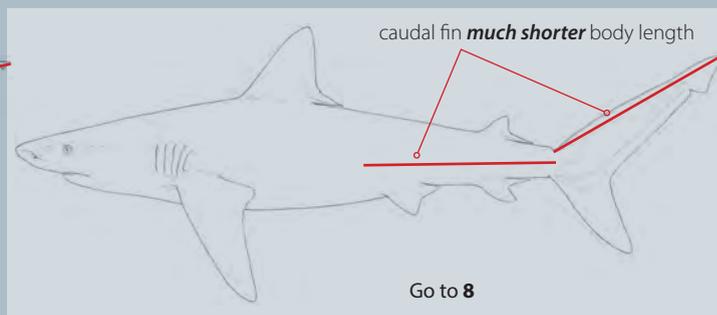
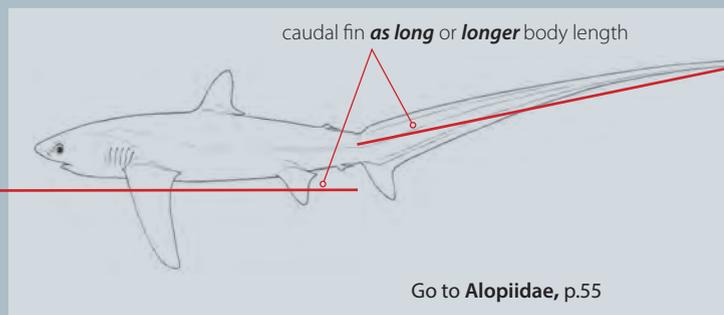
6a Mouth **does not** extend behind eyes. **Checkerboard pattern** → **Rhincodontidae**, p.69

6b Mouth **does** extend behind eyes. **No** checkerboard pattern → **7**, p.12



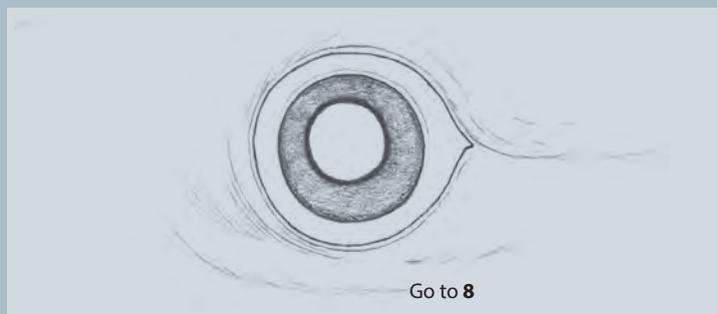
7a Caudal fin as long or longer than body length → **Alopiidae** p.55

7b Caudal fin shorter than body length → 8)



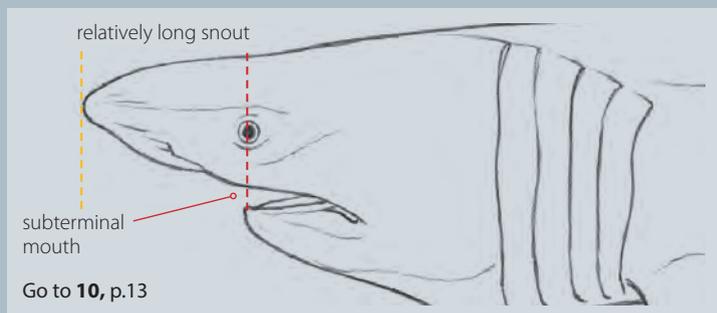
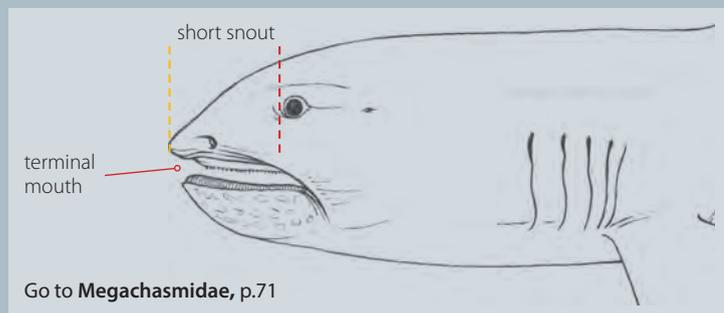
8a Eyelids present → **Carcharhinidae** p.21

8b Eyelids absent → 9)



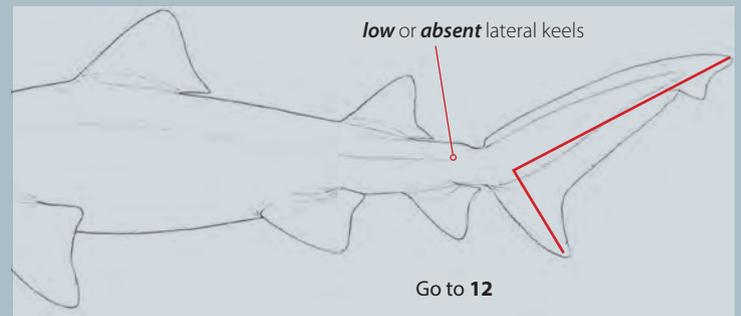
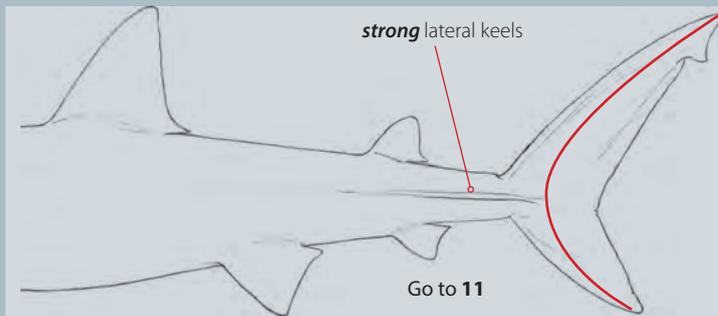
9a Short snout. Terminal mouth → **Megachasmidae** p.71

9b Relatively long snout. Sub-terminal mouth → 10) p.13



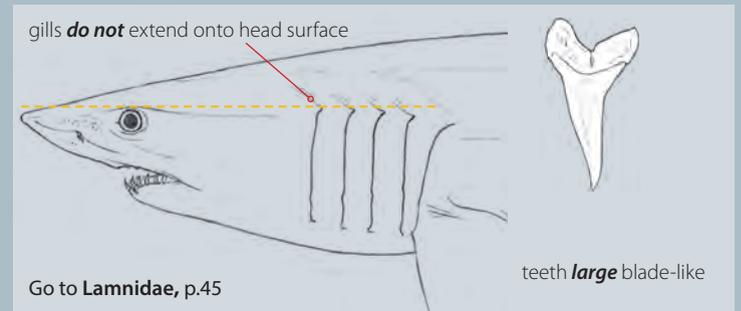
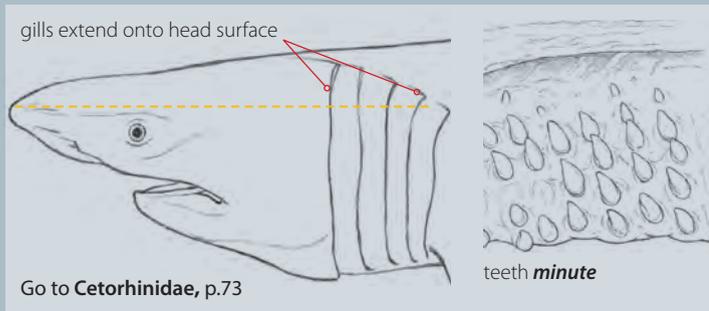
10a Caudal fin 'C'-shaped. Strong lateral keels → 11)

10b Caudal fin not 'C'-shaped. Weak or absent lateral keels → 12)



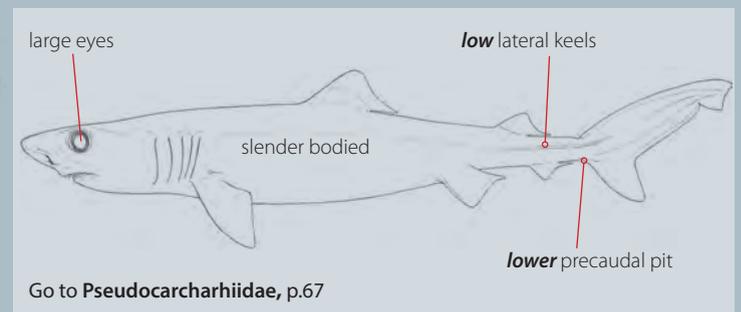
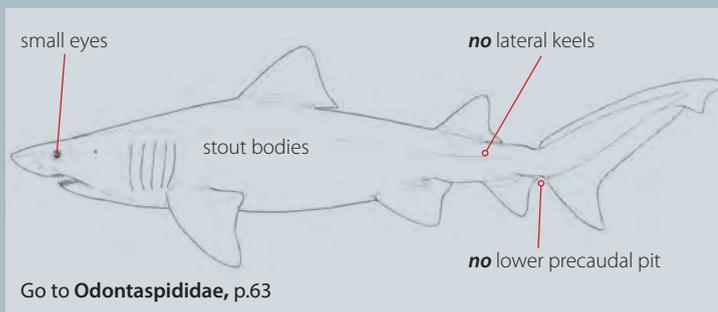
11a Teeth minute. Large gills extend onto surface of head → **Cetorhinidae** p.73

11b Large blade-like teeth. Gills do not extend onto surface of head → **Lamnidae** p.45

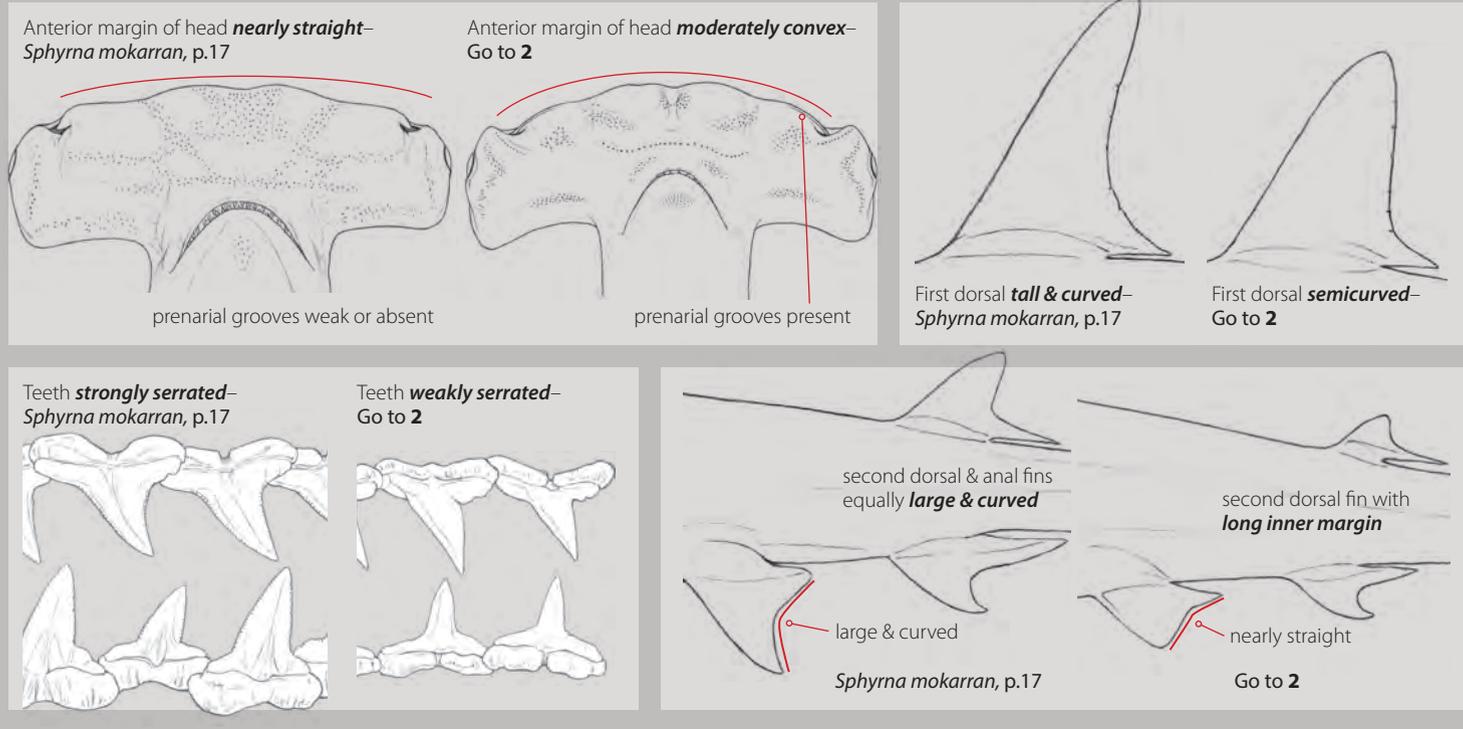


12a Stout bodied. Small eyes. **No** lower pre-caudal pit → **Odontaspidae** p.63

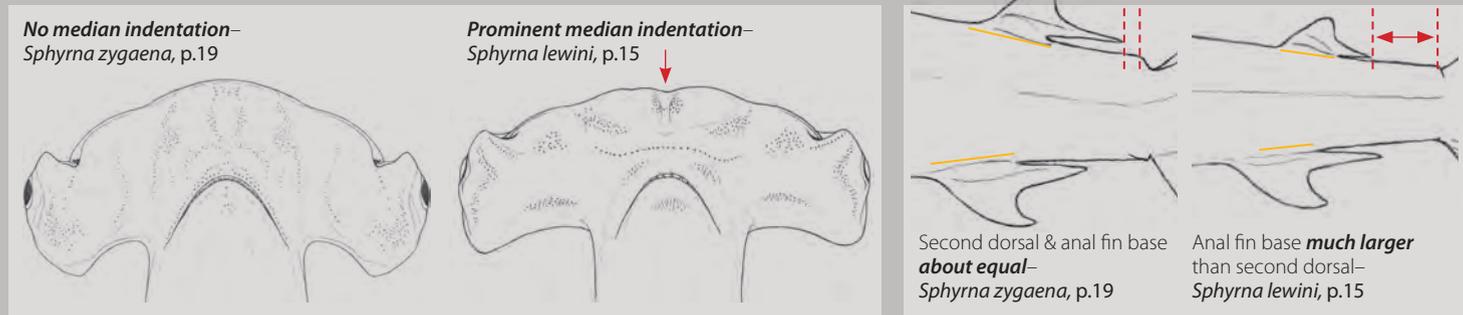
12b Slender bodied. Large eyes. **Upper** and **lower** pre-caudal pit present → **Pseudocarchariidae** p.67



- 1a** Anterior margin of head nearly straight. Prenarial grooves absent or hardly developed. First dorsal fin tall & strongly falcate. Teeth strongly serrated at all sizes. Pelvic fins large & falcate. Second dorsal & anal fins equally very large & falcate → *S. mokarran* p.17
- 1b** Anterior margin of head moderately convex. Prenarial grooves well-developed. First dorsal usually semifalcate. Teeth weakly serrated in adults. Pelvic fins with nearly straight posterior edges. Second dorsal fin with a long inner margin → **2**



- 2a** No median indentation on anterior margin of head. Free rear tip of second dorsal fin well ahead of upper caudal fin origin. Anal fin base about as large as second dorsal fin base. → *S. zygaena* p.19
- 2b** Prominent median indentation on anterior margin of head. Free rear tip of second dorsal fin nearly reaching upper caudal fin origin. Anal fin base noticeably larger than that of second dorsal fin → *S. lewini* p.15



Sphyrna lewini

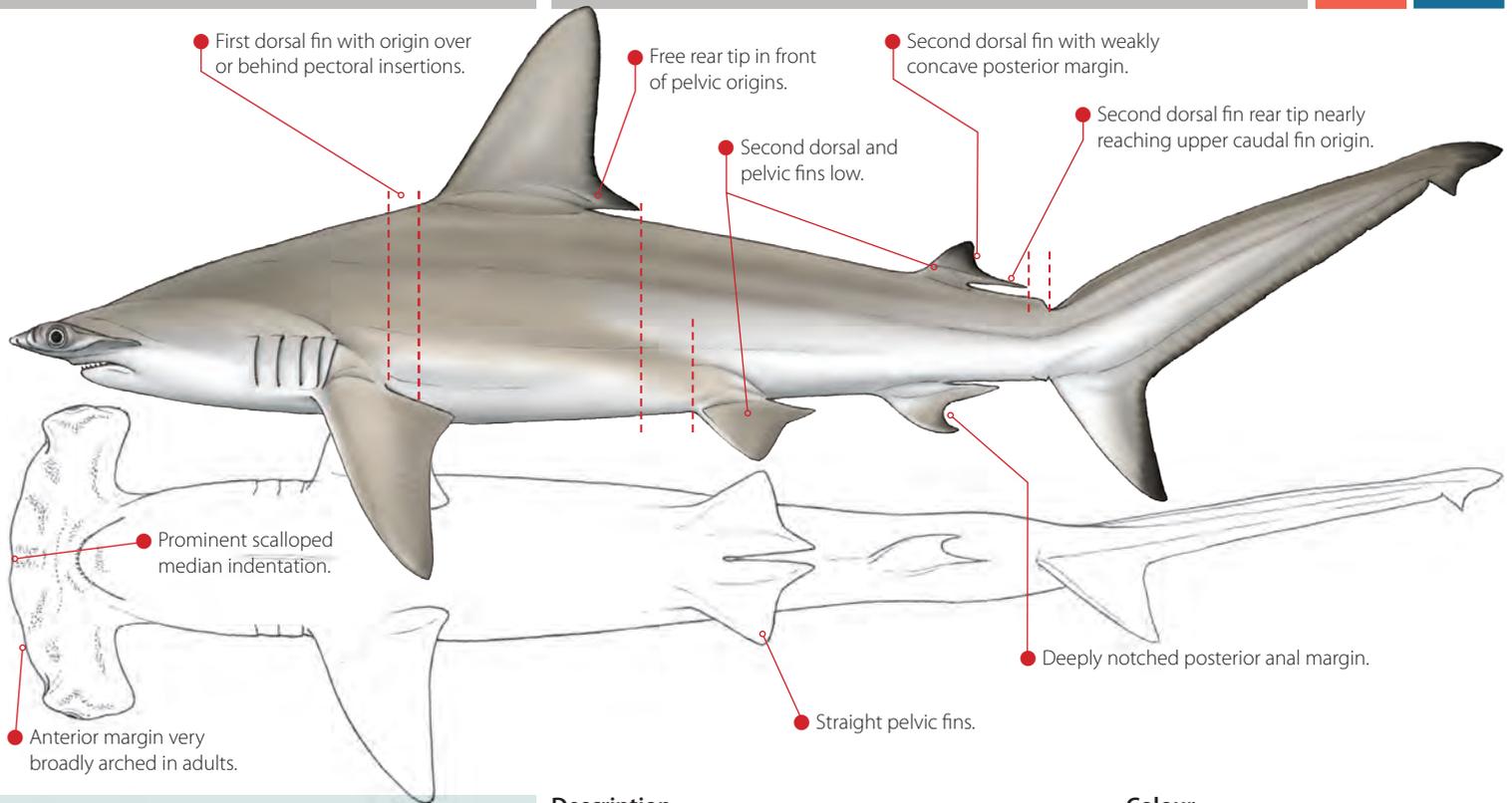
(Griffith & Smith, 1834)

Scalloped Hammerhead

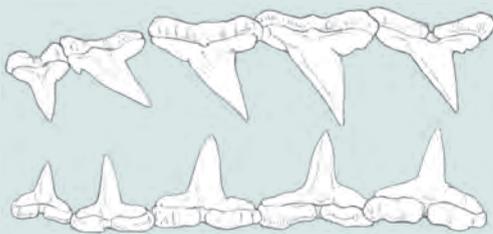
Requin-marteau Halicorne

EN

LL



Dentition



Teeth approximately actual size.

Teeth large, with a long slender, smooth-edged cusp, no lateral cusplets, similar in both jaws; no intermediate teeth.

Tooth rows: upper 30–36, lower 30–35.

Description

Anterior margin of “hammerhead” curved and with a prominent scalloped indentation. Moderately high first dorsal fin with origin over or behind pectoral insertions and free rear tip in front of pelvic origins. Second dorsal fin with long posterior margin with free rear tip nearly reaching upper caudal origin. Straight to nearly straight pelvic fins. Deeply notched posterior anal margin.



© NOAA Fisheries, USA

Colour

Grey-brown above, white below, undersides of pectoral fin tips dusky (larger specimens) to black (younger specimens).

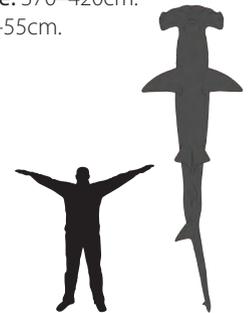
Size

Males mature: 140–150cm.

Females mature: 212cm.

Maximum size: 370–420cm.

Birth size: 40–55cm.

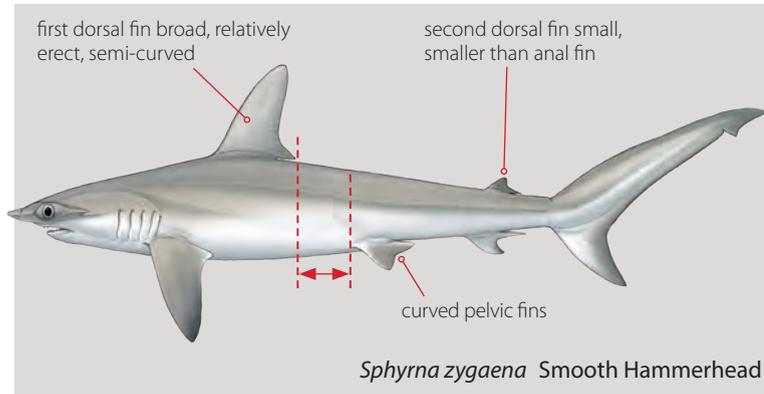
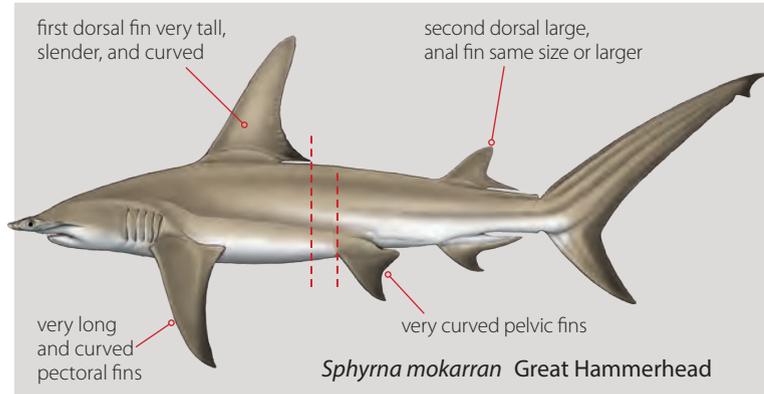
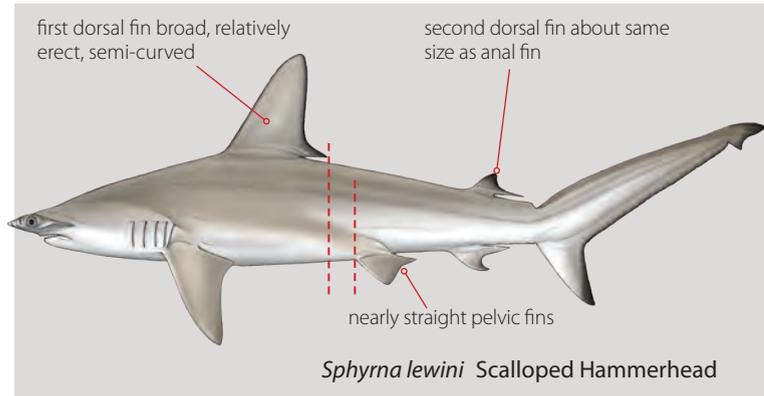


SIMILAR SPECIES

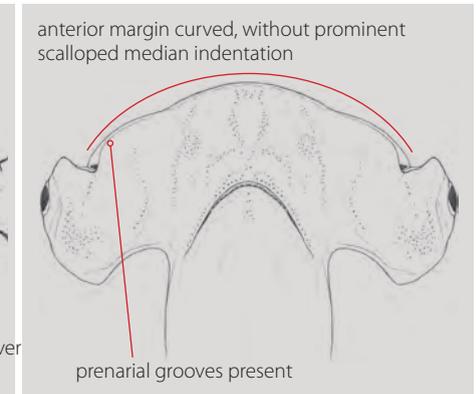
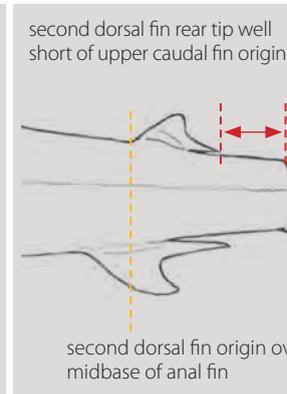
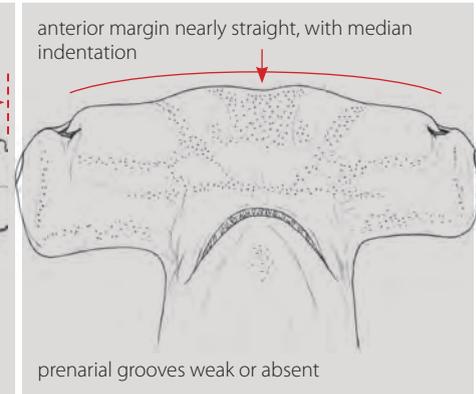
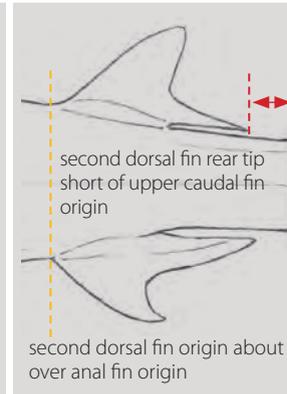
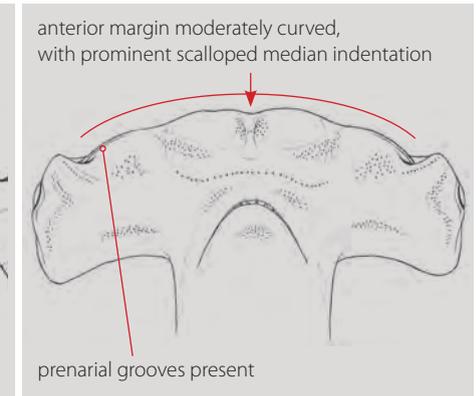
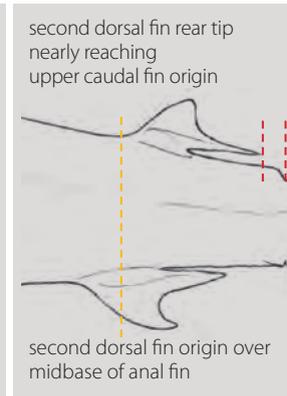
Moderately curved first dorsal fin with origin over or behind pectoral fins insertion and free rear tip in front of pelvic origins, low second dorsal fin with weakly concave posterior margin the long posterior margin is about twice its

height with the free rear tip nearly or not quite reaching the upper caudal fin origin, nearly straight pelvic fins, anal fin with deeply notched posterior margin; undersides of pectoral fins dusky or black-tipped.

First dorsal, pectoral and pelvic fin sizes and shapes



Second dorsal and anal fins Ventral view of heads

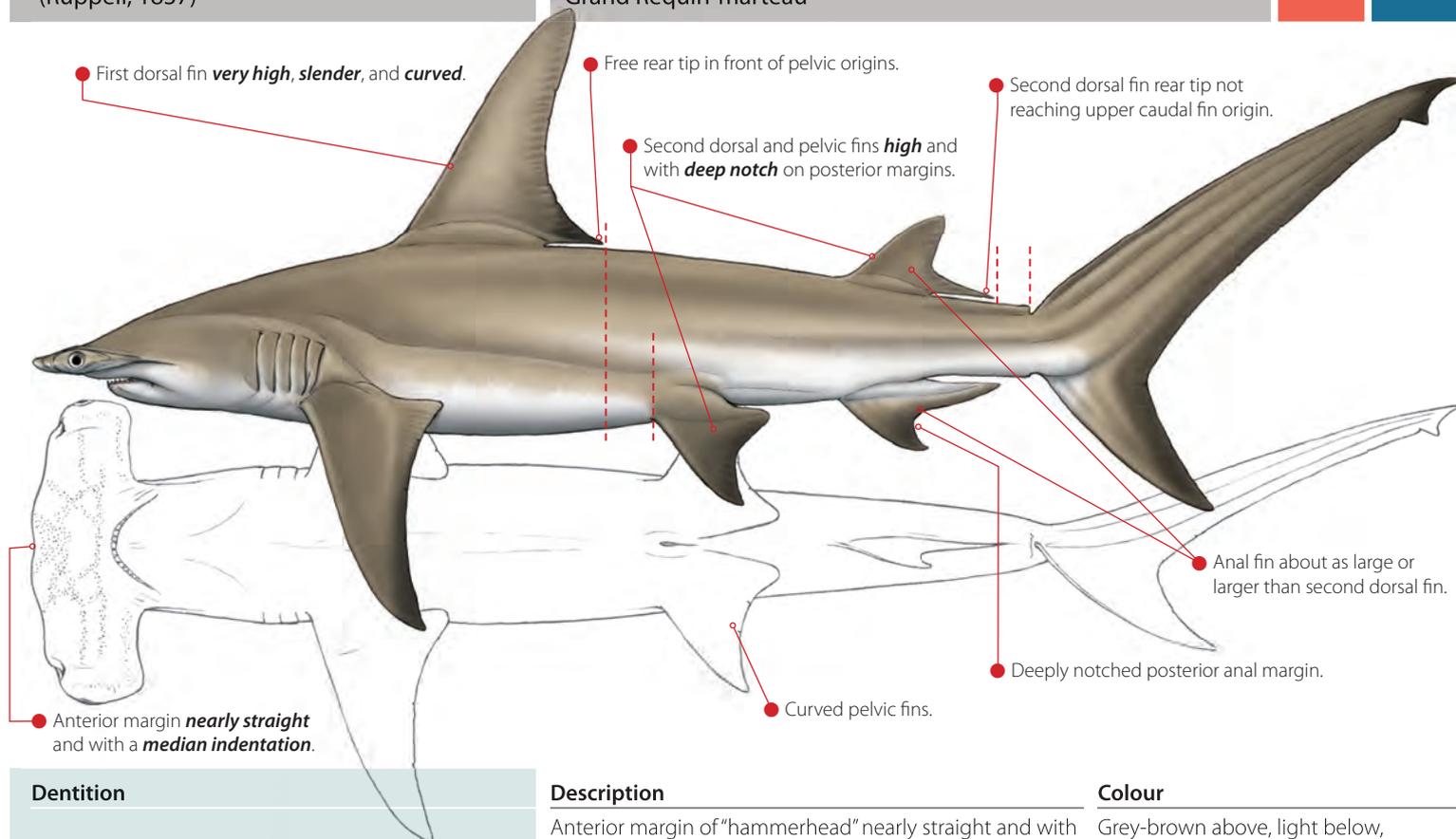


Sphyrna mokarran
(Rüppell, 1837)

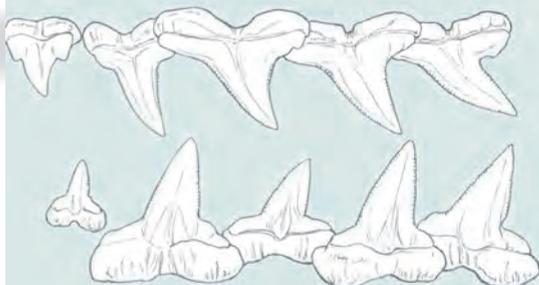
Great Hammerhead
Grand Requin-marteau

EN

LL



Dentition



Teeth approximately actual size.

Teeth strongly serrated at all sizes.

Tooth count: upper jaw 36–37, lower jaw 34–35.

Description

Anterior margin of “hammerhead” nearly straight and with a median indentation. Very high first dorsal fin with rear tip in front of pelvic origins. Second dorsal and pelvic fins high and with deep notches on posterior margins. Anal fin deeply notched and about as large or larger than second dorsal fin.



© NOAA Fisheries, USA

Colour

Grey-brown above, light below, without fin markings.

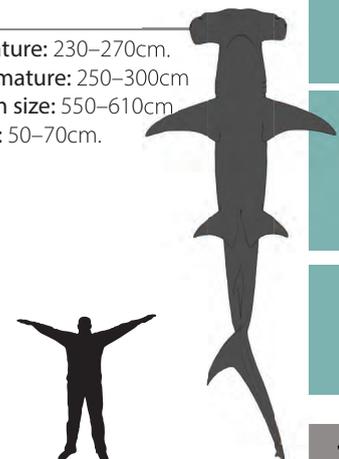
Size

Males mature: 230–270cm.

Females mature: 250–300cm

Maximum size: 550–610cm

Birth size: 50–70cm.



Sphyrna mokarran

Hammer-shaped head

5 Gillis

Anal fin

SHARK

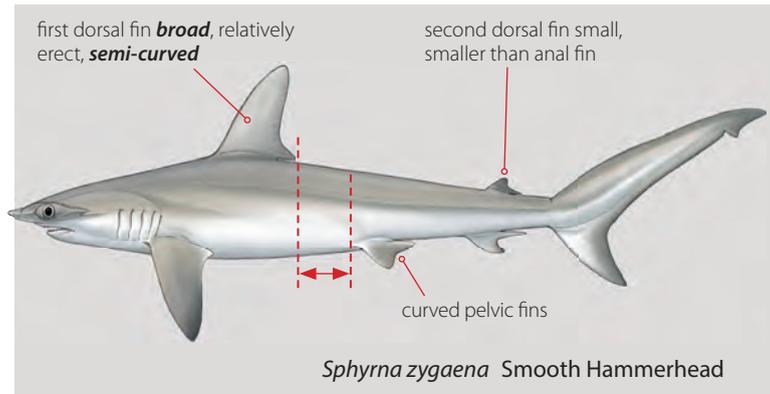
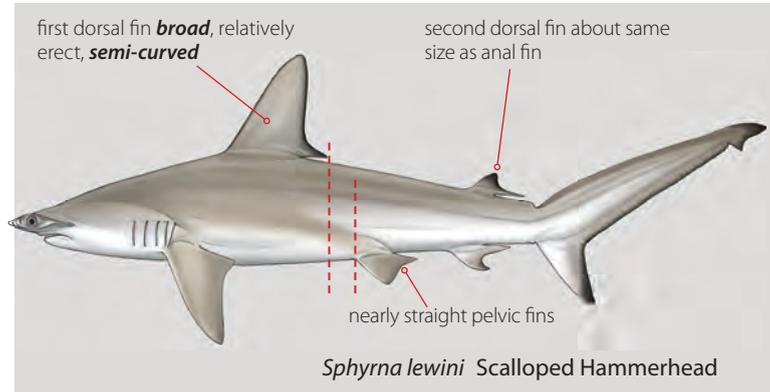
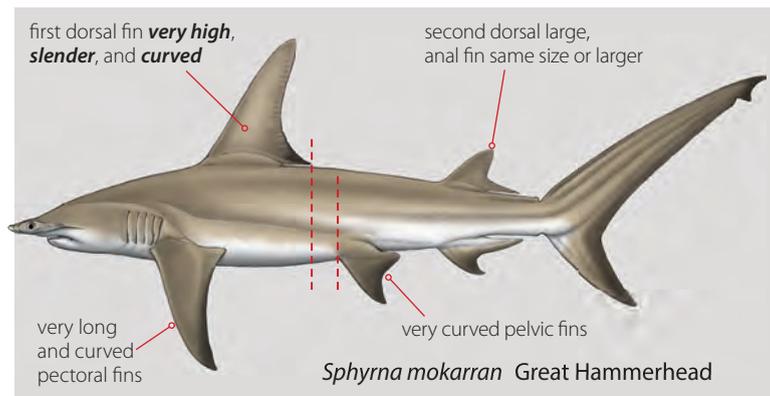
17

SIMILAR SPECIES

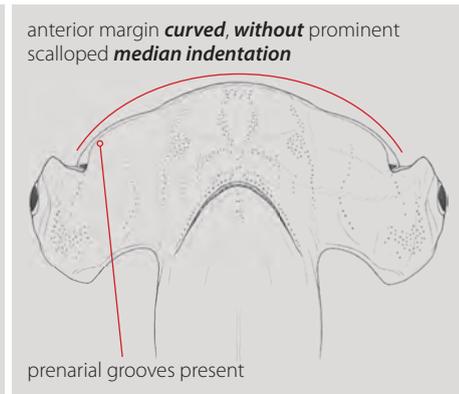
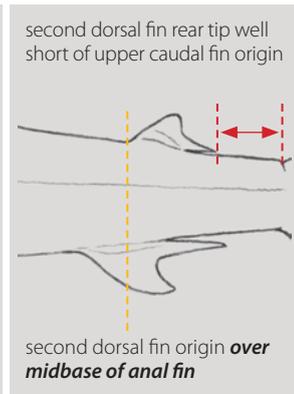
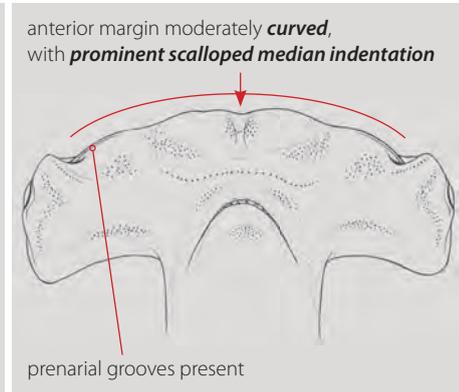
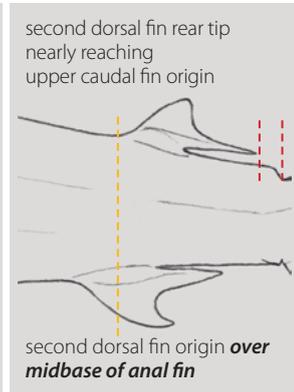
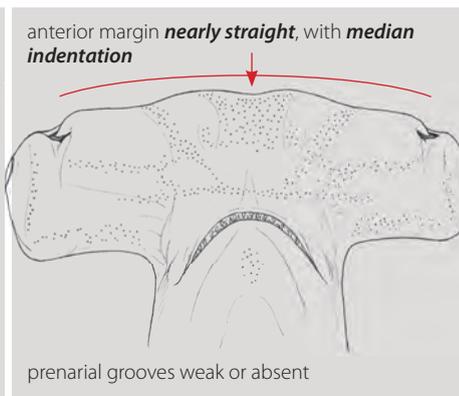
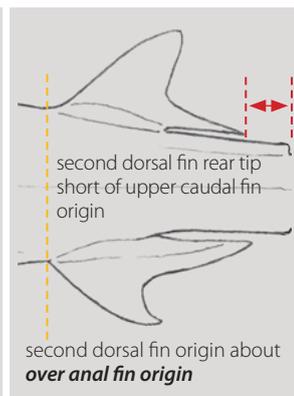
Head anterior margin nearly straight with a median indentation; first dorsal fin very high and curved with the rear tip in front of the pelvic fins origin, second dorsal fin rear tip does not reach near the upper caudal fin origin, anal

fin about as large or larger than second dorsal fin with a deeply notched posterior.

First dorsal, pectoral and pelvic fins sizes and shapes



Second dorsal and anal fins Ventral view of heads



Sphyrna zygaena

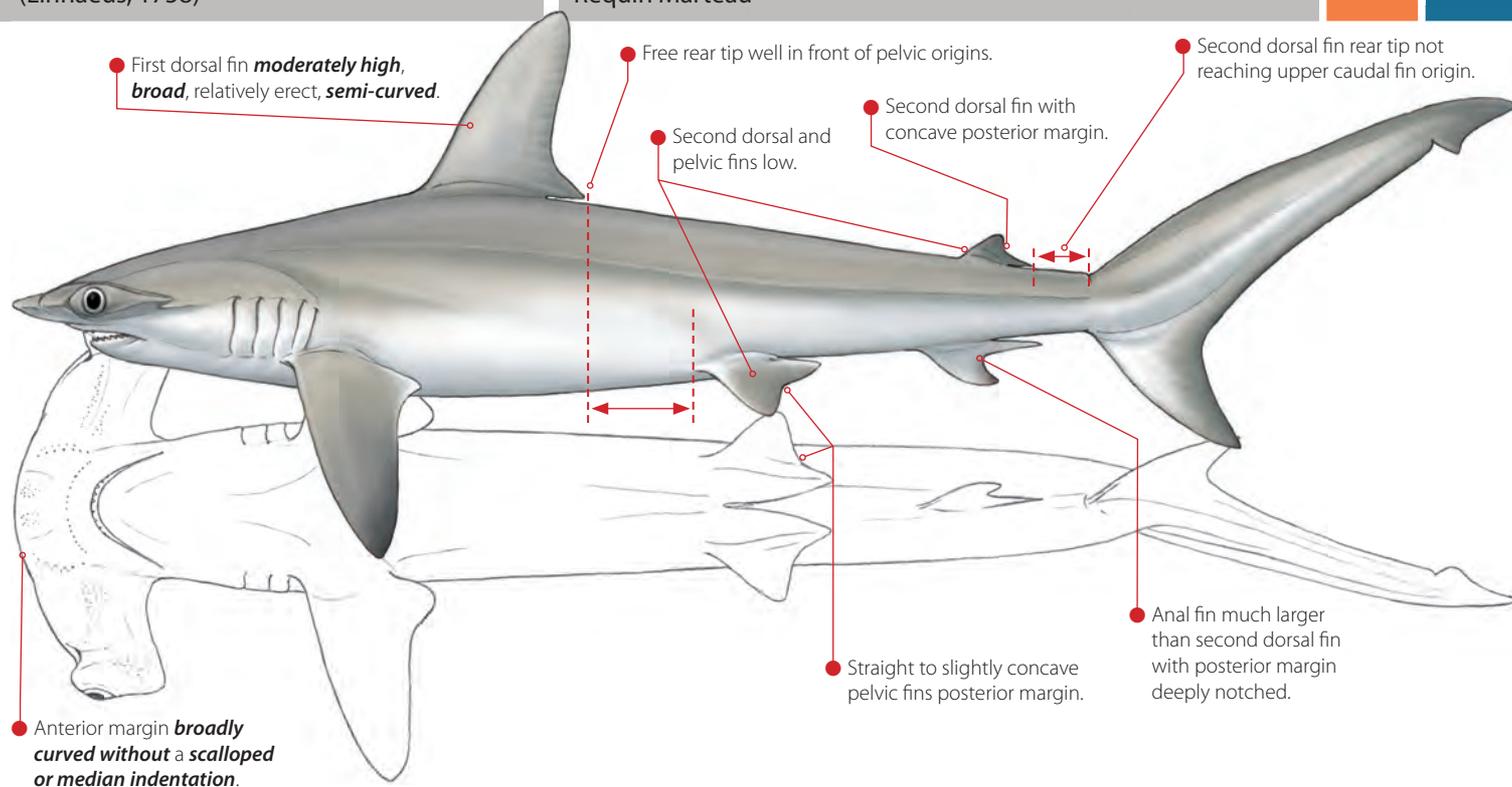
(Linnaeus, 1758)

Smooth Hammerhead

Requin Marteau

VU

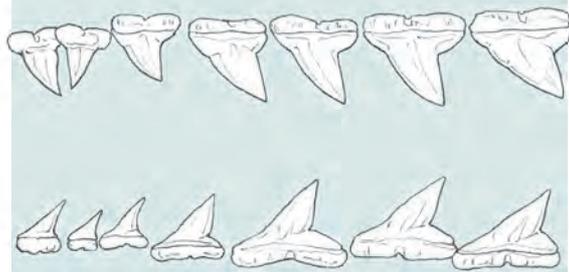
LL



Sphyrna zygaena

Hammer-shaped head

Dentition



Teeth approximately actual size.

Teeth with very broad cusps and smooth to weakly serrated edge.

Tooth counts: upper jaw 30–32, lower jaw 29–30.

Description

Anterior margin of “hammerhead” curved and without a prominent scalloped indentation. Moderately high first dorsal fin. Second dorsal and pelvic fins low, second dorsal fin rear tip not reaching upper caudal fin origin. Anal fin much larger than second dorsal fin.



© Reeve/Henderson (Sultan Qaboos University, Muscat, Oman)

Colour

Dark olive or dark grey-brown above, white below, undersides of pectoral fin tips dusky.

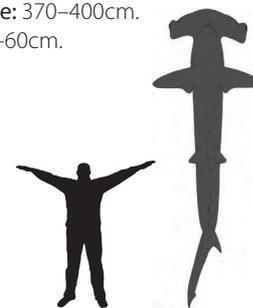
Size

Males mature: 210–240cm.

Females mature: 250–260cm.

Maximum size: 370–400cm.

Birth size: 50–60cm.



5 Gills

Anal fin

SHARK

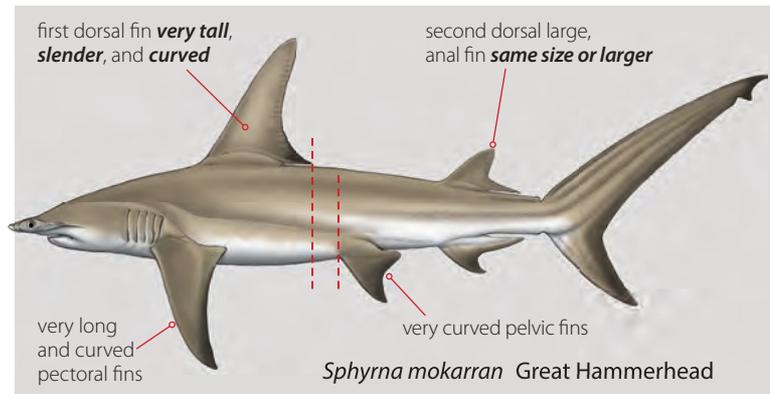
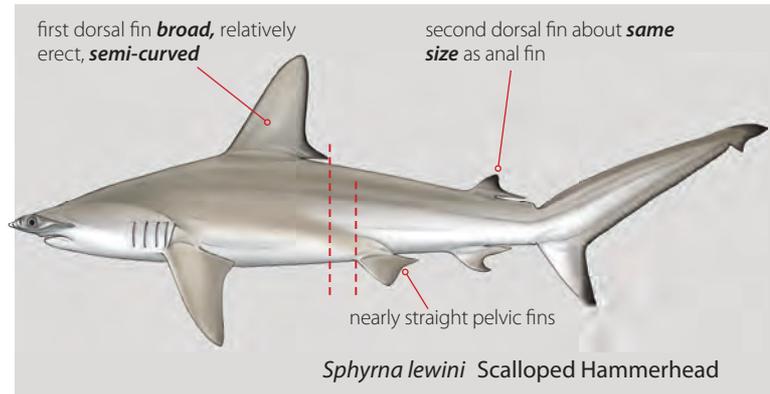
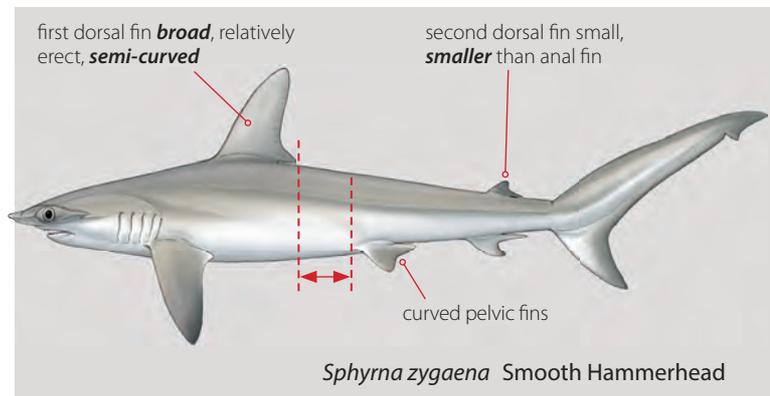
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SIMILAR SPECIES

Anterior margin of "hammerhead" curved without a prominent scalloped indentation; moderately high first dorsal fin, second dorsal fin tip does not

reach the upper caudal fin origin, anal fin much larger than second dorsal fin with posterior margin deeply notched.

First dorsal, pectoral and pelvic fins sizes and shapes



Second dorsal and anal fins Ventral view of heads

