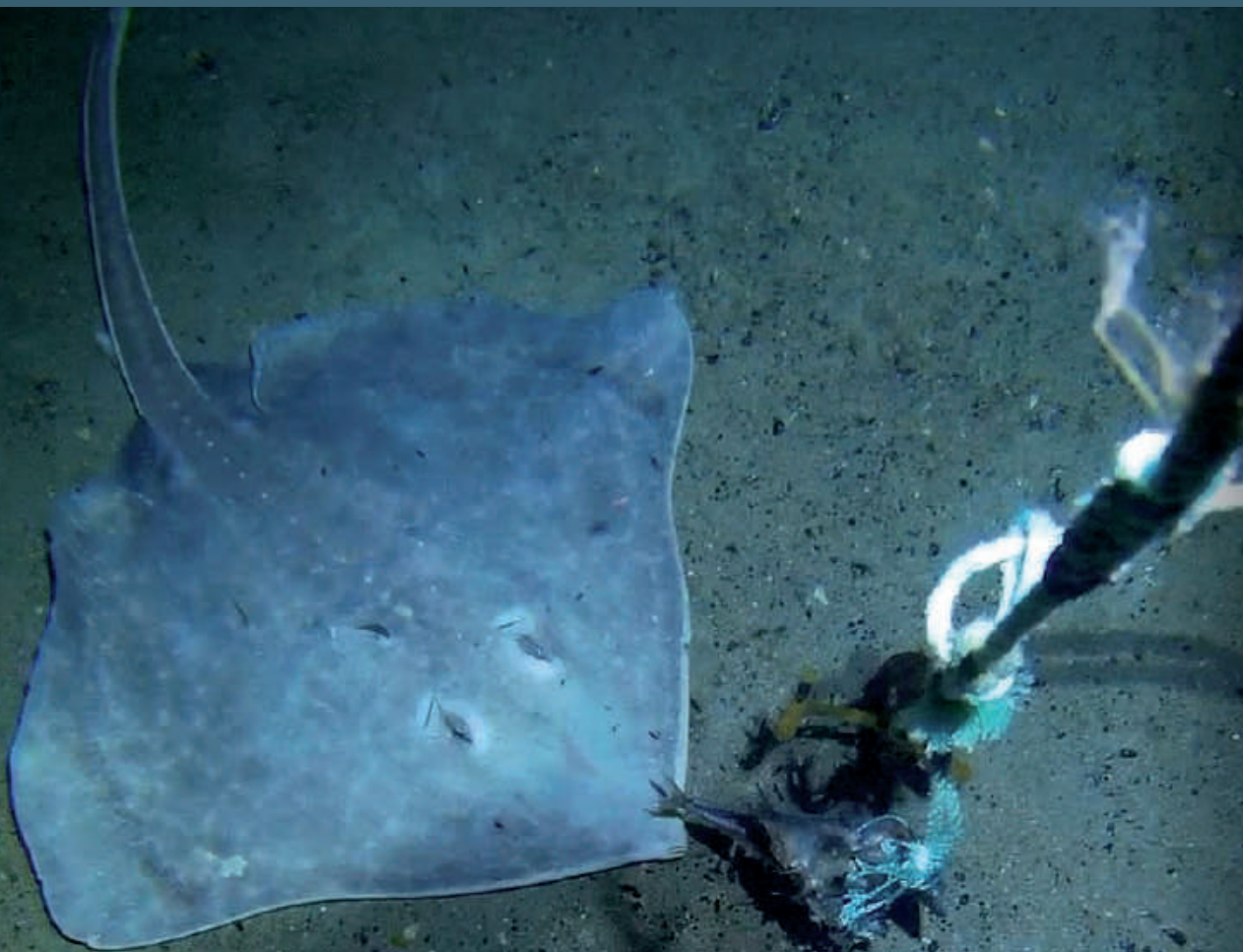


ID GUIDE TO ELASMOBRANCHS OF THE FALKLAND ISLANDS



Elasmobranquios de las Islas
Falkland

포클랜드 섬의 연골어류

sharktrust.org/falklands



INTRODUCTION

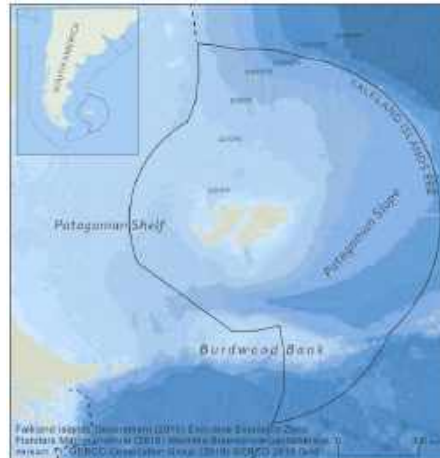
The waters around the Falkland Islands are highly productive, supporting a diverse abundance of around 24 species of elasmobranchs (sharks, skates and rays). This field guide aids quick and accurate identification, advising on biology, distribution, and morphology of 18 species of skate, one ray and six sharks encountered in Falklands waters. This guide has been designed for use by fishers, observers and researchers, as well as the public.

Elasmobranchs play pivotal roles in maintaining healthy and balanced marine ecosystems. Yet, they exhibit biological traits that make them vulnerable to overfishing - slow growth, late maturity, low reproductive rates, and longevity. These characteristics vary according to species, making some more resilient to fishing pressure than others.

The commercial fishing industry operating in Falklands waters is managed by the Falkland Islands Fisheries Department (FIFD). Whilst many skates and rays are retained as bycatch, skate is also a target catch in some fisheries. All landed skates and rays are currently recorded as a single mixed species assemblage, such as 'ray' rather than by individual species.

Accurate species-specific reporting is vital to help monitor population trends, observe changes in species diversity and distribution, and inform management towards long-term sustainable fisheries.

This guide has been produced by the Shark Trust, in close collaboration with the FIFD and funded by the John Ellerman Foundation.



HOW TO USE THIS GUIDE

At the bottom of each page is a banner of icons (see below) with key information specific to each species.

FIFD code*:
3 letter code
unique to each
species.

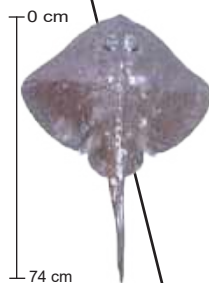
IUCN Red List status:
Global conservation
status of this species.

Maximum total length:
Measured from the tip
of the snout to the tip of
the tail.

Depth:
Minimum and
maximum depth
in metres that
each species has
been reported in
Falklands waters.

Reference code:
Individual code
assigned to each
species.

Critically Endangered	CR
Endangered	EN
Vulnerable	VU
Near Threatened	NT
Least Concern	LC
Data Deficient	DD
Not Assessed	NA



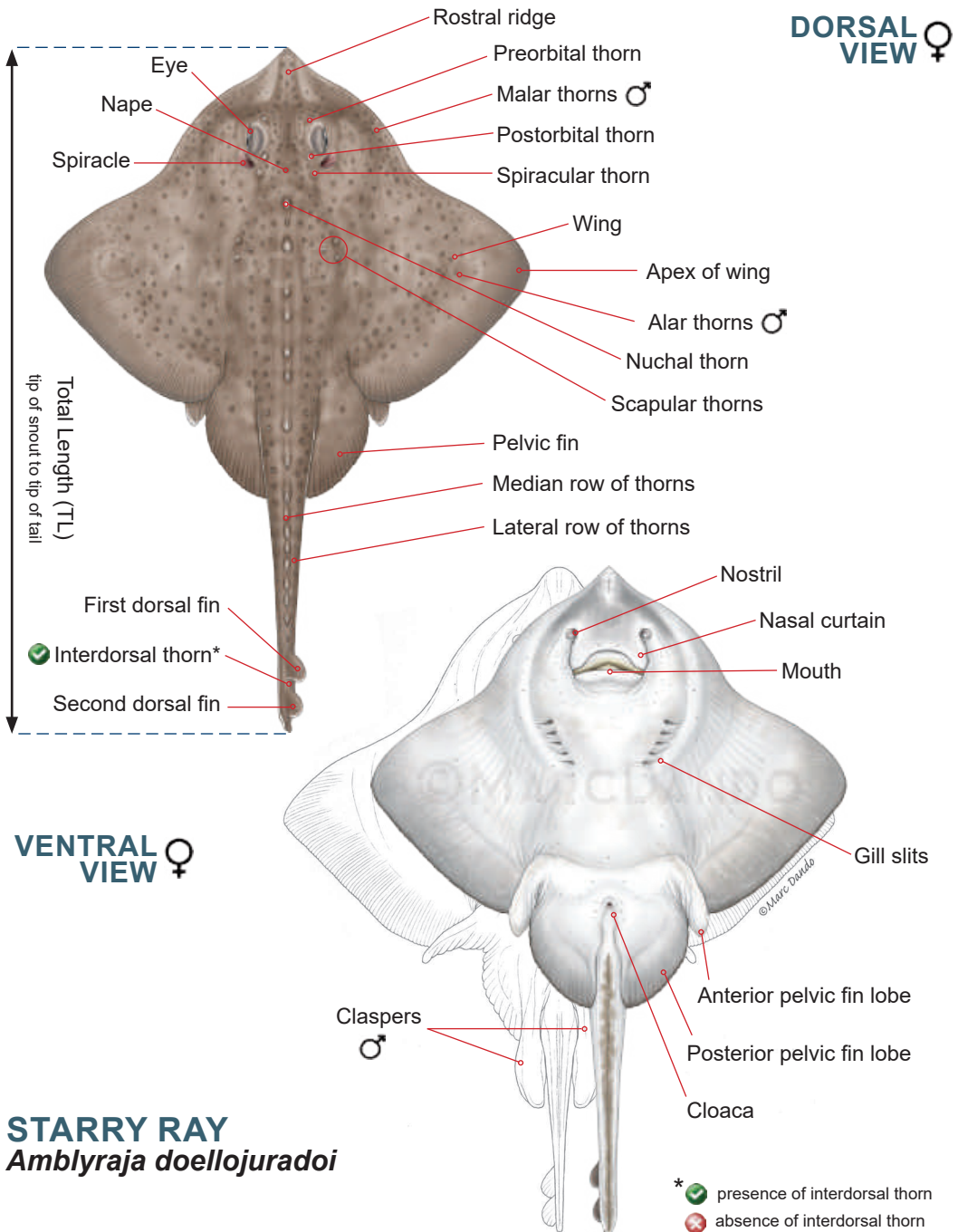
RDO

Global: LC

Max TL: 74cm

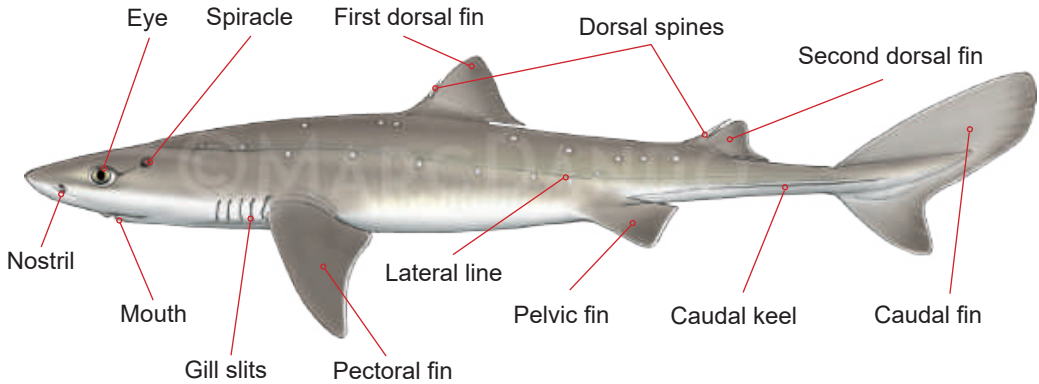
Depth: 77- >1000m

SKATE MORPHOLOGY

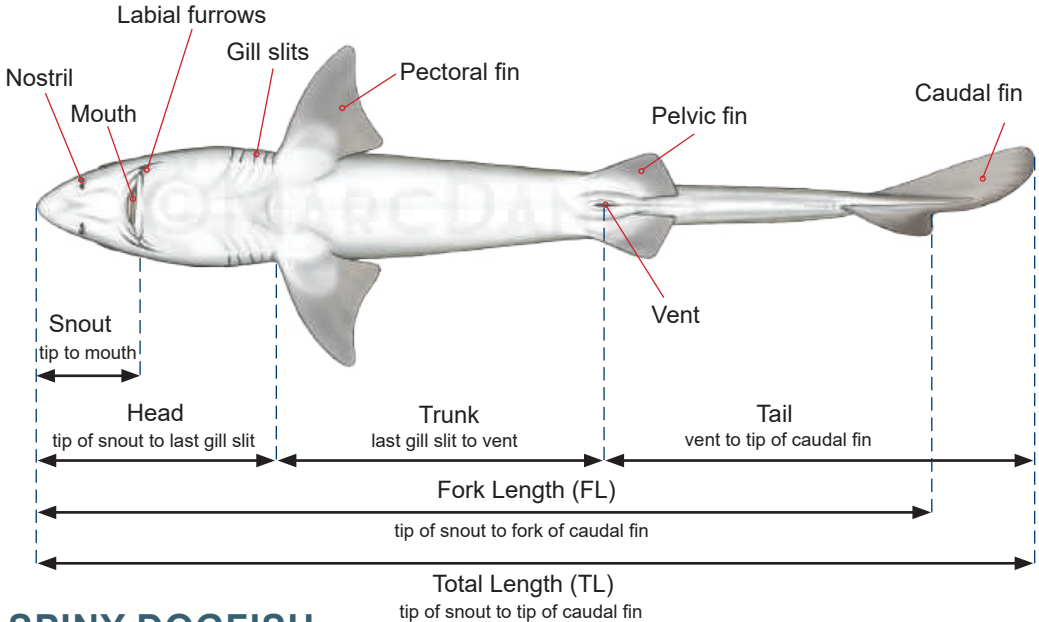


SHARK MORPHOLOGY

LATERAL VIEW ♀



VENTRAL VIEW ♀

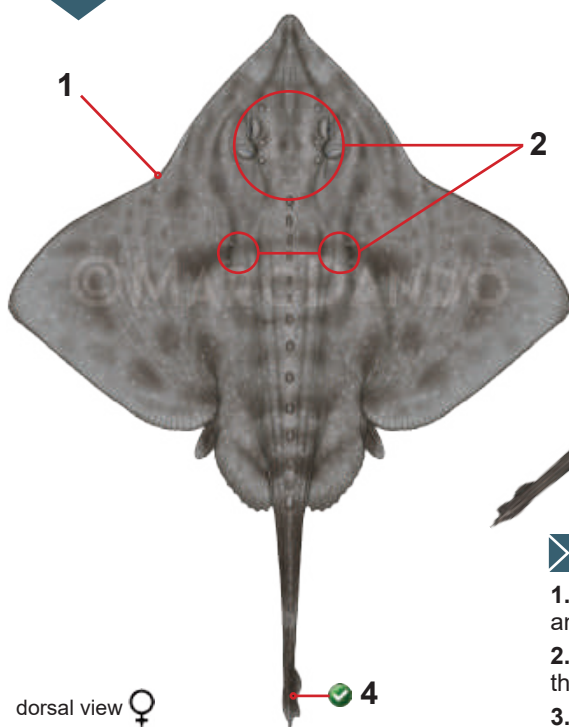


SPINY DOGFISH *Squalus acanthias*

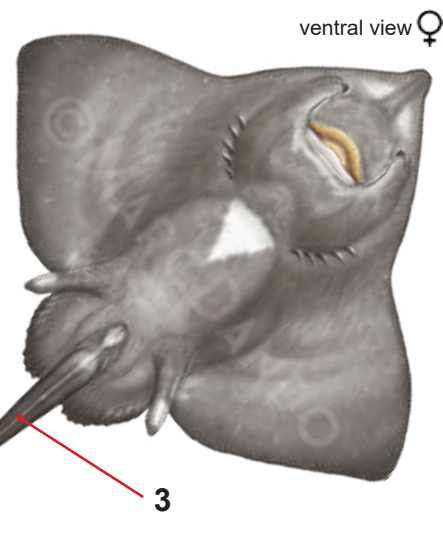
ANTARCTIC STARRY SKATE

Amblyraja cf. georgiana

IDENTIFY



dorsal view ♀



ventral view ♀

IDENTIFICATION AND COLOUR

1. Disc broad and thick; apex of wings abruptly angular.⁴
2. Usually 3 thorns near each eye; 2–3 scapular thorns, arranged in a triangle.⁴
3. Usually a conspicuous grey-brown median stripe running along ventral side of tail.⁷
4. Dorsal fins small, joined or separated slightly; usually one interdorsal thornlet.⁴

► **Dorsal surface:** dark brown to greyish brown, usually with dense reticulated pattern.⁴

► **Ventral surface:** varies from white with dark edges to entirely dark except white snout, branchial region, gill slits and belly.⁴

SCIENTIFIC NAME

Amblyraja cf. georgiana (Norman, 1938)

COMMON NAMES

ANTARCTIC STARRY SKATE, Antarctic Skate, Raya estrellada antártica (CHL), 땅가오리 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: 620–2240m on deep water slopes of Patagonian Shelf; more common east of Falkland Islands and Burdwood Bank.^{1,2,3}

SW Atlantic: reported shallower from 20–350m; widely distributed in shelf waters including South Georgia and Patagonia.⁴

Southern Ocean: New Zealand sub-Antarctic and the Ross Sea (Scott Island).⁵

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 140cm. Mature: 80–90cm.^{3,4}

► Max. age: 28–37 years (Ross Sea).⁸

► Size at birth: 16–20cm.^{2,4,8}

► Diverse diet; includes Flat-nose Codling *Antimora rostrata*, Deepwater Crayfish *Thymops birsteinii*, fishes, shrimps, crabs and squid in Falklands waters; Antarctic Krill *Euphausia superba* important part of diet in South Georgia.^{2,5}

RGE

Global:

DD

Max TL:

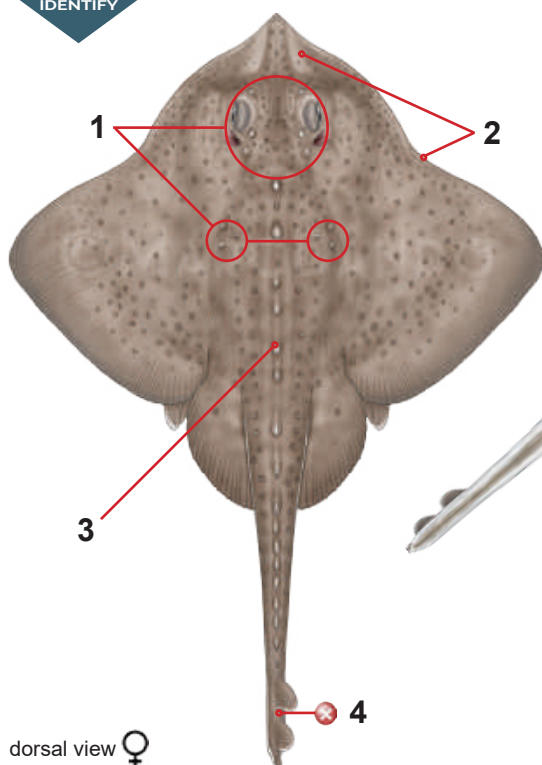
140cm

Depth:

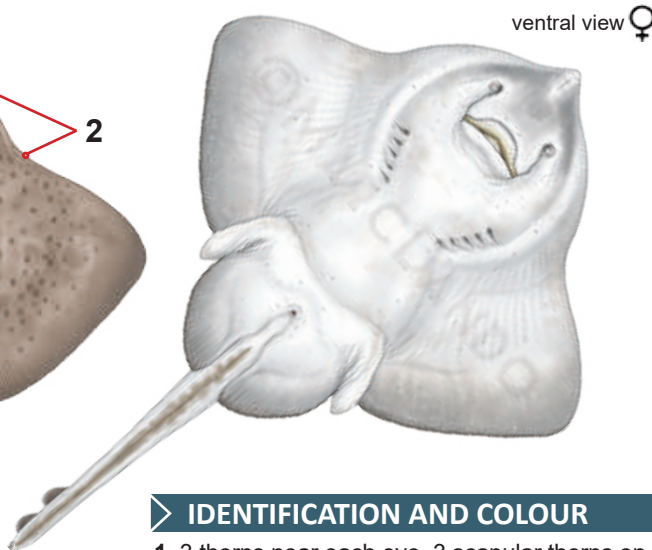
620 – 2240m

STARRY RAY

Amblyraja doellojuradoi



dorsal view ♀



ventral view ♀

SCIENTIFIC NAME

Amblyraja doellojuradoi (Pozzi, 1935)

COMMON NAMES

STARRY RAY, Southern Thorny Skate, Raya erizo (ARG, CHL, URY), 별 가오리 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 77–>1,000m on outer Patagonian Shelf to lower continental slope and Burdwood Bank; occasionally found at shallower depths in northern waters.^{3,4}

SW Atlantic: 51–642m from Uruguay to Argentina.⁹

SE Pacific: single record off Punta Arenas, Chile.⁹

IDENTIFICATION AND COLOUR

1. 3 thorns near each eye. 3 scapular thorns on each shoulder. Thorns pronounced.⁴

2. Broad head, thick, slightly flabby disc, short stiff snout, undulating anterior margins.²

3. Single intermittent row of large thorns running from nape to tail.⁴

4. Short, robust tail; no interdorsal thorn.⁴

► Occasionally a pale blotch near front of each eye and at base of wings.⁴

► **Dorsal surface:** medium to dark brown; indistinct pattern of dark spots and blotches.⁴

► **Ventral surface:** white, changing to bluish along periphery in adults; brown blotches occasionally present on tail.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 74cm. Mature: females 41cm, males 45cm.^{3,4,10}

► Peak reproductive period in Southern Hemisphere autumn, reportedly produces eggcases throughout the year. Eggcase capsule length: 7–8cm.^{3,10}

► Juveniles feed primarily on isopods and polychaetes, adults feed on bony fishes and larger benthic prey.^{2,7,11}

► Will often curl up in a ball when caught.³

RDO

Global:

LC

Max TL:

74cm

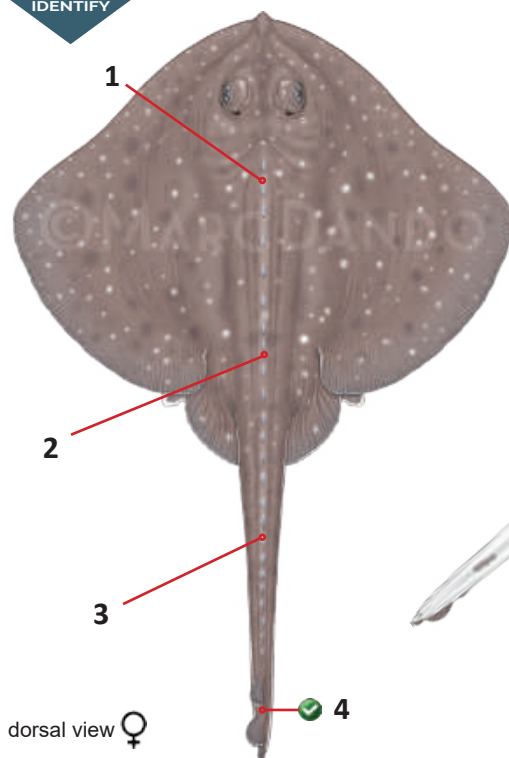
Depth:

77–>1000m

WHITE-SPOTTED SKATE

Bathyraja albomaculata

IDENTIFY



dorsal view ♀

ventral view ♀



IDENTIFICATION AND COLOUR

1. 3–4 large thorns behind head, rest of disc smooth.^{3,4}
2. Single row of median thorns running from nape to first dorsal fin.^{3,4}
3. All thorns curved towards posterior.²
4. Single interdorsal thorn.²

► **Dorsal surface:** greyish brown with numerous distinctive white spots and dark blotches.^{3,4}

► **Ventral surface:** white; tail with irregular grey markings.⁴

SCIENTIFIC NAME

Bathyraja albomaculata (Norman, 1937)

COMMON NAMES

WHITE-SPOTTED SKATE, White Dotted Skate, Raya de manchas blancas (ARG), Rayas de lunares (CHL), 흰점박이 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: primarily 200–300m, recorded to >1000m over entire Patagonian Shelf and Burdwood Bank.^{2,3}

SW Atlantic: distributed throughout southern Patagonian Shelf between 52°S and 54°S; northern-most record 41°S, off Uruguay.⁴

SE Pacific: Chilean waters from 26°S to 56°S.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: females 100cm, males 85cm. Mature: females 65cm, males 63cm.^{4,12}

► Eggcase capsule length: 8–9cm.³

► Adults feed primarily on polychaetes; juveniles feed on amphipods.^{13,14}

RAL

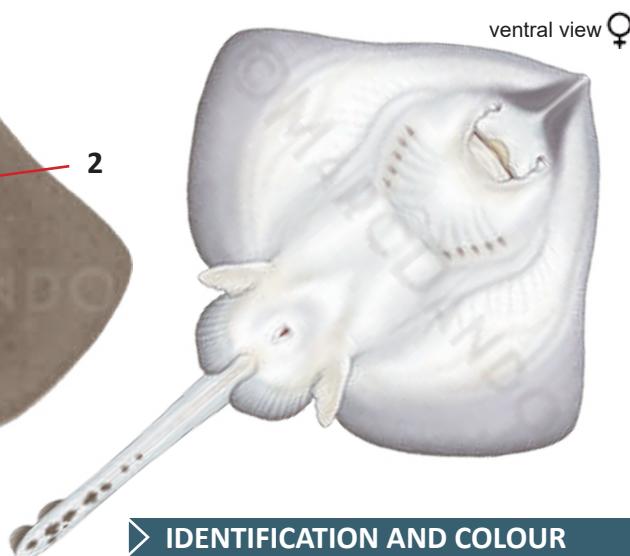
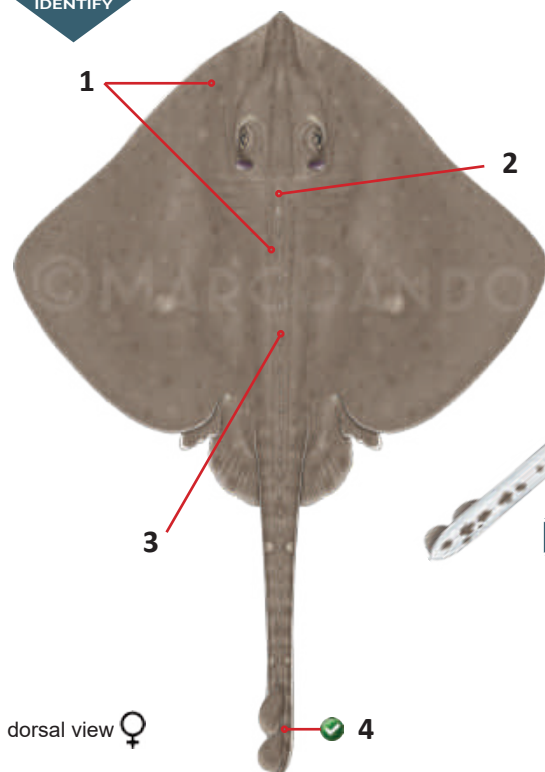
Global: **VU**

Max TL: **100cm**

Depth: **200 – >1,000m**

BROADNOSE SKATE

Bathyraja brachyurops



IDENTIFICATION AND COLOUR

1. Adults have spinules along front edge of disc, midline and tail.²
2. Nuchal thorns present.⁴
3. Median row of thorns running from nape to first dorsal.⁴
4. Short tail and single interdorsal thorn.^{2,4}

► Alar thorns (only in males) arranged in 20–22 radial rows.^{2,4}

► **Dorsal surface:** uniformly greyish brown to sandy brown with an ocellus on each wing and whitish markings.^{2,3,4}

► **Ventral surface:** uniformly white with irregular greyish blotches on tail.^{2,4}

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 125cm. Mature: females 67cm, males 65cm.^{15,4,16}

► Eggcase capsule length 8–9cm.^{3,4,17}

► Spawning takes place above the shelf break.^{3,17}

► Adults feed primarily on Rockcod *Patagonotothen ramsayi* and Patagonian Squid *Doryteuthis gahi*; juveniles feed on benthic invertebrates.⁸

SCIENTIFIC NAME

Bathyraja brachyurops (Fowler, 1910)

COMMON NAMES

BROADNOSE SKATE, Raya de los canales (ESP), Raya espinosa (URG), 넓은코 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: widespread around the Falkland Islands, primarily from 100–875m; spawning aggregations reported on northeast Patagonian Shelf.^{2,3,4,15}

SW Atlantic: southern Brazil to southern Argentina.⁴

RBR

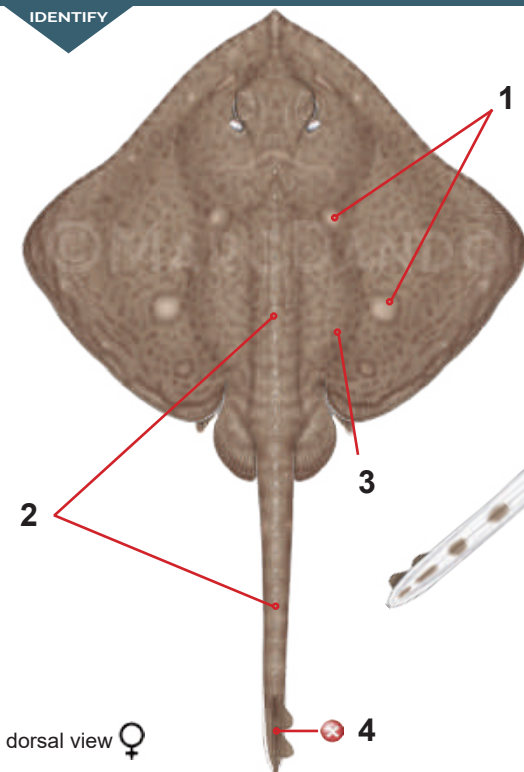
Global: **NT**

Max TL: **125cm**

Depth: **100 – 875m**

JOINED-FINS SKATE

Bathyraja cousseauae



dorsal view ♀



ventral view ♀

IDENTIFICATION AND COLOUR

1. Single pair or pairs of conspicuous whitish ocelli margined with brown on posterior base of each wing.^{2,4}
2. Widely spaced thorns running from nape to mid-shoulder, then posterior trunk to first dorsal; median row also covered in spinules.^{2,4,19}
3. Smooth disc in adults; dense covering of spinules in smaller individuals (<30 cm disc width).⁴
4. Small dorsal fins joined at bases; no interdorsal thorn.⁴

► **Dorsal surface:** grey-brown to yellow-brown with dark speckled pattern made up of indistinct pale and dark spots of various sizes.^{4,19}

► **Ventral surface:** uniformly white; tail often with brown or grey blotches, or almost entirely brown.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 133cm. Mature: females 98cm, males 91cm.^{3,20}

► Eggcase capsule length: 8–9cm.⁴

► Feeds primarily on bony fishes, as well as isopods and amphipods.²

SCIENTIFIC NAME

Bathyraja cousseauae
(Díaz de Astarloa & Mabragaña, 2004)

COMMON NAMES

JOINED-FINS SKATE, Cousseau's Skate,
Raya aletas juntas (ARG, CHL),
일련 지느러미 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 121–>1300m on outer Patagonian Shelf and upper Slope; recorded northwest of, and occasionally on Burdwood Bank.^{1,2,3}

SW Atlantic: recorded in Argentinian waters from 38°S to 54°S.³

SE Pacific: reported southwest of Gonzalo Island (56°S, 68°W), Chile.^{1,18}

RBZ

Global:

LC

Max TL:

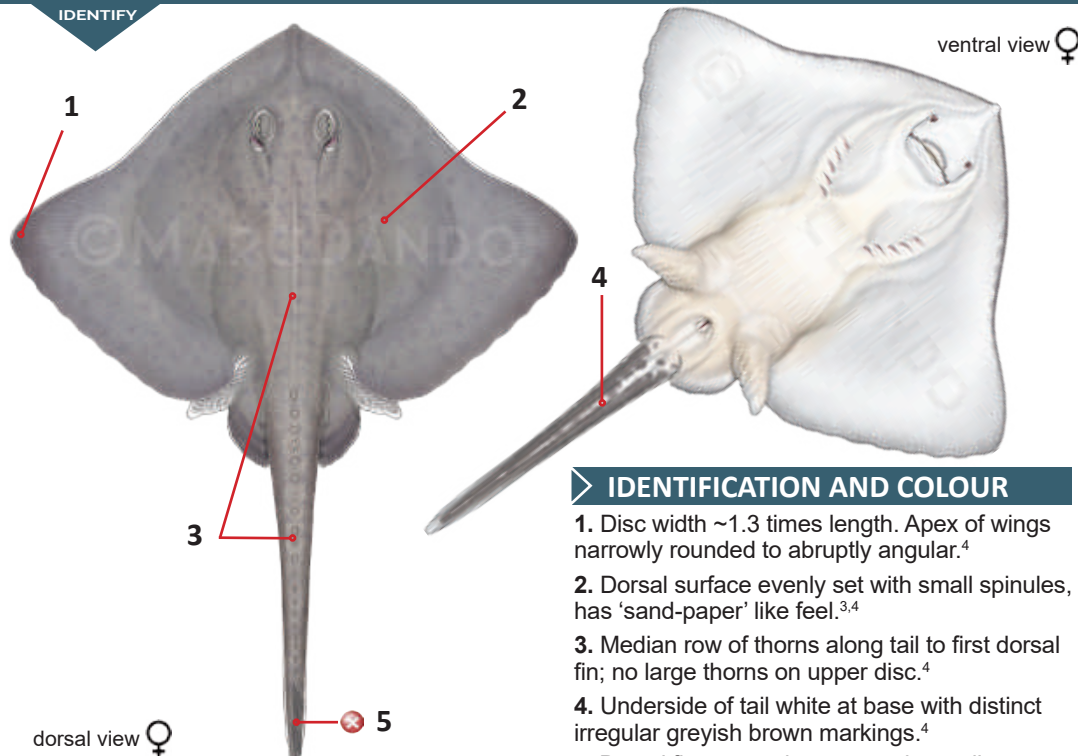
133cm

Depth:

121 – >1,300m

GRAYTAIL SKATE

Bathyraja griseocauda



IDENTIFICATION AND COLOUR

1. Disc width ~1.3 times length. Apex of wings narrowly rounded to abruptly angular.⁴
2. Dorsal surface evenly set with small spinules, has 'sand-paper' like feel.^{3,4}
3. Median row of thorns along tail to first dorsal fin; no large thorns on upper disc.⁴
4. Underside of tail white at base with distinct irregular greyish brown markings.⁴
5. Dorsal fins narrowly separated; usually no interdorsal thorn.⁴

► **Dorsal surface:** plain, dark greyish brown; juveniles may have black-spotted pattern.⁴

► **Ventral surface:** white with broad dark rear margins.⁴

SCIENTIFIC NAME

Bathyraja griseocauda (Norman, 1937)

COMMON NAMES

GRAYTAIL SKATE, Raya Iija (ARG), Raya austral (CHL), Raya de cola gris (CHL), 회색 꼬리 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 106–1,010m over entire Patagonian Shelf and Slope - predominantly the latter. Occasionally reported in deeper water around Burdwood Bank.^{1,3}

SW Atlantic: southern Uruguay to Argentina.^{9,21}

SE Pacific: Chile south of 41°S.¹³

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 157cm. Mature: females 108cm (17.8 years), males 94cm (14 years).¹⁵

► Max. age estimated at 28 years.¹⁵

► Spawning takes place all year round on grounds just below the shelf break, although fewer females lay in Southern Hemisphere winter. Eggcase capsule length: 13–14cm.^{3,15,21}

► Juveniles feed primarily on benthic amphipods and isopods; adults feed on bony fishes including Rockcod *Patagonotothen ramsayi*, and also Patagonian Squid *Doryteuthis gahi*.¹³

RGR

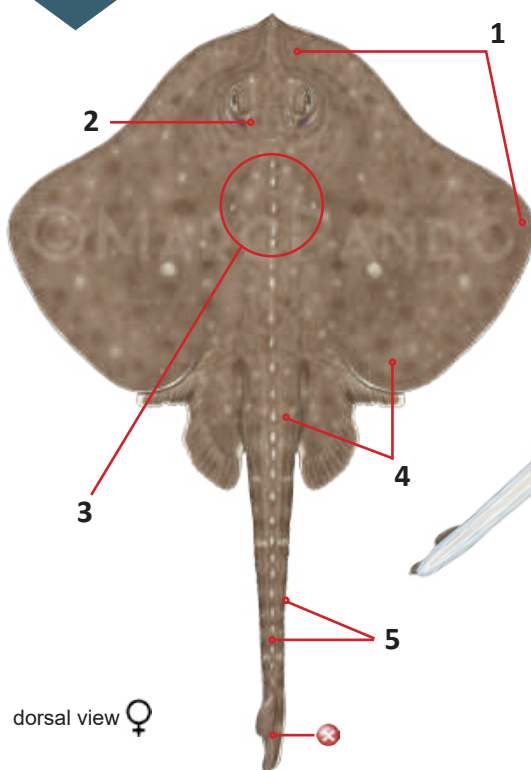
Global: **EN**

Max TL: **157cm**

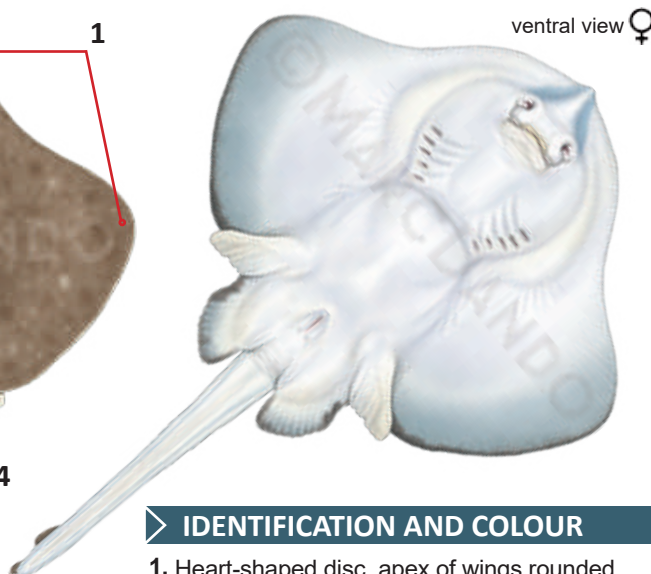
Depth: **106 – 1,010m**

PATAGONIAN SKATE

Bathyraja macloviana



dorsal view ♀



ventral view ♀

IDENTIFICATION AND COLOUR

1. Heart-shaped disc, apex of wings rounded, very short snout.⁴
2. A pair of large thorns next to each eye.²
3. Nuchal thorns in shape of cross behind head.³
4. Adults have coarse spinules on disc margins, median row and tail.⁴
5. Row of median thorns along tail, two bands of densely set spinules run either side.⁴

► **Dorsal surface:** dark brown to greyish with faint spots, occasionally 1–2 pairs of light ocelli encircled with a dark band on each wing and smaller ocelli over pelvic fins.²

► **Ventral surface:** white, often dusky margins on posterior wings and pelvic fins.²

SCIENTIFIC NAME

Bathyraja macloviana (Norman, 1937)

COMMON NAMES

PATAGONIAN SKATE, Raya espinosa (URG), 파타고티아 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: widespread around Patagonian Shelf - primarily from 150–200m, recorded 113–600m.^{1,3}

SW Atlantic: Uruguay to southern Argentina.^{1,4,9}

SE Pacific: Southern Chile.^{4,9}

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 71cm. Mature: females 46–52cm, males 50–53cm.^{4,16}

► Spawning takes place inshore. Eggcase capsule length 7–8cm.^{1,3,4,16}

► Adults feed primarily on small crustaceans and benthic polychaetes, juveniles feed on amphipods.^{2,4,22}

RMC

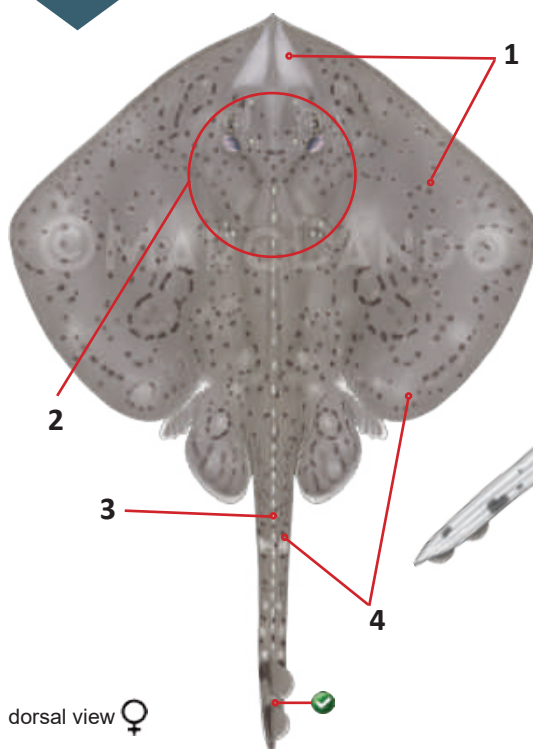
Global: **NT**

Max TL: **71cm**

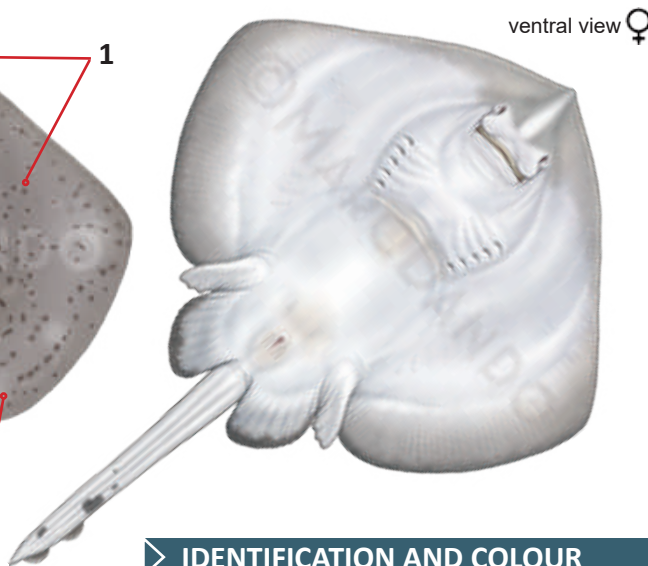
Depth: **113 – 600m**

MAGELLANIC SKATE

Bathyraja magellanica



dorsal view ♀



ventral view ♀

SCIENTIFIC NAME

Bathyraja magellanica (Philippi, 1902)

COMMON NAMES

MAGELLANIC SKATE, Grey Skate, *Raya atigrada* (URG), 마젤란 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 58–572m, primarily 58–150m on northeast, northwest and southeast Patagonian Shelf, and Burdwood Bank.^{1,2,3}

SW Atlantic: southern Chile and Argentina.^{4,23}

IDENTIFICATION AND COLOUR

1. Heart-shaped disc, apex of wings broadly rounded; blunt snout with semi-transparent triangle visible both sides.^{2,4}
 2. A pair of large thorns next to each eye. 2 large thorns on each shoulder.
 3. Single median row of thorns.^{2,4}
 4. Median row and margins of disc covered in coarse spinules. Single interdorsal thorn.^{2,4}
- Alar thorns arranged in 18–20 radial rows present in males.^{2,4}

► **Dorsal surface:** grey to greyish brown; marbled pattern of dark spots, large pale blotches and streaks; light spots on tail give appearance of bands.^{2,4}

► **Ventral surface:** white with dark blotches and spots along posterior disc, pelvic fin margins and on tail tip.²

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 105cm. Mature: 58–65cm.^{4, 23,24}

► Eggcase capsule length 8–9cm.²³

► Feeds primarily on crustaceans, polychaetes and small bony fishes.^{4,24}

RMG

Global:

LC

Max TL:

105cm

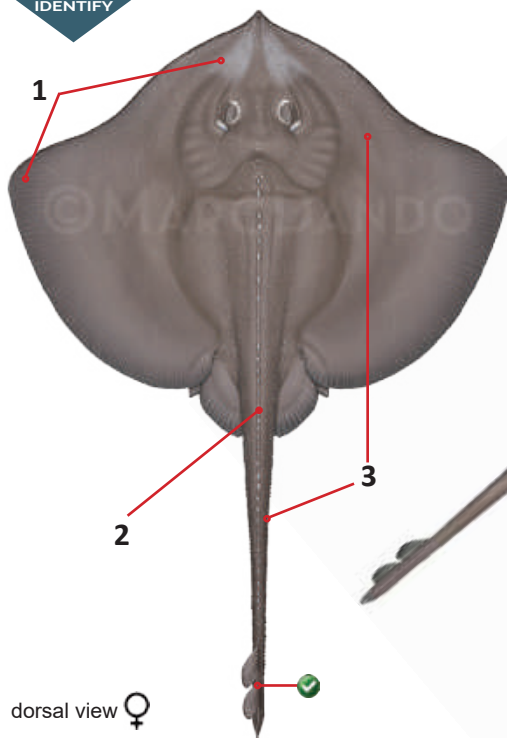
Depth:

58 – 572m

DARKBELLY SKATE

Bathyraja meridionalis

IDENTIFY



dorsal view ♀



ventral view ♀

SCIENTIFIC NAME

Bathyraja meridionalis Stehmann, 1987

COMMON NAMES

DARKBELLY SKATE, Raya vientre oscuro (URG, ARG, CHL), 검은 배 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 650–1,900m on deepwater slopes off east Patagonian Shelf and Burdwood Bank.²

SW Atlantic: reported to 2,240m on continental and insular slopes and submarine rises from Argentina to southern Chile; Scotia Ridge including South Georgia.⁹

SE Pacific: rare, southern Chile at 54°S.⁹

Southern Ocean: Ross Sea, reported at 77°S, 78°W; possibly circumglobal.²⁵

IDENTIFICATION AND COLOUR

1. Large, heavy-bodied skate; broad snout with small bluntly pointed tip; apex of wings bluntly angular.⁴

2. Almost continuous median row of thorns from nape to first dorsal fin.⁴

3. Upper disc and tail very rough; usually one interdorsal thornlet.⁴

► **Dorsal surface:** uniform dark grey-brown in juveniles, to pale brown in adults; no dots, patterns or blotches.⁴

► **Ventral surface:** uniformly dark brown in juveniles to pale brown in adults; oro-nasal region, gill slits and tips of anterior pelvic-fin lobes usually whitish.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 150cm. Mature: females 126cm, males 121cm (South Georgia).⁷

► Feeds on crayfish, crabs, shrimps and benthic fishes.^{2,4}

RME

Global:

LC

Max TL:

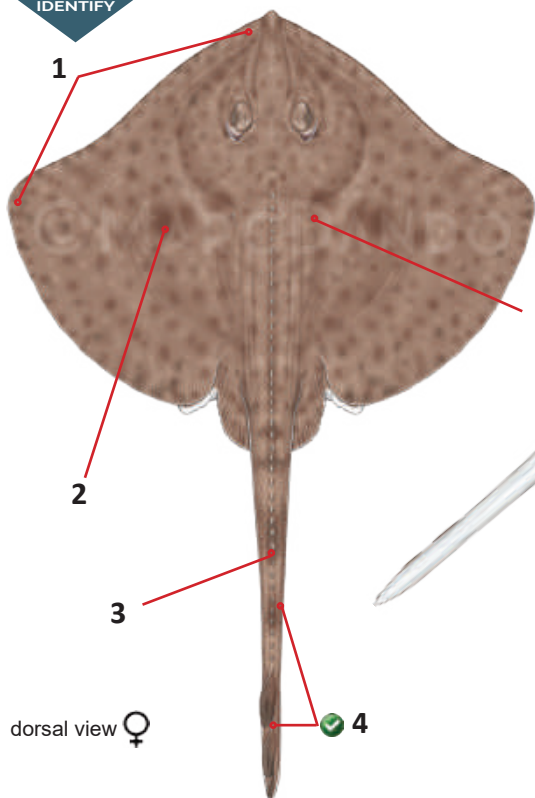
150cm

Depth:

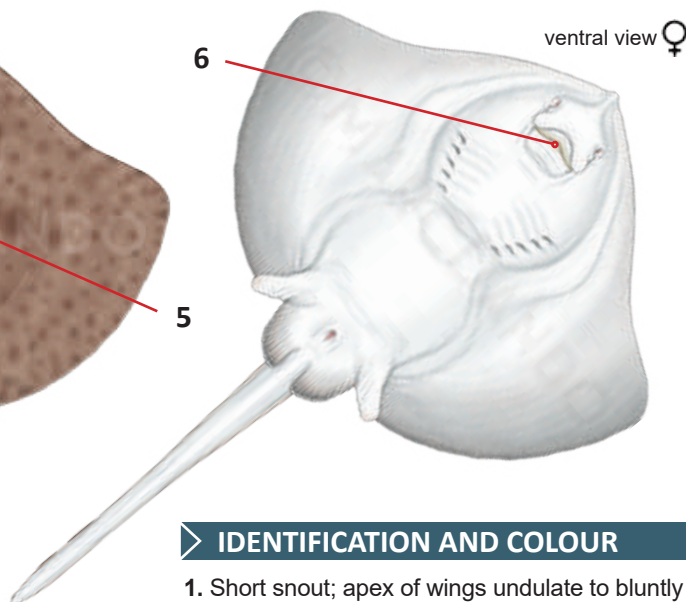
650 – 1,900m

MULTISPINE SKATE

Bathyraja multispinis



dorsal view ♀



ventral view ♀

IDENTIFICATION AND COLOUR

1. Short snout; apex of wings undulate to bluntly angled tip.⁴
2. Large, dark (sometimes faint) ocelli on each wing.⁴
3. Single median row of robust thorns from nape to first dorsal.⁴
4. Tail covered in small spinules; small dorsal fins, narrowly separated; one interdorsal thorn.⁴
5. Single scapular thorn sometimes present.^{2,4}
6. Teeth flattened for crushing crabs (only skate in region with flattened teeth).^{2,4}

- Anterior margin of dorsal surface densely set with small spinules, remainder of disc smooth.²
- **Dorsal surface:** greyish brown with reticulate pattern of light and dark spots.⁴
- **Ventral surface:** white with dusky markings along disc periphery and genital area.⁴

SIZE, BIOLOGY AND ECOLOGY

- Max. TL: 131cm. Mature: 97cm.^{4,26}
- Feeds primarily on crustaceans (mainly crabs including *Peltarion spinosulum*) and isopods. Polychaetes, molluscs and small bony fishes less common in diet.^{2,27}

SCIENTIFIC NAME

Bathyraja multispinis (Norman, 1937)

COMMON NAMES

MULTISPINE SKATE, Raya espinosa (CHL), Raya blanca (CHL), Raya aserrada (ARG), 다 가시 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 72–1,300m throughout Patagonian Shelf and Slope waters; Burdwood Bank.^{1,2,3}

SW Atlantic: southern Brazil to Argentina.⁹

SE Pacific: southern Chile - northern limit reported at 45°S, off the Darwin Channel.⁹

RMU

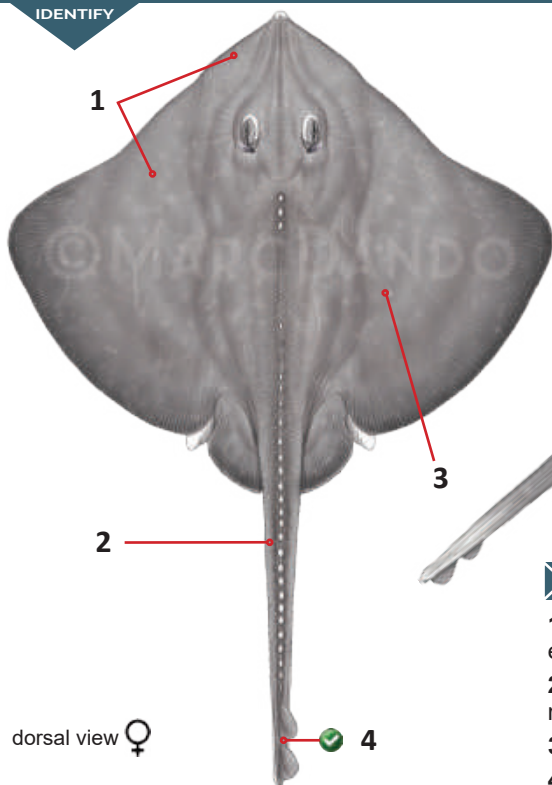
Global: **NT**

Max TL: **131cm**

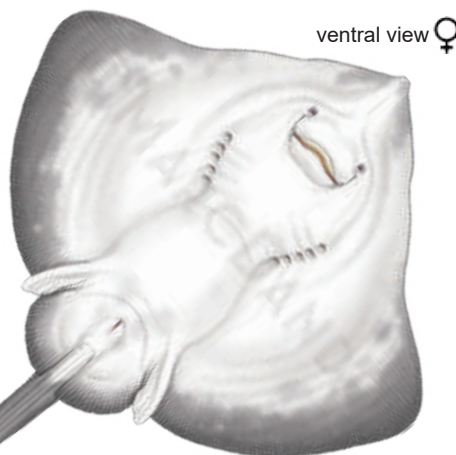
Depth: **72 – 1,300m**

WHITEMOUTH SKATE

Bathyraja papilionifera



dorsal view ♀



ventral view ♀

IDENTIFICATION AND COLOUR

1. Large, heavy bodied skate; moderately elongated snout.²
2. Up to 32 large thorns in single, intermittent row from nape to first dorsal fin.²
3. No other thorns on disc.²
4. Usually a single, robust interdorsal thorn.²

► **Dorsal surface:** dark brown with small pale dots and dark blotches in juveniles; colouration gradually changes to pale brown without dots or blotches in adults.^{2,4}

► **Ventral surface:** whitish centrally; dark areas around the periphery of the disc, cloaca and underside of tail; butterfly-shaped blotch near cloaca in juveniles.^{2,4}

SCIENTIFIC NAME

Bathyraja papilionifera Stehmann, 1985

COMMON NAMES

WHITEMOUTH SKATE, Atlantic Butterfly Skate, Raya boca blanca (ARG), 흰 입 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 827–2,000m on eastern slope of the Patagonian Shelf, also Burdwood Bank.^{1,2,3}

SW Atlantic: 637–2,000m on continental slopes and submarine rises in deepwater from Uruguay to southern Argentina.⁹

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 150cm. Mature: females 130cm, males 122cm.⁴

► Little else known of the biology of this species.

RPA

Global:

LC

Max TL:

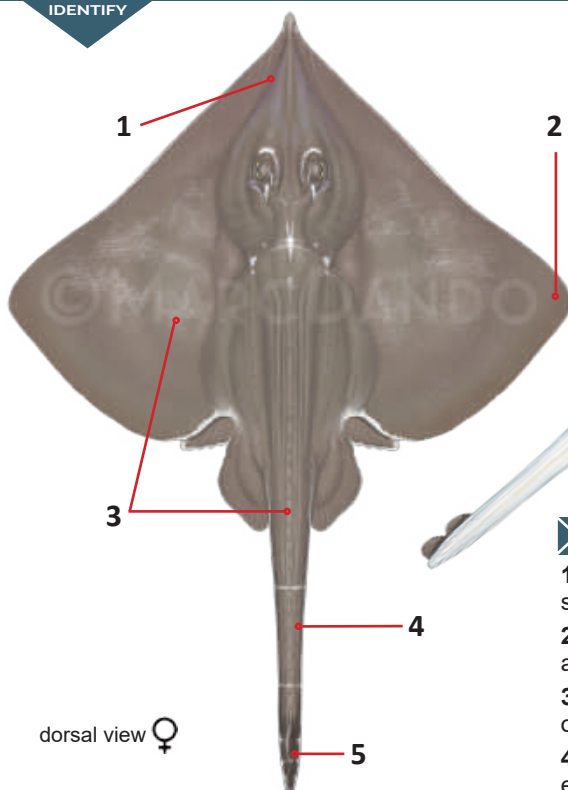
150cm

Depth:

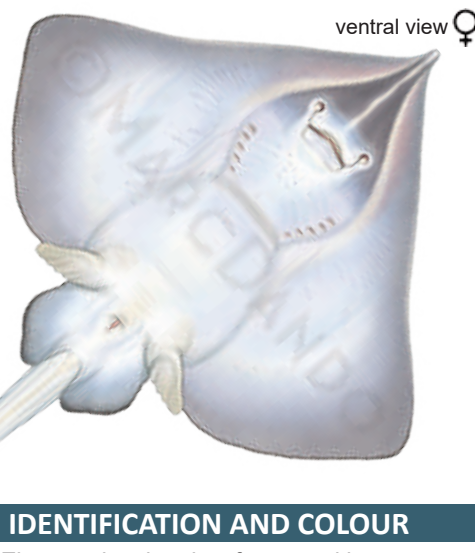
827 – 2,000m

CUPHEAD SKATE

Bathyraja scaphiops



dorsal view ♀



ventral view ♀

SCIENTIFIC NAME

Bathyraja scaphiops (Norman, 1937)

COMMON NAMES

CUPHEAD SKATE, Glassy-nose Ray, Raya picuda (URG), 접시머리 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 102–1,160m, primarily 250–300m. Widespread over the Patagonian Shelf, particularly the northeast.^{2,3}

SW Atlantic: southern Brazil to Argentine Patagonia.^{4,9}

IDENTIFICATION AND COLOUR

1. Elongated, pointed, soft snout with semi-transparent triangle present in adults.⁴
2. Apex of wings bluntly angular; undulating anterior margins in adult males.⁴
3. Single median row of thorns along tail; no other thorns on disc.²
4. Spinules along median row, tail and anterior edges.²
5. Juveniles have single interdorsal thorn, often absent in adults.²

► Alar thorns arranged in radial rows present in males.²

► **Dorsal surface:** reddish to greyish brown, often with faint light spots, occasionally white markings on wings in adults.²

► **Ventral surface:** white along centre, pale purple towards margins.²

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 117cm. Mature: females unknown, males 74cm.⁴

► Eggcase capsule length 8–9cm.^{3,21}

► Adults feed primarily on fishes, juveniles on small crustaceans.⁴

RSC

Global:

LC

Max TL:

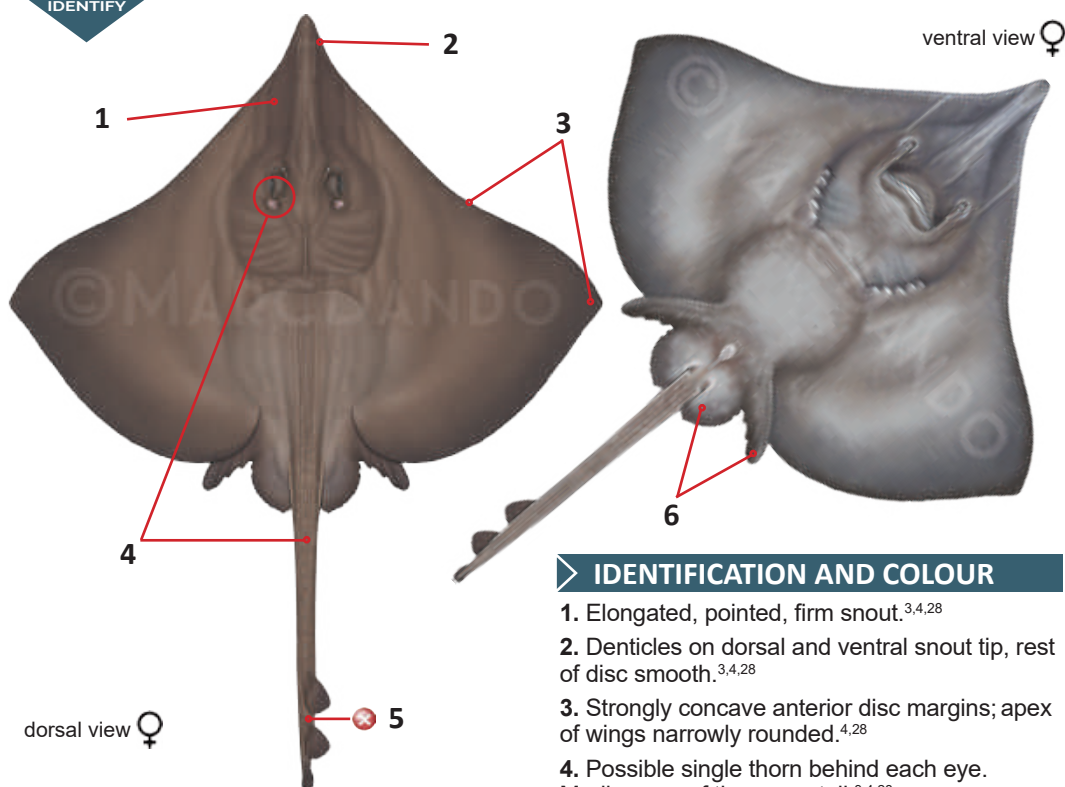
117cm

Depth:

102 – 1,160m

ARGENTINE SKATE

Dipturus argentinensis



dorsal view ♀

ventral view ♀

SCIENTIFIC NAME

Dipturus argentinensis (Figueroa, 2008)

COMMON NAMES

ARGENTINE SKATE,

Raya hocicuda de cola larga (ARG),
아르헨티나 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 116–393m throughout the Patagonian Shelf.^{3,4}

SW Atlantic: reported from 85–140m off Argentina's central and southern Patagonian continental shelf.^{4,28,29}

IDENTIFICATION AND COLOUR

1. Elongated, pointed, firm snout.^{3,4,28}
2. Denticles on dorsal and ventral snout tip, rest of disc smooth.^{3,4,28}
3. Strongly concave anterior disc margins; apex of wings narrowly rounded.^{4,28}
4. Possible single thorn behind each eye. Median row of thorns on tail.^{3,4,28}
5. Long, low, well developed first and second dorsal fins, no interdorsal thorn.^{4,28}
6. Small pelvic fins, anterior lobe slightly smaller than posterior lobe.^{4,28}

► **Dorsal surface:** uniformly purplish brown, darker margins on pectoral and pelvic fins.^{3,4,28}

► **Ventral surface:** brown, darker centrally and on anterior pelvic fin lobes.^{4,28}

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 94cm. Mature: females unknown, males >77cm.²⁸

► Little else known of the biology of this species.

RDA

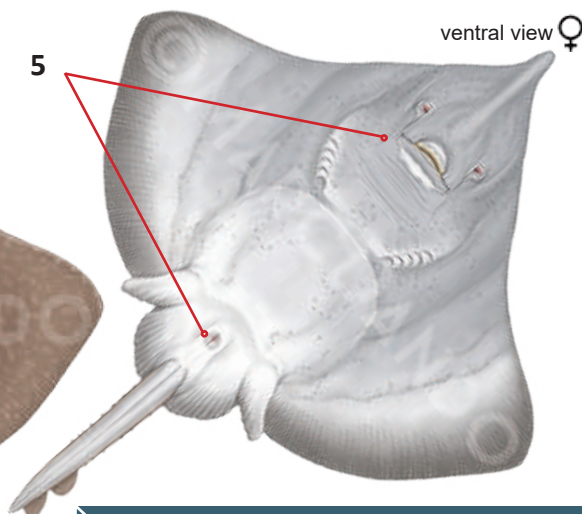
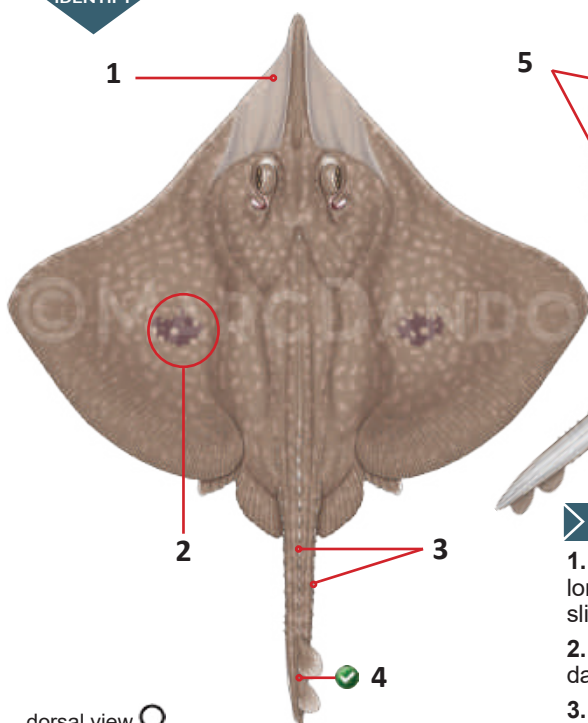
Global: **DD**

Max TL: **94cm**

Depth: **116 – 393m**

WARRAH SKATE

Dipturus lamillai



IDENTIFICATION AND COLOUR

1. Large, heavy-bodied skate with a broad head; long, narrowly pointed snout that is firm and slightly translucent.^{3,30}

2. Most individuals with white spots and a large dark ocellus on each wing.^{3,30}

3. Median row of thorns along tail with a single row of parallel thorns either side, thorns more widely spaced at tail.³⁰

4. Short tail; single interdorsal thorn.³⁰

5. Ventral surface has numerous distinct, black dots and streaks around mouth, gills, pelvic girdle and cloaca.³⁰

► Small patches of thorns around head and on wings in males.³⁰

► **Dorsal surface:** medium brownish with numerous lighter brown spots; often joined to form lines and complex patterns in females.^{3,30}

► **Ventral surface:** dusky grey with black dots and streaks.³⁰

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 160cm.³

► Feeds primarily on demersal fishes and crustaceans.³²

SCIENTIFIC NAME

Dipturus lamillai (Concha, 2019)*
*(sp nov.) previously described as
Dipturus chilensis (Guichenot, 1848)

COMMON NAMES

WARRAH SKATE*, Wolf Skate, Raya lobo (ARG, CHL, URG). 늑대 홍어 (KOR).
*previously called 'Yellownose Skate'

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 62–572m; to date only recorded in waters surrounding the Falkland Islands, particularly northern waters.^{3,30,31}

RFL

Global:

LC

Max TL:

160cm

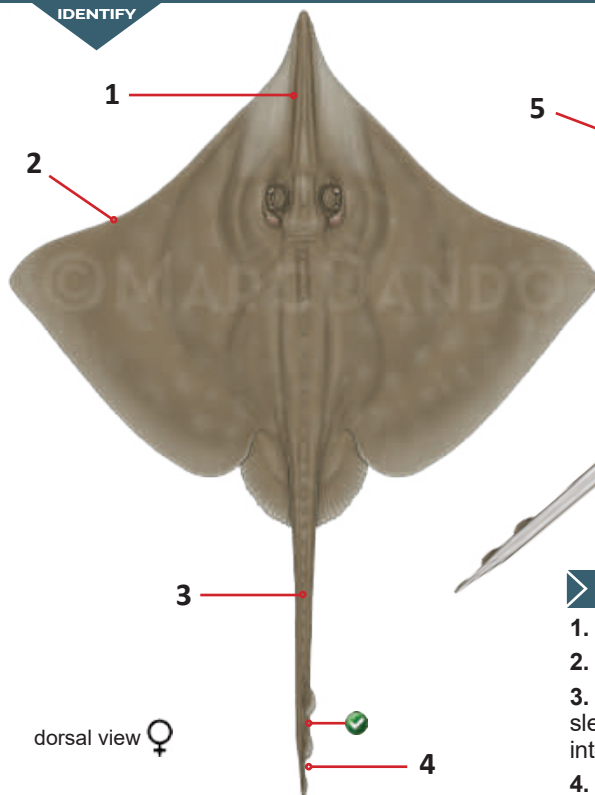
Depth:

62 – 572m

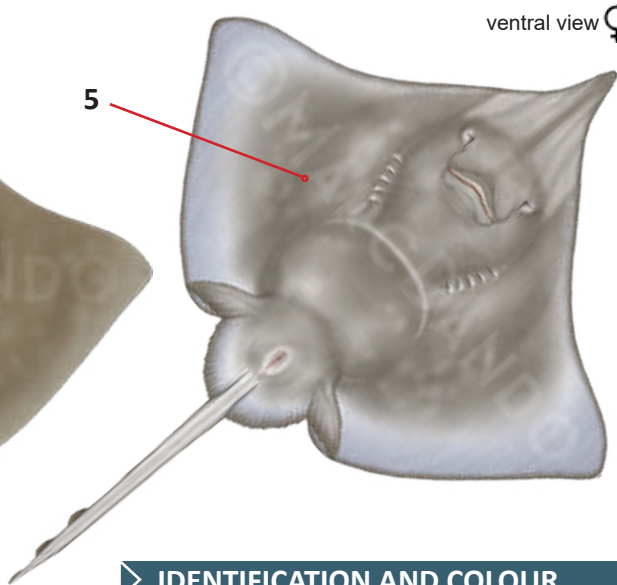
THINTAIL SKATE

Dipturus leptocaudus

IDENTIFY



dorsal view ♀



ventral view ♀

SCIENTIFIC NAME

Dipturus leptocaudus
(Krefft & Stehmann, 1975)

COMMON NAMES

THINTAIL SKATE, Raya de cola delgada (URG, ARG, CHL), 가는꼬리 홍어 (KOR).

DEPTH AND DISTRIBUTION

SW Atlantic: recorded from 10–550m on continental shelf and upper slope off southern Brazil; abundant along the Brazilian slope.^{4,33}

IDENTIFICATION AND COLOUR

1. Elongate, narrowly pointed, firm snout.^{4,34}

2. Concave anterior wing margins.^{4,34}

3. Median row of up to 10 thorns along a slender tail scattered with thornlets; single interdorsal thornlet.^{4,34}

4. Distinct space between second dorsal fin and tail tip.^{4,34}

5. Ventral surface dark, covered with black mucus.^{4,34}

► **Dorsal surface:** dark brown with numerous rough-edged pale blotches; dorsal fins dark.⁴

► **Ventral surface:** dark greyish to black.^{4,34}

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: ≥88cm.⁴

► Eggcase capsule length 13–15cm.⁴

► 17cm at birth.⁴

► Little else known of the biology of this species.

RLE

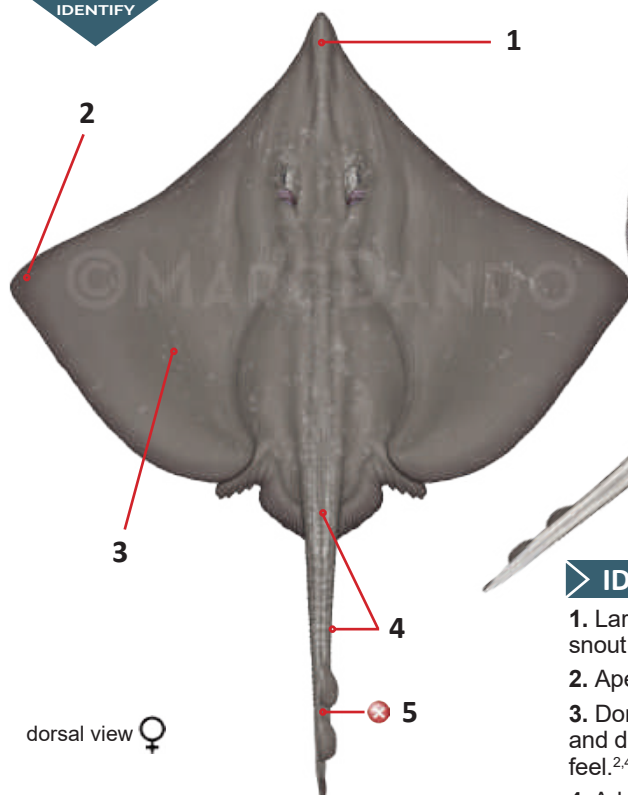
Global: **VU**

Max TL: **≥88cm**

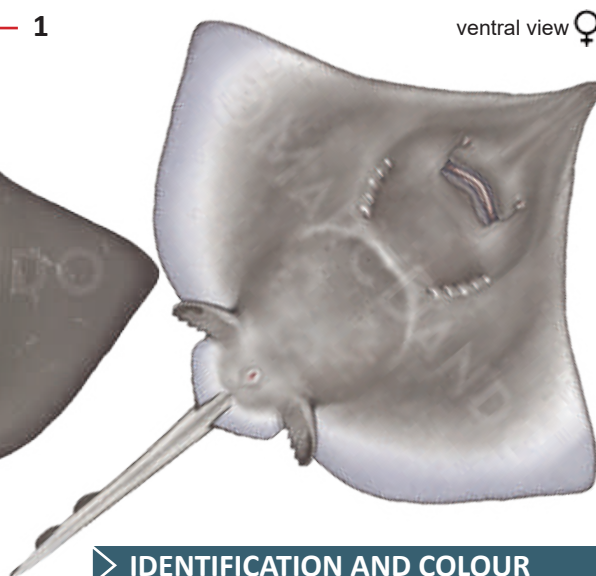
Depth: **10 – 550m**

ROUGHSKIN SKATE

Dipturus trachyderma



dorsal view ♀



ventral view ♀

IDENTIFICATION AND COLOUR

1. Large skate; elongated, narrowly pointed snout.⁴
2. Apex of wings narrowly rounded to angular.⁴
3. Dorsal surface covered in spinules, largest and densest on snout, has sandpaper-like feel.^{2,4}
4. Adults have multiple rows of thorns on tail; single row of thorns in juveniles.⁴
5. No interdorsal thorn.⁴

► **Dorsal surface:** uniformly dark grey to brownish black.^{2,4}

► **Ventral surface:** dark reddish brown to black; gill slits, cloaca and mouth whitish.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 264cm. Mature: females 200cm (13–15 years), males 186cm.^{4,37}

► Eggcase capsule length 20–23cm.³⁷

► Feeds primarily on crustaceans and bony fishes.⁴

SCIENTIFIC NAME

Dipturus trachyderma
(Krefft & Stehmann, 1974)

COMMON NAMES

ROUGHSKIN SKATE, Raya vientre áspera (URG), 걱정이 홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 84–538m, primarily 250–300m on northern Patagonian Shelf.^{2,3}

SW Atlantic: southern Brazil to Uruguay and Argentina.^{3,9}

SE Pacific: southern Chile.^{9,35,36}

RTR

Global: **EN**

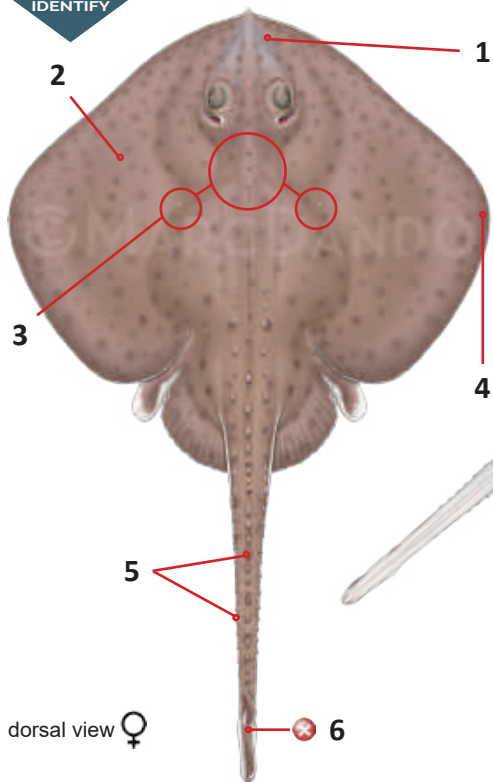
Max TL: **264cm**

Depth: **84 – 538m**

SHORTFIN SANDSKATE

Psammobatis normani

IDENTIFY



dorsal view ♀

ventral view ♀

IDENTIFICATION AND COLOUR

1. Heart-shaped disc; short, blunt, flexible snout.²
2. Disc largely smooth with fine spinules.²
3. 4–5 nuchal thorns, 1–3 scapular thorns on each shoulder.⁴
4. Apex of wings broadly rounded.²
5. 3–5 rows of thorns along tail.⁴
6. Dorsal fins slightly separated; no interdorsal thorn.²

► Undulating anterior wing margins in males.²

► **Dorsal surface:** uniformly brownish; sometimes with dark spots on disc and pelvic fins.⁴

► **Ventral surface:** uniformly white.⁴

SCIENTIFIC NAME

Psammobatis normani McEachran, 1983*

*Easily confused with other sand skate species, often reported as just 'sand skate' *Psammobatis* spp. (RPX)^{2,3}

COMMON NAMES

SHORTFIN SANDSKATE, Raya marrón claro (URG), 짧은지느러미 모래홍어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 35–280m, primarily 150–250m. Widespread in shallower waters throughout Patagonian Shelf.^{3,38}

SW Atlantic: Uruguay to Argentina.^{4,39}

SE Pacific: southern Chile.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 58cm. Mature: females 39–51cm, males 41–56cm.^{4,39}

► Eggcase capsule length 4–5cm.^{3,4,40,41}

► Feeds primarily on crustaceans and polychaetes.^{4,39,41}

► Larger individuals regularly found in deeper water.^{4,41}

RPN

Global:

LC

Max TL:

58cm

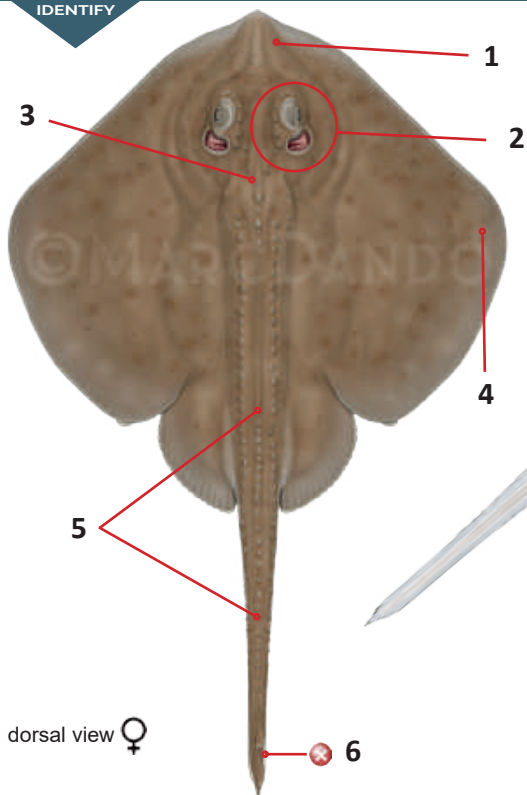
Depth:

35 – 280m

SMALLTHORN SANDSKATE

Psammobatis rudis

IDENTIFY



ventral view ♀



IDENTIFICATION AND COLOUR

1. Heart-shaped disc; short, blunt, flexible snout.²
2. Rosette of orbital thorns.⁴
3. Numerous thorns on nape.^{2,4}
4. Apex of wings broadly rounded.⁴
5. Shallow groove along midline from mid-disc to first dorsal fin, irregular row of small thorns.⁴
6. Dorsal fins small, usually joined at bases, no interdorsal thorn.²

► Mid-disc anterior and posterior margins covered in coarse thornlets in adults.⁴

► **Dorsal surface:** colour variable, usually brownish with symmetrical pale and darker blotches and spots; adult males often have a black snout.^{2,4}

► **Ventral surface:** white; posterior disc margins normally dusky.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max TL: 53cm. Mature: 36–46cm.^{4,39}

► Eggcase capsule length 4–5cm.^{3,40,41}

► Feeds primarily on crustaceans, also polychaetes, molluscs and bony fishes.^{4,39}

SCIENTIFIC NAME

Psammobatis rudis Günther, 1870*

*Easily confused with other sand skate species, often reported as just 'sand skate' *Psammobatis* spp. (RPX)^{2,3}

COMMON NAMES

SMALLTHORN SANDSKATE,
Raya hocico blanco (ARG),
작은빨 모래호어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: recorded from 35–280m; widespread in shallower waters over Patagonian Shelf.²

SW Atlantic: Uruguay to southern Argentina.^{4,39}

SE Pacific: southern Chile.⁴

RPR

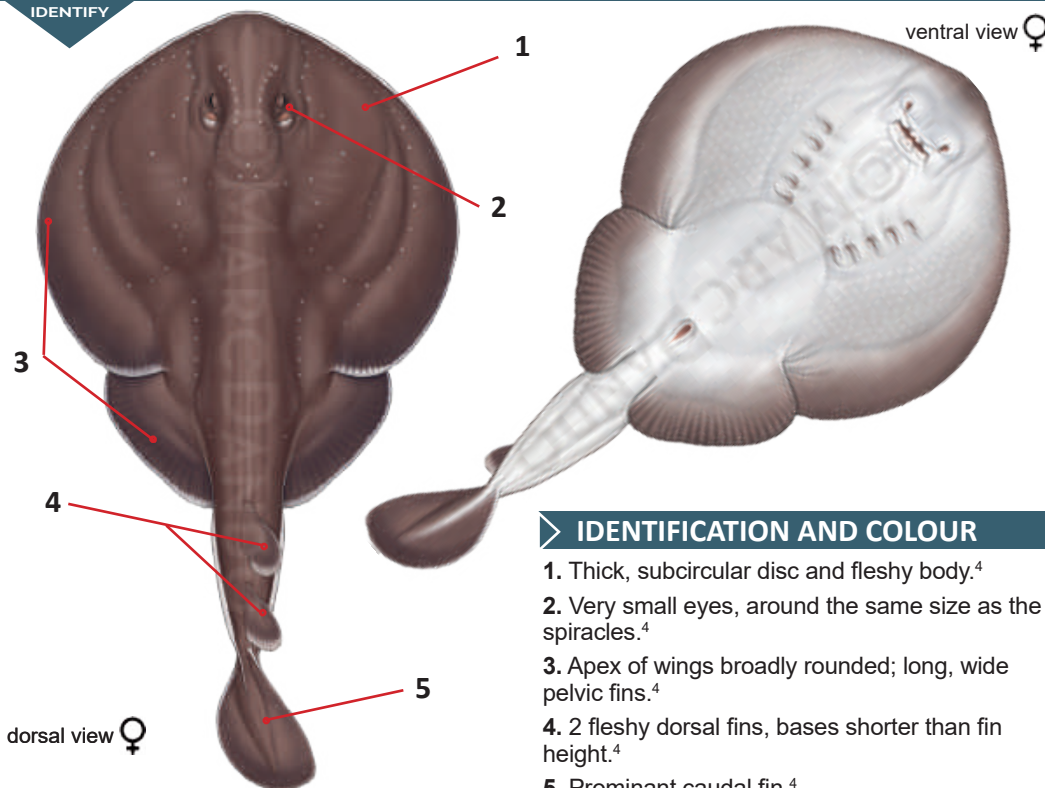
Global: **LC**

Max TL: **53cm**

Depth: **35 – 280m**

APRON RAY

Discopyge tschudii



dorsal view ♀

ventral view ♀

SCIENTIFIC NAME

Discopyge tschudii Heckel, 1846

COMMON NAMES

APRON RAY, Electric Ray, Apron Numbfish, Raya eléctrica (ARG, CHL, URG), Tembladera/ Tembladerilla (CHL), Tremolina (ARG), 앞치마 가오리/전기 가오리 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: rare in Falklands waters.³

SW Atlantic: reported from 20–140m in continental shelf waters from southern Brazil to southern Argentina.^{42,43,44}

SE Pacific: Chile to southern Peru.^{42,44}

IDENTIFICATION AND COLOUR

1. Thick, subcircular disc and fleshy body.⁴
2. Very small eyes, around the same size as the spiracles.⁴
3. Apex of wings broadly rounded; long, wide pelvic fins.⁴
4. 2 fleshy dorsal fins, bases shorter than fin height.⁴
5. Prominent caudal fin.⁴

► **Dorsal surface:** colour variable, light brown/ olive brown/purplish brown, sometimes with darker blotches.⁴

► **Ventral surface:** uniformly creamy white, sometimes with darker blotches near electric organs.⁴

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 55cm. Mature: females unknown, males 23–29cm.^{4,42}

► Segregates by sex. Males larger than females in Argentinian waters.^{4,42}

► Aplacental viviparous: usually 2–5 pups, up to 12 reported off Argentina.^{4,42}

► Size at birth: 8–9cm.⁴²

► Feeds primarily on polychaetes, also amphipods and clams.⁴³

DIT

Global:

LC

Max TL:

55cm

Depth:

20 – 140m

EGGCASE INFORMATION

Skates (Order: Rajiformes) and some sharks (e.g. Family: Scyliorhinidae) are oviparous, meaning they produce eggs encased in a tough, leathery eggcase made of collagen and keratin. These serve to protect the yolk-sac and embryo as it develops. Small slits along the horns or margins allow oxygenated water to enter, which is then pumped around the capsule when the embryo moves around or beats its tail.

Attachment methods to anchor eggcases after deposition can vary. Mucus filaments on eggcases attract detritus that both weighs them down on the seabed and provides camouflage. After a lengthy incubation period, which varies between species and can be more than a year for some, the young, fully formed skate or shark will emerge from an opening between the horns and is then fully independent.

Once empty, eggcases are much lighter and can drift ashore where they can be found washed up on beaches. The empty eggcases can also be found entangled in fishing gear. Differing sizes, shapes, and features can help determine which species it once belonged to. By reporting spent eggcases, important information can be gathered about diversity and broad distribution of oviparous elasmobranchs, as well as potentially indicating the location of egg-laying sites.

The Shark Trust's **Great Eggcase Hunt** (eggcase.org) welcomes records from around the world. Records from the Falkland Islands can help build a better picture of breeding populations and species diversity. In turn, these records can contribute towards distribution assessments and help advise on sustainable fisheries management.

Included here (see overleaf) are some of the more commonly found skate eggcases from around the Falkland Islands.



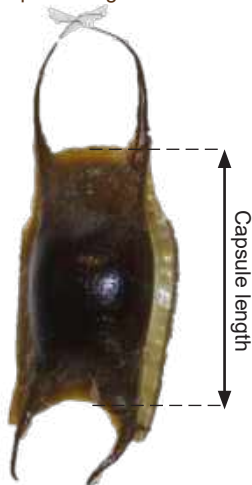
Hatching Sequence: Illustrations © Marc Dando

EGGCASES OF THE FALKLAND ISLANDS

STARRY RAY

Amblyraja doellojuradoi

Capsule length: 7–8cm



WHITE-SPOTTED SKATE

Bathyrāja albomaculata

Capsule length: 8–9cm



BROADNOSE SKATE

Bathyrāja brachyurops

Capsule length: 8–9cm



JOINED-FINS SKATE

Bathyrāja cousseauae

Capsule length: 8–9cm



GRAYTAIL SKATE

Bathyrāja griseocauda

Capsule length: 13–14cm



PATAGONIAN SKATE

Bathyrāja macloviana

Capsule length: 7–8cm



CUPHEAD SKATE

Bathyrāja scaphiops

Capsule length: 8–9cm



SAND SKATES

Psammobatis spp.

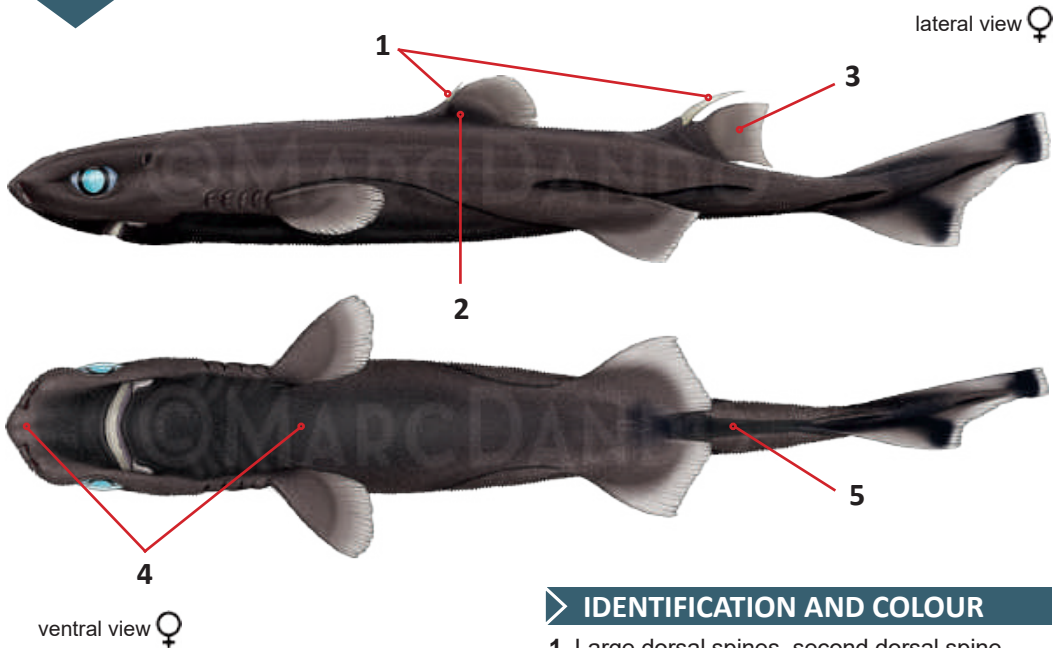
Capsule length: 4–5cm



BROADBANDED LANTERNSHARK

Etmopterus gracilispinis

IDENTIFY



IDENTIFICATION AND COLOUR

1. Large dorsal spines, second dorsal spine prominent and hooked.⁴⁵
2. First dorsal fin situated well behind pectoral rear tips.⁴⁵
3. Second dorsal fin larger than first.⁴⁵
4. Moderately slim body, narrow head, rounded snout.⁴⁵
5. Short, slender tail.⁴⁵

- **Dorsal surface:** blackish-brown body; inconspicuous, elongated black mark above and behind pectoral fins and at caudal fin base.^{3,45}
- **Ventral surface:** blackish-brown.^{3,45}

SCIENTIFIC NAME

Etmopterus gracilispinis Krefft, 1968

COMMON NAMES

BROADBANDED LANTERNSHARK,
Tollo lucerno bandoneado (ESP),
넓은얼룩 투명상어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: benthic or epipelagic; rare in Falklands waters.³

SW Atlantic: found from 100 – >1,000m over outer continental shelf and upper to mid slope. Common off Brazil and Argentina.^{45,46}

SIZE, BIOLOGY AND ECOLOGY

- Max. TL: ~33cm. Mature: females ~33cm, males 26cm.⁴⁵
- Assumed to be viviparous.^{45,46}
- Size at birth: 13cm.^{45,46}

ETG

Global:

LC

Max TL:

33cm

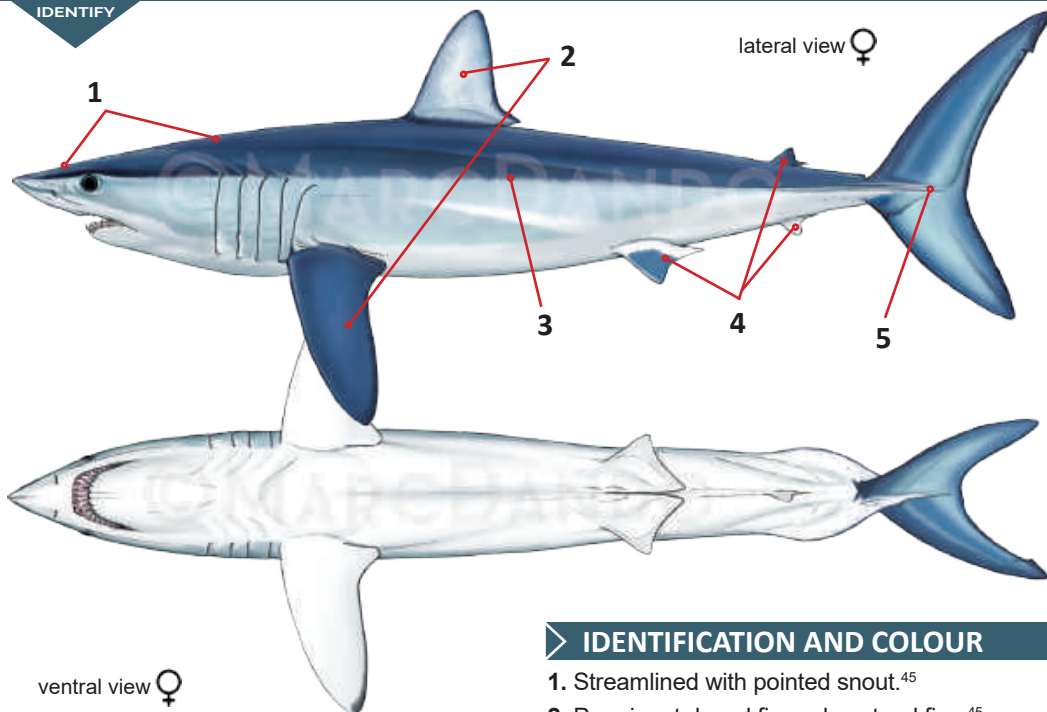
Depth:

100 – >1,000m

SHORTFIN MAKO SHARK

Isurus oxyrinchus

IDENTIFY



ventral view ♀

SCIENTIFIC NAME

Isurus oxyrinchus Rafinesque, 1810

COMMON NAMES

SHORTFIN MAKO SHARK,
Marrajo carite (ARG), Marrajo (CHL),
Tiburón (CHL), Moro (URG), 청상아리 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: pelagic; infrequent visitor to Falklands waters.³

SW Atlantic: Brazil to central Argentina.⁹

SE Pacific: northern Chile.⁹

Global: recorded from 0–600m in all temperate and tropical waters from 50°N (to 60°N in the Northeast Atlantic) to 50°S; primarily in waters 17–20°C, occasionally to 10°C.^{9,45}

IDENTIFICATION AND COLOUR

1. Streamlined with pointed snout.⁴⁵
2. Prominent dorsal fin and pectoral fins.⁴⁵
3. Distinct demarcation line along flank.⁴⁵
4. Small second dorsal, anal and pelvic fins.⁴⁵
5. Lunate caudal fin with single keel.⁴⁵

► **Dorsal surface:** metallic blue.⁴⁵

► **Ventral surface:** white, including snout and mouth.⁴⁵

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: 400cm. Mature: females 270–300cm, males 195–215cm (varies regionally).^{9,45}

► Gestation period of 15–18 months on a 3 year cycle.^{45,47}

► 4–25 pups, average 10–18 pups per litter.^{45,47}

► Feeds primarily on bony fishes, other elasmobranchs, cetaceans, cephalopods and marine mammals.⁴⁵

► One of a small number of known endothermic sharks.⁴⁵

ISX

Global:

EN

Max TL:

400cm

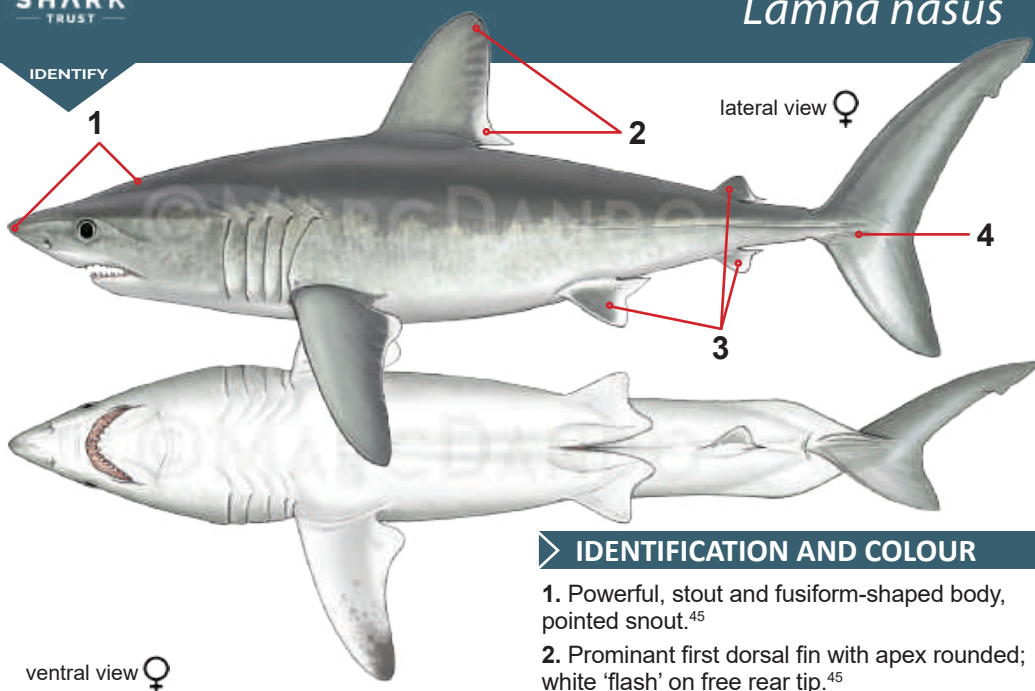
Depth:

0 – 600m

PORBEAGLE SHARK

Lamna nasus

IDENTIFY



IDENTIFICATION AND COLOUR

1. Powerful, stout and fusiform-shaped body, pointed snout.⁴⁵
2. Prominent first dorsal fin with apex rounded; white 'flash' on free rear tip.⁴⁵
3. Small pelvic, second dorsal and anal fins.⁴⁵
4. Large crescent-shaped caudal fin with secondary keel.⁴⁵

► **Dorsal surface:** dark blue to grey.⁴⁵

► **Ventral surface:** pale grey to white, often with dusky markings.⁴⁵

SCIENTIFIC NAME

Lamna nasus (Bonnaterre, 1788)

COMMON NAMES

PORBEAGLE SHARK, Tiburón sardinero (ARG), Marrajo sardinero (ESP), Tiburón pinocho (URY), 비악상어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: pelagic; occurs throughout Patagonian Shelf, Slope and Burdwood Bank. Recorded from 0–>1,000m on eastern Patagonian Slope and east of Burdwood Bank.^{3,48}

Global: wide-ranging (coastal and oceanic) in temperate and cold-temperate waters worldwide. Centres of distribution are North Atlantic and a circumpolar band in the Southern Hemisphere from 30°S to 55°S.^{49,50}

SIZE, BIOLOGY AND ECOLOGY

► Max. fork length (FL): 298cm. Mature: females 170–180cm FL (13–16 years), males 140–150cm FL (6–8 years). All SW Pacific.^{3,50,51}

► Max. age ~65 years in the Southern Hemisphere.⁵²

► Southern Hemisphere Porbeagle are smaller, grow slower and live twice as long as their Northern Hemisphere conspecifics.^{50,51}

► Aplacental viviparity; average 4 pups per litter, gestation period 8–9 months.⁵³

► Active predator of fish and cephalopods including Patagonian Squid *Doryteuthis gahi*; importance of squid in diet appears to decrease in larger sharks.^{48,51}

POR

Global:

VU

Max FL:

298cm

Depth:

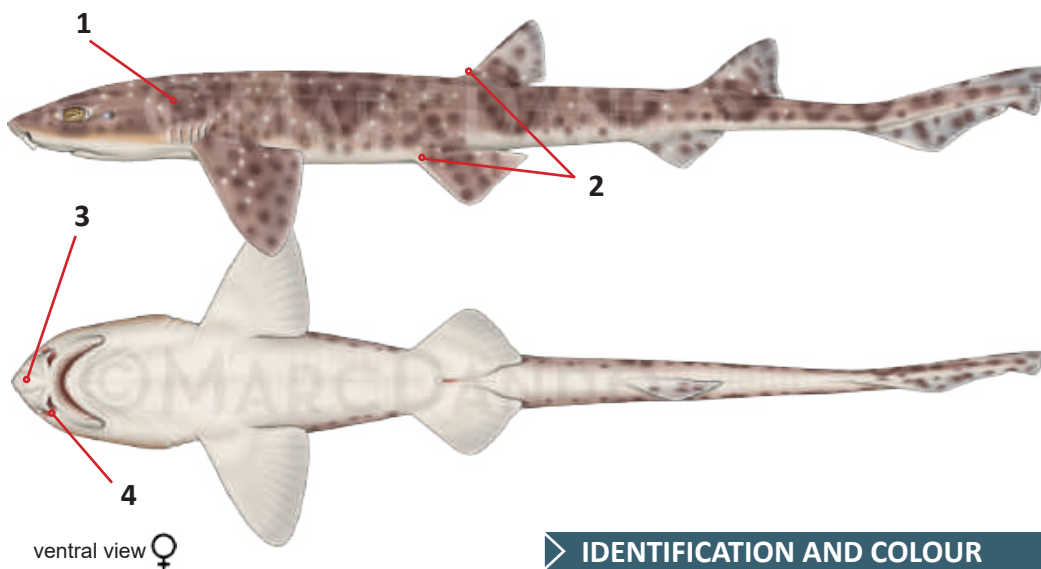
0 – >1,000m

NARROWMOUTH CATSHARK

Schroederichthys bivius

IDENTIFY

lateral view ♀



ventral view ♀

SCIENTIFIC NAME

Schroederichthys bivius (Müller & Henle, 1838)

COMMON NAMES

NARROWMOUTH CATSHARK, Pejegato bocachica (ESP), Tubarão-lagarto (BRA), Pintarroja (URG), 좁은주둥이 갯이상어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: benthic to epipelagic; 50–550m, widespread over Patagonian Shelf.^{3,54}

SW Atlantic: 14–359m, primarily <130m; on continental shelf and upper slopes from southern Brazil to Beagle Channel, southern Argentina.^{9,55}

SE Pacific: southern to central Chile.⁹

IDENTIFICATION AND COLOUR

1. Moderately slim body.⁴⁵
2. First dorsal fin set slightly behind origin of pelvic fins.⁴⁵
3. Short, narrow, rounded snout.⁴⁵
4. Anterior nasal flaps lobed and narrow.⁴⁵

► **Dorsal surface:** greyish brown with 7–8 dark brown saddles, 2 saddles in the interdorsal space. Large dark spots and small light spots scattered across dorsal surface.⁴⁵

► **Ventral surface:** greyish brown.⁴⁵

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: females 80cm, males 90cm. Mature: females 40cm, males 53cm.^{3,9,45}

► Oviparous; females lay eggs in shallow, sheltered areas including estuaries.⁹

► Size at birth: 14–20cm.⁴⁵

► Feeds primarily on squat lobsters and other crustaceans.^{45,54}

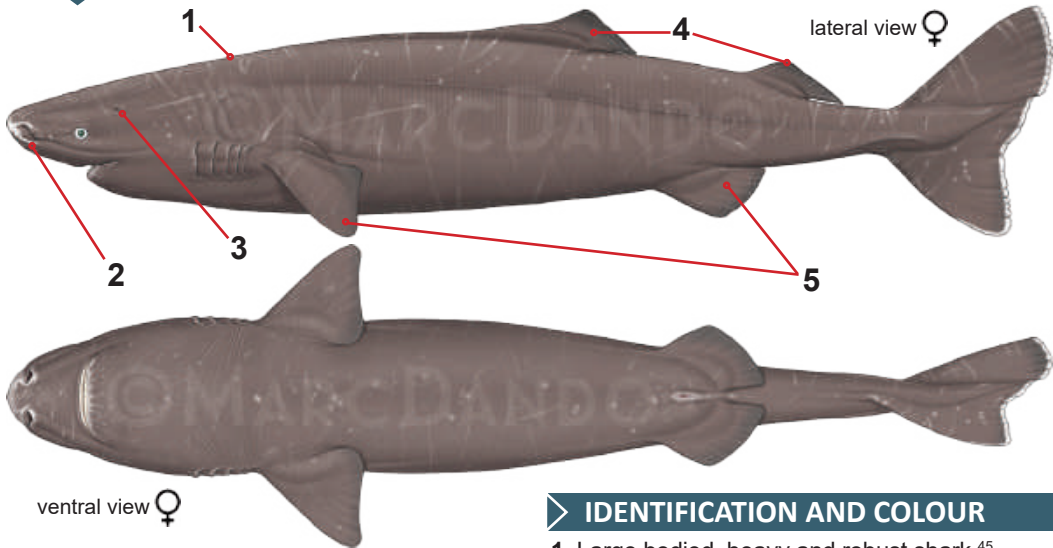
DGH

Global: LC

Max TL: 90cm

Depth: 50 – 550m

IDENTIFY



SCIENTIFIC NAME

Somniosus spp. (Genus)*

*Several species of this genus are likely to occur around the Falkland Islands. Until taxonomy is confirmed, the following entry is for *S. antarcticus* Whitley 1939.^{3,56,58}

COMMON NAMES

SLEEPER SHARK, Southern Sleeper Shark, Tollo dormilón del sur (ESP), Tiburón dormilón (ARG), 남부 잠꾸러기 상어 (KOR).

DEPTH AND DISTRIBUTION

SW Atlantic: benthic or epipelagic, 300–1,442m on continental and insular shelves and upper slopes.⁵⁶

Global: widely distributed in the Southern Ocean and cool temperate parts of the Southern Hemisphere.⁵⁷

IDENTIFICATION AND COLOUR

1. Large bodied, heavy and robust shark.⁴⁵
2. Short, blunt, rounded snout.⁴⁵
3. Large spiracles behind the eyes.⁴⁵
4. 2 small dorsal fins; first dorsal fin set back towards pelvic fins.⁴⁵
5. Small pectoral and pelvic fins; no anal fin.⁴⁵

► Shorter first and second dorsal fins distinguish *S. antarcticus* from *S. microcephalus* and *S. pacificus*.⁵⁸

► **Dorsal and ventral surfaces:** uniform dark brown to black; can be pale greyish underneath, with a pinkish flush on fins. Mucus covers the body.^{57,58}

SIZE, BIOLOGY AND ECOLOGY

► Max. TL: ~600cm. Mature: females 435cm, males ~400cm.⁵⁶

► Viviparous; 10 pups recorded in uterus of 5m female.⁵⁶

► Size at birth estimated: 40cm.⁵⁶

► Ambush predator and scavenger. Varied diet; primarily feeds on cephalopods, bony fishes, other sharks, crustaceans, marine mammals, birds and carrion.^{45,56}

SOM

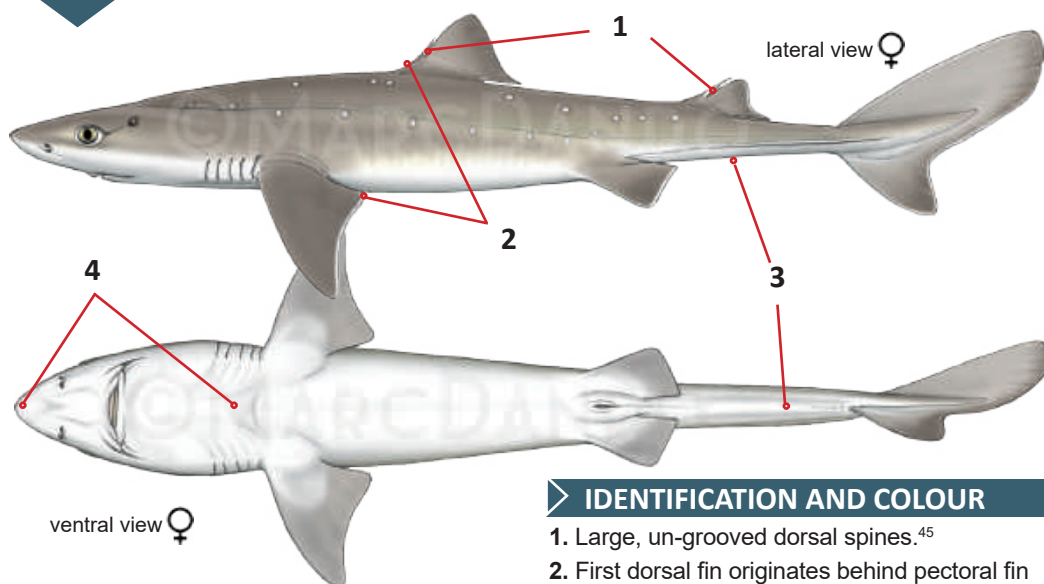
Global: **LC**

Max TL: **600cm**

Depth: **300 – 1,442m**

SPINY DOGFISH

Squalus acanthias



IDENTIFICATION AND COLOUR

1. Large, un-grooved dorsal spines.⁴⁵
 2. First dorsal fin originates behind pectoral fin rear tips.⁴⁵
 3. No anal fin.⁴⁵
 4. Moderately slim body, narrow head, pointed snout.⁴⁵
- Dorsal fin tips and edges dusky or plain in adults.⁴⁵
 - Posterior pectoral fin tips often have lighter margins in adults.⁴⁵
 - **Dorsal surface:** grey to bluish grey, rows of white spots frequently present on flanks.⁴⁵
 - **Ventral surface:** pale grey to whitish.⁴⁵

SIZE, BIOLOGY AND ECOLOGY

- Max. TL: 124cm. Mature: females 66–120cm, males 52–100cm (10–20 years).^{45,60}
- Viviparous; 1–32 pups per litter.⁴⁵
- Gestation period of 12–24 months.^{45,60}
- Size at birth: 18–33cm.⁴⁵
- Aggregates, feeds primarily on bony fishes such as Hoki *Macruronus magellanicus*, Herring *Sprattus fuegensis*, also squid and crustaceans.⁵⁴
- Segregates by size and sex.⁴⁵

SCIENTIFIC NAME

Squalus acanthias Linnaeus, 1758

COMMON NAMES

SPINY DOGFISH, Piked Dogfish, Spurdog, Mielga (ESP), Galludo (URG), Cação Espinho (BRA), 곱상어 (KOR).

DEPTH AND DISTRIBUTION

Falkland Islands: benthic or epipelagic; 50–644m, widespread over Patagonian Shelf.^{3,54}

SW Atlantic: southern Brazil to Beagle Channel, southern Argentina from 34°S to 54°S.^{44,59,60}

SE Pacific: southern Chile to southern Peru.^{9,45}

Global: boreal and temperate cosmopolitan species, found from 50–600m, possibly to 1,446m on continental, insular shelves and occasionally slopes.^{9,45}

DGS

Global: **VU**

Max TL: **124cm**

Depth: **50 – 644m**

Key References:

1. Arkhipkin *et al.* (2012). Skate assemblage on the eastern Patagonian Shelf and Slope: Structure, diversity and abundance. *J. Fish Biol.* 80, 1704–1726.
2. Bizikov *et al.* (2004). Identification guide and biology of the Falkland skates. Stanley, Falkland Islands: FIFD.
3. Farrugia (2018). Pers. Obs. FIFD.
4. Last *et al.* (2016). Rays of the World. CSIRO publishing.

For the full list of references visit:
sharktrust.org/falklands

For more detail on conservation status of species visit:
iucnredlist.org

Citation: Shark Trust 2020. *ID guide to Elasmobranchs of the Falkland Islands*. The Shark Trust. UK. 32 pp.

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