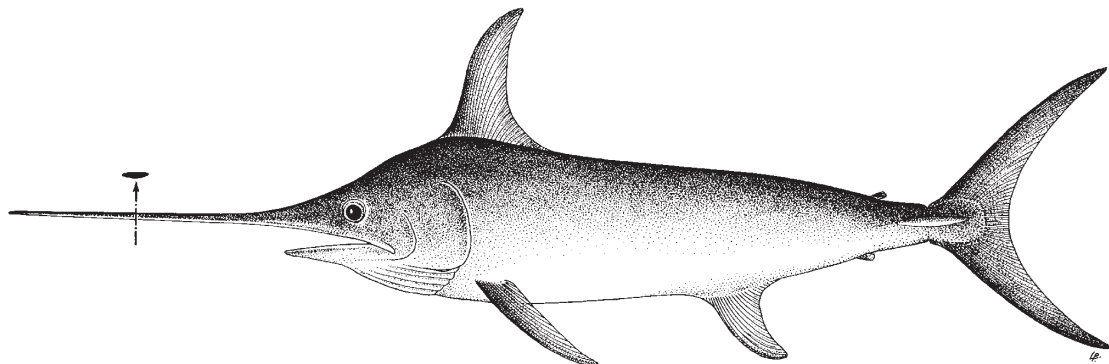


**XIPHIIDAE****Swordfishes**

by I. Nakamura

**A single species in this family.***Xiphias gladius* Linnaeus, 1758

SWO

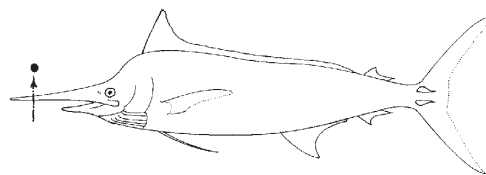
**Frequent synonyms / misidentifications:** *Xiphias estara* Whitley, 1964 / None.**FAO names:** En - Swordfish; Fr - Espadon; Sp - Pez espada.

**Diagnostic characters:** Body elongate and cylindrical. Eye large. **Upper jaw prolonged into a long bill, flat oval in cross-section** (upper jaw much longer than lower jaw in adults, but both jaws nearly equally prolonged into long bills in immature individuals). Mouth large, not protrusible. Fine file-like teeth in individuals to about 1.3 m total length, disappearing with growth. Gill openings wide, left and right gill membranes only anteriorly slightly united, free from isthmus. No gill rakers on gill arches. **Two widely separate dorsal fins in adults**, the first with 38 to 45 soft rays and the second with 4 or 5 soft rays, the former much larger than the latter (dorsal fins continuous in immature specimens). Two separate anal fins in adults, the first with 12 to 16 soft rays much larger than the second with 3 or 4 soft rays (anal fins continuous in immature specimens). Caudal fin very large, forked and lunate. **A large median keel present on each side of caudal peduncle. A large and deep notch on both upper and lower profiles of caudal peduncle.** Pectoral fins with 17 to 19 rays, falcate, a little rigid and situated low in position on body. **Pelvic fins absent.** Scales with small spines present in specimens to about 1.3 m total length, disappearing with growth. Lateral line indistinct, but recognizable in specimens up to about 1.3 m total length as a wavy-shaped line, disappearing with growth. Vertebrae 26 (15+11 or 16+10). **Colour:** dorsal and lateral side of body blackish brown, gradually fading to light brown on ventral side; fin membrane of first dorsal fin dark brown; other fins brown or dark brown.

**Similar families occurring in the area**

Istiophoridae: upper jaw prolonged as in the swordfish, but shaped as a spear rather than a sword, its cross-section being round (flat-oval in *Xiphias*), pelvic fins present, 2 keels on either side of caudal-fin base (1 strong keel in *Xiphias*), a shallow notch on both upper and lower profiles of caudal peduncle (deep notch in *Xiphias*); vertebrae 24 (26 in *Xiphias*).

Alepisauridae: somewhat similar to swordfishes in general appearance, but easily distinguished by their jelly-like body, absence of prolonged jaws, no keels at base of caudal fin and no scales on body, presence of fang-like teeth and an adipose fin (instead of rayed second dorsal fin), and presence of pelvic fins.

**Istiophoridae****Alepisauridae**

Belonidae: both jaws prolonged, dorsal and anal fins both single and similar in size and shape, pectoral fins not falcate except *Ablennes*, and pelvic fins present.

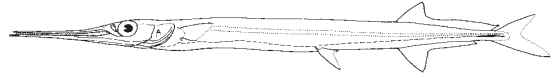
**Size:** Maximum total length about 4.5 m, commonly to 3 m. Maximum body weight about 540 kg.

**Habitat, biology, and fisheries:** An epi- and mesopelagic, oceanic species, usually found in surface waters warmer than 13°C, the optimum temperature ranging from 18° to 22°C in the northwestern Pacific. Swordfish has the greatest temperature tolerance among billfishes, ranging from 5° to 27°C. Based on records of forage organisms taken by swordfish, its depth distribution in the northwestern Pacific ranges normally from the surface to a depth of about 550 m. Larvae are more frequently encountered at temperatures above 24°C. Adults are opportunistic feeders, known to forage for their food from the surface to the bottom over a wide depth range. They feed on pelagic squids where abundant. Based on stomach contents from swordfishes, it is most likely that they use their sword to kill some of the prey, particularly squids, as shown by the slashes on the bodies of prey found in their stomachs. Swordfish are caught by longline, harpoon, drift gill net, set net, and other fishing gear in commercial fisheries, and by trolling in sports fishing. From 1990 to 1995, the FAO Yearbook of Fishery Statistics reports a range of yearly catch of around 3 730 to 5 690 t of *Xiphias gladius* from the Western Central Pacific.

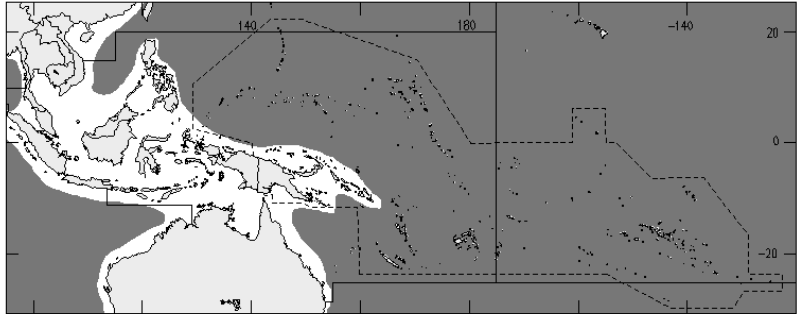
**Distribution:** Cosmopolitan in tropical, temperate and sometimes cold waters of all oceans.

#### Reference

Nakamura, I. 1985. FAO species catalogue. Vol. 5. Billfishes of the world. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date. *FAO Fish. Synop.*, (125)5:65 p.



**Belonidae**

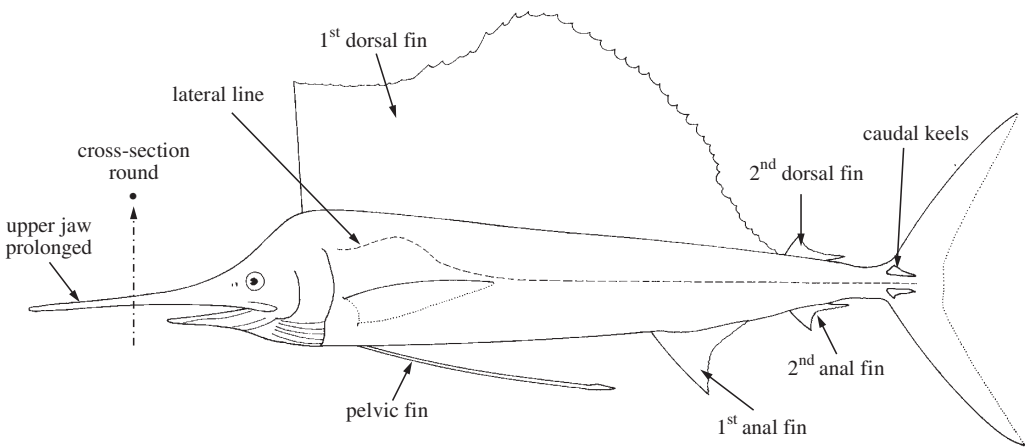


## ISTIOPHORIDAE

### Billfishes

by I. Nakamura

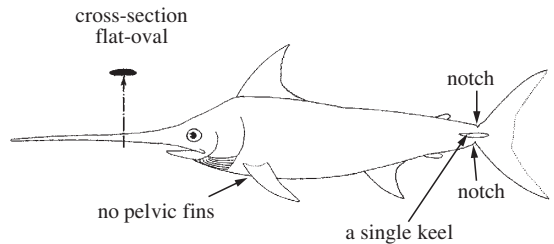
**Diagnostic characters:** Body elongate and moderately compressed (size to 5 m). **Upper jaw prolonged into a long spear, round in cross-section**, much longer than lower jaw. Mouth not protrusible, with fine, rasp-like teeth on both jaws. Gill openings wide, right and left branchiostegal membranes completely united and free from isthmus. No gill rakers on gill arches, gill filaments reticulated. Two dorsal fins, close together, the first much larger than the second. Two anal fins, the second much smaller than the first and similar in size and shape to second dorsal fin. **Both first dorsal and anal fins can be folded back into grooves.** Caudal fin large and forked, with **a pair of keels on either side at base, a small shallow notch on both upper and lower profiles of caudal peduncle.** Pectoral fins falcate. **Pelvic fins present, with 1 spine and 2 soft rays.** Lateral line always well visible (except in large individuals of *Makaira mazara* and *M. indica*). Body covered with more or less imbedded, narrow, and pointed scales. Vertebrae 24 (12+12 or 11+13). **Colour:** back and upper sides blue (sometimes darker), lower sides and belly silvery white. In some species there are horizontally aligned spots or longitudinal lines on body and/or black spot on the first dorsal fin membrane.



**Habitat, biology, and fisheries:** Billfishes are primarily inhabitants of warm seas, usually the upper layers of water above the thermocline, but during the summer months they follow schools of smaller fishes into temperate, sometimes cold waters. Being among the largest and swiftest fishes of the oceans, they perform long distance migrations. All billfishes are of some commercial value throughout the world (high commercial value in Japanese markets) and provide excellent food. Most of the species are exploited commercially by longline fleets, harpoons, set nets, and drift gill nets; all are regarded as excellent game fishes by sports fishermen. For 1995, the FAO Yearbook of Fishery Statistics reports a total catch of 13 176 t of Istiophoridae from the Western Central Pacific.

### Similar families occurring in the area

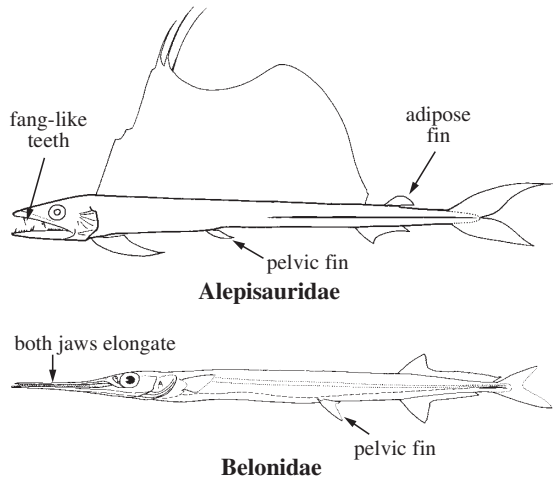
Xiphiidae: upper jaw prolonged as in istiophorids, but shaped as a sword rather than a spear, its cross-section being flat-oval (round in Istiophoridae), pelvic fins absent, a single strong keel on either side of caudal-fin base (2 keels in Istiophoridae), a deep notch on both upper and lower profiles of caudal peduncle (shallow notch in Istiophoridae), vertebrae 26 (24 in Istiophoridae), adults are further characterized by 2 well-separated dorsal fins, absence of teeth in jaws and of scales on body, and by the fact that lateral line is not visible externally.



### Xiphiidae

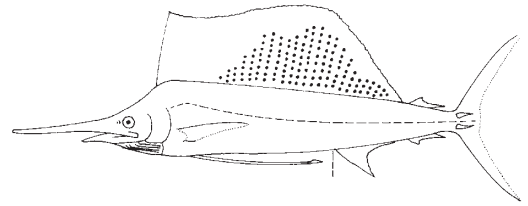
Alepisauridae: somewhat similar to sailfish (genus *Istiophorus*) in general appearance, but easily distinguished by their jelly-like body, absence of prolonged jaws, no keels at base of caudal fin and no scales on body, presence of fang-like teeth, an adipose fin (instead of rayed second dorsal fin), and insertion of pelvic fins far behind pectoral fins.

Belonidae: large representatives may be somewhat similar to small spearfishes (genus *Tetrapturus*) with first dorsal fin folded into a groove, but they have both jaws prolonged, dorsal and anal fins both single and similar in size and shape, pectoral fins not falcate except *Ablennes*, and pelvic fins inserted far behind pectoral fins.

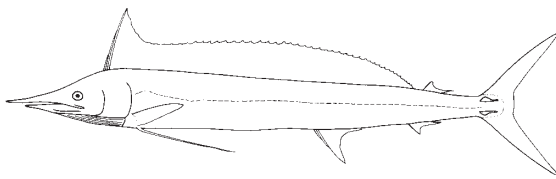


**Key to the species of Istiophoridae occurring in the area**

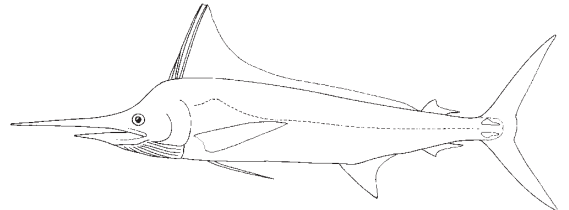
- 1a. First dorsal fin sail-like, much higher than maximum body depth; pelvic-fin rays very long, almost reaching to anus (Fig. 1) . . . . . *Istiophorus platypterus*
- 1b. First dorsal fin not sail-like, only slightly higher to lower than maximum body depth; pelvic-fin rays not as long, far from reaching to anus (Figs 2 to 5) . . . . . → 2
- 2a. Anterior part of first dorsal fin slightly higher than, or nearly equal to body depth; profile of head between preorbital region and origin of first dorsal fin nearly flat (Fig. 2) to slightly elevated (Fig. 3); body compressed . . . . . (*Tetrapturus*) → 3
- 2b. Anterior part of first dorsal fin lower than body depth; profile of head between preorbital region and origin of first dorsal fin steeply elevated (Figs 4 and 5); body not compressed . . . . . (*Makaira*) → 4
- 3a. Bill short, less than 15% of body length (Fig. 2) . . . . . *Tetrapturus angustirostris*
- 3b. Bill moderately long, more than 18% of body length (Fig. 3) . . . . . *Tetrapturus audax*



**Fig. 1** *Istiophorus platypterus*



**Fig. 2** *Tetrapturus angustirostris*



**Fig. 3** *Tetrapturus audax*

- 4a. Pectoral fins rigid, not able to be folded back against sides of body; lateral line single (Fig. 4) . . . . . *Makaira indica*
- 4b. Pectoral fins not rigid, able to be folded back against sides of body; lateral line looped (Fig. 5) . . . . . *Makaira mazara*

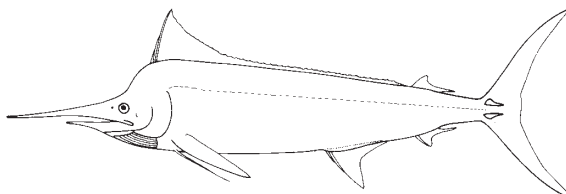


Fig. 4 *Makaira indica*

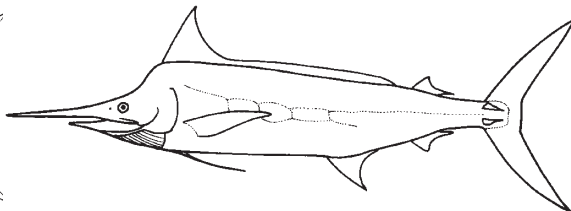








Fig. 5 *Makaira mazara*

**List of species occurring in the area**

The symbol  is given when species accounts are included.

-  *Istiophorus platypterus* (Shaw and Nodder, 1792)
-  *Makaira indica* (Cuvier, 1832)
-  *Makaira mazara* (Jordan and Snyder, 1901)
-  *Tetrapturus angustirostris* Tanaka, 1915
-  *Tetrapturus audax* (Philippi, 1887)

**Reference**

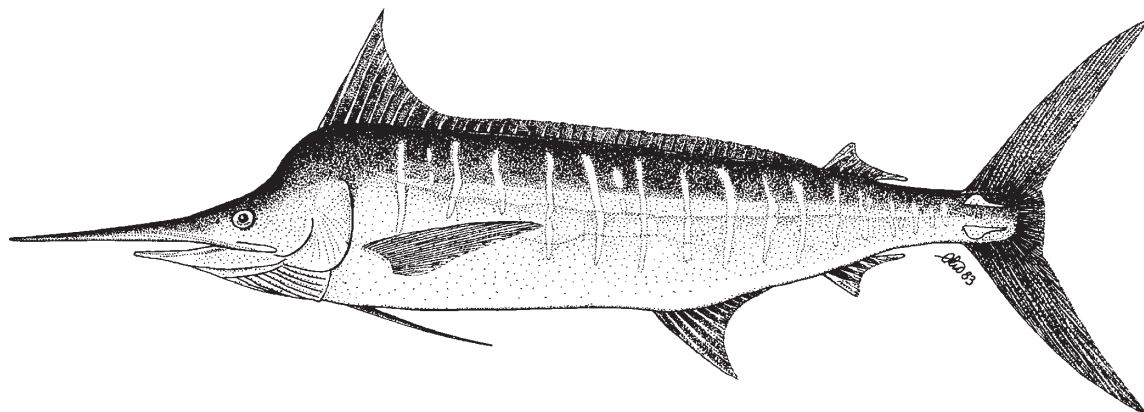
Nakamura, I. 1985. FAO species catalogue. Vol. 5. Billfishes of the world. An annotated and illustrated catalogue of marlins, sailfishes, spearfishes and swordfishes known to date. *FAO Fish. Synop.*, (125)5:65 p.

*Makaira mazara* (Jordan and Snyder, 1901)

BIZ

**Frequent synonyms / misidentifications:** None / *Makaira nigricans* Lacepède, 1802.

**FAO names:** **En** - Indo-Pacific blue marlin; **Fr** - Makaire bleu de l'Indo-Pacifique; **Sp** - Aguja azul del Indo-Pacífico.

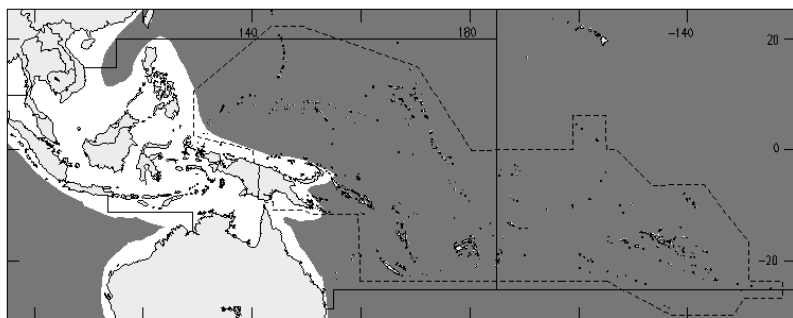


**Diagnostic characters:** Body elongate-fusiform and not strongly compressed. Bill long, extremely stout, and round in cross-section. **Nape conspicuously elevated.** Two dorsal fins, first with 40 to 45 rays, lower than body depth throughout its length, with a pointed anterior lobe and a long base, second dorsal fin with 6 or 7 soft rays, **its position slightly backward with respect to that of second anal fin.** Two anal fins, first with 12 to 17 rays and second with 6 or 7 soft rays. Caudal fin larger and strongly forked, 2 keels on each side of caudal peduncle and a shallow notch on both dorsal and ventral surfaces. Pectoral fins depressible to sides of body, with 20 to 23 rays. Pelvic fins shorter than pectoral fins, with 1 spine and 2 soft rays. **Lateral line looped.** Body covered with densely imbedded scales, each with 1 or 2 long acute spines. **Vertebrae 24 (11+13).** **Colour:** body blue dorsally, silvery white ventrally, first dorsal fin membrane blue black, unspotted, other fins dark brown, about 15 obscure vertical bars on body.

**Size:** Maximum total length about 5 m, body weight to about 900 kg.

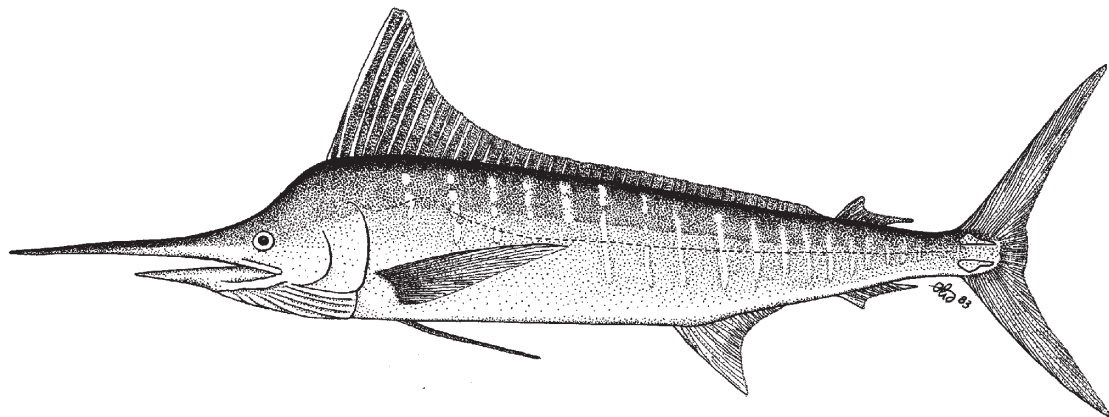
**Habitat, biology, and fisheries:** Epipelagic and oceanic species mostly confined to waters on warmer side of 24°C surface isotherm and known to effect seasonal north-south migrations. Indo-Pacific blue marlins are not usually seen close to land masses or islands, unless there is a deep drop-off of shelf (900 to 1 800 m as in waters off Kailua-Kona, Hawaii). Stomachs contained mostly squids (around the Philippines) and tuna-like fishes (off New Zealand and in the Central Pacific). In Hawaiian waters, tuna-like fishes make up more than 85% in volume of diet of this species. From 1990 to 1995, the FAO Yearbook of Fishery Statistics reports a range of yearly catch of 4 085 to 9 662 t of this species from the area.

**Distribution:** Throughout tropical, subtropical, and sometimes temperate waters of the Indo-Pacific. The most tropical among billfishes, chiefly distributed in equatorial areas.



*Tetrapturus audax* (Philippi, 1887)

MLS

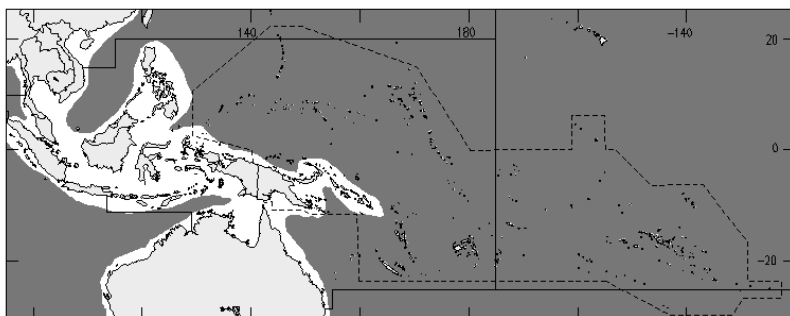
**Frequent synonyms / misidentifications:** None / None.**FAO names:** En - Striped marlin; Fr - Marlin raye; Sp - Marlin rayad.

**Diagnostic characters:** Body elongate-fusiform and fairly compressed. Bill long, stout, and round in cross-section. **Nape fairly elevated.** Two dorsal fins, first dorsal fin low posteriorly, with 37 to 42 rays, **height of anterior part of first dorsal fin higher than body depth**, second dorsal fin small, with 5 or 6 soft rays. Two anal fins, first with 13 to 18 rays and second with 5 or 6 soft rays. Pectoral fins depressible to side of body, with 21 to 23 rays. Pelvic fins shorter than pectoral fins in larger specimens, slightly longer than pectoral fins in smaller specimens with 1 spine and 2 soft rays. Lateral line single. Body covered with densely imbedded scales, each with 1 or sometimes 2 acute spines. **Vertebrae 24 (12+12).** **Colour:** body dark blue dorsally, silvery white ventrally, first dorsal fin membrane blue black, other fins dark brown, about 20 conspicuous vertical bars on body.

**Size:** Maximum total length about 3.5 m, body weight to about 200 kg.

**Habitat, biology, and fisheries:** Epipelagic and oceanic species, usually swimming above thermocline. This species is the most and widely distributed of all billfishes, especially in the eastern and northern Central Pacific, where it is much more abundant than in the western Pacific. In the Indian Ocean, it is abundant in the western Arabian Sea. *Tetrapturus audax*, like other billfishes and tunas, is carnivorous and a non-selective feeder. From 1990 to 1995, the FAO Yearbook of Fishery Statistics reports a range of yearly catch of 663 to 2 004 t of *T. audax* from the Western Central Pacific.

**Distribution:** Throughout tropical, subtropical, and sometimes temperate waters of the Indian and Pacific oceans. Latitudinal limits are about 45°N to 35° to 40°S in the Pacific Ocean, and 35°S in the southeastern Indian Ocean.

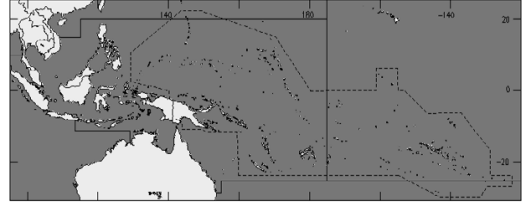
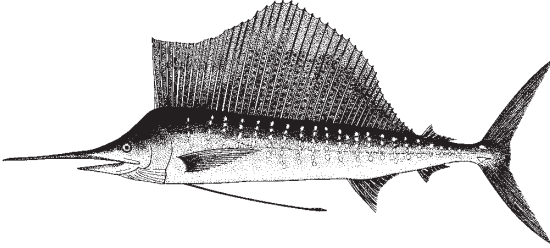


***Istiophorus platypterus*** (Shaw and Nodder 1792)

SFA

**En** - Indo-Pacific sailfish; **Fr** - Voilier de l'Indo-Pacifique; **Sp** - Pez vela del Indo-Pacífico.

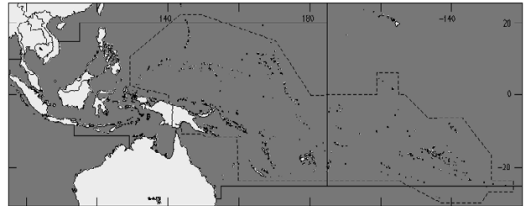
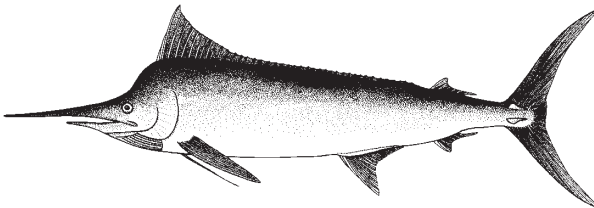
Maximum total length about 3.5 m, maximum body weight about 100 kg. Oceanic, epipelagic, and highly migratory, usually above thermocline. Most densely distributed in waters close to coasts and islands. Feeds on a wide variety of fishes, crustaceans, and cephalopods. Caught mainly with longlines, set nets, and sometimes by trolling and harpooning from boats. From 1990 to 1995, the FAO Yearbook of Fishery Statistics reports a range of yearly catch of 356 to 629 t of *Istiophorus platypterus* from the area. Throughout tropical, subtropical, and sometimes temperate waters of the Indo-Pacific.

***Makaira indica*** (Cuvier, 1832)

BLM

**En** - Black marlin; **Fr** - Makaïre noir; **Sp** - Aguja negra.

Maximum total length about 4.5 m, maximum body weight about 700 kg. Oceanic, highly migratory, and epipelagic, usually above thermocline. Most densely distributed in waters close to coasts and islands. Feeds on a wide variety of fishes, crustaceans, and cephalopods, but mostly on small tunas in waters where small tunas are abundant. Caught mainly by commercial longliners, trolling of sportfishing, harpooning and sometimes by set nets and gill nets. From 1990 to 1995, the FAO Yearbook of Fishery Statistics reports a range of yearly catch of 334 to 1 656 t of *Makaira indica* from the area. Throughout tropical and subtropical (sometimes temperate) waters of the Indo-Pacific.

***Tetrapturus angustirostris*** Tanaka, 1915**En** - Shortbill spearfish; **Fr** - Makaira à rostre court; **Sp** - Marlin trompa corta.

Maximum total length about 2 m, maximum body weight about 52 kg. Highly oceanic, migratory, and epipelagic, usually above thermocline. Seldom approaching shore. Feeds on a wide variety of fishes, crustaceans, and cephalopods. Caught as bycatch of commercial longlines. Throughout tropical and subtropical (sometimes temperate) waters of the Indian and Pacific oceans.

