

INDIAN TUNAS—A PRELIMINARY REVIEW, WITH A KEY FOR THEIR IDENTIFICATION

BY S. JONES AND E. G. SILAS

(Central Marine Fisheries Research Station)

INTRODUCTION

UNTIL recently only scant attention has been paid to the study of Scombroid fishes in general and tunas in particular occurring in the Indian Seas. That tunas form an untapped resource awaiting exploitation needs hardly any stress. Year after year, Japanese fishing vessels operating in the high seas off Indian coast and other parts of the Indian Ocean reap rich harvests as will be evident from reports of catch statistics published by them (Average years fishing condition of tuna long line fisheries by the Nankai Regional Fisheries Laboratory and other publications emanating from Japan).

Due to the spade-work done by Kishinouye (1923), Serventy (1941), Godsil and Byers (1944), Rosa (1950), Fraser-Brunner (1951), Godsil (1954) and others we have a fair idea of the species of tunas occurring in the Indo-Pacific. However, the lacuna in our knowledge of the species of tunas occurring along the Indian coast is rather appalling. Day (1878) records the undermentioned four species.

Day's species	Up-to-date Nomenclature
<i>Thynnus thunnina</i> Cuvier and Valenciennes	= <i>Euthynnus affinis affinis</i> (Cantor)
<i>Thynnus pelamys</i> Linnaeus	= <i>Katsuwonus pelamis</i> (Linnaeus)
<i>Thynnus macropterus</i> Temminck and Schlegel	= <i>Neothynnus macropterus</i> (Temminck and Schlegel)
<i>Pelamis chilensis</i> Cuvier and Valenciennes	= <i>Sarda orientalis</i> (Temminck and Schlegel)

From Ceylon waters Deraniyagala (1952) lists in addition *Thynnus* (*Kishinoella*) *tonggol* (Bleeker) [= *Kishinoella tonggol* (Bleeker)], while he does not mention *Sarda orientalis* as occurring there. In addition to the four species given by Deraniyagala, Munro (1955) mentions an additional

species, *Auxis thazard* (Lacépède). The 1953 *Proceedings of the Indo-Pacific Fisheries Council* contains a brief reference to *Euthynnus affinis* and *Thynnus tonggol* as constituting the tuna fishery of India. There is no mention of any species in a brief note on the tuna fisheries of Bombay by Deodhar (1953) in the same publication. Smith (1949) records *A. thazard* (Lacépède), *Euthynnus pelamis* (Linnaeus); *Euthynnus alletteratus* (Rafinesque), *Thynnus thynnus* (Linnaeus), *Sarda chilensis* (Cuvier and Valenciennes), *Germo itosibi* (Jordan and Evermann), *Germo albacora* (Lowe), and *Germo alalunga* (Bonnaterre) from South African waters of both the Indian Ocean and the Atlantic, while de Beaufort (1951) describes *Euthynnus pelamis* (Linnaeus), *E. alletteratus affinis* (Cantor), *Thynnus sibi* (Schlegel), *T. macropterus* (Schlegel), *T. tonggol* (Bleeker), and *Auxis thazard* (Lacépède) from the Indo-Australian Archipelago.

Jones (1958 a) recorded two species of Frigate mackerels *Auxis thazard*, and *A. tapeinosoma* from Indian waters and Jones (1958 b) and Jones and Kumaran (1959) have reported on the Tuna Fishery of Minicoy Island of the Laccadive Archipelago, therein also recording *Auxis thazard*, *Neothunnus macropterus*, and *Katsuwonus pelamis*. In the series entitled "Eggs, larvæ and juveniles of fishes from Indian waters", *Katsuwonus pelamis*, *Neothunnus macropterus*, *Euthynnus affinis*, *Auxis* spp. and *Sarda orientalis*, have received attention (Jones 1959 and 1960 a and b). While recording seven scombroid fishes including *Euthynnus affinis* and *Gymnosarda unicolor* (Rüppell) from the Andaman-Nicobar waters (Jones, Silas and Dawson, 1960) attention was also drawn to the fact that more intensive surveys would show the presence of other species of scombroids in those waters. Japanese works already mentioned indicate the occurrence of *Thynnus germo* (Lacépède), *T. orientalis* (Temminck and Schlegel), *Parathunnus mebachi* (Kishinouye), and *Neothunnus macropterus* (Temminck and Schlegel) in the Andaman-Nicobar waters of the Indian Seas.*

Herein we are able to record 13 species and subspecies of tunas from Indian Seas. Of these we have been able to examine material of ten and of the remaining, *Cybiosarda elegans* Whitely known also from Western Australia and is likely to occur in other parts of the Indian Ocean is included. *Thynnus thynnus orientalis* and *T. alalunga* are based on Japanese records.

The more one looks into the systematics of the tunas, the greater will one find the similarities at the species level between those occurring in the

* Fish collections made during February-March 1961 from the Andaman Islands by Messrs. K. V. Rao and G. Luther of this Institute has added one more species of tuna, *Kishinoella tonggol* (Bleeker), to the list.

Indo-Pacific on the one hand and in the Atlantic Ocean on the other hand. Hence the nomenclature used here is the result of a preliminary assessment of the species occurring in these oceans; priority being given to the earlier names proposed.

BODY DIMENSIONS USED IN DESCRIBING TUNAS

Marr and Schaefer (1949) have defined the body dimensions used for describing tunas and to facilitate easy reference we give these characters below and have also indicated them in the accompanying figure (Fig. 1). Characters which should not be missed are marked thus*.

1. **Total length*.—Tip of snout to caudal fork depressing small fleshy flap extending posteriorly to indicate end of hypural.
2. **Head length*.—Tip of snout to most posterior point on sub-opercle depressing fleshy margin extending posteriorly.
3. **Snout to insertion of first dorsal*.
4. **Snout to insertion of second dorsal*.
5. **Snout to insertion of anal*.
6. **Snout to insertion of ventral*.
7. **Greatest depth*.—Greatest vertical distance between dorsal and ventral contours with first dorsal depressed in its slot and the exact position indicated with reference to the number of the dorsal spine, the insertion of which is nearest the upper end of the vertical.
8. **Length of pectoral*.—From the point of intersection of the dorsal margin of the pectoral with the body to the tip of the fin.
9. *Pectoral insertion to insertion of first dorsal*.
10. *Length base first dorsal*.—Insertion of first dorsal to insertion of second dorsal.
11. *Length base second dorsal*.—Insertion of second dorsal to intersection of posterior margin of it with body contour including any attached finlet.
12. *Caudal spread*.—Distance between dorso-posterior and ventro-posterior extremities of caudal fin.
13. *Length longest dorsal spine*.—Longest spine of first dorsal.
14. *Length first dorsal spine*.—First spine of first dorsal.
15. **Length second dorsal*.—From anterior insertion to tip with fin in normal position.

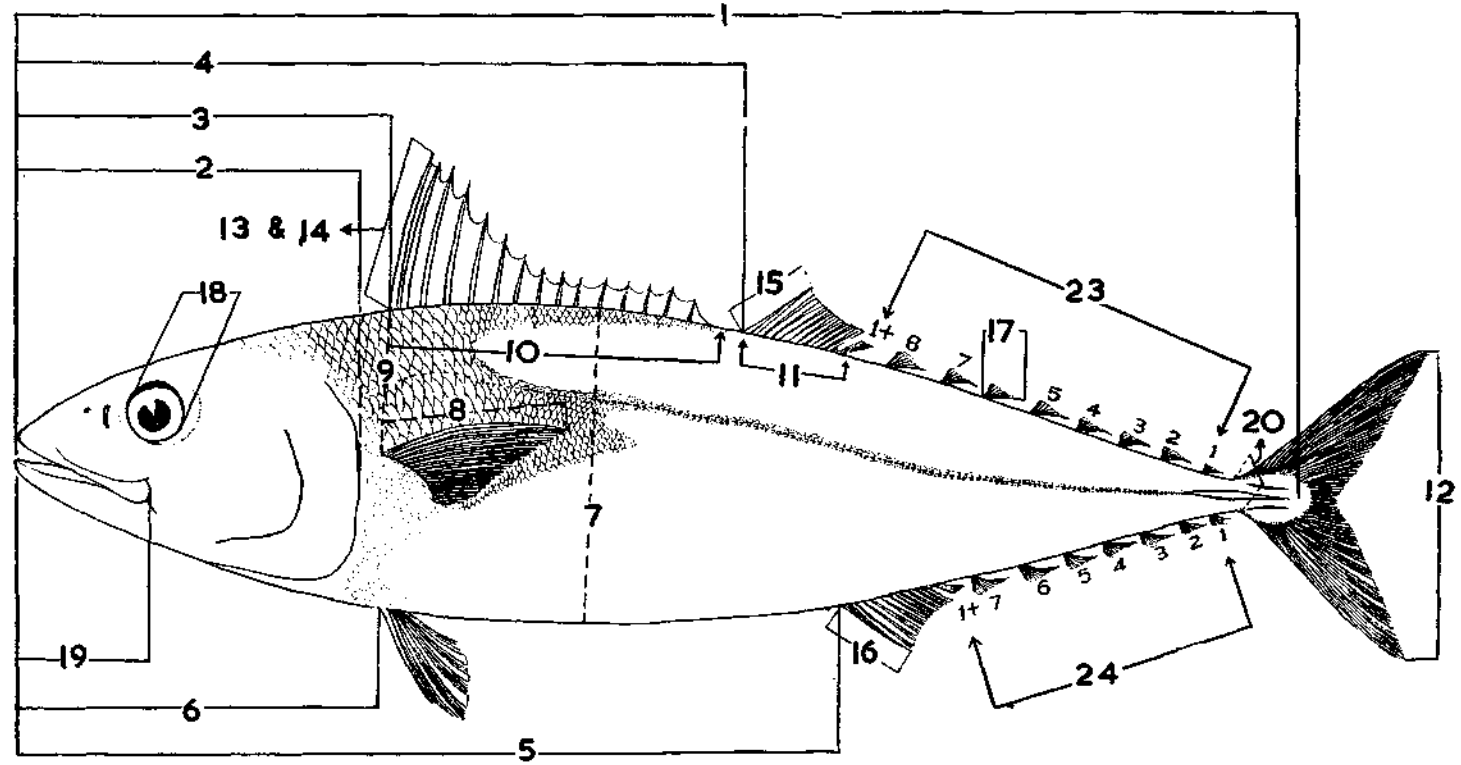


FIG. 1. Schematic drawing of tuna showing methodology to be used in taking body proportions. The numbers in the figure correspond with those given under the section "Body dimensions used in describing tunas" (Nos. 21, 22 and 25 are not indicated in the figure).

16. **Length anal.*—From anterior insertion to tip with fin in normal position.
17. *Length longest dorsal finlet.*
18. **Diameter of iris.*—Greatest diameter measured to margin of yellow iris and adjoining black tissue. Generally oblique to median line of body.
19. **Length maxillary.*—Tip of snout to posterior end of maxillary.
20. *Least depth caudal peduncle.*—Least vertical distance behind finlet but ahead of base of caudal.
21. *Greatest width caudal peduncle at keels.*
22. **Number of first dorsal spines.*
23. **Number of dorsal finlets.*—Most posterior one is counted as No. 1 and the one nearest second dorsal is the last. In case of attached finlet the latter is indicated as +1 (e.g., 8+1).
24. **Number of anal finlets.*—Same procedure as above.
25. **Number of gill rakers.*—Refers to number of gill rakers on the outer side of the outermost gill arch, those of the upper limb and lower limb being indicated separately (e.g., 7+12).

In addition to these, the undermentioned characters should also be noted whenever possible.

**Weight.*

**Sex.*—“Determined by inspection. Very immature males and females may be difficult to distinguish. Ovaries, which are tubular, may often roll between the fingers, while testes, which are solid, will turn over. The testes of ripening or ripe males are enlarged, solid, white bodies, not round in cross-section. The ovaries of ripening or ripe females are enlarged, turgid, pink or yellow-orange bodies, round in cross-section. Ova may often be distinguishable with the naked eye. The testes of spawned-out (*and recovering*) males are less turgid, tougher and pinker than those not spawned, and are difficult or impossible to distinguish from maturing testes in early stages. The ovaries of spawned-out females are hollow, more or less flabby, sac-like tubes” (Marr and Schaefer, 1948). (*The portion in parenthesis ovs*).

**Liver.*—Whether the surface of the liver is plain or only striated along the margin or the entire surface (Fig. 2).

KEY TO THE SPECIES OF INDIAN TUNAS^{1, 2}

- 1 a. First and second dorsal fins widely separated by distance exceeding length of base of first dorsal.....2
- 1 b. First and second dorsal fins contiguous or separated by only a narrow interspace not exceeding diameter of orbit.....3
- 2 a. Corselet scales abruptly taper immediately below end of first dorsal and continue as a very narrow band having not more than four rows of scales in a line below second dorsal; gill rakers on lower limb about 40.
.....*Auxis thazard* (Lacépède)

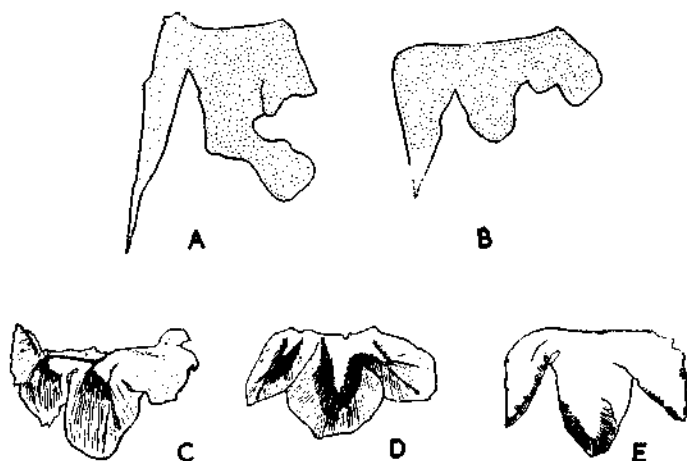


FIG. 2. Liver of five species and subspecies of tunas showing the plain and striated conditions. A. Oceanic skipjack, *Katsuwonus pelamis*; B. Yellowfin tuna *Neothunnus macropterus*; C. Albacore *Thunnus alafunga*; D. Oriental bluefin (tuna *Thunnus thynnus orientalis*); E. Big-eyed tuna *Parathunnus obseus mebachi* (after Godsil and Byers, 1944).

- 2 b. Corselet scales gradually taper behind first dorsal and continue as a wide band with 7-12 rows of scales in a line below seventh dorsal finlet; gill rakers on lower limb about 45-46.
.....*Auxis thynnoides* Bleeker

¹ Sette (1952: *Proc. Indo-Pacific Fisher. Council., 4th Meeting, Sec. 1: 65-67*) in the Report for 1952 of the Sub-Committee on Tuna, lists also *Grammatorecynus bicarinatus* (Quoy and Gaimard) under 'Available tuna morphometric data'. However, for reasons given below (p. 377), we have not included this species in this review on Indian Tunas. The presence of a second decurved lateral line commencing from a point above mid-length of pectoral and travelling along the lower half of the abdomen to the caudal keel where it becomes confluent with the upper lateral line should help in easily distinguishing this species from all the tunas, though this has been recorded from Indian waters (Jones, Silas and Dawson, 1960).

² Body proportions given apply to late juveniles and adults.

- 3 a. Distance from tip of snout to end of maxilla 50% or more of head length; end of maxilla surpasses vertical below middle of orbit.
.....4
- 3 b. Distance from tip of snout to end of maxilla considerably less than 50% of head length; end of maxilla does not surpass vertical below middle of orbit.....6
- 4 a. Vomer with villiform teeth; dorsal and anal finlets 9 or 10/7 or 8.
.....*Cybiosarda elegans* Whitely
- 4 b. Vomer edentulous; dorsal and anal finlets 6-8/5 or 6.....5
- 5 a. Dorsal with 18 or 19 spines; end of maxilla surpassing vertical below posterior border of orbit; 6-9 horizontal dark stripes on upper half of body appear as short broken bars in juveniles.
.....*Sarda orientalis* (Temminck and Schlegel)
- 5 b. Dorsal with 14 spines; end of maxilla reaching to vertical below posterior third of orbit; No dark stripes on body.
.....*Gymnosarda unicolor* (Rüppell)
- 6 a. Body completely scaled; those of corselet and lateral line usually larger7
- 6 b. Body naked except for corselet and lateral line.....12
- 7 a. Anterior insertion of second dorsal nearer to posterior end of caudal keel than to posterior margin of orbit.....8
- 7 b. Anterior insertion of second dorsal nearer posterior margin of orbit than to posterior end of caudal keel.....10
- 8 a. Pectoral short, not exceeding head length excluding snout and falling short of vertical below anterior insertion of second dorsal by distance equalling its own length; pre-operculum distinctly rounded along posterior margin.
.....*Thunnus thynnus orientalis* (Temminck and Schlegel)
- 8 b. Pectoral elongate, one to one and a half times length of head and extends to or surpasses vertical below anterior insertion of second dorsal; preoperculum more or less angular at lower posterior margin.....9
- 9 a. Gill rakers on lower limb 19-21; surface of liver markedly striated; vent rounded; distance between tip of pectoral and end of caudal keel much less than head length.
.....*Thunnus alahunga* (Bonnaterre)

- 9 b. Gill rakers on lower limb 16-18; liver marked with faint striations on margin only; vent elliptical; distance between tip of pectoral fin and end of caudal keel greater than head length.
.....*Parathunnus obseus mebachii* (Kishinouye)
- 10 a. Gill rakers not more than 18 on lower limb, generally 15 or 16; air-bladder absent; finlets with hardly any yellow, being predominantly dusky.
.....*Kishinoella tonggol* (Bleeker)
- 10 b. Gill rakers 19-22 on lower limb; air-bladder present; finlets lemon yellow with narrow dusky edging.....11
- 11 a. Pectoral surpassing vertical below anterior insertion of second dorsal; anal and second dorsal not elongate and shorter than pectoral.
.....*Neothunnus macropterus* (Temminck and Schlegel)
- 11 b. Pectoral falls short of vertical below anterior insertion of second dorsal; anal and second dorsal greatly elongate, being considerably longer than pectoral.
.....*Neothunnus itosibi* (Jordan and Evermann)
- 12 a. Four or more dark conspicuous longitudinal stripes on lower half of body; gill rakers 15 or 16 + 36-40.
.....*Katsuwonus pelamis* (Linnaeus)
- 12 b. No dark stripes on lower half of body, instead a few conspicuous black spots on side of body behind corselet below pectoral base; gill rakers 7-10 + 22-25.
.....*Euthynnus affinis affinis* (Cantor)

NOTES ON THE SPECIES

Family: SCOMBRIDÆ

We recognise the family Scombridæ as defined by Regan (1909) and on the basis of osteological and other characters given by Starks (1910), Kishinouye (1923), Godsil and Byers (1944), Fraser-Brunner (1950), Rivas (1951) and de Sylva (1955), the following subfamily groupings are adopted.

Subfamily Scombrinæ .. (*Scomber* Linnaeus; *Pneumatophorus* Jordan and Gilbert; *Rastrelliger* Jordan and Starks; and *Grammatorcynus* Gill).

Subfamily Gasterochismatinæ (*Gasterochisma* Richardson).

Subfamily Thunninæ .. (*Thunnus* South; *Parathunnus* Kishinouye; *Neothunnus* Kishinouye; *Katsuwonus*

Kishinouye; *Euthynnus* Lutken; *Kishinoella* Jordan and Hubbs; *Allothunnus* Serventy; *Orcynopsis* Gill; *Auxis* Cuvier; *Sarda* Cuvier; *Gymnosarda* Gill; and *Cybiosarda* Whitely).

Subfamily Scomberomorinæ (*Scomberomorus* Lacépède; *Cybium* Cuvier; *Indocybium* Munro; and *Acanthocybium* Gill).

Osteological characters indicate the genus *Grammatorcynus* Gill to be more closely allied to the Scombrinæ than to the Thunninæ. We also feel that the proper place in the System of *Auxis*, *Sarda*, *Gymnosarda* and *Cybiosarda* is nearer to the subfamily Thunninæ than to the Scombrinæ or Scomberomorinæ. Of the genera listed under the subfamilies only *Allothunnus* and *Orcynopsis* do not occur in the Indian region while the subfamily Gastrochismatinæ is not represented in the Indian Seas. The genera and species are dealt with below in the order in which they appear in the Key to the identification of the species.

Subfamily: Thunninæ

Genus: *AUXIS* Cuvier

Auxis thazard (Lacépède)

(Fig. 3)

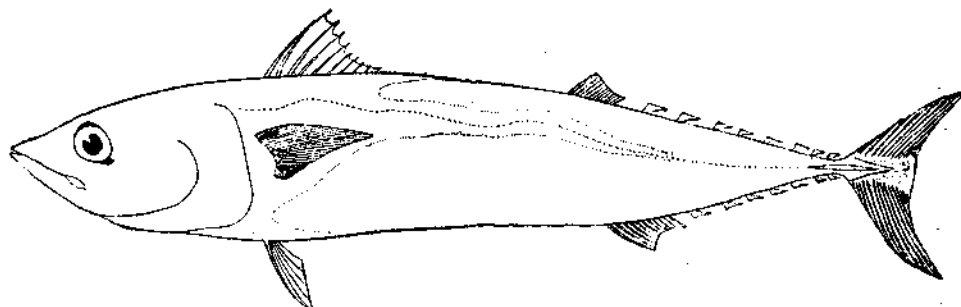


FIG. 3. *Auxis thazard* (Lacépède) (After Jones, 1958).

Scomber thazard Lacépède, 1802. *Historie Naturelle Poissons*, 3: 9.

SYNONYMY.—For detailed synonyms reference is invited to Fraser-Brunner (1950), de Beaufort (1951), Herre (1953) and Jones (1958), with one reservation. The name *Auxis thynnoides* should be substituted for *A. tapeinosoma* where the latter is considered valid, for the typical *A. tapeinosoma* is a synonym of *A. thazard*.

POPULAR NAME.—Short corseletted frigate mackerel.

OCCURRENCE IN INDIAN WATERS.—From Ratnagiri southwards along the west coast; Gulf of Mannar; and Minicoy. Material has been examined from various centres along this range.

GENERAL DISTRIBUTION.—Indo-Pacific and Atlantic.

Auxis thynnoides Bleeker

(Fig. 4)

Auxis thynnoides Bleeker, 1855. *Nat. Tijdschr. Ned. Indie*, 8: 301.

POPULAR NAME.—Long corseletted frigate mackerel.

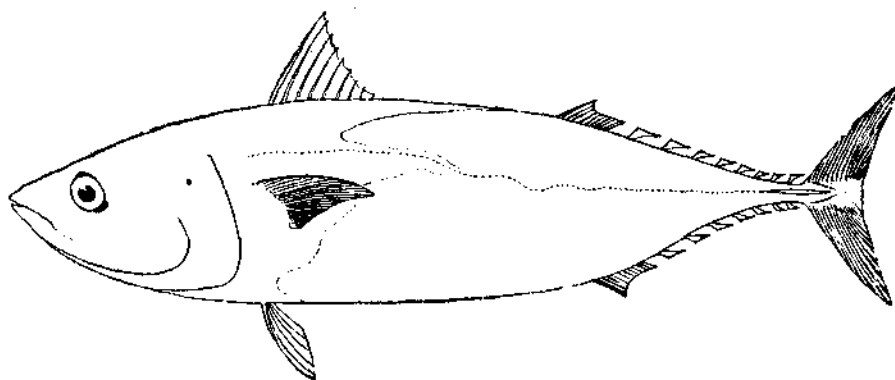


FIG. 4. *Auxis thynnoides* Bleeker (after Jones, 1958—given as *A. tapeinosoma*).

REMARKS.—Fraser-Brunner (1950) drew attention to specimens of *A. thazard* from Celebes, Ambonia and Japan having “a slightly longer preorbital part of the head” representing a local subspecies—*tapeinosoma* of which *A. hira* Kishinouye from Japan was considered a synonymy. As already mentioned, Jones (1958 a) recorded *A. tapeinosoma* along with *A. thazard* from Indian waters. Recently Mutsumoto (1959) has given sufficient valid reasons for considering *A. tapeinosoma* a synonym of *A. thazard*, while recognising Bleeker’s *A. thynnoides* as a good species. The correction that *A. tapeinosoma* Jones (*nec* Bleeker) refers to *A. thynnoides* Bleeker is made here.

OCCURRENCE IN INDIAN WATERS.—Malpe, Calicut and southwards along the West Coast and the Gulf of Mannar. Material has been examined from Malpe, Calicut, Vizhingam, Colachel, and Tuticorin.

GENERAL DISTRIBUTION.—Indo-Pacific.

Genus: *CYBIOSARDA* Whitley

Cybiosarda elegans Whitley

(Fig. 5)

Cybiosarda elegans Whitley, 1935. *Rec. Australian Mus.*, 19: 4.

POPULAR NAME.—Leaping bonito.

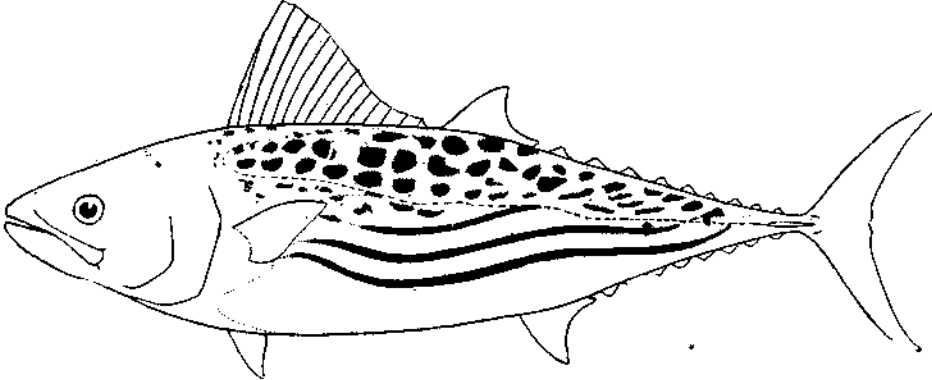


FIG. 5. *Cybiosarda elegans* Whitley (after Fraser-Brunner, 1950—given as *Gymnosarda elegans*).

REMARKS.—Serventy (1941) gives the colour of this species as being a “combination of spots and broken bars above and continuous longitudinal lines below, dark on an iridescent greenish-blue background. First dorsal is strikingly parti-coloured, being jet black in front and pearly-white behind”. It is likely that in large adults the colour may be much subdued.

C. elegans is said to attain over 41 cm. and weigh about one kilogram.

GENERAL DISTRIBUTION.—This little known species has been recorded along the Australian Coast on the eastern side as far south as Sidney and on the western coast as far south as Fremantle. It is one of the species to be looked for, especially in the Indonesian waters as well as the Andaman Sea. In view of this, the species is included here to facilitate its identification by anyone coming across it from the Indian Seas.

Genus: *SARDA* Cuvier

Sarda orientalis (Temminck and Schlegel)

(Fig. 6 a, b)

Pelamys orientalis Temminck and Schlegel, 1850. *Faun. Japonic. Pisces*: 90.

SYNONYMY.—Reference may be made to Fraser-Brunner (1950), Rivas (1951), and Herre (1953).

POPULAR NAME.—Oriental bonito.

REMARKS.—Jones (1960 *b*) has shown the variations in the colour pattern in the juveniles of this species. Figure 6 *a* shows a specimen about 245 mm. from Vizhingam in which the longitudinal lateral bands are still interrupted but in adults these become continuous (Fig. 6 *b* after Fraser-Brunner).

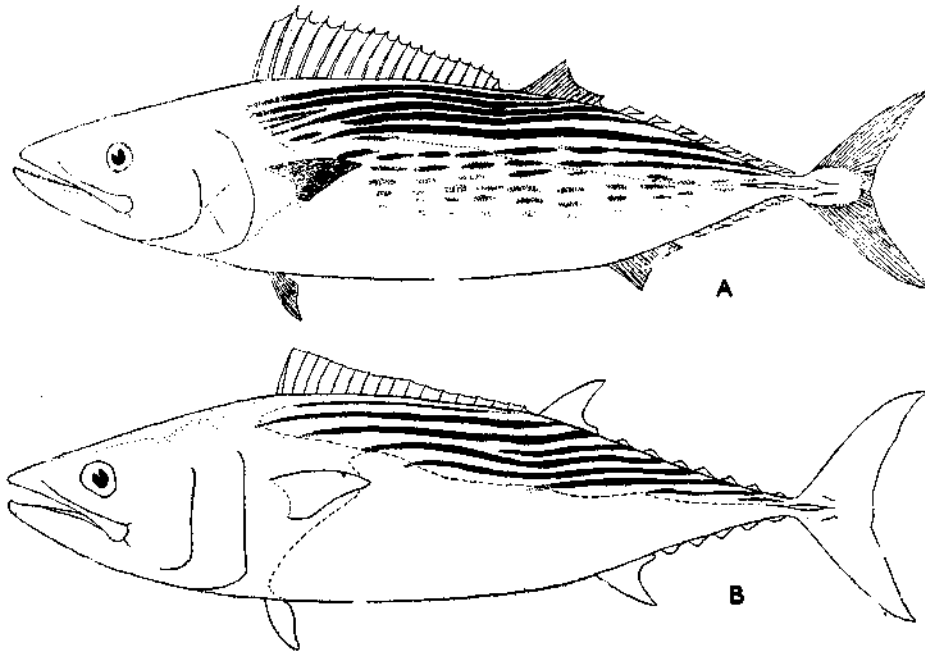


FIG. 6. *Sarda orientalis* (Temminck and Schlegel). Fig. A. 245 mm. long specimen from Vizhingam showing juvenile colouration; Fig. B. Adult (after Fraser-Brunner, 1950).

OCCURRENCE IN INDIAN WATERS.—Along the west coast. We have examined specimens from Vizhingam and Cape Comorin, the largest measuring about 51 cm.

GENERAL DISTRIBUTION.—Indo-Pacific. Its occurrence in the warmer parts of the Atlantic Ocean needs confirmation (see Rivas, 1951).

Genus: *GYMNOSARDA* Gill

Gymnosarda unicolor (Ruppell)

(Fig. 7)

Thynnus (Pelamys) unicolor Ruppell, 1835. *Neue Wirbelt, Fische Rothen.*

Meeres: 40, Plate 12, Fig. 1.

SYNONYMY.—Reference may be made to Fraser-Brunner (1951), Herre (1953) and Schultz (1960).

POPULAR NAME.—Dogtooth tuna.

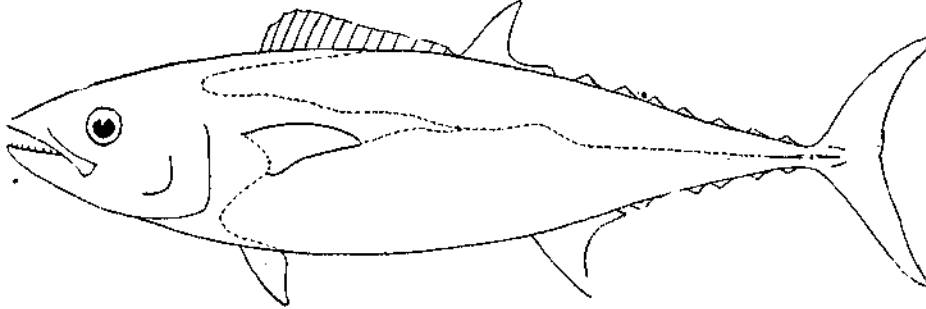


FIG. 7. *Gymnosarda unicolor* (Rüppell) (after Fraser-Brunner, 1950).

REMARKS.—Ogilby and Marshall (1954) remark that the species is said to attain 8 feet in length, but generally specimens less than 4 feet and weighing between 50 and 90 lb. are taken in the waters off Queensland. The corselet scales above the pectoral are covered by the skin so that the body appears totally scaleless. On account of this, the species is also known as the 'scaleless tuna'. The lower jaw is slightly deeper and prominent and the teeth on both jaws are well developed and conspicuous. Fraser-Brunner (1951) gives the interpelvic process of *Gymnosarda* as being bifid as in *Sarda*, and *Orcynopsis*. However, in all the specimens we have examined it is in the form of a single median blade developed to a much lesser degree than seen in *Auxis*, and would appear not to be a good diagnostic character in this case.

OCCURRENCE IN INDIAN WATERS.—Andaman Sea and Laccadive Sea. We have examined several specimens from Port Blair, Andamans and Minicoy Island, Laccadive Archipelago. The Ceylon aqualung diving expert, Mr. Rodney Jonklaas has photographed this fish underwater near the Basses Reefs, south-east of Ceylon.

GENERAL DISTRIBUTION.—Indo-Pacific, from Red Sea to Japan.

Genus: *THUNNUS* South

Thunnus thynnus orientalis (Temminck and Schlegel)

(Fig. 8)

Thynnus orientalis Temminck and Schlegel, 1850. *Fauna Japonic. Pisces*: 94.

SYNONYMY.—Reference may be made to *Thunnus thynnus* (Linnaeus) as given by Herre (1953).

POPULAR NAME.—Oriental bluefin tuna.

REMARKS.—The colouration of *Thunnus orientalis* as figured by Kishinouye (1923) shows vertical rows of spots and short bars of lighter colour

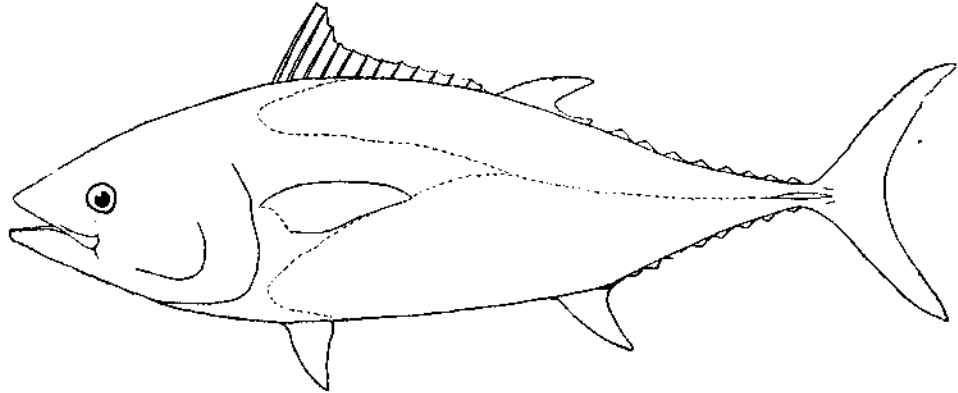


FIG. 8. *Thunnus thynnus orientalis* (Temminck and Schlegel) (after Godsil and Byers, 1944—given as *Thunnus orientalis*).

on the lower half of the body. Japanese tuna catches indicate the occurrence of *T. orientalis* in parts of the Indian seas. The differences between this and the Atlantic *Thunnus thynnus* are very slight indeed, in view of which the above nomenclature is used. It will be desirable to follow this system until such time that a detailed comparison between the Atlantic and Indo-Pacific representatives of this species is made. It is also likely that the southern bluefin tuna *Thunnus maccoyi* Castelnau may be identical with *T. t. orientalis*.

GENERAL DISTRIBUTION.—Warmer waters of the Indo-Pacific.

***Thunnus alalunga* (Bonnaterre)**

(Fig. 9)

Thynnus alalunga Bonnaterre, 1788. *Table Ichth*: 139.

SYNONYMY.—Reference may be made to Fraser-Brunner (1950), and Rivas (1951).

POPULAR NAME.—Albacore.

REMARKS.—This species has figured in the Japanese tuna catches from parts of the Indian Seas, but has been recorded as *Thunnus germo* (Lacépède) by Japanese workers. Smith (1948) lists this as *Germo alalunga* (Bonnaterre).

Boeseman (1947) has shown that *Thynnus sibi* Temminck and Schlegel is a synonym of *Germo alalunga* (Gmelin) [= *Thunnus alalunga* (Gmelin)].

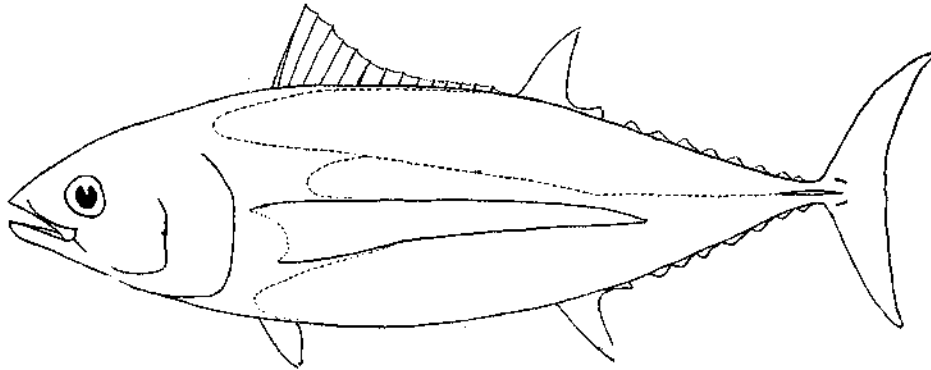


FIG. 9. *Thunnus alalunga* (Bonnatere) (after Fraser-Burnett, 1950—given as *Thunnus* (*T.*) *alalunga*).

Thunnus sibi de Beaufort (*nec* Temminck and Schlegel) is a composite grouping of more than one species. We have not examined any material of *Thunnus alalunga*.

GENERAL DISTRIBUTION.—Warmer seas of the Atlantic and Indo-Pacific.

Genus: *PARATHUNNUS* Kishinouye

Parathunnus obseus mebachi (Kishinouye)

(Fig. 10)

Thunnus mebachi Kishinouye, 1915. *Suisan Gakkwai Ho* (*Proc. Sci. Fisher. Assoc. Imperial Univ. Tokyo*), 1:19, Plate 1, Fig. 11.

POPULAR NAME.—Big-eyed tuna.

REMARKS.—As pointed out by Munro (1957), *Thunnus mebachi* Kishinouye is very closely related to *Thunnus obseus* Lowe from the Atlantic. We find hardly any notable differences between the existing descriptions of these two species on account of which for the time being we have relegated *T. mebachi* [= *Parathunnus mebachi* (Kishinouye)] as a subspecies of the earlier proposed *T. obseus* Lowe.

Japanese records indicate its common occurrence in Indian waters. We have examined a specimen 173 mm. long from the Laccadive Archipelago obtained on one of the M.F.V. *BANGADA* cruises in 1960 which appears to be this species.

GENERAL DISTRIBUTION.—Warm waters of the Indo-Pacific.

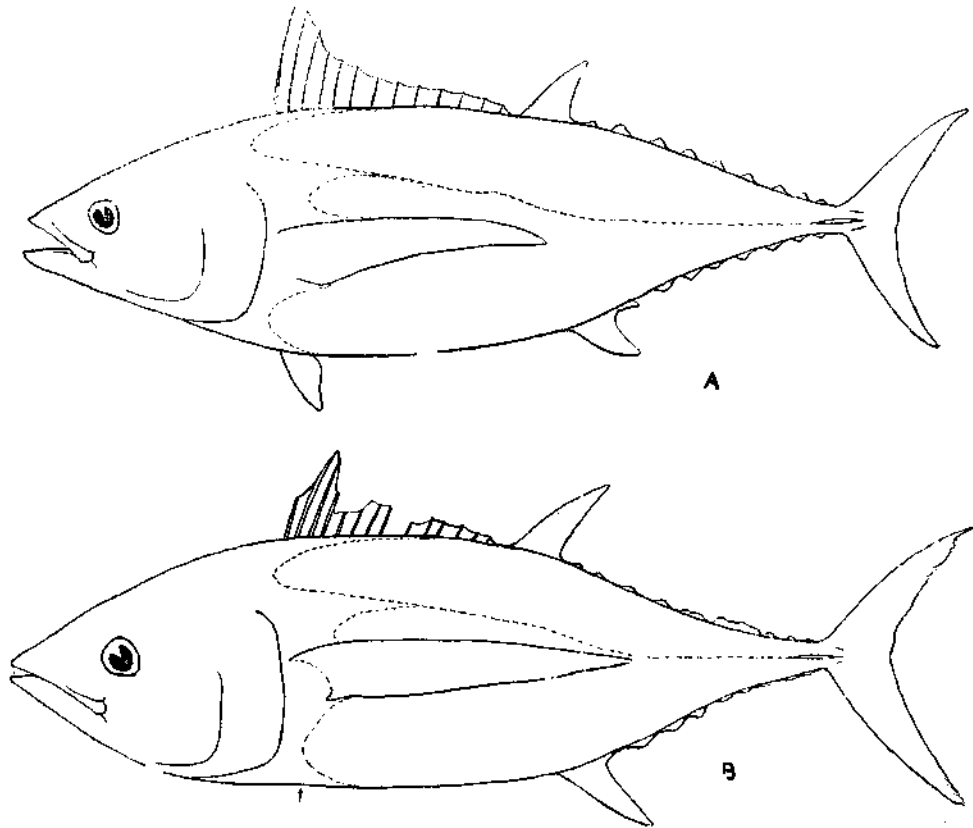


FIG. 10. Fig. A. *Parathunnus obseus* Lowe [after Fraser-Brunner, 1950—given as *Thunnus* (*Parathunnus*) *obseus*]; Fig. B. *Parathunnus obseus mebachi* (Kishinouye) (after Gedsil and Byers, 1944—given as *Parathunnus mebachi*). The pelvic fin in the fish is not spread out, but the approximate position is indicated by the arrow).

Genus: *KISHINOELLA* Jordan and Hubbs

Kishinoella tonggol (Bleeker)

(Fig. 11)

Thynnus tonggol Bleeker, 1852. *Verh. Bat. Gen.*, 24, 89.

SYNONYMY.—Reference may be made to Serventy (1942).

POPULAR NAME.—Northern bluefin tuna.

REMARKS.—On account of the relatively long dark pectorals which generally reach to below the anterior insertion of the second dorsal, the species is often confused with the yellowfin tuna, *Neothunnus macropterus* (Temminck and Schlegel). However, in addition to the characters mentioned

in the 'Key' on p. 376, the following body colouration is very diagnostic of *K. tonggol*. The sides of the body below the level of the pectoral to the caudal keel has a series of narrow linear short lighter (whitish) streaks which are noticeable even in preserved specimens. Instead in *N. macropterus* there are a number of oblique rows of spots which often unite to form short or continuous oblique bars on the sides of the body. In some of the specimens examined, the almost vertical rows of spots alternate with whitish streaks the latter brought about as a result of the coalescence of the spots, which pattern is easily distinguishable from that seen in *K. tonggol*.

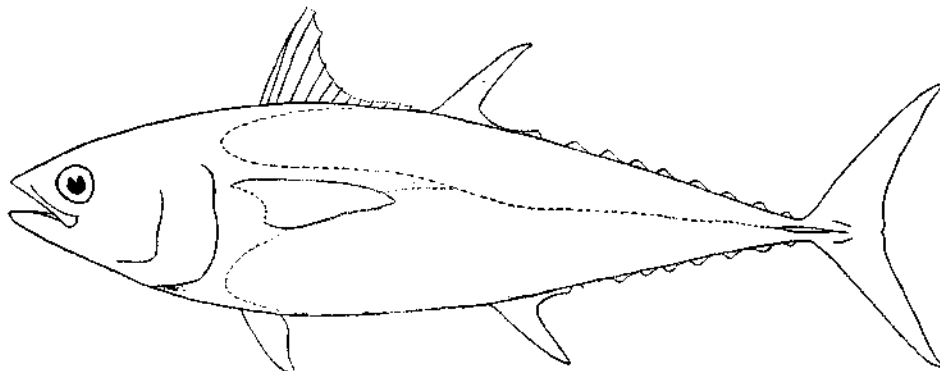


FIG. 11. *Kishinoella tonggol* (Bleeker) [after Fraser-Brunner, 1950—given as *Thunnus* (*Kishinoella*) *tonggol*].

OCCURRENCE IN INDIAN WATERS.—On the west coast from south of Bombay (Ratnagiri) to Cape Comorin; Gulf of Mannar; and the Andaman Sea. We have examined material from Mangalore, Calicut, Cochin, Vizhingam, Colachel, Tuticorin and Port Blair.

GENERAL DISTRIBUTION.—Indian Seas, East Indies, Philippine Seas, Japan and Australia. In the Eastern Pacific *K. tonggol* appears to be replaced by *K. zacalles* Jordan and Evermann.

Genus: *NEOTHUNNUS* Kishinouye

Neothunnus macropterus (Temminck and Schlegel)

(Fig. 12)

Thynnus macropterus Temminck and Schlegel, 1850. *Faun. Japonic. Pisces*, 98, Plate 51.

SYNONYMY.—Reference may be made to Herre (1953) with an exception. We have recognised *Neothunnus itosibi* Jordan and Evermann as being distinct from the typical *N. macropterus*.

POPULAR NAME.—Yellowfin tuna.

REMARKS.—The type of oblique rows of spots seen in the Yellowfin Tuna of the Indo-Pacific has not been reported in the Atlantic yellowfin tuna. It is likely that there may be additional morphometric differences between the Atlantic and Indo-Pacific forms. Considerable confusion centres around the nomenclature of the yellowfin tuna of both the Atlantic and the Indo-Pacific, so much so, an answer to the question "What is the yellowfin tuna of the Indian Seas?" is unanswerable at this stage. Deraniyagala (1952) uses the name *Thunnus (Neothunnus) argentivittatus* (Cuvier and Valenciennes) for the Indo-Pacific yellowfin tuna and mentions "Indian Ocean (Malabar)" as the type locality of *Thynnus argentivittatus* Cuvier and Valenciennes, while Rivas (1951) mentions the original description of *T. argentivittatus* to be based on material from the "Atlantic and Pacific

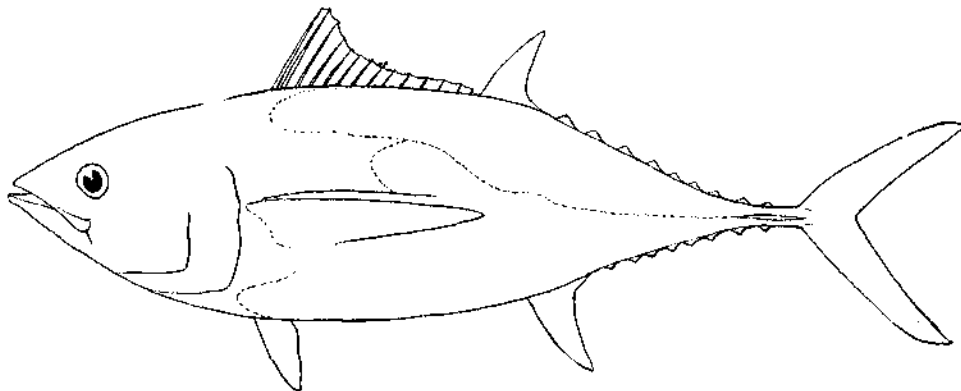


FIG. 12. *Neothunnus macropterus* (Temminck and Schlegel) (after Godsil and Byers, 1944).

Oceans". We are unable to find any reference to 'Malabar' in the original description of this species. There is no doubt that the Indo-Pacific yellowfin tuna is allied to *Thynnus albacora* Lowe (1839) originally described from Madeira in the Atlantic. Perhaps on this account, Schultz (1960) designates the northern tropical Pacific (Marshall Islands) yellowfin as *Neothunnus albacora macropterus* (Temminck and Schlegel). Until such time that a more detailed comparison of the Indo-Pacific and Atlantic yellowfin tunas can be carried out, it will be desirable to indicate the yellowfin from the Indian Seas as *Neothunnus macropterus* (Temminck and Schlegel).

OCCURRENCE IN INDIAN WATERS.—Japanese reports indicate excellent fishing grounds for this species in several parts of the Indian Ocean at certain seasons extending close to the Indian coast. We have examined specimens from the Laccadive Sea, the Gulf of Mannar and Ratnagiri.

GENERAL DISTRIBUTION.—Indo-Pacific.

Neothunnus itosibi Jordan and Evermann

(Fig. 13)

Neothunnus itosibi Jordan and Evermann, 1926. *Occ. Papers Acad. Sci.*,
12: 22, Plate 6.

REMARKS.—This is a problematic species which in a combination of characters involving the relative length of the pectoral and the lengths of the second dorsal and anal fins shows differences from specimens of *N. macropterus* we have examined. The drawing of *Thunnus macropterus* given by Delsman and Hardenberg (1934), and also figured by de Beaufort (1951) is very much like that of *N. itosibi*. There appears to be a close resemblance between *N. itosibi* and *Thunnus allisoni* Mowbray of the Atlantic, but the latter is regarded as a growth stage of the Atlantic yellowfin tuna *N. albacora* (Lowe). After having examined specimens of *N. macropterus*

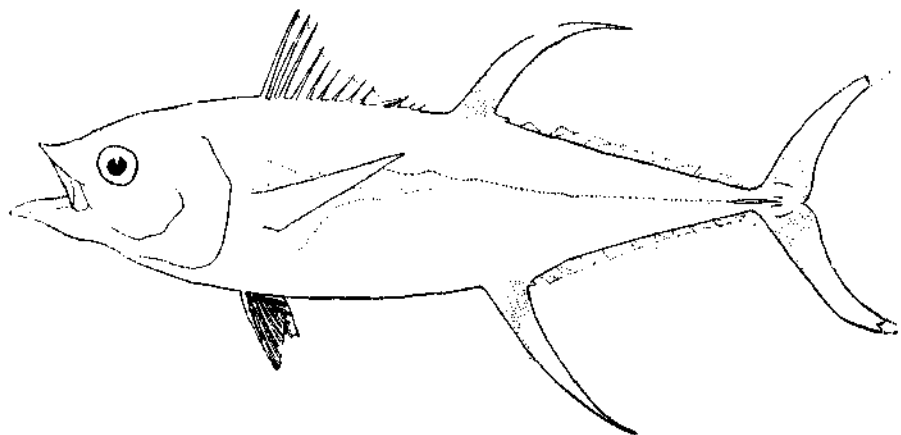


FIG. 13. *Neothunnus itosibi* Jordan and Evermann (from a mounted specimen 125 cm. long in the Madras Government Museum, Madras).

ranging from about 29 to 90 cm. and comparing them with descriptions of *N. itosibi* as well as the Madras specimen mentioned below, it is difficult to reconcile with the view that such long finned forms represent a stage of growth of the yellowfin. No doubt, eventual analysis may show that only one species of yellowfin tuna exists in all the oceans, but with our inadequate knowledge on the subject, it is premature to consider *N. macropterus* and *N. itosibi* as identical. The fact that these two types may be taken together is not conclusive that they are identical, for we have noticed two closely related species of *Auxis* (*A. thazard* and *A. thynnoides*) occurring in the same

school to mention but one instance. So until more information is forthcoming it will be desirable to retain *N. itosibi* as distinct from *N. macropterus*. From Indian waters, we refer to this species one specimen 125 cm. long (Fig. 13) from Madras, mounted in the Madras Government Museum and labelled as *Thynnus macropterus*.

GENERAL DISTRIBUTION.—Indo-Pacific.

Genus: *KATSUWONUS* Kishinouye

Katsuwonus pelamis (Linnaeus)

(Fig. 14)

Scomber pelamis Linnaeus, 1758. *Syst. Nat.*, ed., 10: 297.

SYNONYM.—Reference may be made to de Beaufort (1951) under *Euthynnus pelamis* (Linnaeus).

POPULAR NAME.—Oceanic skipjack.

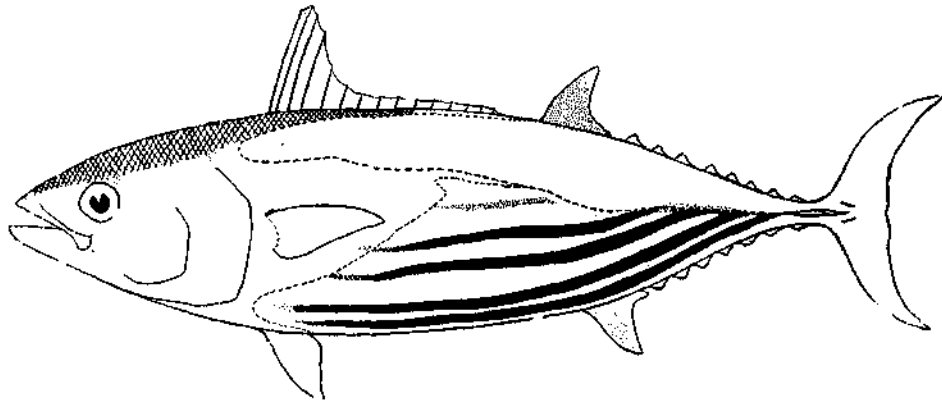


FIG. 14. *Katsuwonus pelamis* (Linnaeus) [after Fraser-Brunner, 1950—given as *Euthynnus (Katsuwonus) pelamis*].

OCCURRENCE IN INDIAN WATERS.—Very well known species forming an important fishery at the Minicoy Island in the Laccadive Archipelago (Jones, 1959, and Jones and Kumaran, 1959) and schools may stray into coastal waters as evidenced from occasional catches at Vizhingam, Ratnagiri and other centres on the west coast and at Tuticorin in the Gulf of Mannar. We have examined several specimens from the Laccadive Sea.

GENERAL DISTRIBUTION.—Indo-Pacific and Atlantic.

Genus: *EUTHYNNUS* Lütken
Euthynnus affinis affinis (Cantor)

(Fig. 15)

Thynnus affinis Cantor, 1850. *Journ. Asiat. Soc. Bengal*, 18: 1088.

SYNONYMY.—Reference may be made to de Beaufort (1951) [who designates this as *E. alletteratus affinis* (Cantor)] with one exception. We consider *Euthynnus yaito* Kishinouye as a possible subspecies of *E. affinis* (Cantor).

POPULAR NAME.—Little tunny.

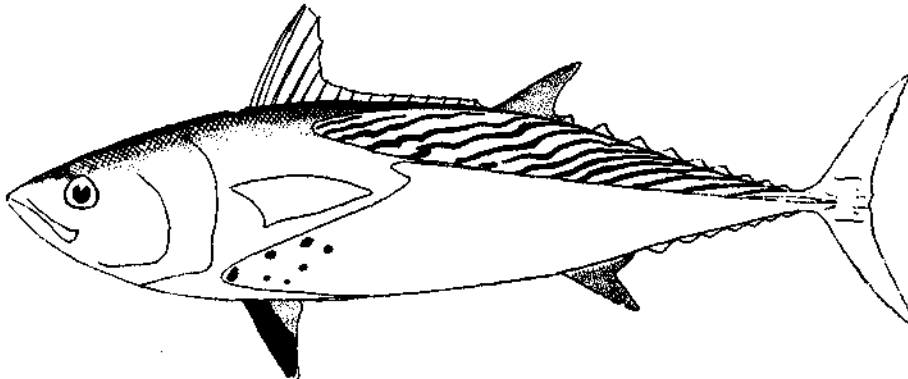


FIG. 15. *Euthynnus affinis affinis* (Cantor) [after Fraser-Brunner, 1950—given as *Euthynnus (Euthynnus) affinis affinis*].

REMARKS.—As Fraser-Brunner (1950) has indicated, the differences between *E. affinis* and *E. alletteratus* Rafinesque, the latter from the Atlantic, are of sufficient magnitude to consider them as being specifically distinct. The Eastern Pacific form *E. lineatus* Kishinouye as indicated by Godsil (1954) appears to be a distinct species.

OCCURRENCE IN INDIAN WATERS.—*E. a. affinis* occurs at several places along the west and east coasts of India and forms a fishery of some magnitude at several centres. We have examined specimens from Vizhingam, Laccadive Sea, Gulf of Mannar, and Andaman Sea. Through the kindness of Mr. Soong Ming Kong, Director of Fisheries, Malaya, we have been able to examine typical specimens of *E. a. affinis* from Malayan waters. Mr. John C. Marr, Chief, Pacific Oceanic Fisheries Investigations, Hawaii, has sent us a specimen of *E. affinis yaito* for comparison.

GENERAL DISTRIBUTION.—Indian Ocean and probably also parts of Western Pacific.

GENERAL REMARKS

This study has been mainly aimed at recording the tuna and tuna-like fishes which occur in the Indian Seas, and also in facilitating their identification as the available information about them is comparatively meagre. Being primarily oceanic fishes, with the existing gears such as shore-seine, gill net, and hook and line, only small percentages of shoals which stray into the shallow coastal waters are liable to be captured except *Euthynnus*, *Kishinoella* and *Auxis*. Secondly for fresh consumption they are not as much favoured for instance as the seer fish [*Scombermorus (Cybium) commerson*]. The absence of a comprehensive work on the species occurring in Indian seas has been another handicap, which deficiency it is hoped this review will help in partly rectifying.

The question of nomenclature has been a difficult one to arrive at any unanimity in the case of certain species of the tunas especially as no detailed comparison of the almost similar forms occurring in the Indo-Pacific and the Atlantic Oceans has been so far carried out. We are unable to say whether even within the distributional limits of the species in the Indo-Pacific, geographical races or subspecies can be differentiated with the possible exception of *Euthynnus affinis*. Although Fraser-Brunner's revision of the Scombridae (1950) settles some of the broader questions, such as the desirability of grouping all scombroid fishes under one family, etc., ichthyologists may not fully agree with the treatment given at the species level. The large size and the consequent difficulties of preservation and hence the non-availability of good series of specimens in Museum collections have been very great handicaps to systematists who have worked on these fishes so much so, reliance had to be placed on earlier, often inadequate and ambiguous descriptions or poorly preserved specimens. Although creditable work has been done in advancing our knowledge, yet due to the aforesaid reasons errors have crept in even in standard works which are widely consulted. For instance, we find that *Thunnus sibi* de Beaufort (*nec* Temminck and Schlegel) refers in part also to *Parathunnus obseus mebachi* (Kishinouye), and to *Kishinoella zacalles* Jordan and Evermann. The fishery biologist who will have an opportunity to examine fresh specimens of small as well as large tunas in the field should be able to help considerably in elucidating several of the unanswered questions.

The yellowfin tunas which may be conveniently grouped as *Neothunnus albacora*-complex is yet another composite group which calls for intensive study. Some of the differences, such as the relative length of the fins which

were treated as characters of importance in specific discrimination have been attributed by some workers to be different growth stages of one and the same species. But in all cases, comparison with good series of specimens are lacking and deductions based on stray specimens may not be conclusive. This leads us to the questions as to: what in fact is the yellowfin tuna of the Indian Seas? Are *Neothunnus macropterus* and *N. itosibi* only nominal species? or whether these two species are only growth stages of one circumtropical species *N. albacora*? or whether they are geographical races of *N. albacora*? or whether they represent two almost identical species of the category which taxonomists call as sibling species? The fact that long-finned and short-finned forms may be taken from the same school need not necessarily follow that they belong to one and the same species, as the occurrence of mixed schools of tunas are not uncommon. We have noticed both species of *Auxis*, *A. thazard* and *A. thynnoides* occurring in the same school and Matsumoto (1960) mentions of similar occurrence.

Multitudinal are the problems that require solving as regards tuna systematics are concerned. We have felt it unnecessary to add to the burden by citing local names used for some of these fishes along various parts of the Indian coast in this review for the following reasons. More than one species is sometimes denoted by the same name or the same species is given different names at different places even in the same linguistic area. Another fact is that only within the last few years with the advent of mechanised boats it has been possible to take some of these fishes from the offshore waters and local names do not exist for some of the species. Considering the need for the standardisation of the popular names of these fishes, we have chosen the most widely current terms in usage in English and where such a name is not already available no attempt has been made to coin any new name.

Another aspect worth mentioning is our complete lack of data regarding the maximum sizes attained by the various species of tunas in Indian Seas. While the frigate mackerels and the oceanic skipjack and the little tunny do not attain large sizes, at the other extreme are the yellowfin tuna, the big-eyed tuna, etc., which grow to considerable size but for which there is practically no data (as to the species, size, weight, sex, etc.) from this area.

Tunas constitute the most potentially important group of oceanic fishes in our waters and the success of our oceanic fisheries programme depends almost entirely to the development of this latent resource. It is hoped that this review will help in as well as stimulate interest towards the proper documentation of data regarding these fishes.

REFERENCES

- Anon. 1953 .. A note on the tuna fishery of India. *Indo-Pacific Fisher. Council, 4th Meeting, Sec. 2*, 257.
- Beaufort, L. F. do. 1951 .. *The Fishes of the Indo-Australian Archipelago*, 9, 216-27.
- Boeseman, M. 1947 .. Revision of the fishes collected by Burger and Von Siebold in Japan. *Zool. Mededeel.*, 28, 1-242, Plates 1-5.
- Day, F. 1878 .. *Fishes of India*, 251-54, Plate 54, Fig. 6; and Plate 56, Fig. 1.
- Deodhar, S. B. 1953 .. Some observations on the tuna fisheries off the Bombay Coast. *Proc. Indo-Pacific Fisher. Council, 4th Meeting, Sec. 2*, 256.
- Deraniyagala, P. E. P. 1952 .. *A Coloured Atlas of Some Vertebrates from Ceylon*, 1. *Fishes*, 102-04, Plates 24 and 25.
- Fraser-Brunner, A. 1950 .. The fishes of the family Scombridae. *Ann. Mag. Nat. Hist. Ser. 12* (3), 121-63, Figs. 1, 2, 4-20.
- Godsil, H. C. 1954 .. A descriptive study of certain tuna-like fishes. *Calif. Fish. and Game, Fish. Bull.*, 97, 1-184.
- and Byers, R. D. 1944 A systematic study of the Pacific Tunas. *Ibid.*, 60, 1-131, with 75 figures.
- Jones, S. 1958 a .. Notes on the frigate mackerels, *Auxis thazard* (Lacépède) and *A. tapinosoma* Bleeker, from Indian waters. *Indian J. Fish.*, 5, 189-94, Figs. 1-2.
- , 1958 b .. The tuna live-bait fishery of Minicoy Island. *Ibid.*, 5, 300-07, Figs.
- , 1959 .. Notes on eggs, larvæ and juveniles of fishes from Indian waters. III. *Katsuwonus pelamis* (Linnaeus) and VI. *Neothunnus macropterus* (Temminck and Schlegel). *Ibid.* 6 (2), 360-73.
- , 1960 a .. Notes on eggs, larvæ and juveniles of fishes from Indian Seas. V. *Euthynnus affinis* (Cantor). *Ibid.*, 7 (1), 101-06.
- , 1960 b .. Notes on eggs, larvæ and juveniles of fishes from Indian waters. VI. Genus *Auxis* Cuvier. VII. *Sarda orientalis* (Temminck and Schlegel). *Ibid.*, 7 (2), 337-347.
- and Kumaran, M. 1959 The fishing industry of Minicoy Island with special reference to the tuna fishery. *Ibid.*, 6 (1), 30-57.
- , Silas, E. G. and Dawson, E. 1961 New records of Scombroid fishes from the Andaman-Nicobar waters. *J. Mar. Biol. Assc. India*, 2 (1), 136-37.
- Kishinouye, K. 1923 .. Contributions to the comparative study of the so-called Scombroid fishes. *J. Coll. Agric. Imp. Univ. Tokyo*, 8 (3), 293-475.
- Marr, J. C. and Schaefer, M. B. 1948 Definitions of body dimensions used in describing tunas. *U.S. Fish. Wildlife Service Fisher. Bull.*, 47, 241-44.
- Munro, I. S. R. 1955 .. *The Marine and Freshwater Fishes of Ceylon*. Canberra, 218-20, Figs. 218-20 on Plate 43.
- , 1957 .. Occurrence of the big-eyed tuna *Parathunnus mebach* (Kishinouye) in Queensland. *Dept. Harbours and Marine, Queensland, Ichthyol. Notes*, 3, 145-48, Fig. 1.

Indian Tunas—A Preliminary Review, with a Key for their Identification 393

- Mutsumoto, W. M. 1959 .. Description of *Euthynnus* and *Auxis* larvæ from the Pacific and Atlantic Oceans and Adjacent Seas. *Dana Rept.*, **50**, 1-34.
- Nakagome, J. 1959 a .. Annual and monthly variations of fishing condition and distribution of yellowfin tuna in the Bengal Bay. *Bull. Japanese Soc. Sci. Fish.*, **25** (3), 186-88.
- , 1959 b .. Annual and periodic variations of fishing condition and distribution of big-eyed tuna in the Bengal Bay. *Ibid.*, **25** (3), 189-92.
- Ogilby, J. D. and Marshall, T. C. 1954 *The Commercial Fishes and Fisheries of Queensland*. Revised Edition, p. 89, Figs. 104-09.
- Rosa, H. 1950 .. Scientific and common names applied to tunas, mackerels and spear fishes of the world with notes on their geographic distribution. A progress report on the compilation of scientific and common names of important food fishes. *F.A.O. of the United Nations* 1-235, (Washington D.C., U.S.A., December 1950).
- Schultz, L. P. 1960 .. Scombridae, in *Fishes of the Marshall and Marianas Islands*, **2**, *Bull. U. S. Nat. Mus.*, **202**: 410-417, pl. 122 & 123.
- Serventy, D. L. 1941 .. The Australian tunas. *Counc. Sci. Industr. Res. Aust.*. Pamphlet No. 104, 1-48, Plates 2-4 and Text-Figs. 4, 5 and 7.
- , 1942 .. The tuna *Kishinoella tonggol* Bleeker in Australia. *J. Counc. Sci. Industr. Res. Aust.*, **15** (2), 101-12, Fig. 1, Plates 3-5.
- Smith, J. L. B. 1948 .. *The Sea Fishes of South Africa*. Central News Agency, S. Africa, 297-99.