

ON FISHES OF THE SUBFAMILY
SCOMBEROMORINÆ (FAMILY SCOMBRIDÆ)
FROM INDIAN WATERS

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INTRODUCTION

WHILE hardly a dozen species of spanish mackerels or seerfishes are recognisable at present from the warmer waters of the Indo-Pacific and the Atlantic, only recently has the nomenclature used to denote these, attained any degree of stability. Though some workers may be still inclined to treat *Scomberomorus* Lacépède, and *Acanthocybium* Gill, under two separate families or subfamilies, for reasons given elsewhere (Jones and Silas, 1960, 376), it is felt that for all practical purposes it will be desirable to treat these as two distinct genera under the subfamily Scomberomorinæ of the family Scombridæ.

In the course of the present study we have encountered only three species of spanish mackerels from the Indian coast. Although this number may be considered to be too few, we have often found field-workers unable to correctly identify them when confronted with them in the fresh state in the fish-landing centres. Since the spanish mackerels constitute an important coastal pelagic fishery along most parts of the Indian coast, and as often two or all three species are landed with the same type of gear or different types of gear at the same place, it is imperative that stress be also laid on accuracy in species determination. It is hoped that this brief review will help fishery workers in their study on this group of fishes.*

The methodology used for body proportions, and collection of other data, does not deviate from that given for 'Indian Tunas' (Jones and Silas, 1960, p. 372).

* In spite of the spanish mackerels forming important fishery along many parts of our coast, the only information available on the biology of these species by Indian workers is limited to the contributions of Krishnamoorthi (1957, *Indian J. Fish.*, 4, 229-53; 1958, *Ibid.*, 5, 270-81), and Jones (1961, *Indian J. Fish.*, 8, 107-20). Vijayaraghavan (1955, *Indian J. Fish.*, 2, 360-72), and Kuthalingam [1959, *J. Madras Univ.*, 29 (2), 139-50] have described the early stages and food and feeding habits of *S. guttatus* and *S. lineolatus* respectively but according to Jones (1961, *loc. cit.*) these do not appear to relate to any species of *Scomberomorus* Lacépède.

RÉSUMÉ

A brief résumé of recent work on scomberomorinae taxonomy is necessary for a proper understanding of the nomenclature used in this study. Day (1878) used the generic name *Cybium* Cuvier to denote five species from Indian seas which are at present referable to *Scomberomorus* Lacépède, the latter name as clearly shown by Munro (1943) having priority over the former. Besides, *Cybium* as used by Day was a composite genus which included as synonyms *Acanthocybium* Gill (a distinct genus of Scomberomorinæ), and *Lepidocybium* Gill (a genus of the family Gempylidæ). The five species of *Cybium* which Day recognised from Indian seas are referable to only three species, *S. guttatus*, *S. lineolatus* and *S. commerson* as shown below:—

Species as given by Day (1878)	Up-to-date nomenclature
1. <i>Cybium kuhlii</i> Cuvier and Valenciennes	= <i>Scomberomorus guttatus</i> (Bloch and Schneider)
2. <i>Cybium interruptum</i> Cuvier and Valenciennes	= <i>Scomberomorus lineolatus</i> (Cuvier)
3. <i>Cybium guttatum</i> (Bloch and Schneider)	= <i>Scomberomorus guttatus</i> (Bloch and Schneider)
4. <i>Cybium commersonii</i> (Lacépède)	= <i>Scomberomorus commerson</i> (Lacépède)
5. <i>Cybium lineolatum</i> Cuvier and Valenciennes	= <i>Scomberomorus lineolatus</i> (Cuvier)

Kishinouye (1923) used the generic name *Cybium* Cuvier and also included in his comparative study of scombroid fishes, *C. commerson*, and *C. guttatum*. Munro's (1943) critical work on the Australian species of *Scomberomorus* has contributed greatly towards our proper understanding of the nomenclatorial status of some of the Indo-Pacific species. His subdivision of the genus into nine subgenera, *Scomberomorus* Jordan and Hubbs; *Cybium* Jordan and Hubbs; *Sawara* Jordan and Hubbs; *Pseudosawara* Munro; *Indocybium* Munro; *Sierra* Fowler; *Chriometra* Lockington; *Cybiosarda* Whitley; and *Lepidocybium* Gill, may not find universal approval. As he pointed out at the time, and subsequently has clearly shown (Munro, 1949), *Lepidocybium* is a gempylid. We have elsewhere placed *Cybiosarda* under the subfamily *Thunninae* (Jones and Silas, 1960). De Beaufort (1951) has already shown that as the type of *Pseudosawara*, namely, *Cybium kuhlii*

is a synonym of *Scomber guttatus* [= *Scomberomorus (Indocybium) guttatus*] *Pseudosawara* becomes a synonym of *Indocybium* Munro. The species pertaining to the five remaining subgenera as proposed by Munro (1943) have been placed under two subgenera, *Scomberomorus* s. str., and *Cybium*, by Fraser-Brunner (1950), the primary distinction being that in the species of the typical subgenus the air-bladder is absent, while it is present in the two species of *Cybium*. Munro (1943) has shown that the presence or absence of air-bladder in the genus *Scomberomorus* cannot be considered to be of much taxonomic significance as it may or may not be present in the same species in different locations along its range of distribution (e.g., *S. commerson*). Besides, we are not quite in full agreement with Fraser-Brunner's treatment of the species from the Indo-Pacific, as will be seen from the arrangement of the species in this account.* Recently Munro (1955) has used *Cybium* and *Indocybium* as distinct genera, which we had also followed elsewhere (Jones and Silas, 1960, p. 377). Reconsidering the matter we feel that while infrageneric categories of *Scomberomorus* may be admissible, the excessive splitting of the subfamily into genera is not desirable, for, a careful scrutiny of the works of Fraser-Brunner (1950), and the regional works on scomberomorphid fishes by Munro (1943), Smith (1949), de Beaufort (1951), Deraniyagala (1953), and Williams (1960) show that the differences between the Atlantic and the Indo-Pacific seerfishes or spanish mackerels are not so great as one would be led to consider at first. Almost every species in the Atlantic has its close counterpart in the Indo-Pacific and as in the Tunas, there is an urgent need for a critical study of the species of spanish mackerels on a global basis. Until such time we feel that the use of the generic name *Scomberomorus* to include the three Indian species of spanish mackerel will serve the purpose.

Based on osteological and morphological characters Kishinouye (1923), and Conrad (1938) have drawn attention to the specialised features of *Acanthocybium*, but at the same time shown its closer affinities to *Scomberomorus* (or *Cybium*) than to any other group of scombroid fishes.

KEY TO THE IDENTIFICATION OF THE GENERA AND SPECIES OF INDIAN
SCOMBEROMORINAE

- 1 a. First dorsal with XIV to XVII spines; gill rakers present; gill lamellae not reticulated; lateral line slightly undulate or with a deep inflection behind second dorsal (*Scomberomorus* Lacépède) 2

* Subsequently in a personal communication Mr. Fraser-Brunner has clarified some of the points concerning his aforesaid work such as: substitution of the word 'two' instead of 'all' in line 9 from bottom on p. 136; "*Cybium lineolatum*" to be separated from the synonymy of *S. (S) guttatus* (p. 160) since it is a distinct species.

- 1 *b.* First dorsal with XXIII to XXVII spines; gill rakers absent; gill lamellæ reticulated; lateral line with a deep inflection beneath X to XV first dorsal spines (*Acanthocybium* Gill).
.....*Acanthocybium solandri* (Cuvier)
- 2 *a.* Gill rakers 2 to 6 (generally 3 or 4) on lower limb of outer arch; a deep inflection in the lateral line below posterior end of D₂ to second dorsal finlet behind it; sides of body of juveniles with large black blotches merging to form distinct dark vertical irregular stripes in adult..... *Scomberomorus commerson* (Lacépède)
- 2 *b.* Gill rakers 7 to 11 on lower limb of outer arch; lateral line running as an even curve above gill opening and pectoral to below second dorsal behind which it may slightly undulate; sides of body with small rounded black spots or with horizontally elongate black streaks3
- 3 *a.* Sides of body with roundish black spots more prominent beneath and just behind pectorals; caudal keel narrow. Distance from D₂ to caudal fork distinctly longer than second predorsal length.
.....*Scomberomorus guttatus* (Bloch and Schneider)
- 3 *b.* Sides of body with irregular rows of horizontal black streaks or broken bars; caudal keel conspicuously broad. Distance from D₂ to caudal fork usually shorter than or rarely equal to the second predorsal length.....*Scomberomorus lineolatus* (Cuvier)

Acanthocybium solandri (Cuvier)

(Figs. 1; 5 *a*; 6 *a*; and 7 *a*)

Cybium solandri Cuvier, 1831. *Hist. Nat. Poiss.*, 8, 192-93 (Type locality: unknown).

SYNONYMY.—Reference may be made to de Beaufort (1951), Deraniyagala (1952) and Rao (1960).

POPULAR NAME.—Wahoo.

REMARKS.—Good descriptions of *A. solandri* from this region already exist in the references cited under 'Synonymy'. These indicate the meristic count in this species to be:

D₁. XXIII-XXVII; D₂. III, 9-10 + 8-10; A. III, 9-10 + 7-9; P₁. ii, 21; P₂. i, 5. Vertebrae 23-33 + 31-34 = 54-66. For four specimens from Vizhingam, Rao (*op. cit.*) found the counts to be 62 (2); 63 (1) and 64 (1).

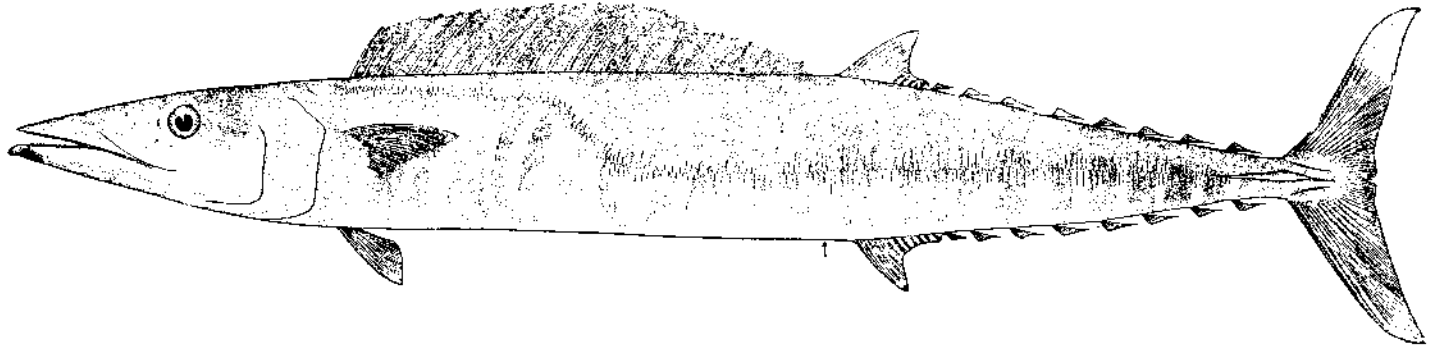


FIG. 1. *Acanthocybium solandri* (Cuvier). Specimen 812 mm. from Andamans.

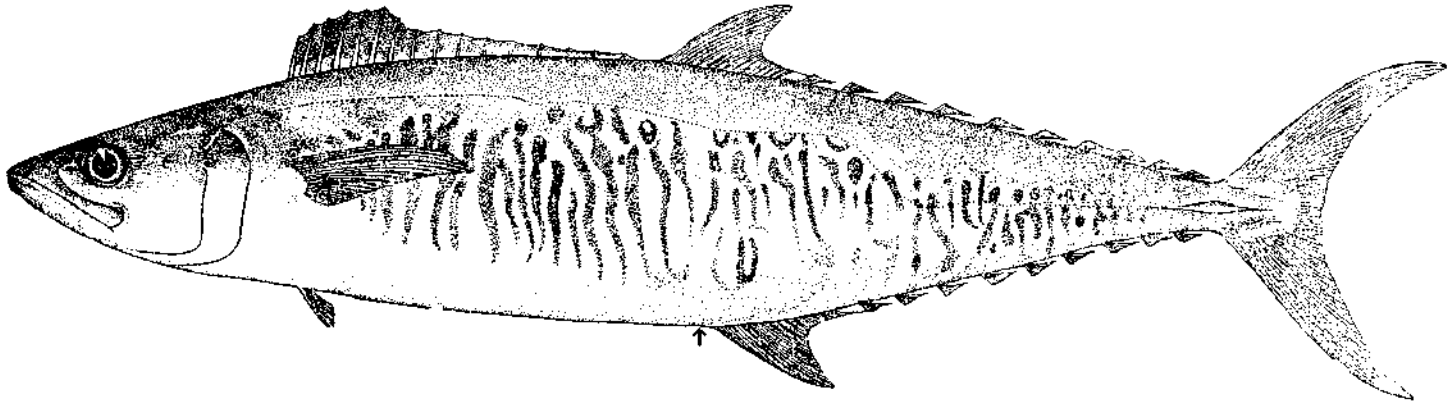


FIG. 2. *Scomberomorus commerson* (Lacépède). Specimen 810 mm. from Andamans.

Herre (1953) resurrected the name *A. forbeei* Seale (1912) from the synonymy of *A. solandri*, but we do not see any grounds for specific separation. *Cybium sara* Lay and Bennet (1839) is yet another synonymy of *A. solandri*.

The wahoo, known the world over as one of the best marine game fishes, attains a length of well over two metres and a weight of 45 kg. or more.

OCCURRENCE IN INDIAN WATERS.—On the west coast from Vizhingam, Colachel and Cape Comorin; on the east coast from Tuticorin, Gulf of Mannar; Minicoy Island in the Laccadive Archipelago; and Port Blair, Andamans.

GENERAL DISTRIBUTION.—Warmer waters of the Atlantic, Pacific and Indian Oceans and the Mediterranean.

Scomberomorus commerson (Lacépède)

(Figs. 2; 5 b; 6 b; and 7 b)

Scomber commerson Lacépède, 1800. *Hist. Nat. Poiss.*, 2, 598–603, pl. 20, Fig. 1 (based on MS Drawing by Commerson. Type locality: Mauritius as given by Cuvier).

SYNONYMY.—*Scomber maculosus* Shaw (1807) (Based on 'Konam' of Russell, 1803, p. 27, pl. CXXXV). *Cybium konam* Bleeker (1851) and *Scomberomorus konam* Bleeker (1851). *Cybium multifasciatum* Kishinouye (1915).

The specific name *commerson* has been used as *commersoni* and *commersonii* by earlier workers. For detailed synonymy reference may be made to Munro (1943), and de Beaufort (1951).

POPULAR NAMES.—Seerfish or Barred spanish mackerel.

REMARKS.—Growth stage of *S. commerson* shows considerable difference in body colouration, but the patterns are more or less constant in the different stages. The meristic characters for this species generally falls within the range given by Munro (1943), namely D_1 . XIV–XVII; D_2 . 16–19 + 8–10; A. 14–18 + 8–10; Gill rakers 0–2 + 3–6; Vertebrae 20 + 25 = 45.

In addition we have encountered specimens showing gill-raker counts of: 2 + 2; 2 + 5; 2 + 6; and 1 + 5, but for the Indian specimens 2 + 3 or 4 is the most frequent combination seen.

As in *Acanthocybium solandri*, large examples of *S. commerson* show short lateral branchings of the lateral line, a feature already commented on by Munro (1943) and Deraniyagala (1952).

OCCURRENCE IN INDIAN WATERS.—From all along the Indian coast and Andamans. In the Laccadive Archipelago, Minicoy Islanders use the name 'Digumas' (other than *Acanthocybium* which is also known by this name) to denote a species of *Scomberomorus* which in all probability refers to *S. commerson*, but this needs confirmation.

GENERAL DISTRIBUTION.—*S. commerson* is the most widely distributed species of the genus. It is known from the Red Sea, East Coast of Africa as far south as Cape of Good Hope, and eastwards through Mauritius, and the coasts of India, Ceylon, Burma, Malaya to the Australian coast, Philippines, Formosa and Japan.

Scomberomorus guttatus (Bloch and Schneider)

(Figs. 3; 5 d; 6 c, d; and 7 c, d)

Scomber guttatus Bloch and Schneider, 1801. *Syst. Ichthyol.*, 23 (Type locality: Tranquebar, India).

SYNONYMY.—*Scomber leopardus* Shaw (1803), *Cybium kuhli* Cuvier and Valenciennes (1831). For detailed synonymy reference may be made to de Beaufort (1951). In addition, *Scomber leopardus* Shaw (1803) based on Russell's drawing and characterisation of a fish he called by the local name *Wingeram* (first species under his division *Scomber*) is a definite synonym of *S. guttatus*. However, Smith (1949) and Fourmanoir (1957) have used the name *Scomberomorus leopardus* erroneously for the species *S. lineolatus* as has been also drawn attention to by Williams (1960). Besides *S. leopardus* (Shaw), Fraser-Brunner (1950) included with a query under *S. guttatus* both *Cybium lineolatum* and *interruptum* as synonyms, but *S. lineolatus* (Cuvier) of which *C. interruptum* is a synonym (see Williams, 1960) is a distinct species.

POPULAR NAME.—Spotted spanish mackerel.

REMARKS.—The original diagnosis of *Cybium kuhli* Cuvier is very brief, but de Beaufort (1951) has given reasons for considering it a synonym of *S. guttatus*. Further de Beaufort mentions that "Day's species, however, cannot be *kuhli* C.V. (= *guttatum* C.V.) if at least the number of pectoral rays, which Day gives as 29, is a misprint". No species of *Scomberomorus* has such a high pectoral finray count which for the genus varies from 15 to 23. Day's drawing of *C. kuhli* (pl. lvi, fig. 2) shows 16 rays and hence there can be no doubt that the number 29 is a misprint. The colour of *C. kuhli* is given by Day as "...bluish above becoming silvery on the side and below. After death the sides assume a dark hue and have

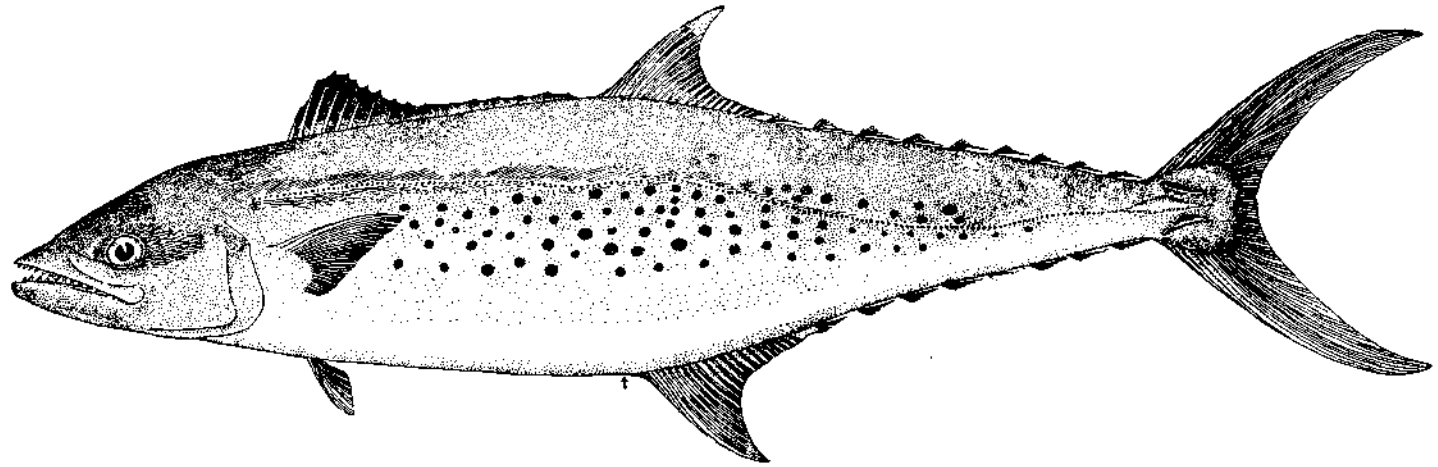


FIG. 3. *Scomberomorus guttatus* (Bloch and Schneider). Specimen 533 mm. from Tuticorin, Gulf of Mannar.

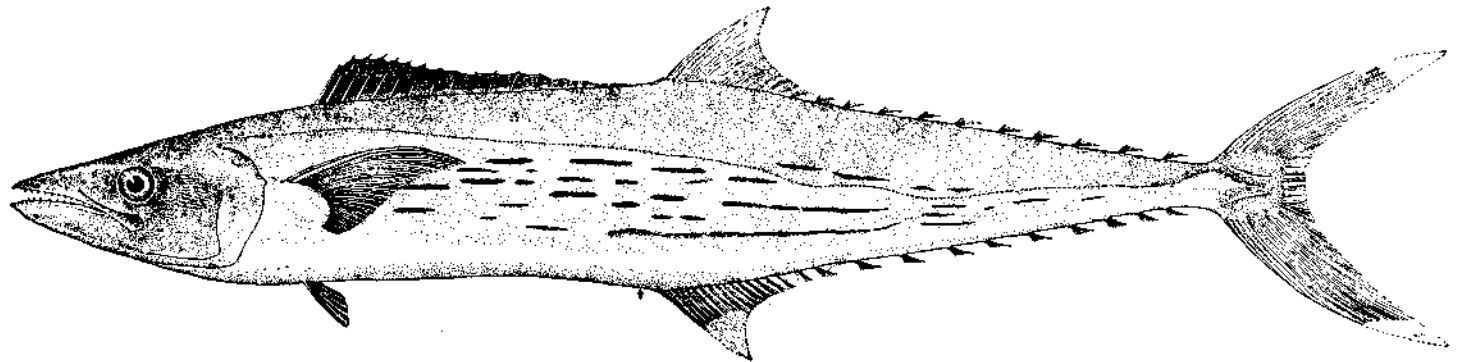


FIG. 4. *Scomberomorus lineolatus* (Cuvier). Specimen 680 mm. from Tuticorin, Gulf of Mannar.

neither bands nor spots: first dorsal black; second dorsal and also anal with dark bases; pectoral with a light outer edge, tips of caudal dark". We have on rare occasions seen freshly caught specimens of *S. guttatus* in which the sides of the body lack the usual spots, being silvery tinged with grey on the upper half of the body, but not differing in the least in other diagnostic characters. This may be one extreme in adult body colouration in this species, while at the other extreme is the condition wherein the sides of the body is studded with innumerable small roundish black spots, about eight irregular rows discernible just behind the pectoral while normally only three or four rows of such spots are seen along the sides of the body.

Of the three species of *Scomberomorus* occurring along our coast, the lateral line is least undulating in its posterior length in *S. guttatus*. In the specimens examined the meristic counts vary as follows:—

D₁. XVI–XVII; D₂. 20–21 + 7–9; P₁. 21–23; A. 19–20 + 7–9; Gill rakers 1–3 + 7–10. The most frequent counts are D₁. XVI; D₂. finlets 8; P₁. 21; A. finlets 8; Gill rakers 2 + 8–9.

Munro (1943) gives the vertebral count of this species as 20 + 26 = 46, and Delsman (1931) as 45–46 (*S. guttatus* 20 + 26 = 46; *S. kuhlii* 20 + 25 = 45). The specimens we have examined from the Tuticorin and Vizhingam coasts show a total number of 48 or 49 vertebræ. Kishinouye (1923) mentions 51 as the count for *Cybius guttatus* from Formosan waters. Thus it would appear that of the three Indian species of *Scomberomorus*, the range of variation of vertebral counts is greatest in *S. guttatus*. The significance of this is not apparent as the stray observations hitherto made do not lead to any conclusions except draw attention to the likelihood of there being geographical races or distinct populations in different geographical locations along the range of distribution of this species.

Several records of *S. guttatus* from Australian waters are referable either to *S. semifasciatus* (Macleay) or *S. queenslandicus* Munro. The absence of records of this species from the British East African coast is interesting.

OCCURRENCE IN INDIAN WATERS.—All along the Indian coast and the Andaman Islands.

GENERAL DISTRIBUTION.—Iranian Gulf, Madagascar and South East Africa, Coast of India, Ceylon, Burma, Malaya, Indonesia, Philippines, China and Formosa.

Scomberomorus lineolatus (Cuvier)

(Figs. 4; 5 c; 6 d; and 7 e)

Cybius lineolatum Cuvier, 1831. *Hist. Nat. Poiss.*, 8, 170 (Type locality: Malabar).

SYNONYMY.—Reference may be made to de Beaufort (1951) and Williams (1960).

POPULAR NAME.—Streaked spanish mackerel.

REMARKS.—A very distinct species of which a critical taxonomic study has been recently carried out by Williams (1960). His study confirms the conspecificity of *S. lineolatus* and *S. interruptum* (Cuvier), as was considered by Smith (1949) and de Beaufort (1951). As mentioned earlier, the nominal species *S. leopardus* Shaw, confounded with *S. lineolatus* by some workers, is a synonym of *S. guttatus*.

For specimens we have examined from the Indian coast the meristic counts vary as follows:—

D₁. XVI-XVII; D₂. 19-20 + 8-9; A. 18-20 + 8-11; Gill rakers 2-3 + 8-11.

Delsman (1931) and Munro (1943) give the vertebral count of *S. lineolatus* as 21 + 29 = 50. In two specimens we have examined from Tuticorin the total count is 49.

Besides the characteristic colouration of blackish narrow streaks or broken bars on the sides of the body, two other conspicuous features seen in juveniles as well as adults are: the markedly rounded ridge running from the side of the pointed snout to the end of the operculum in line with the base of the pectoral fin (Fig. 5 c), and the conspicuous laterally expanded caudal keels (Fig. 7 e).

OCCURRENCE IN INDIAN WATERS.—All along the Indian coast, but generally rarer than the two preceding species.

GENERAL DISTRIBUTION.—British East African waters; Natal coast of South Africa; ? Mozambique Channel and Madagascar; Ceylon, India to the East Indies (Williams, 1960).

SOME COMPARISONS

Text-figures 5-7 are given here mainly to focus attention on additional differences between the species dealt with here. From Fig. 5 it will be seen that the snout in *A. solandri* is conspicuously long and pointed, which condition to a lesser degree is seen in *S. commerson*, and *S. lineolatus*, while in *S. guttatus* the snout is markedly short. Besides in the last-said species, the dorsal profile of the head shows a distinct upward curve slightly ahead of the anterior nostril. The teeth on the jaws are more numerous in *A. solandri*, being 40-55 on each side of the upper and lower jaws while about

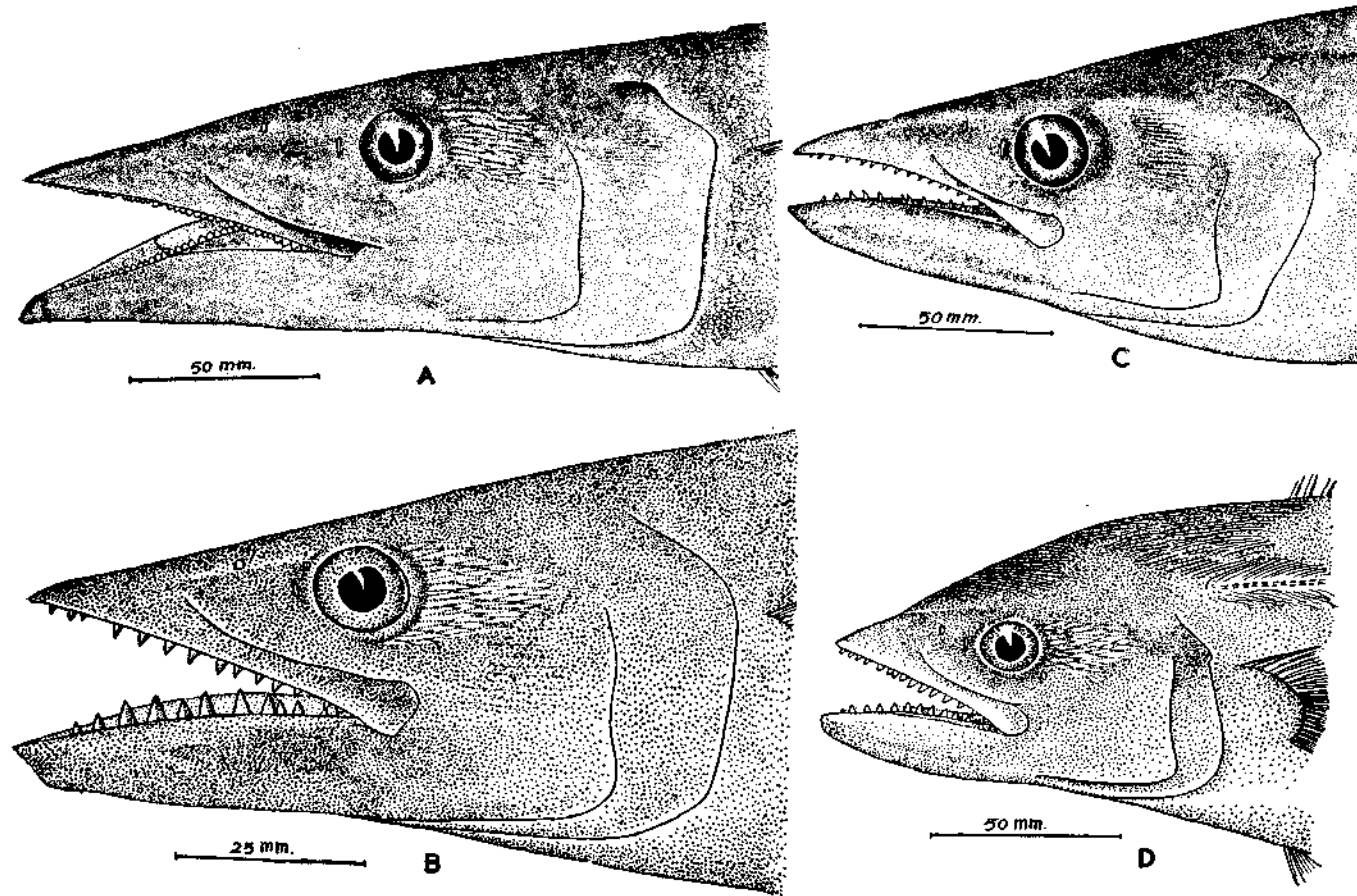


FIG. 5. Lateral view of the head of: (A) *Acanthocybium solandri* (Cuvier); (B) *Scomberomorus commerson* (Lacépède); (C) *S. guttatus* (Bloch and Schneider); and (D) *S. lineolatus* (Cuvier).

12-25 are seen in the species of *Scomberomorus*. In addition, the teeth in *A. solandri* are closely arranged in the jaws, progressively increasing in size posteriorly. They are also broadly triangular with minutely serrated edges. In the species of *Scomberomorus* the teeth are more widely spaced; the series on the lower jaw slightly larger than those on the upper jaw; all teeth slightly directed inwards; and the few middle teeth of each side of the lower jaw larger than the rest in the series, this condition being well seen in *S. commerson*, which has also the outer edges of its teeth finely serrated. The premaxilla is least exposed below the lachrymal in adult *S. lineolatus*.

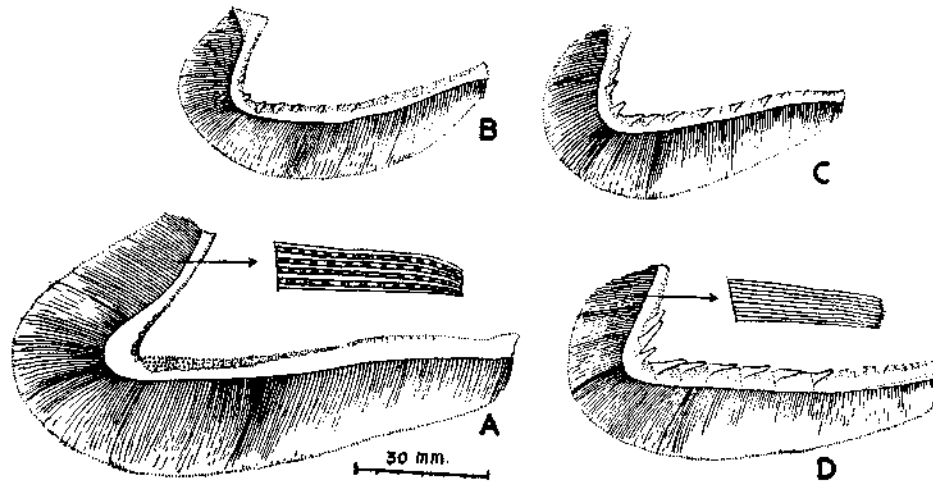


FIG. 6. Outermost gill arch of the right side of: (A) *Acanthocybium solandri* (Cuvier); (B) *Scomberomorus commerson* (Lacépède)—juvenile; (C) *S. guttatus* (Bloch and Schneider); and (D) *S. lineolatus* (Cuvier and Valenciennes).

The outer gill arch of each species figured (Fig. 6) shows the total absence of gill rakers in *A. solandri*; the reduced number of rakers in *S. commerson*; the relatively stumpy gill rakers of *S. guttatus*; and the more developed condition in *S. lineolatus*. These variations can probably be correlated with the food habits and the sizes and disposition of the teeth in the jaws of these species. A unique feature in *A. solandri* is the reticulated nature of the gill filaments (Fig. 6 A), which is quite different from the normal arrangement of the gill filaments as shown here for *S. lineolatus* (Fig. 6 D).

The species are characterised by a pair of lateral peduncular keels and two pairs of caudal keels, one at the upper and the other at the lower half of the base of the caudal fin (Fig. 7). The peduncular keels are long and narrow and end at the middle of the base of the caudal fin in *A. solandri*.

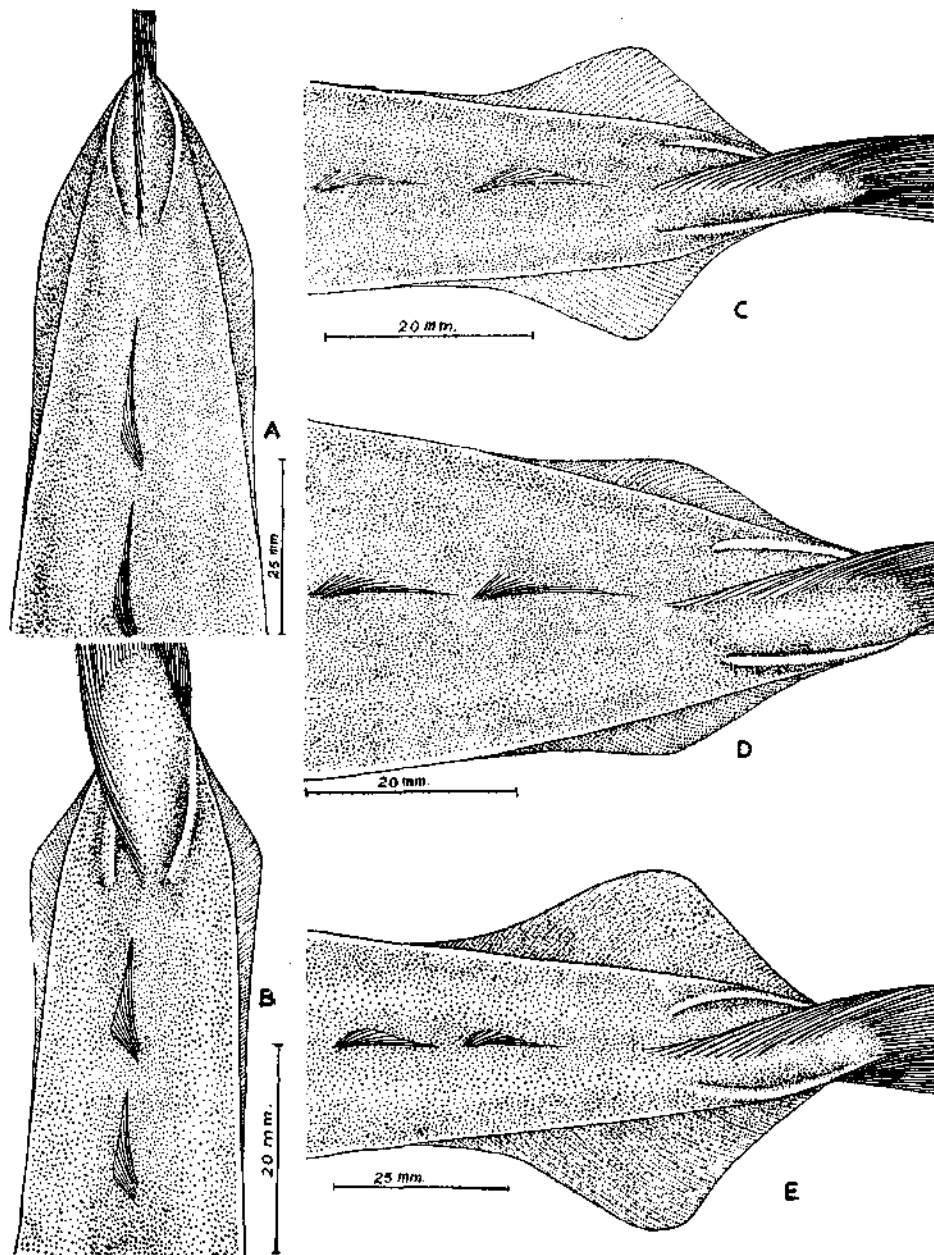


FIG. 7. Dorsal view of caudal peduncle showing nature of caudal peduncular keels in: (A) *Acanthocybium solandri* (Cuvier); (B) *Scomberomorus commerson* (Lacépède)—adult; (C) *S. guttatus* (Bloch and Schneider)—juvenile; (D) Same—adult; (E) *S. lineolatus* (Cuvier)—adult.

In *S. commerson*, the condition is more or less the same, but the keel ends well in front of the base of the caudal fin as in other species of *Scomberomorus*. The peduncular keels are most prominent in *S. lineolatus* where the width at its widest part will be about one-fourth its basal length. In adult specimens of *A. solandri*, *S. commerson*, and *S. guttatus* the greatest width of the caudal keel on one side is contained 5.5 times or more in the basal length of the keel.

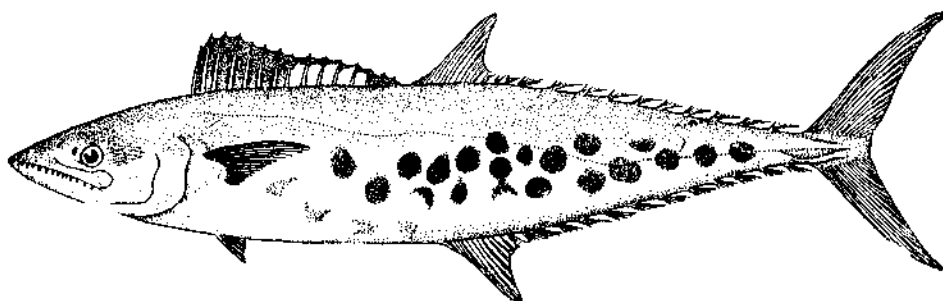


FIG. 8. *Scomberomorus queenslandicus* Munro (after Munro, 1943).

GENERAL REMARKS

Certain species of *Scomberomorus* have restricted distribution, but it is likely that one or two may turn up as rarities in Indian waters. From the pattern of distribution of the species, the one most likely to occur may be *S. queenslandicus* Munro (Fig. 8), a species closely allied to *S. commerson* but showing the following characteristics: D_1 . XV-XVII; D_2 . 16-20 + 9-10; P_1 . 20-23; A . 15-20 + 9-10; gill rakers 0-1 + 4-7; and vertebrae 20 + 28 = 48. Unlike the vertical bars seen in the adults of *S. commerson*, in *S. queenslandicus* the sides of the body are marked with diffuse rounded blotches, each larger than the diameter of the eye and arranged in about three rows below the lateral line. Another notable difference is the absence of a deep inflection in the lateral line in *S. queenslandicus*. This species is at present known from both the east and west coasts of Australia, and on account of its colouration has often been confused by Australian workers with *S. guttatus*. Specimens of this species from Indian waters should be preserved.

Another species which has most often figured in scomberomorid taxonomy is the rare gempylid *Lepidocybium flavobrunneum* (Smith) (Fig. 9) related to *Gempylus serpens* Cuvier recently recorded for the first time from this part of the Indian Ocean (Jones, 1960). No doubt, the general shape of the body, the presence of a spinous dorsal, and dorsal and anal finlets and

the wide peduncular keels give it the scombroid appearance, but careful examination will show the differences in the (1) fewer number of dorsal spines (VIII–XI); (2) fewer dorsal and anal finlets (4–6 dorsal and 4–5 anal finlets); (3) teeth conical and recurved; (4) gill rakers undeveloped or in the form of 6 or 7 vestigial projections on the lower limb of the outer gill arch; (5) the skeletal character, namely the caudal rays not deeply forked at the base and consequently the hypural mostly exposed. The tortuous lateral line which may always not be well defined is another specific character. Any worker who happens to come across this rarity from the Indian seas should not fail to preserve the specimen and in order to facilitate in its identification a figure of it is also given here.

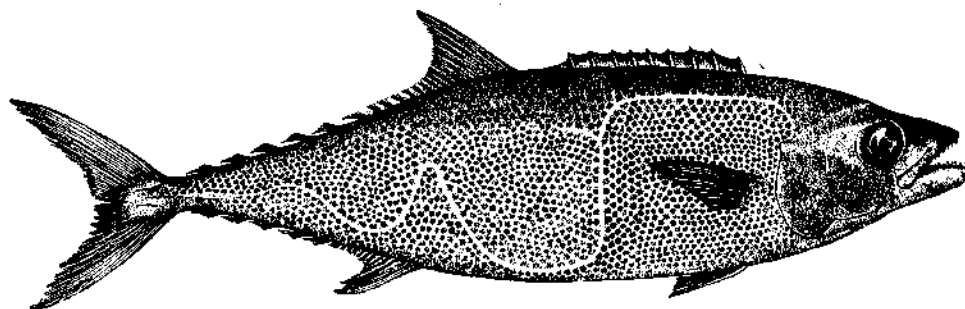


FIG. 9. *Lepidocybium flavobrunneum* (Smith). Drawn from a photograph of a specimen from Hawaiian waters, kindly sent by Mr. J. C. Marr, Director, Pacific Oceanic Fisheries Investigations, Honolulu, Hawaii.

The relative sizes attained by the species of Indian spanish mackerels vary. *S. commerson* attains the largest size and specimens 1.2–1.3 metres long taken in line fishing or in shore seines weigh 12–15 kg. Such large specimens were invariably found to be females, but a large male 99 cm. with fully mature testes weighed 7.7 kg. We have no information whether males and females of such large size occur together during spawning season or whether the males are smaller or belong to a different year class than the females. One instance worth mentioning is that of seven *S. commerson* taken on troll lines used from the ferry steamer S.S. CHOLUNGA in February 1960 in the Port Blair—Mayabunder run in the Andamans, three males, all oozing milt measured 750, 780 and 810 mm. while the four females taken in the same vicinity measured 1100–1200 mm. and had ovaries almost fully ripe. Generally specimens between 180 and 500 mm. are taken in gill nets along most parts of our coast, while it is not uncommon to see specimens ranging from small size to 1 metre or over taken in a single shore seine haul when more than one school is caught. Munro (1943) notes that besides the

regular fishery of small-sized specimens weighing about 5.5 kg., occasionally 22–27 kg. specimens of *S. commerson* are taken in the North Queensland and Western Australian waters, specimens 140 cm. weighing 18–23 kg. Rare exceptions of 40–45 kg. weights for *S. commerson* measuring about 2 metres in length are known. However, the record size appears to be the one mentioned by Ogilby and Marshall (1954) of a specimen 7 feet 6 inches (2.286 metres) weighing 58.96 kg. taken off Townsville, Australia in 1948.

S. lineolatus comes next in the order of size. We have examined several specimens caught in shore seines and drift nets along parts of Madras and Kerala coasts measuring between 600 and 800 mm. and weighing from 3.6–5.5 kg. Smaller specimens are usually taken in gill nets and shore seines. In no case were the gonads mature, which suggests that the species may attain a still larger size. Willaims (1960) gives 3–3.6 kg. as the average weight of *S. lineolatus* taken along the British East African Coast and mentions that spent females are obtained in September–November months. Hardly any information is available about the ecology and biology of this species from the Indian seas.

Specimens of *S. guttatus* between 450 and 520 mm. in length and weighing between 0.5–1.5 kg. taken along parts of the Madras coast are found to have fully mature gonads during the months May–July. In several places along our coast numerically this species is landed more than either *S. commerson* or *S. lineolatus*. Krishnamoorthi's work (1958) on the biology of this species from the Rameswaram Island (Madras coast) indicates that it may attain 885 mm. and we have seen one caught in November at Rameswaram measuring 815 mm. Krishnamoorthi, however, does not report the occurrence of *S. lineolatus* at Rameswaram Island, though we find it regularly occurring in the catches along with *S. guttatus* and *S. commerson*, though not in such large numbers as *S. guttatus*.

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