

FISHES OF THE SUBORDER SCOMBROIDEI OF TAIWAN¹

SIN-CHE LEE

Institute of Zoology, Academia Sinica, Taipei,
Taiwan 115, Republic of China

AND

HUNG-CHIA YANG

Fisheries Research Institute Kaohsiung Branch,
Kaohsiung, Taiwan 800, Republic of China

(Received February 19, 1983)

Sin-Che Lee and Hung-Chia Yang (1983) Fishes of the suborder Scombroidei of Taiwan. *Bull. Inst. Zool., Academia Sinica* 22(2): 217-242. Thirty-nine scombroid species in 5 families known to surrounding waters of Taiwan are revised. Among them, two trichiurids with forked caudal fin, *Evoxymetopon taeniatus* and *E. poeyi* are recognized as new records of the Taiwan area. Keys, diagnoses, synonyms and figures of all studied species are given.

The fishes belonging to suborder Scombroidei are currently classified into 3 superfamilies, namely Xiphioidae, Scombroideae and Trichiuridae (Nelson, 1976). They constitute the most important fishery resources with great economical value in the surrounding waters of Taiwan. Large scale exploitation of these natural resources have been carried out for the past decades by longliners, trawlers and other fishing methods.

Most scombroids are widely distributed and have consequently been described several times under different taxonomic names. A precise systematic revision should be made since identification of species is often difficult due to the considerable morphological changes associated with growths. It is the purpose of this study to revise the systematic status and to synopsise the species of Scombroidei in Taiwan.

Six families with 36 genera and about 94 species are recorded throughout the world

(Nelson, 1976), among them, 39 valid species in 5 families are confirmed to occur in Taiwan. The earliest report on the fishes of Scombroidei in Taiwan was that of Jordan and Evermann (1902) who listed 5 species: *Trichiurus japonicus*, *Scomber japonicus*, *S. kanagurta* (= *Rastrelliger kanagurta*), *Gymnosarda alleterata* (= *Euthynnus affinis*) and *Scomberomorus kuhlii* (= *Scomberomorus guttatus*). In 1909, Jordan and Richardson added *Scomberomorus commersoni*. In 1938, Nakamura reported 6 spearfishes including *Tetrapturus angustirostris*, *Istiophorus orientalis* (= *I. platypterus*), *Makaira mitsukurii* (= *Tetrapturus audax*), *M. mazara*, *M. marlina* (= *M. indica*) and *Xiphias gladius*. A year later, he (Nakamura, 1939) added further 9 species, namely *Acanthocybium solandri*, *Cybius chinese* (= *Scomberomorus sinensis*), *C. koreanum* (= *Scomberomorus koreanus*), *C. nipponium* (= *S. nipponius*), *Sarda chilensis* (= *Sarda orientalis*), *gymnosarda nuda* (= *G. unicolor*), *Katsuwonus pelamis*, *Auxis hira* (= *A. rochei*) and *A. maru* (= *A. thazard*). Later in 1951, Liang

1. Paper No. 244 of the Journal Series of the Institute of Zoology, Academia Sinica.

added *Promethichthys prometheus* and *Trichiurus haumela* (= *T. lepturus*) in his list. In 1969, Chen, added further 13 species including *Scomber scomber tapeinocephalus* (= *S. australasicus*), *Thunnus thynnus*, *Germo alalunga* (= *Thunnus alalunga*), *Parathunnus sibi* (= *Thunnus obesus*), *Neothunnus macropterus* (= *T. albacares*), *N. rarus* (= *T. tonggol*), *Lepidocybium flavobrunneum*, *Ruvettus pretiosus*, *Neopinnula orientalis*, *Mimasea taeniosoma*, *Acinacea notha*, *Rexea solandri* and *Trichiurus muticus* (= *Tentoriceps cristatus*). In 1971, Chang and Lee added *Rastrelliger faughni*. As the result of the present study, two trichiurids with forked caudal fin, *Evoxymetopon taeniatum* and *E. poeyi* have been added to make a total of 39 species of Scombroidei known to Taiwan.

MATERIALS AND METHODS

Specimens small enough to fit in the available containers were collected and deposited in the Museums of the Institute of Zoology, Academia Sinica and Taiwan Fisheries Research Institute. They were collected mainly by longliners, ottertrawlers, gill nets and set nets from the coastal waters of Taiwan. Specimens too large to preserve in any available containers, were identified and recorded in the field or fish market and were not kept for museum specimens. Total length (TL), fork length (FL), standard length (SL), head length, (HL), and body depth (BD), of the specimens were measured. All these measurements were made with measuring board and recorded to the nearest 1 mm. Fin ray counts included elements of dorsal and anal fin rays together with finlets of both. Vertebrae (including urostyle) for small specimens were counted from radiographs and those for large ones were neglected. Gill rakers were counted only from the left first gill arch.

RESULTS

Systematic accounts

1. Premaxilla and nasal forming a rostrum and extending into a sword; pectorals

- set in a very low position, more or less close to ventral base2
- Premaxilla and nasal not forming a sword-like rostrum; pectorals higher.....3
2. Body scaled; teeth present both in juvenile and adult; ventrals present; caudal peduncle with two keels on each side; rostrum shorter than $\frac{1}{2}$ body length; vertebrae 24.....Istiophoridae
- Body naked; teeth absent in adult; ventrals absent; caudal peduncle with a single keel on each side; rostrum distinctly longer than $\frac{1}{2}$ body length...Xiphiidae
3. Body spindle-like; ventrals I, 5; caudal fin well developed; caudal peduncle strong with keels on each side.....Scombridae
- Body well elongated or band-like; caudal fin absent or present with great part of hypural exposed; caudal peduncle without keels except *Lepidocybium*.....4
4. Body compressed, long but not band-like; dorsal fin with a well defined notch to separate spinuous and soft rays; caudal fin present but not deeply forked at base; vertebrae less than 50.....
- Acinaceidae (=Gempylidae)
- Body very long, band-like; dorsal fin continuous without any notches; caudal minute or absentTrichiuridae

Family Istiophoridae

Key to species of Istiophoridae

1. First dorsal distinctly higher than body depth; ventrals rather long almost reaching the anus.....*Istiophorus platypterus*
- First dorsal not distinctly higher than body depth; ventrals very short, far before the anus.....2
2. The highest dorsal ray nearly as high as or slightly longer than body depth; body rather compressed3
- The highest dorsal ray much shorter than body depth; cross section of body more or less round4
3. Almost all rays of the first dorsal much of a height; pectorals much shorter than

ventrals; rostrum shorter, only slightly protruded beyond the tip of lower jaw.

..... *Tetrapturus angustirostris*

- First dorsal fin rays gradually decreased height posteriorly; pectorals about the same length as ventrals; rostrum much longer than the lower jaw.....*T. audax*
4. Pectorals capable of folding back along the body sides.....*Makaira mazara*
- Pectorals extending out rigidly, almost at right angle to body axis, not capable of folding back.....*M. indica*

1. *Istiophorus platypterus*
(Shaw and Nodder, 1792)

Fig. 1.

- Xiphias velifer* Bloch and Schneider, 1801: 93.
- Histiophorus immaculatus* Day, 1884: 199; Klunzinger, 1884: 122.
- Istiophorus gladius*, Fowler, 1936: 80; Jones and Silas, 1962: 66.
- Istiophorus platypterus*, Nakamura, *et al.*, 1968: 55.
- Istiophorus orientalis*, Nakamura, 1938: 17; Chen, 1969: 305.
- Histiophorus gladius*, de Beaufort and Chapman, 1951: 240.

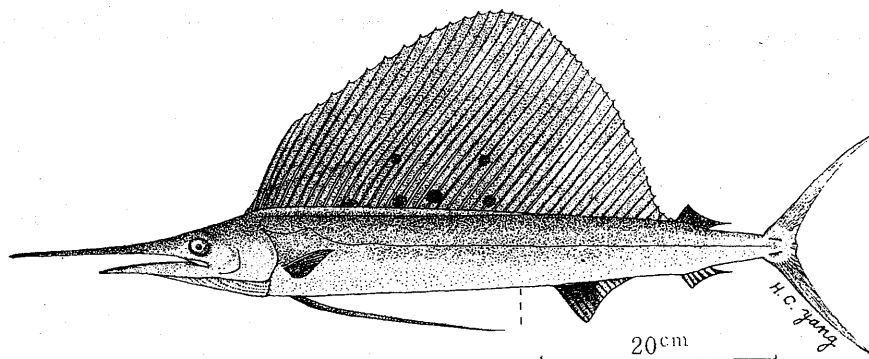


Fig. 1. *Istiophorus platypterus*, 672 mm fork length.

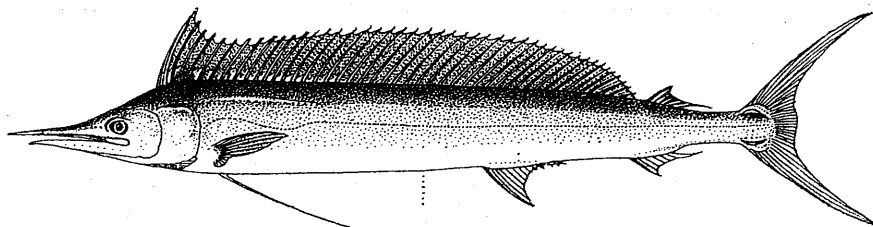


Fig. 2. *Tetrapturus angustirostris*.

Materials: 1 specimen, 672 mm FL, September 1955, Keelung; 10 specimens, 1860mm-2290 mm SL, July 1980, Chengkong.

Diagnosis: D¹. III, 9, XXX-XXXIII; D². 6-7; A¹. II, 11; A². 6-7; V.I,2; vertebrae 24. Soft dorsal rays distinctly longer than body depth. Ventral fins extremely elongated almost reaching the anus. Color in fresh condition purplish black above and brown below. First dorsal purplish with dark blotches.

2. *Tetrapturus angustirostris*
(Tanaka, 1914)

Fig. 2

Tetrapturus angustirostris Tanaka, 1914: 324; Nakamura, 1938: 16; Hirasaka and Nakamura, 1947: 11; Jones and Silas, 1962: 72; Nakamura *et al.*, 1968: 59; Chen, 1969: 305.

Materials: 1 specimen, 1621 mm SL, April 1978, Chengkong.

Diagnosis: D¹. III, 11-13, XXXV-XXXVII; D². 6; A¹. II, 12; A². 7; V.I,2; vertebrae 24. Snout slightly longer than the lower jaw. Dorsal rays throughout the entire fin almost the same height. Pectoral fin much shorter than

ventral fin. Color in fresh condition lead black dorsally and whitish ventrally.

3. *Tetrapturus audax* (Philippi, 1887)

Figs. 3a-b

Makaira mitsukurii, Nakamura, 1938: 19; Chen, 1969: 305.

Kajikia mitsukurii, Hirasaka and Nakamura, 1947: 14.

Kajikia formosana, Hirasaka and Nakamura, 1947: 13; Chen, 1969: 305.

Tetrapturus audax, Jones and Silas, 1962: 74; Nakamura *et al.*, 1968: 67.

Materials: 1 specimen, 1920 mm FL, April 1978, Chengkong; 1 specimen, 1610 mm FL, February 1955, Keelung; 1 specimen, 2040 mm FL, May 1956, Keelung.

Diagnosis: D¹. III, 12-15, XXII-XXV; D². 6; A¹. II, 12-13; A². II, 12-13; V. I, 2; vertebrae 24. Snout much longer than lower jaw. Dorsal rays gradually decreased their heights posteriorly. Pectoral nearly as long as ventral fin. Color in fresh condition brownish dorsally and whitish ventrally, with several whitish vertical stripes. Dorsal fin bluish with black spots at base, disappearing with ages.

4. *Makaira mazara* (Jordan and Snyder, 1901)

Fig. 4

Tetrapturus mazara Jordan and Snyder, 1901: 305.

Makaira mazara, Nakamura, 1938: 19; Nakamura *et al.*, 1968: 68.

Eumakaira nigra, Hirasaka and Nakamura, 1947: 16; Chen, 1969: 305.

Materials: 10 specimens, 1830 mm-2850 mm SL, July 1980, Chengkong

Diagnosis: D¹. III, 14-16, XXIII-XXVII; D². 7; A¹. II, 14; A². 7; V. I, 2; vertebrae 24. Pectoral fins capable of being folded flat against body side. Color in fresh condition blackish above and whitish below, with white vertical stripes.

5. *Makaira indica* (Cuvier, 1831)

Fig. 5

Tetrapturus indicus Cuvier in Cuvier and Valenciennes, 1831: 286.

Makaira marlina, Nakamura, 1938: 20.

Marlina marlina, Hirasaka and Nakamura, 1947: 15; Chen, 1969: 305.

Makaira indica, Jones and Silas, 1962: 82; Nakamura *et al.*, 1968: 72.

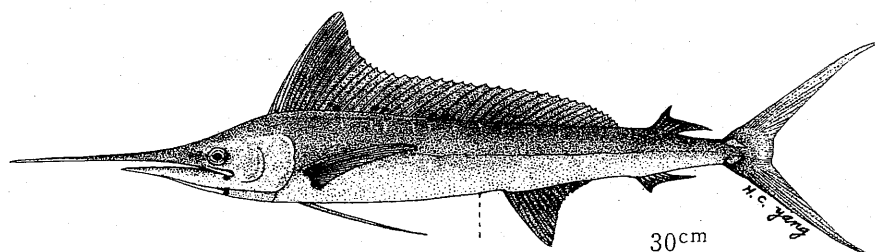


Fig. 3a. *Tetrapturus audax*, 1610 mm fork length.

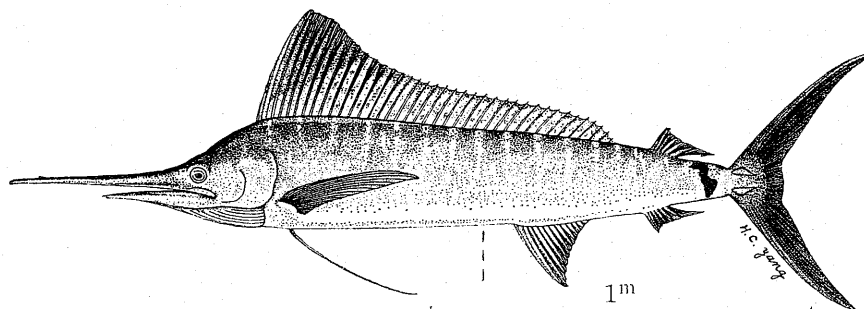


Fig. 3b. *Tetrapturus audax*, 2040 mm fork length.

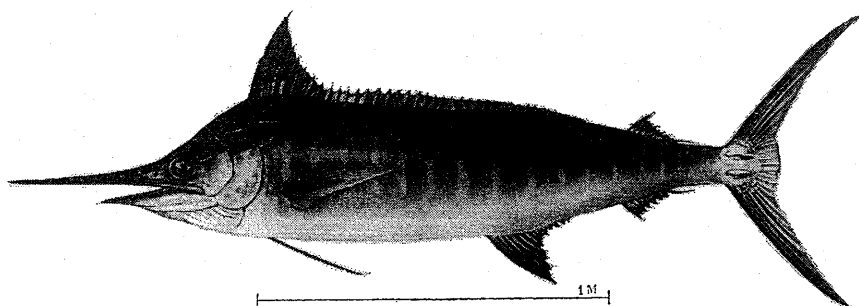


Fig. 4. *Makaira mazara* (after, Nakamura, 1938).

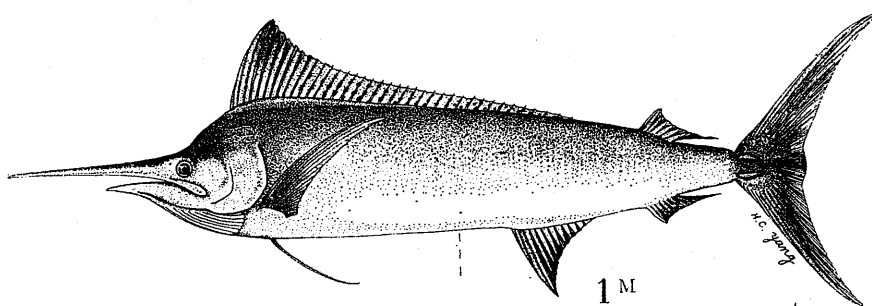


Fig. 5. *Makaira indica*, 2230 mm fork length.

Materials: 10 specimens, 1770 mm–2330 mm SL, July 1980, Chengkong; 1 specimen, 2230 mm FL, May 1956, Keelung.

Diagnosis: D¹. III, 10–12, XXIII–XXV; D². 7; A¹. II, 10–11; A². 7; V. I, 2; vertebrae 24. Pectoral fin standing out at right angle to body axis, incapable of being folded back. Color in fresh condition steel-blue above and whitish below.

Family Xiphiidae

6. *Xiphias gladius* Linnaeus, 1758

Fig. 6

Xiphias gladius Linnaeus, 1758: 248; Nakamura, 1938: 22; Hirasaka and Nakamura, 1947: 18; Jones and Silas, 1962: 88; Nakamura *et al.*, 1968: 52; Chen, 1969: 306.

Xiphias imperator Bloch and Schneider, 1801: 93.

Materials: 1 specimen, 1940 mm FL (1840 mm SL), December 1982, Chengkong; 1 specimen, 1309 mm FL, April 1956, Keelung.

Diagnosis: D¹. III, 9, XXVI; D². 4; A¹. II, 7, IX–X; A². 4; vertebrae 26. Snout much elongated, longer than 4 times of lower jaw or longer than 1/2 standard length. Anterior-most dorsal and anal fin rays protruded. Ventral fin absent. Caudal peduncle with single median

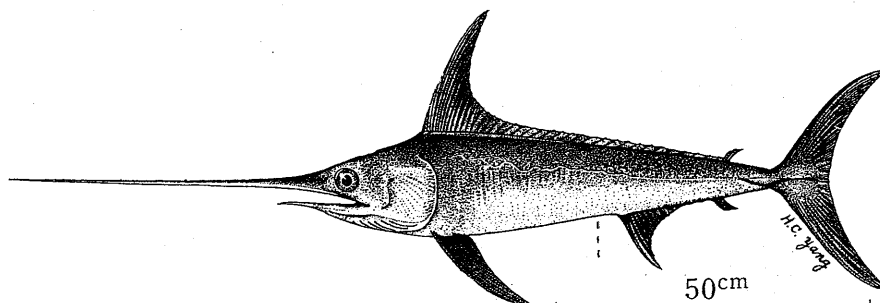


Fig. 6. *Xiphias gladius*, 1309 mm fork length.

keel. Color in fresh condition dark purplish dorsally and ventrally.

Family Scombridae

Key to species of Scombridae

1. Two small keels on each side of caudal peduncle2
Three keels on each side of caudal peduncle5
2. Body depth much shorter than head length; vomer and palatines toothed; interneural bones under first dorsal 12-18; first anal spine strong.....3
Body depth about head length; vomer and palatines toothless; interneural bones under first dorsal 10-11; anal spine rudimentary4
3. Body depth 4.75-5.26 in fork length; first dorsal IX-X (mostly IX); interneural bones under first dorsal 13-15; belly unmarked.....*Scomber japonicus*
Body depth 5.59-6.13 in fork length; first dorsal X-XII (mostly XI); interneural bones under first dorsal 18-22; belly marked with black spots..*S. australasicus*
4. Body deeper, 3.71-4.11 in fork length; gill rakers rather long, 30-40 on lower branch of left first arch; bristles on one side of longest gill raker about 130.....
.....*Rastrelliger kanagurta*
Body slender, its depth 4.44 in fork length; gill rakers as short as in *Scomber*, 21-25 on lower branch of left first arch; bristles on each side of longest gill raker about 55.....*R. faughni*
5. First dorsal XXIII-XXVII; gill filaments fused into a net, gill rakers absent.....
.....*Acanthocybium solandri*
First dorsal X-XVI; gill filaments separate, gill rakers present.....6
6. Body naked except the scaly corselet and lateral line.....7
Body completely scaled, scales may be enlarged on corselet and lateral line....
.....11
7. Both jaws with conical teeth; longitudinal grooves on the base of dorsal and on cheek; swimbladder present.....
.....*Gymnosarda unicolor*
Teeth not in conical; above-mentioned grooves absent; swimbladder absent...8
8. The distance between two separate dorsals subequal or shorter than 1/5 head length9
Two dorsal fins widely separated with the gap greater than 1/2 head length10
9. Palatines toothless; vertebrae 41; dark longitudinal stripes present below lateral line, no wavy stripes on back and no dark blotches present below pectoral base.....*Euthynnus pelamis*
Teeth on palatines and on vomer; vertebrae 39; oblique dark wavy stripes on back but without longitudinal stripes below lateral line; dark blotches may be present below the pectoral base
.....*E. affinis*
10. Corselet scales along lateral line in 7-12 scale-row width under origin of second dorsal; corselet tapers gradually and evenly throughout the length, ends at second dorsal finlet; first dorsal IX-X..
.....*Auxis rochei*
Corselet scales in 2-4 scale-row width under origin of second dorsal, corselet tapering abruptly at midway between the two dorsals to a narrow band of 3-4 scale width along lateral line; first dorsal X-XI*A. thazard*
11. Gill rakers less than 15; teeth on both jaws large; lateral line variously undulated, sometimes with accessory branches; corselet poorly developed or absent; scales equal in size12
Gill rakers over 20; teeth on both jaws small; lateral line straight; corselet well developed; scales enlarged on corselet and lateral line.....17
12. Body shape like tuna; edge of teeth rounded; vomer toothless; about 25 longitudinal bands on back...*Sarda orientalis*
Body long; teeth with sharp edge; vomer toothed13
13. Swimbladder present; lateral line simple,

- bent downward abruptly.....14
 Swimbladder absent; profile of lateral line almost straight, occasionally with numerous fine short branches.....15
14. Pectoral large and rounded; lateral line with a marked bent on shoulder near the tip of pectoral; gill rakers 9-11; two rows of indistinct dark spots on body side*Scomberomorus sinensis*
 Pectoral pointed; lateral line bent sharply below the end of second dorsal; gill rakers 3-4; body with about 50 cross bands..... *S. commersoni*
15. First dorsal base distinctly longer than head length, spines XIX-XX; tongue toothless*S. niphonius*
 First dorsal base as long as or only slightly longer than head length, spines less than XIX; tongue furnished with teeth ...16
16. Head length equal or slightly shorter than body depth, but longer than the vertical distance between lateral line and origin of anal fin; dorsal spines XV-XVII; gill rakers 3-12.....*S. guttatus*
 Head much shorter than body depth, but nearly equal the vertical distance between lateral line and origin of anal fin; dorsal spines XIV; gill rakers 13-15. *S. koreanus*
17. Pectoral fin much elongated, extending at least to the origin of second dorsal fin.18
 Pectoral fin very short, 4.6-6.0 in standard length, reaching only the 10th spine of the first dorsal*Thunnus thynnus*
18. Pectoral fin not reaching the second dorsal finlet19
 Pectoral fin band-like, reaching the second dorsal finlet*T. alalunga*
19. Gill rakers of the left first gill arch 25-3320
 Gill rakers of the left first gill arch less than 25.....*T. tonggol*
20. Body shape more or less obtuse, the proportion of body depth to fork length much greater than 1/4; second dorsal and anal fins not protruded with ages; pectoral fin reaching first dorsal finlet*T. obesus*
 Body more or less compressed, the proportion of body depth to fork length equal or slightly shorter than 1/4; second dorsal and anal fins protruded with ages; pectoral fin hardly reaching the origin or middle of second dorsal fin.....*T. albacares*

7. *Scomber japonicus* Houttuyn, 1782

Fig. 7

Scomber scomber japonicus, Temminck and Schlegel, 1850: 92; Chen, 1969: 300.

Scomber pneumatophorus, Günther, 1860: 359.

Scomber japonicus, Kishinouye, 1823: 403 (Hirasaba); Fowler, 1936: 63; Nakamura, 1939: 9; Jones and Silas, 1962: 13; Collette, 1963: 19; Matsui, 1967: 79; Chang and Lee, 1971: 78.

Materials: 37 specimens, 214 mm-284 mm SL, November 1970, Formosan Bank; 1 specimen, 280 mm FL, June 1981, Keelung.

Diagnosis: D¹. IX-X (mostly IX); D². 12+5; A. I, 11-13+5; V. I, 5; vertebrae 31.

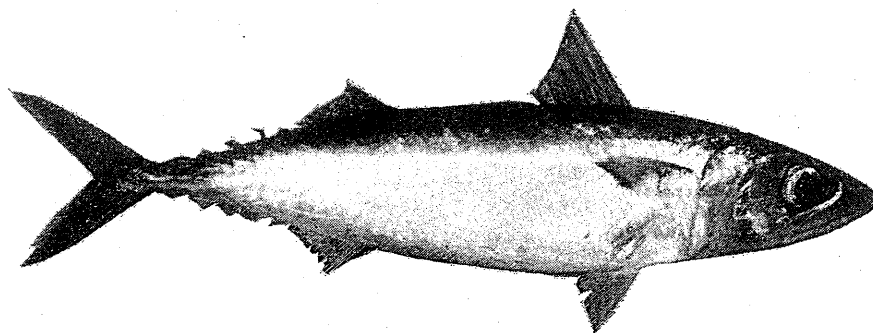


Fig. 7. *Scomber japonicus*, 280 mm fork length.

Body higher, depth 4.75–5.26 in fork length. Ventral surface of body unmarked.

8. *Scomber australasicus* Cuvier, 1831

Fig. 8

Scomber australasicus Cuvier and Valenciennes, 1831: 49; Collette, 1963: 19; Matsui, 1967: 79; Chang and Lee, 1971: 80.

Scomber japonicus, Kishinouye, 1923: 406 (form Gomasaba); Nakamura, 1939: 9.

Pneumatophorus japonicus, Manacop, 1956: 84.

Scomber scombrus tapeinocephalus, Chen, 1969: 302.

Materials: 31 specimens, 219 mm–264 mm FL, November 1970, Nanfanao; 1 specimen, 376 mm FL, October 1955, Keelung.

Diagnosis: D¹. X–XII (mostly XI or XII); D². 12+5; A. I, 12+5; V. I, 5; vertebrae 31. Body depth 5.59–6.13 in fork length. Ventral surface of body with black spots.

Remarks: This species is easily distinguishable from *S. japonicus* in having more numerous dorsal spines (10–12 mostly 11 or 12 dorsal spines vs 9) and slender body shape,

and the presence of ventral black spots.

9. *Rastrelliger kanagurta* (Cuvier, 1816)

Fig. 9

Scomber kanagurta, Cuvier and Valenciennes, 1831: 49; Jones and Silas, 1962: 15.

Rastrelliger chrysozonus, Kishinouye, 1923: 406; Nakamura, 1939: 9; Manacop, 1956: 92; Chen, 1969: 302.

Rastrelliger kanagurta, Fowler, 1936: 65; Collette, 1963: 20; Chang and Lee, 1971: 82.

Materials: 17 specimens, 219 mm–253 mm FL, April 1971, Formosan Bank.

Diagnosis: D¹. IX–X; D². 12+5; A. 12+5; V. I, 5; vertebrae 31. Body deeper, 3.71–4.11 in fork length. Snout longer than eye diameter. Gill rakers rather long, feather-like, 30–40 on the lower half of left first gill arch. Color in fresh condition bluish grey above and silvery below with a series of black spots along the base of dorsal fin and several yellowish lines on lateral side.

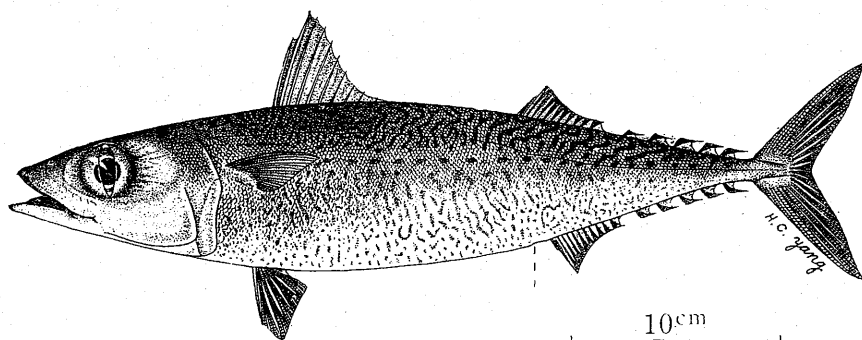


Fig. 8. *Scomber australasicus*, 376 mm fork length.

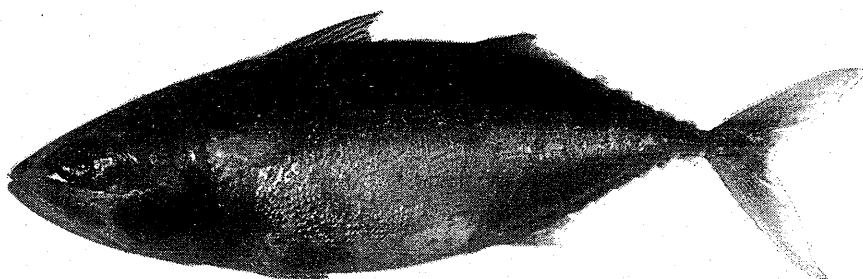


Fig. 9. *Rastrelliger kanagurta*, 235 mm fork length.

10. *Rastrelliger faughni* Matsui, 1967

Fig. 10

Rastrelliger faughni Matsui, 1967: 74; Chang and Lee, 1971: 82.

Pneumatophorus (*Scomber*) *australasicus*, Manacop, 1956: 80.

Materials: 1 specimen, 215 mm FL, December 1955, Kaohsiung; 1 specimen, 194 mm FL, November 1981, Hengchun.

Diagnosis: D¹. X, 12; D². 12+5; A. 12+5; V. I, 5; vertebrae 31. Body depth 4.44 in fork length.

Remarks: This species is distinguishable from *R. kanaguata* in having slender body (depth 4.4 in fork length vs 3.71-4.11) and fewer gill rakers on the lower limb of the left first arch (25 vs 30-40).

Materials: 10 specimens, 860 mm-1300 mm FL, April 1978, Chengkong; 1 specimen, 1260 mm FL, date not known, Keelung.

Diagnosis: D¹. XXIII-XXVI; D². 11-13+9-10; V. I, 5; vertebrae 54-64 (23-33+31). Body much elongated, 7.45 in fork length. Lateral line bent below 13th dorsal spine. Snout very long. Gill rakers absent. Color in fresh condition bluish above and greyish below with about 30 dark transverse streaks on body side.

Remarks: This species is easily confused with *Scomberomorus commersoni* at first glance due to the similarity in color patterns. However, it differs from the latter in having more numerous dorsal spines (22-26 vs 16-17), the lateral line abruptly bent downward below the 13th dorsal spine, completely scaled body and in having no gill raker.

11. *Acanthocybium solandri*
(Cuvier and Valenciennes, 1831)

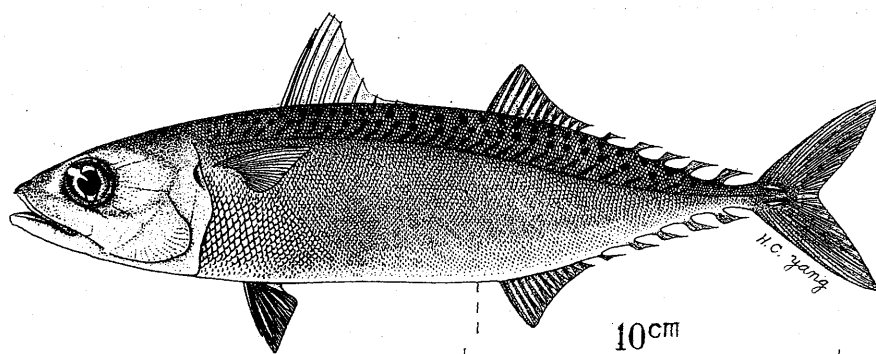
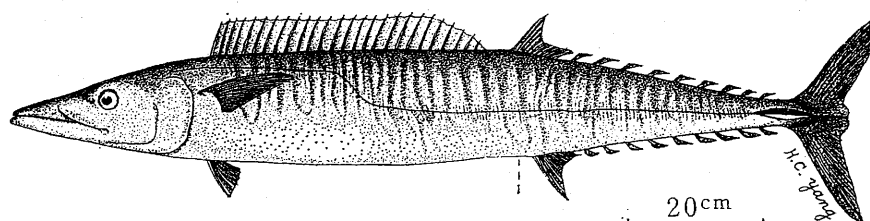
Fig. 11

Cybium solandri Cuvier and Valenciennes, 1831: 192.
Acanthocybium solandri, Kishinouye, 1923: 411;
Fowler, 1936: 74; de Beaufort and Chapman, 1951: 228; Nakamura, 1939: 9; Jones and Silas, 1962: 63; Collette, 1963: 26.

12. *Gymnosarda unicolor* (Ruppell, 1838)

Fig. 12

Pelamys nuda, Günther, 1860: 368.
Gymnosarda nuda, Kishinouye, 1923: 426; Nakamura, 1939: 11.
Gymnosarda unicolor, Jones and Silas, 1962: 27; Chen, 1969: 304.

Fig. 10. *Rastrelliger faughni*, 215 mm fork length.Fig. 11. *Acanthocybium solandri*, 1260 mm fork length

Materials: 1 specimen, 850 mm FL, October 1943, Keelung.

Diagnosis: D¹. XIV; D². 12-13+6-7; A. 10-12+6; V. I, 5; gill rakers 12-14; vertebrae 38 (19+19). Body almost naked except few rudimentary scales on corselet, lateral line, caudal peduncle and either side of dorsal base. The scales on dorsal base and cheek form longitudinal grooves. Eighteen to 23 and 10-16

equally sized conical teeth on both jaws, respectively. Color in fresh condition generally blue above and pale greyish below except pale margins of second dorsal and anal fins.

Remarks: This species is distinguishable from other species of subfamily Katsuwoninae in having conical teeth on both jaws, and longitudinal grooves on base of dorsal fin and on cheek.

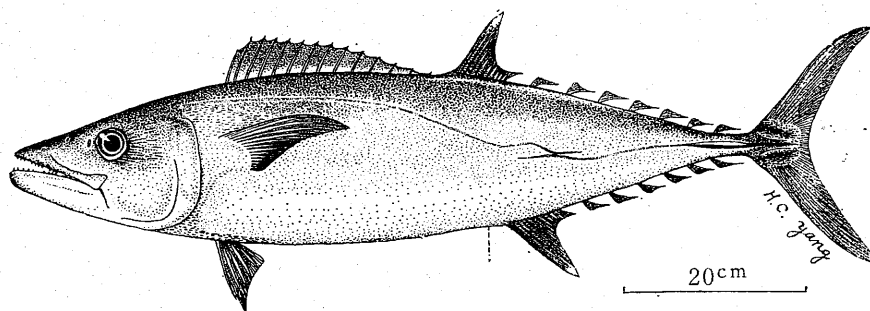


Fig. 12. *Gymnosarda unicolor*, 850 mm fork length.

13. *Euthynnus pelamis* (Linnaeus, 1758)

Fig. 13

Scomber pelamis Linnaeus, 1758: 297.

Thynnus pelamys, Cuvier and Valenciennes, 1831: 113.

Katsuwonus pelamis, Kishinouye, 1923: 453; Nakamura, 1939: 11; Jones and Silas, 1962: 45; Collette, 1963: 35; Chen, 1969: 303.

Euthynnus pelamis, de Beaufort and Chapman, 1951: 217.

Materials: 1 specimen, 305 mm FL, December 1969, Nanfanao; 1 specimen, 474 mm FL,

September 1955, Keelung; 5 specimens, 515 mm-590 mm FL, January 1983, Chengkong.

Diagnosis: D¹. XV-XVII; D². II, 11-14+7-8; A. II, 12-16+6-8; gill rakers 51-59; vertebrae 41 (20+21). Villiform teeth on both jaws; toothless on vomer and palatine. Antermost spine of first dorsal elongated, the last spine located adjacent to the origin of the second dorsal, very short. Corselet well developed. Color in fresh condition lead green above and silvery below with 4 or more longitudinal brownish bands.

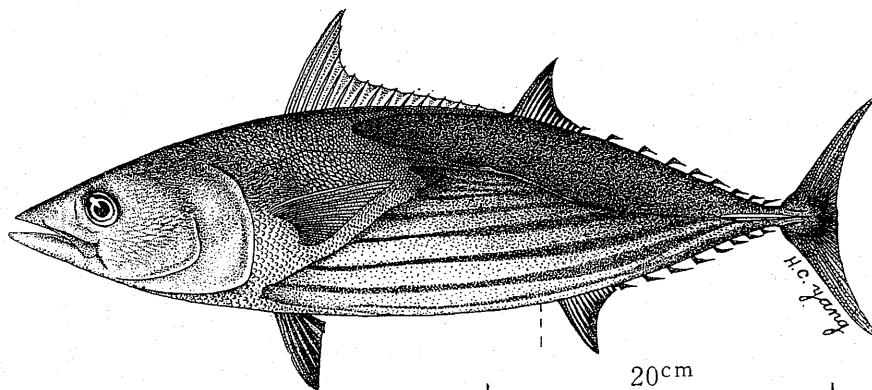


Fig. 13. *Euthynnus pelamis*, 474 mm fork length.

14. *Euthynnus affinis* (Cantor, 1849)

Fig. 14

Thynnus affinis Cantor, 1849: 1088.

Euthynnus yaito, Kishinouye, 1923: 457; Nakamura, 1939: 12; Chen, 1969: 303.

Euthynnus affinis, Collette, 1963: 34.

Euthynnus alletteratus affinis, de Beaufort and Chapman, 1951: 218.

Materials: 6 specimens, 311 mm–360 mm FL, December 1969, Nanfanao.

Diagnosis: D¹. XV–XVI; D². 11–12+8; A. 12–13+7 (one with 6); gill rakers 29–32 (8–9+21–23); vertebrae 39 (19+20). The gap between two dorsals shorter than eye diameter in juveniles and longer in adults. Color in fresh condition dark blue above with about 10 oblique dark stripes and silvery below; one to seven (mostly 3–4) black blotches present below pectoral base.

Remarks: The Atlantic *Euthynnus alletteratus* was listed by Chen (1969) according to the

records of Jordan and Everman (1902) and Jordan and Richardson (1909). We consider that record a misidentification of the present species.

15. *Auxis rochei* (Risso, 1810)

Fig. 15

Auxis tapeinosoma Bleeker, 1854: 408; Chen, 1969: 303.

Auxis maru Kishinouye, 1923: 463; Nakamura, 1939: 12.

Auxis thynnoides, Jones and Silas, 1962: 23.

Auxis rochei, Collette, 1963: 32.

Materials: 2 specimens, 270 mm–322 mm FL, June 1969, Nanfanao; 1 specimen, 276 mm FL, July 1956, Keelung.

Diagnosis: D¹. X; D². 11–12+7–8; A. 12+7; gill rakers 48 (12+36); vertebrae 39. Body cross section nearly rounded. Corselet tapers gradually, ending at below the second dorsal finlet. Color in fresh condition bluish green

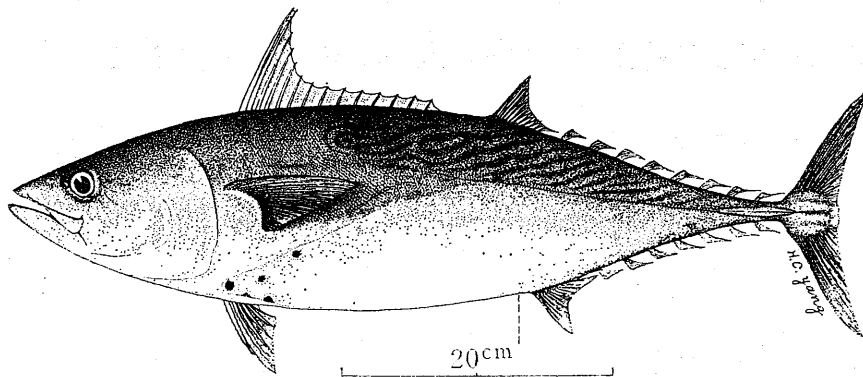


Fig. 14. *Euthynnus affinis*, 660 mm fork length.

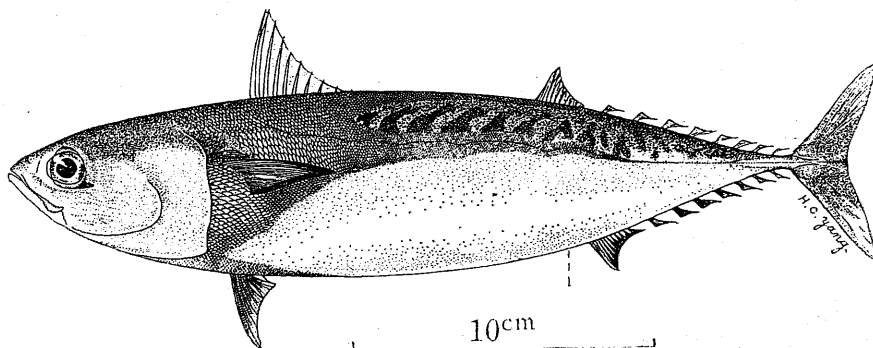


Fig. 15. *Auxis rochei*, 276 mm fork length.

above with irregular wavy dark oblique bands, and silvery below. A small triangular black spot at lower posterior margin of orbit.

16. *Auxis thazard* (Lacépède, 1802)

Fig. 16

Auxis hira Kishinouye, 1923: 462; Nakamura, 1939: 12; Chen, 1969: 303.

Auxis thazard, de Beaufort and Chapman, 1951: 226; Jones and Silas, 1962: 20; Collette, 1963: 32.

Materials: 2 specimens, 303 mm–306 mm FL, December 1969, Nanfanao; 1 specimen, 350 mm FL, March 1964, Tungkang.

Diagnosis: D¹. X; D². 12+8; A. 12–13+7; gill rakers 38–42 (9–11+29–31); vertebrae 39.

Remarks: This species resembles *A. rochei*, but is distinguishable in having a more compressed body and the corselet located more anteriorly, ending under the middle of the second dorsal base.

17. *Sarda orientalis*
(Temminck and Schlegel, 1850)

Fig. 17

Pelamys orientalis Temminck and Schlegel, 1850: 90. *Sarda orientalis*, Kishinouye, 1923: 424; Nakamura, 1939: 11; Jones and Silas, 1962: 26; Collette, 1963: 30; Collette and Chao, 1975: 604. *Sarda chilensis*, Chen, 1969: 304.

Materials: 4 specimens, 520 mm–970 mm FL, April 1978, Chengkong.

Diagnosis: D¹. XVIII–XIX; D². 12–14+8; A. 13–14+6–7; gill rakers 8–14; vertebrae 44–45. Body covered with tiny scales, which on corselet well developed. Sixteen and 10–13 compressed conical teeth on upper and lower jaw, respectively, some of them canine-like. Palatine with a series of strong teeth while vomer and tongue are toothless. Swimbladder absent. Color in fresh condition greyish blue above and silvery below, with 6–8 black longitudinal bands in adult and 15 or more in juvenile.

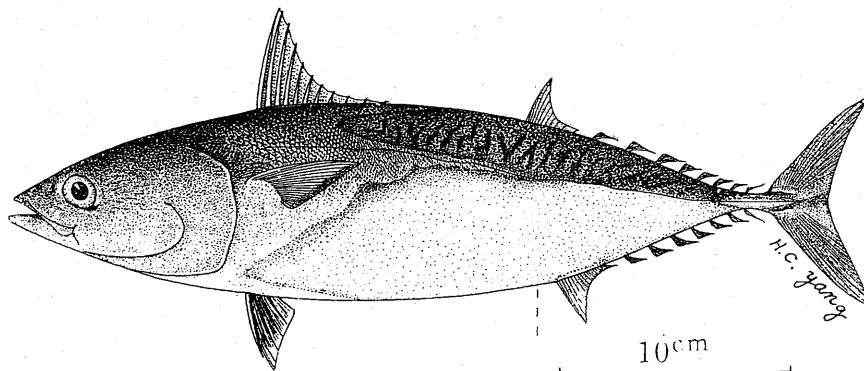


Fig. 16. *Auxis thazard*, 350 mm fork length.

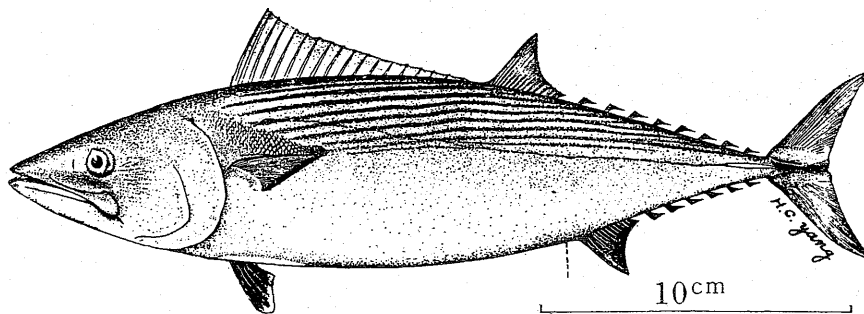


Fig. 17. *Sarda orientalis*, 257 mm fork length.

18. *Scomberomorus sinensis*
(Lacépède, 1800)

Fig. 18

Scomber sinensis, Günther, 1860: 369.

Cybium chinense, Kishinouye, 1923: 418; Nakamura, 1939: 10.

Scomberomorus sinensis, Fowler, 1936: 285; Chen, 1969: 303.

Materials: 1 specimen, 1056 mm FL, March 1964, Tungkan; 1 specimen, 1200 mm FL, January 1954, Keelung.

Diagnosis: D¹. XVI-XVII; D². 15+8; A. 16+7; gill rakers 9-11; vertebrae 40 (18+22). About 20 and 15 compressed canine-like teeth on upper and lower jaws respectively. Lateral line abruptly bent behind the distal tip of pectoral fin, or roughly below the 11st dorsal spine; the anterior half of the lower segment more or less wavy. Spinuous dorsal low. Pectoral fin large, rounded distally. Color in fresh condition bluish green above and silvery below with two longitudinal series of indistinct dark blotches which usually disappear in large adults.

Remarks: This species is easily separable from other related species of *Scomberomorus* in having rounded pectoral fin.

19. *Scomberomorus commersoni*
(Lacépède, 1800)

Fig. 19

Scomber commersoni, Bloch and Schneider, 1801: 545.

Scomberomorus commersoni, Jordan and Richardson, 1909: 177; Fowler, 1936: 71; de Beaufort and Chapman, 1951: 230; Jones and Silas, 1962: 54; Collette, 1963: 303.

Cybium commersoni, Kishinouye, 1923: 416; Nakamura, 1939: 10.

Materials: 2 specimens, 244 mm-610 mm FL, December 1982, Kaoshiung.

Diagnosis: D¹. XVI-XVII; D². 15-18+9; A. 14-17+9-10; gill rakers 3-4; vertebrae 44 (20+24). Teeth on both jaws compressed, triangular with serrated edges, 30 and 20 in number on upper and lower jaws, respectively. Lateral line abruptly bent below the second dorsal finlet and continued on a more or less wavy course to the caudal base. Color in fresh

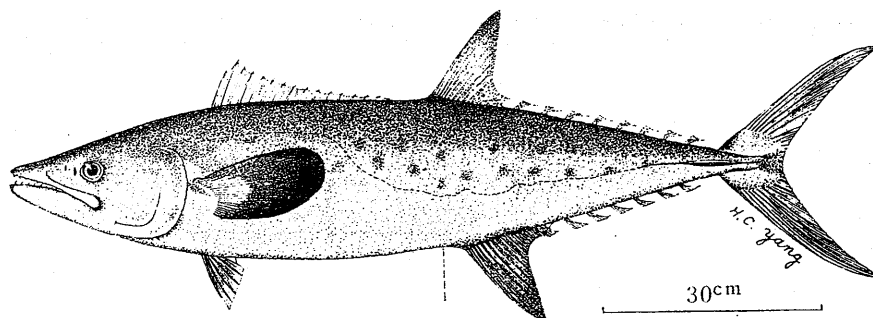


Fig. 18. *Scomberomorus sinensis*, 1056 mm fork length.

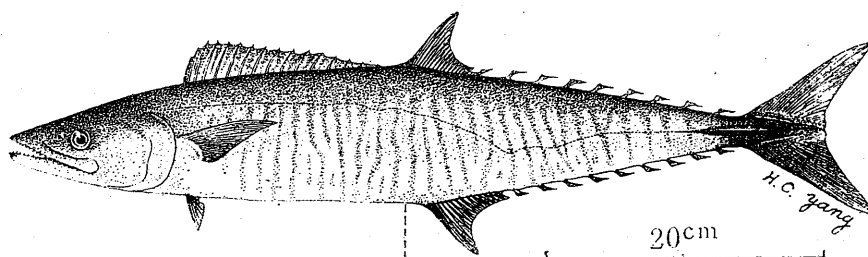


Fig. 19. *Scomberomorus commersoni*, 580 mm fork length.

condition greyish green above and silvery below with 50-60 wavy brownish transverse bands on body side which are represented by fewer cross bars or lengthy spots in young specimens.

Remarks: This species differs from the rest of *Scomberomorus* species in having serrated edges of teeth, much less number of gill rakers (3-4), wavy transverse bands on body side and the lateral line abruptly bent down below the second dorsal finlet.

20. *Scomberomorus niphonius*
(Cuvier and Valenciennes, 1831)

Fig. 20

Cybius niphonium Cuvier and Valenciennes, 1831: 180; Kishinouye, 1923: 421; Nakamura, 1939: 11.

Scomberomorus niphonius, Fowler, 1936: 73; Jones and Silas, 1962: 52.

Sawara niphonia, Chen, 1969: 304.

Materials: 1 specimen, 619mm FL, December 1969, Keelung; 1 specimen, 619 mm FL, March 1956, Keelung.

Diagnosis: D¹. XIX-XX; D². 15-16+8-9;

A. 15-17+8; gill rakers 12-14; vertebrae 50 (22+28). Twenty-three and 18 compressed, triangular teeth on upper and lower jaws respectively. Lateral line slightly undulated, not abruptly bent. Pectoral fin short and sharply tipped. Swimbladder absent. Color in fresh condition lead green above and silvery below, with 8-9 longitudinal series of brownish spots on body side.

Remarks: This species differs from the following species in having much longer spinuous dorsal base and more dorsal spines.

21. *Scomberomorus guttatus*
(Bloch and Schneider, 1801)

Fig. 21

Scomber guttatus Bloch and Schneider, 1801: 23.

Cybius kuhlii, Cuvier and Valenciennes, 1831: 178.

Cybius guttatus, Cuvier and Valenciennes, 1831: 173; Kishinouye, 1923: 419; Nakamura, 1939: 10.

Scomberomorus guttatus, Fowler, 1936: 72; de Beaufort and Chapman, 1951: 232; Jones and Silas, 1962: 62; Collette, 1963: 24.

Scomberomorus kuhlii, Matsubara, 1955: 520.

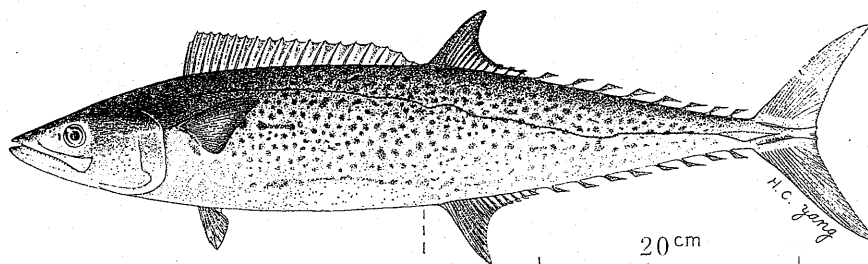


Fig. 20. *Scomberomorus niphonius*, 619 mm fork length.

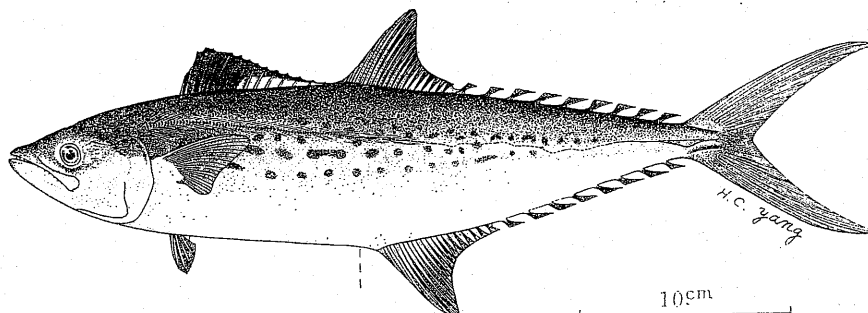


Fig. 21. *Scomberomorus guttatus*, 353 mm fork length.

Materials: 1 specimen, 365 mm FL, January 1974, Kaohsiung; 1 specimen, 343 mm FL, October 1979, Tungkang; 1 specimen, 353 mm FL, April 1956, Tamshui.

Diagnosis: D¹. XV-XVII; D². 18-20+9; A. 20+8-9; gill rakers 3-12 (0-3+3-9); vertebrae 51(21+30). Body depth 4.83-4.84 in standard length, subequal or slightly longer than head length (head length 0.98-1.01 in body depth). About 17 compressed pointed teeth on each jaw. Lateral line slightly undulated, without abrupt bent. Color in fresh condition greyish blue above and silvery white below, with 3-4 longitudinal series of brownish spots on body side. Spinuous dorsal black with a lengthy white patch along the posterior half of dorsal base.

22. *Scomberomorus koreanus*
(Kishinouye, 1915)

Fig. 22

Cybium koreanum, Kishinouye, 1923: 420; Nakamura, 1939: 10.

Cybium kuhlii, Day, 1878: 254.

Scomberomorus koreanus, Matsubara, 1955: 520.

Sawara koreana, Chen, 1969: 304.

Materials: 1 specimen, 550 mm FL, February 1964, Kaohsiung.

Diagnosis: D¹. XIV; D². 18-22+8-9; A. 18-22+7-8; gill rakers 13-15; vertebrae 46 (20+26). Body depth 3.66 in standard length, much deeper than head length (head length 1.36 in body depth). About 16-19 and 13-15 long,

pointed teeth on upper and lower jaws respectively. Lateral line without abrupt bent anywhere. Color in fresh condition bluish green above and silvery white below with 4-5 longitudinal series of small dark spots on body side. Dorsal fin black, pectoral fin with a black lower margin.

Remarks: This species is easily distinguished from *S. guttatus* in that the head is much shorter than the body depth (head length 1.36 vs 0.98-1.01 in body depth). In addition, *S. guttatus* has fewer vertebrae (46 vs 51). Other distinguishing characters between these two species have been discussed by Devaraji (1976).

23. *Thunnus thynnus* (Linnaeus, 1758)

Fig. 23

Scomber thynnus Linnaeus, 1758: 297.

Thynnus orientalis Schlegel in Temminck and Schlegel, 1850: 94.

Thunnus orientalis, Kishinouye, 1923: 437; Nakamura, 1939: 1,

Thunnus thynnus, Fowler, 1936: 67; Collette, 1963: 38; Iwai *et al.*, 1965: 31; Chen, 1969: 303.

Thunnus thynnus orientalis, Jones and Silas, 1962: 30.

Materials: 1 specimen, 190 mm FL, October 1955, Keelung.

Diagnosis: D¹. XIII-XV; D². 14+8-9; A. 13-15+7-8; gill rakers 36-39; L1.230. Pectoral fin shorter than head length, hardly reaching below the eleventh dorsal spine. Second dorsal and anal fins low. Color in fresh condition

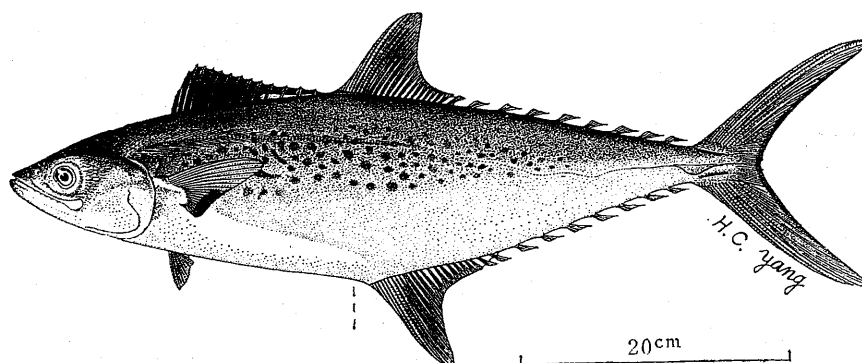


Fig. 22. *Scomberomorus koreanus*, 550 mm fork length.

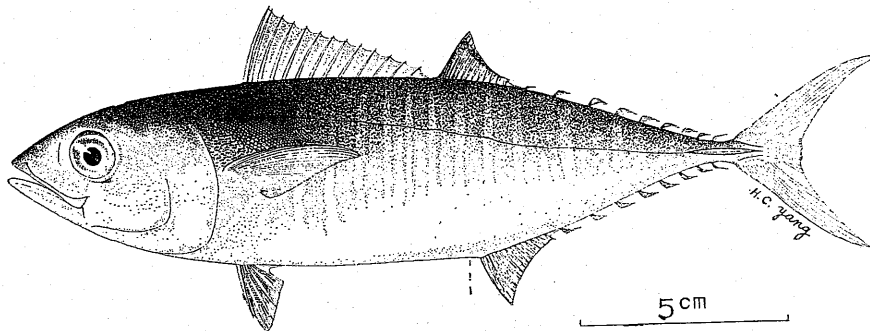


Fig. 23. *Thunnus thynnus*, 190 mm fork length.

greenish black on back and silvery white below, with 10-20 transverse silvery white bands in juvenile. Second dorsal grey with yellowish distal margin, dorsal finlets yellowish, other fins greyish.

24. *Thunnus alalunga* (Bonnaterre, 1788)

Fig. 24

Thunnus germo Kishinouye, 1923: 434; Nakamura, 1939: 2.

Thunnus alalunga, Jones and Silas, 1962: 34; Collette, 1963: 37; Iwai *et al.*, 1965: 28.

Germo alalunga, Chen, 1969: 303.

Materials: 1 specimen, 1001 mm FL, November 1955, Keelung.

Diagnosis: D¹. XIV; D². 14+8; A. 14+8; gill rakers 27-28; L1. 210. Pectoral fin extremely elongated, reaching below the second dorsal finlet. Color in fresh condition, bluish green above and silvery white below. Pectoral fin black, other fins greyish.

25. *Thunnus tonggol* (Bleeker, 1851)

Fig. 25

Thynnus tonggol Bleeker, 1851: 356.

Neothunnus rarus Kishinouye, 1923: 448; Chen, 1969: 303.

Kishinoella rara, Nakamura, 1939: 8.

Thunnus tonggol, de Beaufort and Chapman, 1951: 225; Jones and Silas, 1962: 38; Collette, 1963: 43; Iwai *et al.*, 1965: 39.

Kishinoella zacalles, Tincker, 1978: 326.

Materials: 1 specimen, 294 mm FL, December 1959, Nanfanao.

Diagnosis: D¹. XIII; D². 13-14+8-9; A. 13+8; gill rakers 20-24; L1. 220. Tail longer than trunk length, 2.6 in standard length. Pectoral fin long triangular, measuring 3.72 in standard length (or 4.08 in fork length), slightly shorter than head length; its tip reaching the origin of second dorsal. Color in fresh condition, greenish black above and paler on median line and silvery grey below; ventro-

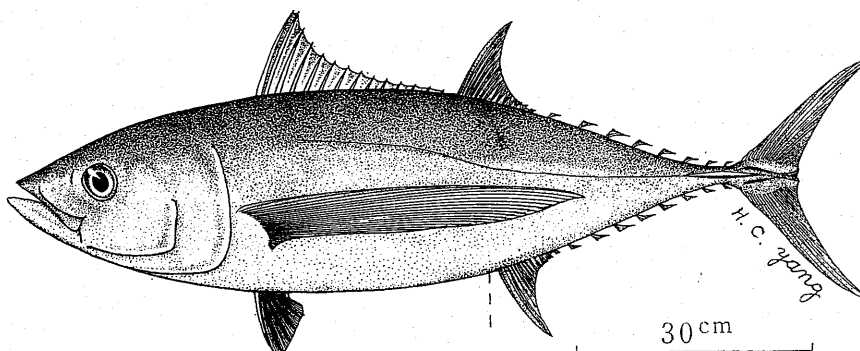


Fig. 24. *Thunnus alalunga*, 1001 mm fork length.

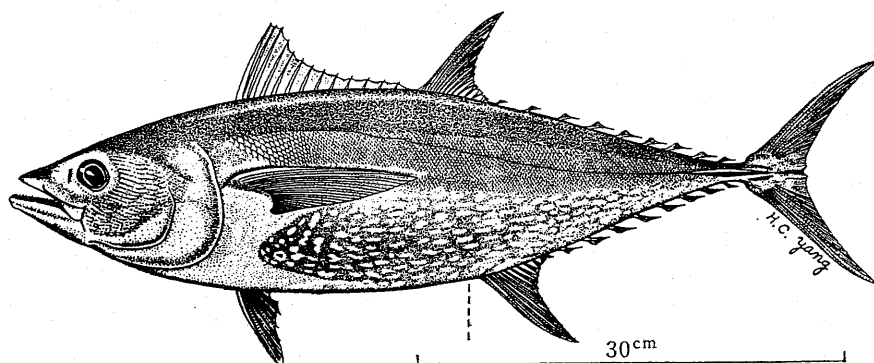


Fig. 25. *Thunnus tonggol*, 552 mm fork length.

lateral side with 5-10 longitudinal series of silvery dots.

Remarks: This species exhibits an apparent resemblance to juvenile yellow fin (*T. albacares*), but it is distinct from the later by the absence of swimbladder. Nakamura (1939) recognized two forms of so-called least tuna (*Kishinoella rara*) from Formosan waters: the short pectoral fin *Kishinoella rara* and the long pectoral fin *K. zacalles*, however, both of them are now considered as the same (Iwai, *et al.*, 1965). The specimen described in this paper agrees more closely to *K. rara* than *K. zacalles*. It is suggested that *Thunnus tonggol* includes two populations: the former *K. rara* of Kishinouye (Nakamura, 1939) from the Western Pacific region including Australia, and the other, *K. zacalles* of Jordan and Evermann (Tincker, 1978) from Hawaiian waters.

26. *Thunnus obesus* (Lowe, 1839)

Fig. 26

Parathunnus mebachi, Kishinouye, 1923: 442; Nakamura, 1939: 4.

Thunnus sibi, de Beaufort and Chapman, 1951: 222.

Thunnus obesus mebachi, Jones and Silas, 1962: 36.

Thunnus obesus, Collette, 1963: 40; Iwai *et al.*, 1965: 34.

Parathunnus sibi, Chen, 1969: 303.

Materials: 1 specimen, 888 mm FL, November 1955, Keelung; 38 specimens, 1210 mm-1640 mm FL, March, 1983, Tunkang.

Diagnosis: D.¹ XIV-XV; D.². 13+9; A. 13+9; gill rakers 26-28; L1. 190. Small conical teeth on both jaws, vomer and palatines. Eyes large, equal or larger than 1/2 snout length (eye/snout=0.67). Pectoral fin much long and pointed, reaching the first dorsal finlet in

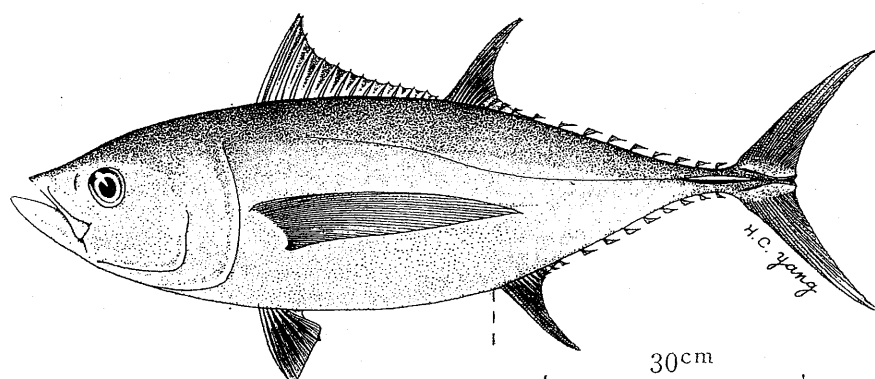


Fig. 26. *Thunnus obesus*, 888 mm fork length.

juvenile (<1 m) and beyond the origin of second dorsal in large adults. Color in fresh condition blackish green above and silvery white below. Dorsal and anal finlets bright yellowish with black margin, other fins greyish.

27. *Thunnus albacares* (Bonnaterre, 1788)

Fig. 27

Thynnus macropterus Schlegel in Temminck and Schlegel, 1842: 98; Day, 1878: 253.

Neothunnus macropterus, Kishinouye, 1923: 446; Fowler, 1936: 68; Nakamura, 1939: 5; Chen, 1969: 303.

Thunnus (*Neothunnus*) *albacares macropterus*, Jones and Silas, 1962: 40.

Thunnus macropterus, de Beaufort and Chapman, 1951: 223.

Thunnus albacares, Collette, 1963: 41; Iwai *et al.*, 1965: 36.

Materials: 2 specimens, 720 mm–1180 mm FL, April 1978, Chengkong; 1 specimen, November 1955, Kaohsiung.

Diagnosis: D¹. XIII–XIV; D². 12–15+8–9; A. 14–15+8–9; gill rakers 27–30; L1. 270. Small conical teeth on both jaws, vomer and palatines. Second dorsal and anal fins long falcate, distinctly longer than body depth in adult but shorter in juvenile. Pectoral fin long, 3.17–3.50 in fork length in juvenile and 3.71 in adult, extending to below the middle of second dorsal fin and to the origin of second dorsal, respectively. Color in fresh condition almost black on back, yellowish on body side and silvery white below, with silvery transverse lines and dots in young of 400 mm–700 mm FL. First dorsal fin greyish tinged with yellowish, second dorsal, anal and finlets of both bright yellowish.

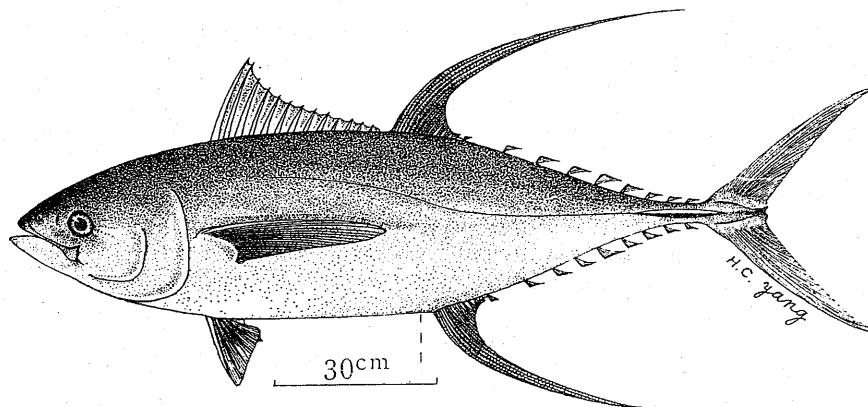


Fig. 27. *Thunnus albacares*, 1380 mm fork length.

Family Acinaceidae (Gempylidae)

**Key to genera and species of Acinaceidae
(Gempylidae)**

1. A single lateral keel on each side of caudal peduncle; scales minute, irregular with small porous scales between; lateral line remarkably tortuous, but very faint and extremely difficult to trace.....
.....*Lepidocybium flavobrunneum*
- Caudal keel absent; scales normal; the undulating lateral line almost obsolete..2
2. Belly keeled; body covered with minute cycloid scales and bony tubercles; lateral line obscure.....*Ruvettus pretiosus*
- Belly not keeled; skin smooth; lateral line prominent.....3
3. Ventrals well developed I, 5; no finlet behind dorsal and anal fins; two lateral lines.....4
- Ventrals rudimentary or absent; finlets behind dorsal and anal fins; one or two lateral lines.....5
4. Body fusiform, depth 1/4 standard length;

- palatines with teeth; lower lateral line running along ventral profile of body..
 *Neoepinnula orientalis*
 Body much elongated, depth 1/10 body length; palatines toothless; lower lateral line running along median body side..
 *Thyrsitoides marleyi*
 5. Body much elongated; 6-7 finlets; ventral very small, 1 spine, 4-5 soft rays; most part of maxilla embedded; vertebrae 49
 *Acinacea notha*
 Body moderately elongated; 2 or 3 finlets; ventral 1 spine, or wanting; maxilla completely exposed; vertebrae 33-34..6
 6. Two lateral lines; ventral 1 spine in juvenile, disappears in adult; 2 or 3 finlets; vertebrae 33 or 34.. *Rexea solandri*
 One lateral line; ventral always 1 spine; 2 finlets; vertebrae 34.....
 *Promethichthys prometheus*

28. *Lepidocybium flavobrunneum*
 (Smith, 1849)

Fig. 28

Lepidocybium flavobrunneum, Smith, 1965: 310; Matsu-

bara, 1955: 534; Chen, 1969: 307.

Materials: 2 specimens, 900 mm-1250 mm FL (880 mm-1220 mm SL), November 1982, Chengkong; 1 specimen, 605 mm FL (547 mm SL), December 1982, Tungking.

Diagnosis: D¹. IX; D². 18+6; A. 16+4-5; gill rakers absent. Teeth on vomer much enlarged. Spinuous dorsal very low. Single lateral line highly undulate. A single lateral keel on each side of caudal peduncle. Generally dark brown, slightly paler below.

29. *Ruvettus pretiosus* Cocco, 1829

Fig. 29

Ruvettus pretiosus, Herre, 1936: 59; Kamohara, 1938: 46; Smith, 1965: 309; Chen, 1969: 307.

Materials: 1 specimen, 350 mm FL, May 1953, Shiaoliuchiu.

Diagnosis: D¹. XIV; D². 2+15+2; A. 2+15+2; P. 14; V. I; gill rakers 8. Body deeper, 4.84 in standard length. Lateral body surface very rough, ventral surface sharply edged. Lateral line single, obscure. Generally dark brown.

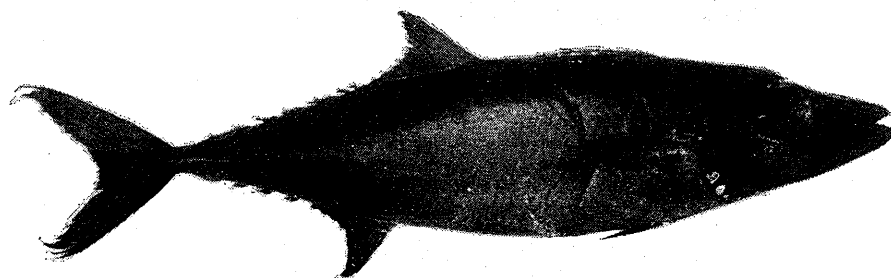


Fig. 28. *Lepidocybium flavobrunneum*, 605 mm fork length.

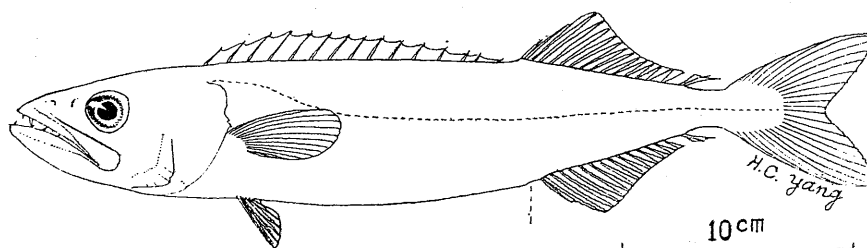


Fig. 29. *Ruvettus pretiosus*, 350 mm fork length.

30. *Neopinnula orientalis*
(Gilchrist and von Bonde, 1924)

Neopinnula orientalis, Kamohara, 1938: 48; Matsubara and Iwai, 1952: 196.

Epinnula orientalis, Smith, 1965: 311.

Materials: 1 specimen, 200 mm FL, May 1964, Tungkang.

Diagnosis: D¹. XV; D². I, 19-20; A. 19-20; P. 13-14; V. I, 5; gill rakers 7; vertebrae 32 (16+16). Body fusciform, 3.8-4.2 in length. Two lateral lines, the upper branch running along the dorsal base and lower branch along the ventral profile of body. No finlets behind dorsal and anal fins. Generally brownish, much darkened on spinuous dorsal.

31. *Thyrsitoides marleyi* (Fowler, 1929)

Fig. 30

Mimasea taeniosoma Kamohara, 1936: 930; Matsubara and Iwai, 1952: 200; Chen, 1969: 307.

Thyrsitoides marleyi, Smith, 1965: 311; Nakamura, 1980: 357.

Materials: 1 specimen, 853 mm FL, March 1957, Keelung.

Diagnosis: D¹. XVII; D². 2+15; A. 1+15; P. 13; gill rakers 6(1+5); vertebrae 34 (19+15). Body elongated, depth 8.41 in standard length (or 8.90 in fork length). Two lateral lines, the upper branch running along the base of spinuous dorsal and the lower branch almost at the median position of body side. No

finlets behind dorsal and anal fins. Generally brownish, paler below. The first four dorsal spines blackish.

32. *Acinacea notha*
Bory de St. Vincent, 1804

Fig. 31

Gempylus serpens, Fowler, 1936: 75; de Beaufort and Chapman, 1951: 198; Matsubara and Iwai, 1952: 202; Smith, 1965: 311.

Acinacea notha, Matsubara, 1955: 535; Chen, 1969: 307.

Materials: 1 specimen, 723 mm FL, May 1963, Kaohsiung.

Diagnosis: D¹. XXVIII; D². I, 12+6; A. III, 10+6; P. 14; V. I, 4; gill rakers 6; vertebrae 49 (26+23). Body much elongated, depth 15.7 in standard length or 16.8 in fork length. Two lateral lines, the upper branch running along the base of spinuous dorsal and the lower branch running along the median position of body side. Six or 7 finlets behind dorsal and anal fins, respectively. Generally dark brown.

33. *Rexea solandri* (Cuvier, 1831)

Fig. 32

Gempylus solandri Cuvier in Cuvier and Valenciennes, 1831: 215.

Rexea solandri, Matsubara and Iwai, 1952: 204; Matsubara, 1955: 535; Chen, 1969: 307.

Rexea prometheoides, de Beaufort and Chapman, 1951: 201.

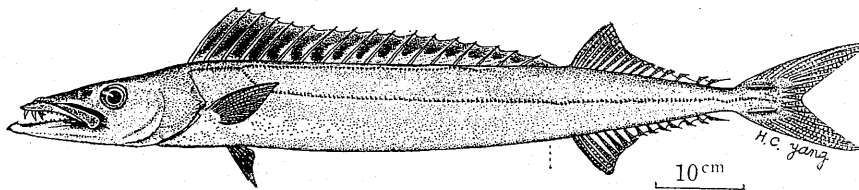


Fig. 30. *Thyrsitoides marleyi*, 853 mm fork length.

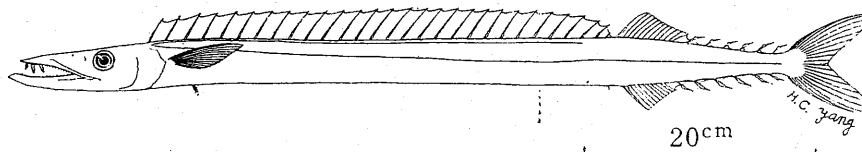
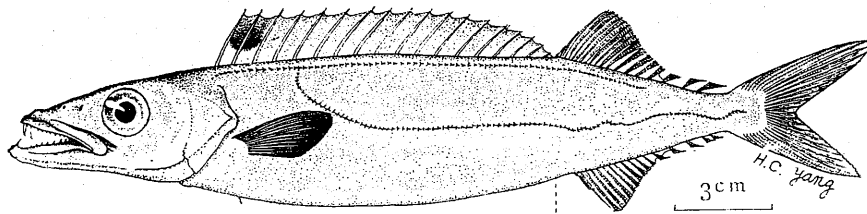


Fig. 31. *Acinacea notha*, 723 mm fork length.

Fig. 32. *Rexea solandri*, 236 mm fork length.

Materials: 1 specimen, 236 mm FL, December 1960, Kaohsiung.

Diagnosis: D¹. XVIII; D². 4+14+2; A. 3+12+3; P. 13; V. I; gill rakers 17 (10+7); vertebrae 33. Body deeper, 4.64 in standard length (or 5.06 in fork length). Two lateral lines, the upper branch running along the dorsal base and the lower branch near the median position of body side. Two and 3 finlets behind dorsal and anal fins, respectively. Ventral fins rudimentary, represented by a pair of tiny spines which usually disappear in large adult. Greyish green tinged with silvery white. Dorsal fins greyish with a black patch on the first three dorsal spines.

34. *Promethichthys prometheus* (Cuvier, 1831)

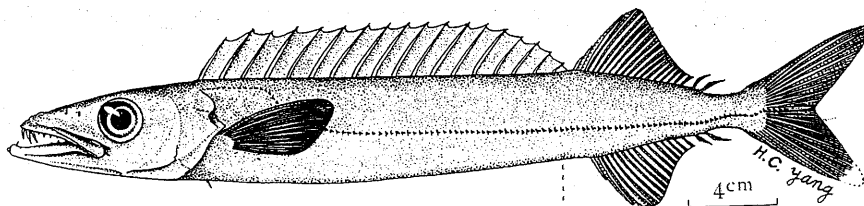
Fig. 33

Gempylus prometheus Cuvier in Cuvier and Valenciennes, 1831: 213.

Promethichthys prometheus, Herre, 1926: 218; Kamohara, 1938: 49; Matsubara and Iwai, 1952: 209; Matsubara, 1955: 536; Chen, 1969: 308.

Materials: 1 specimen, 366 mm FL, date not known, keelung; 1 specimen, 265 mm FL, November 1980, Tungkan; 1 specimen, 323 mm FL, June 1978, Chengkong.

Diagnosis: D¹. XVII-XVIII; D². 3+16+2; A. 2+14+2; P. 15; V. I; gill rakers 14 (4-5

Fig. 33. *Promethichthys prometheus*, 366 mm fork length.

+9-10); vertebrae 34. Body moderately elongated, 6.32-7.05 in standard length (6.92-7.75 in fork length). Single lateral line which abruptly bent down from the point below the 4th dorsal spine and running continuously near the median position of body side. Two finlets behind dorsal and anal fins. Ventral fins represented by a pair of minute spines. Dark purplish above and paler below, dorsal fin black.

Family Trichiuridae

Key to genera and species of Trichiuridae

1. Ventral fin absent; lateral line descending

steeply from the shoulder and running near ventral profile of the body; lower margin of operculum more or less concave; interorbital region more or less flattened; first anal spine not in a scale-like structure (*Trichiurus*)2

Ventral fin present; lateral line descending gently from the shoulder and running near the median or submedian position on body side; lower margin of operculum convex; interorbital region convex; first anal spine with a scale-like structure...3

2. More barbed teeth than pointed teeth on lower jaw; ventral process of articular bone longer, 2/5 to 1/2 total length of

articular bone; anterior end of dorsal process not exceed that of ventral process; body depth 12-15 in total length or 4.7-5.6 in preanal length; eyes, pectoral and dorsal fins yellowish when alive.....*Trichiurus lepturus*

More pointed teeth than barbed teeth on lower jaw; ventral process of articular bone shorter, less than 2/5 total length of articular bone, anterior end of dorsal process extends far beyond that of ventral process; body depth 14-17 in total length or 5.5-6.5 in preanal length; eyes, pectoral and dorsal fins not in yellowish when alive.....*Trichiurus japonicus*

3. Caudal fin absent; dorsal rays 125-147, first 5 rays spinous; body depth 18-22 in total length*Tentoriceps cristatus*

Caudal fin present; dorsal rays 77-93, first 10 rays spinuous; body depth 11-13 in total length (*Evoxymetopon*)4

4. Dorsal rays 77, first ray not protruded ...

.....*Evoxymetopon taeniatum*

Dorsal rays 91, first ray enlarged, much elongated.....*E. poeyi*

35. *Trichiurus lepturus* Linnaeus, 1758

Fig. 34

Trichiurus lepturus Linnaeus, 1758: 246; Tucker, 1956: 114; James, 1967; Lee *et al.*, 1977: 80.

Trichiurus haumela Day, 1878: 201; Fowler, 1936: 78; de Beaufort and Chapman, 1951: 194; Chen, 1969: 308.

Materials: 64 specimens, 726mm-1625mm TL, March to May, 1976, Tungkan.

Diagnosis: D. 137-141; P. 10-12; V. absent; precaudal vertebrae 37-40. Uniformly silvery when alive. Dorsal fin with black distal margin and yellowish base, fin membrane between first three dorsal rays black. Pectoral fins and eyes yellowish.

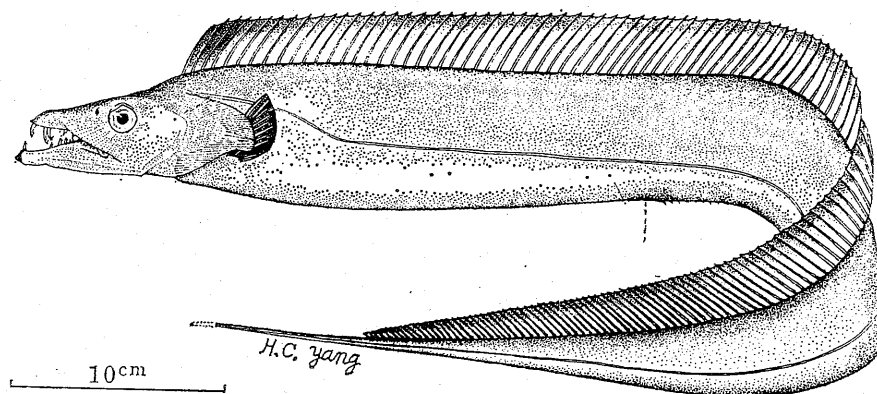


Fig. 34. *Trichiurus lepturus*, 765 mm total length.

36. *Trichiurus japonicus* Temminck and Schlegel, 1844

Fig. 35

Trichiurus lepturus japonicus Temminck and Schlegel, 1844: 102.

Trichiurus japonicus, Günther, 1860: 347; Fowler, 1936: 79; Lee *et al.*, 1977: 81.

Trichiurus auriga Klunzinger, 1884: 120; de Beaufort and Chapman, 1951: 196.

Trichiurus lepturus, Tucker, 1956: 114 (in part); James, 1967: 17 (in part).

Materials: 67 specimens, 885mm-1259mm TL, June to July 1976, Chengkong.

Diagnosis: D. 137-141; P. 11; V. absent; precaudal vertebrae 38-40. Color in fresh condition silvery white, darker on back, Dorsal fin base whitish, distal half of pectoral fin and the entire whiptail black, eyes greyish.

37. *Tentoriceps cristatus* (Klunzinger, 1884)

Fig. 36

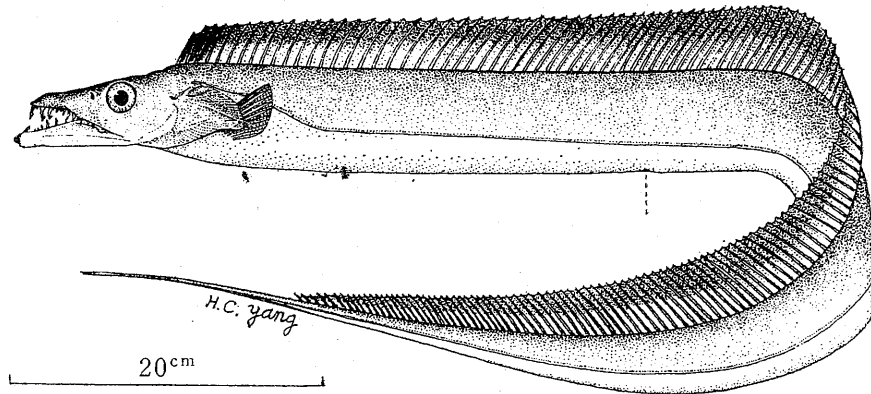


Fig. 35. *Trichiurus japonicus*, 1054 mm fork length.

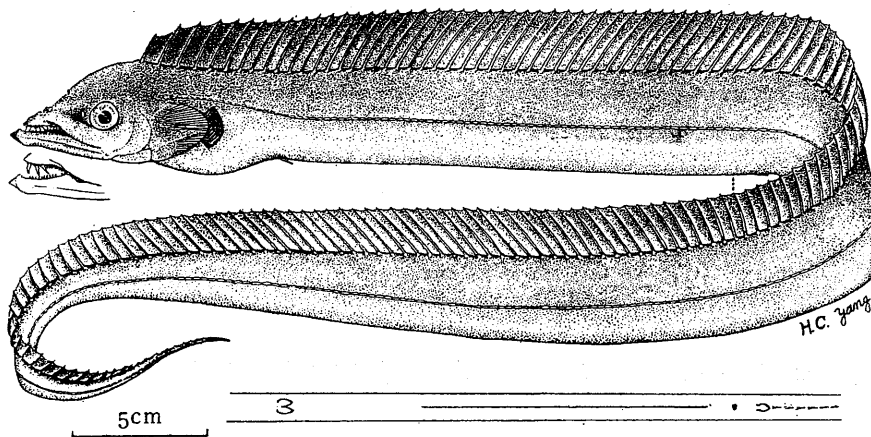


Fig. 36. *Tentoriceps cristatus*, 742 mm total length.

Trichiurus cristatus Klunzinger, 1884: 120.

Tentoriceps cristatus, Tucker, 1956: 110; Senta, 1975: 175; Lee *et al.*, 1977: 78.

Trichiurus mutica, Chen, 1969: 308.

Materials: 25 specimens, 635 mm–825 mm TL, 1969–1974, Pescadores.

Diagnosis: D. 125–147; P. 11–12; V. I; precaudal vertebrae 46–48. Upper profile of head strongly convex, forming a sharp cranial crest. Teeth on both jaws small and pointed. Anal fin rudimentary, first spine distinct and covered by a piece of V-shaped process, the following spinules embedded in skin. Lateral line running near the median position on body side. Color in fresh condition dark grey above and silvery below. Dorsal fin yellowish with black dots, whiptail dusky, anus surrounded by a black ring.

38. *Evoxymetopon taeniatus* (Poey 1863)

Fig. 37

Evoxymetopon taeniatus Poey, in Gill, 1863: 228; Matsubara, 1955: 536; Tucker, 1956: 99.

Materials: 1 specimen (male), 1700 mm TL, October 1979, Chengkong.

Diagnosis: D. 79–91; A. 19; P. 12; V. I. Body depth 11.07 in total length. Upper profile of head strongly convex forming a well developed cranial ridge. Ventral fin rudimentary, represented by a pair of scale-like structure. Anterior half of anal fin rays embedded in the skin except the first keel-like scale, the remaining anal elements on the posterior half very short, about 18 in numbers. Caudal fin deeply forked. Color in fresh condition silvery white, darker on back.

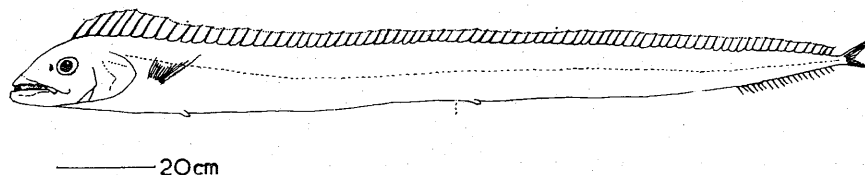


Fig. 37. *Evoxymetopon taeniatus*, 1700 mm total length.

39. *Evoxymetopon poeyi* Günther, 1887

Fig. 38

Evoxymetopon poeyi Günther, 1887: 39; Tucker, 1956: 99; Abe and Asai, 1975: cover 1-3.

Materials: 1 specimen (female), 1985 mm TL, February 1978, Shiao-liuchiu.

Diagnosis: D.1, 90; P. 12; A. 1, 93; V. I; gill rakers 26. Body depth 12.27 in total length. Upper profile of head gently convex. First dorsal ray enlarged and much elongated, nearly as long as head length. Ventral fin represented by a pair of minute scale-like structure. Silvery white, darker on back.

Remarks: This species resembles *E. taenia-*

tus but is distinguishable from the latter in having much elongated and protruded first dorsal ray, fewer dorsal fin elements and the upper profile of head does not as steeply as that of *E. taeniatus*. Tucker (1956) suggested that *E. poeyi* with an elongated first dorsal ray was male and *E. taeniatus* with normal fin ray was female of one species and that the elongated first dorsal ray was a sexual dimorphic character. In fact, the specimens of *E. poeyi* and *E. taeniatus* we examined were female and male, respectively. The sex of our specimens of these species falsifies Tucker's hypothesis and we infer that *E. poeyi* with an elongated first dorsal ray should remain a valid species.

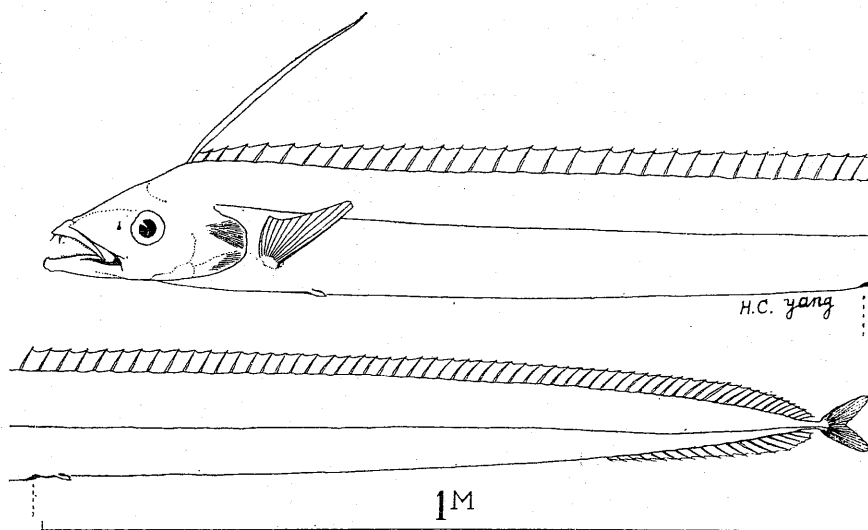


Fig. 38. *Evoxymetopon poeyi*, 1985 mm total length.

Acknowledgements: The senior author (SCL) would like to express his gratitude to National Science Council of the Republic of China (NSC-66B-0204-02(01)) for financial support.

REFERENCES

- ABE, T. and M. ASAI (1975) Records of *Evoxymetopon poeyi* Günther from Japan. *UO* 25: cover 1-3.

- BLEEKER, P. (1851) Oven eenige nieuwe en soorten van Makreelachtige visschen van den Indischen Archipel. *Nat. Tijdschr. Ned. Indie* 1: 314-372.
- BLEEKER, P. (1854) Fauna ichthyologicae japonicae species novae. VI. *Nat. Tijds. Ned. Ind.* 102: 395-426.
- BLOCH, M. E. and J. G. SCHNEIDER (1801) *Systema ichthyologiae iconibus cs illustratum*. Sanderiano Commisum, Berlin (reprinted 1967). 584 pp.
- CANTOR, T. E. (1849) Catalogue of Malayan fishes. *J. Asiatic Soc. Bengal* 18(2): 983-1443.
- CHANG, K. H. and S. C. LEE (1971) Study on the fishes of subfamily Scombrinae from Taiwan. *Act. Oceanogr. Taiwanica* 1: 77-88.
- CHEN, J. T. F. (1969) *A synopsis of the vertebrates of Taiwan*. Vol. 1. Commercial Books Co., Taipei. 548 pp.
- COLLETTE, B. B. (1963) *Preliminary field guide to the mackerel and tuna-like fishes of the Indian Ocean (Scombridae)*. Smiths. Inst., Washington. 48 pp.
- COLLETTE, B. B. and L. N. CHAO (1975) Systematics and morphology of the bonitos (*Sarda*) and their relatives (Scombridae, Sardini). *Fish. Bull.* 73(3): 516-625.
- CUVIER, B. and M. VALENCIENNES (1831) *Histoire naturelle des poissons*. Vol. 8. Paris. 509 pp.
- DAY, F. (1878) *The fishes of India, being a natural history of the fishes known to inhabit the seas and freshwater of Indian, Burma and Ceylon*. 2 Vols. Today and Tomorrow's Book Agency, New Delhi (reprinted 1967). 778 pp.
- DE BEAUFORT, L. F. and W. F. CHAPMAN (1951) *The fishes of Indo-Australian Archipelago*. Vol. 9. E. J. Brill, Leiden. 484 pp.
- DEVARAJI, M. (1976) Discovery of the scombrid *Scomberomorus koreanus* (Kishinouye) in India, with taxonomic discussion on the species. *Jap. J. Ichthyol.* 23(2): 79-87.
- FOWLER, H. W. (1936) A synopsis of the fishes of China. VI. The mackerels and related fishes. *Hongkong Nat.* 7(1): 61-80.
- GILL, T. (1863) Synopsis of the family of Lepturoids and description of a remarkable new generic type. *Proc. Acad. Nat. Sci. Philadelphia* 1863: 224-229.
- GÜNTHER, A. (1860) *Catalogue of the acanthopterygian fishes in the collection of the British Museum*. Vol. 2. London. 548 pp.
- GÜNTHER, A. (1887) Report on the deep-sea fishes collected by H. M. S. Challenger during the years 1873-1876. *Rep. Sci. Res. Exp. Voy. H. M. S. Challenger, Zool.* 22: 1-335.
- HERRE, A. W. C. T. (1926) Four rare Philippine fishes. *Philip. J. Sci.* 31(2): 217-227.
- HERRE, A. W. C. T. (1936) Notes on fishes in the Zoological Museum of Stanford University. V. New or rare Philippine fishes from the Herre 1933 Philippine expedition. *Philip. J. Sci.* 59(3): 357-373.
- HIRASAKA, K. and H. NAKAMURA (1947) On the Formosan spearfishes. *Bull. Oceanogr. Inst. Taiwan* 3: 9-24.
- IWAI, T., I. NAKAMURA and K. MATSUBARA (1965) Taxonomic study of the tunas. *Misaki Mar. Biol. Inst. Kyoto Univ. Spec. Rep.* 2: 1-51.
- JAMES, P. S. B. R. (1967) The ribbonfishes of the family Trichiuridae of India. *Mem. Mar. Biol. Ass. India* 1: 1-226.
- JONES, S. and E. G. SILAS (1962) A systematic review of the scombroid fishes of India. *Symp. on Scombroid fish.* 1: 1-105.
- JORDAN, D. S. and J. O. SNYDER (1901) Description of nine new species of fishes contained in Museum of Japan. *J. Coll. Sci., Imp. Univ. Tokyo.* 15: 301-311.
- JORDAN, D. S. and B. W. EVERMANN (1902) Notes on a collection of fishes from the island of Formosa. *Proc. U. S. Nat. Mus.* 15(1289): 315-368.
- JORDAN, D. S. and R. E. RICHARDSON (1909) A catalogue of the fishes of the island of Formosa or Taiwan, based on the collection of Dr. Hans Sauter. *Mem. Carneg. Mus.* 4(4): 159-204.
- KAMOHARA, T. (1936) Supplementary note on the fishes collected in the vicinity of Kochi-Shi. (X). *Zool. Mag.* 48(11): 929-935.
- KAMOHARA, T. (1938) Gempylidae of Japan. *Annot. Zool. Jap.* 17(1): 45-50.
- KISHINOUE, K. (1923) Contributions to the comparative study of the so-called scombroid fishes. *J. Coll. Agri., Imp. Univ. Tokyo.* 8(3): 293-475.
- KLUNZINGER, C. B. (1884) *Die fischdes Rothen Meeres I. Theil acanthopteri veri owen*. E. Schweizerbart'sche Verlagshandlung (K. Koch). Stuttgart. 133 pp.
- LEE, S. C., K. H. CHANG, W. L. WU and H. H. YANG (1977) Formosan ribbonfishes (Perciformes: Trichiuridae). *Bull. Inst. Zool., Academia Sinica* 16(2): 77-84.
- LINNAEUS, C. (1758) *Systema naturae sive regna tria naturae* (ed. 10). Laurenti Salvii Holmae, Leipzig. 824 pp.
- MANACOP, P. R. (1956) A preliminary systematic

- study of the Philippine chub-mackerels, family Scombridae genera *Pneumatophorus* and *Rastrelliger*. *Philip. J. Fish.* 4(2): 79-101.
- MATSUBARA, K. and I. IWAI (1952) Studies on some Japanese fishes of the family Gempylidae. *Pacif. Sci.* 6(3): 193-212.
- MATSUBARA, K. (1955) *Fish morphology and hierachy*. Part 1. Ishizaki-Shoten, Tokyo. 789 pp.
- MATSUI, T. (1967) Review of the mackerel genera *Scomber* and *Rastrelliger*. *Copeia* (1967): 77-83.
- NAKAMURA, H. (1938) Report of an investigation of the spearfishes of Formosan waters. *Rep. Taiwan Govern. Gen. Fish. Exp. Sta.* 10: 1-34.
- NAKAMURA, H. (1939) A note on tunnies with a list of scombroid fishes from Formosa waters. *Rep. Taiwan Govern. Gen. Fish. Exp. Sta.* 13: 9-14.
- NAKAMURA, I., T. IWAI and K. MATSUBARA (1968) A review of the sailfish, spearfish, marlin and swordfish of the world. *Misaki Mar. Biol. Inst., Kyoto Univ. Spec. Rep.* 4: 1-95.
- NAKAMURA, I. (1980) New record of a rare gempylid, *Thyrsitoides marleyi*, from the sea of Japan. *Jap. J. Ichthyol.* 26(4): 357-360.
- NELSON, J.S. (1976) *Fishes of the world*. Wiley-Interscience. New York, London, Sydney and Toronto. 416 pp.
- SENTA, T. (1975) Redescription of trichiurid fish *Tentoriceps cristatus* and its occurrence in the south China Sea and the Straits of Malacca. *Jap. J. Ichthyol.* 21: 175-182.
- SMITH, J.L.B. (1965) *The sea fishes of southern Africa*. Central News Agency, Ltd., South Africa (revised). 580 pp.
- TANAKA, S. (1911-1914) *Figures and description of the fishes of Japan*. Vols. 16-30. Daiich Shoin, Tokyo. 324 pp.
- TEMMINCK, C. and H. SCHLEGEL (1842-1850) Pisces In *Siebold's fauna Japonica*. 323 pp.
- TINKER, S.W. (1978) *Fishes of Hawaii*. Hawaiian Service Inc., Honolulu. 532 pp.
- TUCKER, D.W. (1956) Studies on the trichiurid fishes. 3. A preliminary revision of the family Trichiuridae. *Bull. Brit. Mus. (Nat. Hist.) Zool.* 4: 73-130.

臺灣之鯖形亞目魚類

李 信 徹 楊 鴻 嘉

本報告係記述棲息於臺灣海域之五科三十九種鯖形亞目之魚類，其中屬於帶魚科 (Trichiuridae) 之二種具有尾鰭之 *Evoxymetopon taeniatus* 及 *E. poeyi* 為臺灣之新紀錄種。每種魚類均備有分種檢索表，種之特徵，同物異名及外形圖，以利學者之參考。