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INDIAN OCEAN ANCHOVIES COLLECTED BY THE *ANTON BRUUN* AND *TE VEGA*, 1963-64

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INTRODUCTION

DURING the International Indian Ocean Expedition of 1963/64, the United States research vessels ANTON BRUUN and TE VEGA collected, *inter alia*, nearly eighteen hundred specimens of anchovy (Family Engraulidae). These were sent to the British Museum (Natural History) for identification after preliminary sorting by the Sorting Center of the Smithsonian Institute in Washington.

The anchovies were caught (by various types of trawl) in four main areas :

(*a*) *Bay of Bengal* (Anton Bruun, cruise 1, stations 39A, 40, 41, 41A, 44, 44A, 45, 46, 47, 47B, Mar. 31-Apr. 5 1963).

(*b*) *Arabian Sea* (Anton Bruun, cruise 4, stations 203B, 203C, 211A, 212A, 217A, 223A, 224A, 225A, 228A, 236A, 241A, 242A, 243A, 244A, 248A, 267A, 268A, 274A, 275A, 276A, 277A, Nov. 15-Dec. 8 1963 ; also cruise VI off Bombay, May 12 1964).

(*c*) *Eastern coast of Africa* (Anton Bruun, cruise 8, stations 403A, 408B—Mozambique Channel, Oct. 9 1964 ; cruise 9, stations 9, HA-10, FT-2—Kenya coast and Comoro Is., Nov. 16-25 1964 ; cruise A, station 3—near Sokotra, Feb. 25 1963) (Te Vega, station 138—Comoro Is., and from Mombasa and Madagascar, Jan. 25-Nov. 16 1964).

(*d*) *East Indies* (Anton Bruun—Thailand, Mar. 22 1963) (Te Vega, cruise 1, station 53—Halmaheira, Sept. 24 1963 ; cruise 6, stations 246, 251—Guadalcanal, Solomons, March 10 and 20 1965).

The location of the stations is cited in the list of material under each species, and the approximate areas are shown on the map (Figure 1).

The following 5 genera and 16 species are represented in this collection.

Stolephorus buccaneeri (Strasburg) (7 specimens)

Stolephorus Species A (85 specimens)

Stolephorus commersonii Lacepède (10 specimens)

Stolephorus indicus (van Hasselt) (3 specimens)

Stolephorus macrops Hardenberg (7 specimens)

Stolephorus Species C (5 specimens)

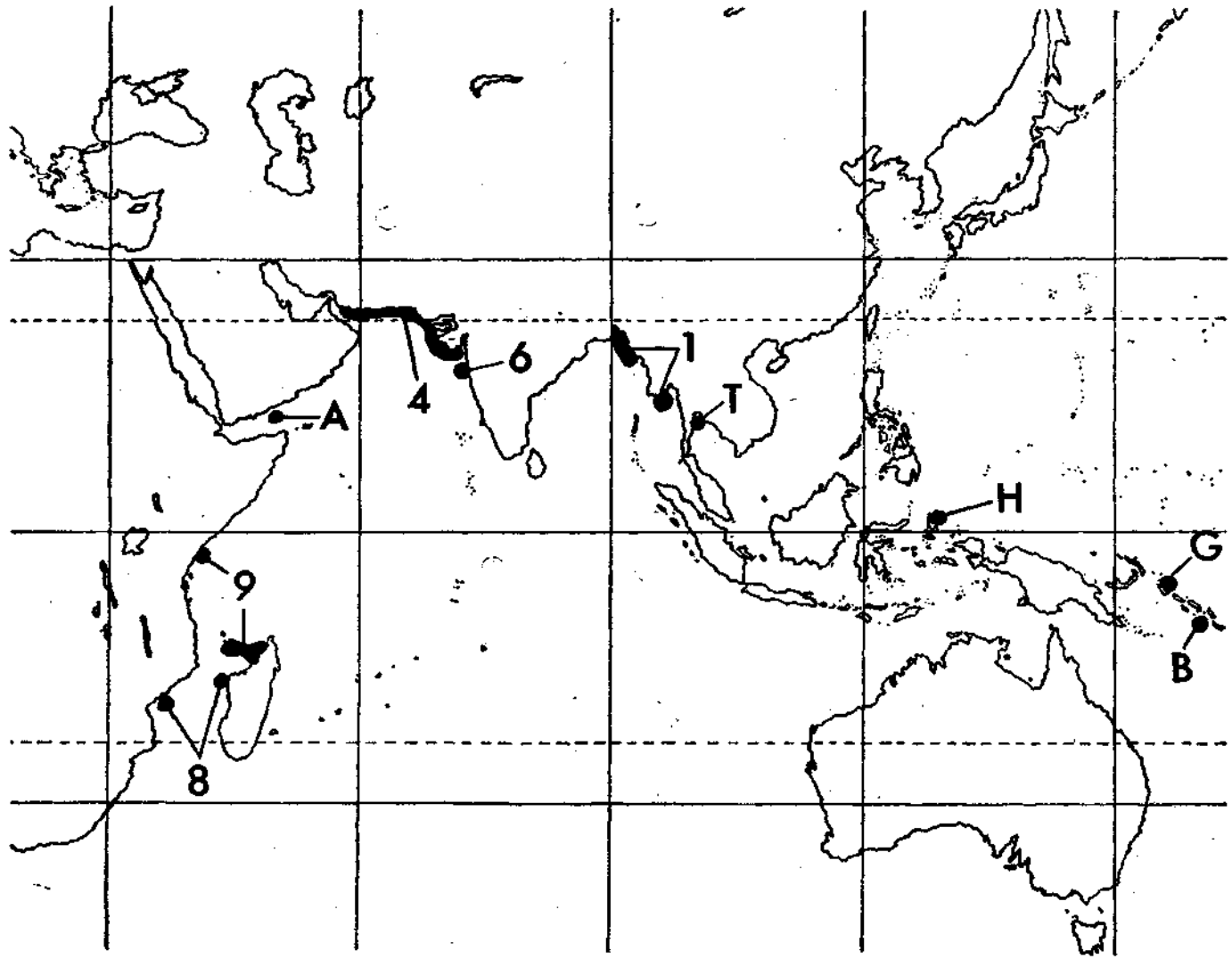

FIG. 1. Areas in which anchovies were caught by the Anton Bruun and Te Vega. 1, 4, 6, 8, 9 cruise numbers.
A Cruise A, sta. 3. T Patong Bay, Phuket, Thailand. H Kau Bay, Halmaheira.
G Guadalcanal. B Bougainville I.

Stolephorus bataviensis Hardenberg (6 specimens)

Stolephorus sp. (juveniles) (139 specimens)

Thrissina baelama (Forsskål) (274 specimens)

Thryssa malabarica (Bloch) (4 specimens)

Thryssa setirostris (Broussonet) (7 specimens)

Thryssa dussumieri (Valenciennes) (460 specimens)

Thryssa vitrirostris (Gilchrist & Thompson) (56 specimens)

Setipinna taty (Valenciennes) (45 specimens)

Setipinna godavari Babu Rao (53 specimens)

Coilia ramcarati (Hamilton Buchanan) (1 specimen)

Coilia neglecta sp. nov. (618 specimens)

One new species is described from this collection and two new species, referred to here as *Stolephorus* Species A and C, will shortly be described by Mr. Ronquillo. The present material is noteworthy for the contribution that it makes to museum collections of Indian Ocean anchovies. Many of the species have hitherto been poorly represented, and it is remarkable that by far the most abundant species in this collection (*Thryssa dussumieri* and *Coilia neglecta* sp. nov.) have until now been rare or unrepresented.

The review by Fowler (1941 : 666-723) is still the most comprehensive work on Indo-Pacific anchovies. Considerable advances have since been made, and the genus *Stolephorus* is now under review by Mr. I. Ronquillo, while Dr. S. Dutt is revising the Indian species of *Thryssa*. They have generously allowed me to use their unpublished findings, and this has enabled better keys to be constructed for the genera *Stolephorus* and *Thryssa*. New keys for the genera *Setipinna* and *Coilia* are also given, based on the present material and published and unpublished work by the author.

The specimens are generally in excellent condition, and the initial sorting and labelling (by Irving, Munroe, Seater, Lucas, Goodyear, Aimone and Knapp) deserves comment for its accuracy. A part of the collection is now incorporated in the collections of the British Museum (Natural History) ; the relevant batches are marked with an asterisk, with the registration number in parenthesis.

Acknowledgement is made here to the Smithsonian Institution for graciously donating a part of the collection to the British Museum. I am most grateful to Mr. I. Ronquillo for help with specimens of *Stolephorus* and Dr. S. Dutt for his invaluable notes on *Thryssa*.

Stolephorus Lacepède, 1803

The seven species of *Stolephorus* listed here are all fairly common in the Indian Ocean. Their identification is not always possible using the keys of Fowler (1941 : 696) or Babu Rao (1966 : 102), and much material has been mis-identified in the past. Through the work of Mr. I. Ronquillo, new and more stable characters have been

found and the key given here (for all species) is based on his studies (species recorded here are marked with an asterisk).

I. Anal origin under or behind last dorsal ray ; muscular portion of isthmus not reaching to hind border of branchiostegal membrane, leaving portion of urohyal exposed.

A. Maxilla pointed posteriorly, projecting beyond anterior border of pre-operculum ; urohyal plate bony.

1. Lower gillrakers 24-27 ; head short, its length more than 4 times in S.L. .....*S. heterolobus* (Rüppell, 1837)

2. Lower gillrakers 21-24 (rarely 25) ; head long, its length less than 4 times in S.L.....*Species A (see p. 17)

B. Maxilla truncate posteriorly, not reaching beyond anterior border of pre-operculum ; urohyal plate fleshy.

1. Maxilla 4-5 times in S.L., just reaching to anterior border of pre-operculum.

(*a*) Lower gillrakers 23-24.....*S. purpureus* Fowler, 1900

(*b*) Lower gillrakers 16-18.....Species B (see below)

2. Maxilla 5-6 times in S.L., not reaching to anterior border of pre-operculum ; lower gillrakers 24-26 .....**S. buccaneeri* Strasburg, 1960

II. Anal origin under dorsal base ; muscular portion of isthmus extending forward beyond hind margin of branchiostegal membrane.

A. Hind border of pre-operculum indented near maxilla tip.

1. Double pigment line on back behind dorsal base ; body deep, its depth equal to upper jaw ; snout short and blunt.

(*a*) Pre-dorsal spine present (but no spine on pelvic scute) ; lower gillrakers 20-27.....**S. macrops* Hardenberg, 1933 (*S. baganensis* Hardenberg of authors)

(*b*) Pre-dorsal spine absent ; lower gillrakers 23-30..... .....*Species C (see p. 18)

2. No double pigment line on back, melanophores absent or at most irregularly scattered ; body more slender, its depth less than upper jaw ; snout longer, pointed.

(*a*) Head large, its length 4.0-4.2 in S.L. ; lower gillrakers 26-30 ; pre-pelvic scutes 6-9.....*S. holodon* (Boulenger, 1902)

(*b*) Head smaller, its length 4.2-4.5 times in S.L. ; lower gillrakers 19-21 ; pre-pelvic scutes 5-6.....*S. andhraensis* Babu Rao, 1966

B. Hind border of pre-operculum evenly rounded near maxilla tip.

1. Pre-dorsal spine present, and spine on pelvic scute ; lower gillrakers 23-27 .....*S. tri* (Bleeker, 1852)

2. No pre-dorsal spine, no spine on pelvic scute.

(*a*) Maxilla tip reaching to or just beyond *anterior* border of pre-operculum; posterior frontal fontanelles narrow, lateral borders straight; 4-5 pre-pelvic scutes.....**S. indicus* (van Hasselt, 1823)

(*b*) Maxilla tip reaching to or beyond *posterior* pre-operculum border.

(i) Posterior frontal fontanelles broad, lateral borders sigmoid; lower gillrakers more than 21, more than 23 on whole 3rd arch.

(α) Pre-pelvic scutes 3-4 (rarely 5); lower gillrakers 23-27..... .....**S. commersonii* Lacepède, 1803

(β) Pre-pelvic scutes 5-6 (usually 6); lower gillrakers 25-29..... .....*S. chinensis* (Günther, 1880)

(ii) Posterior frontal fontanelles narrow, lateral borders straight; lower gillrakers not more than 23, less than 21 on whole 3rd arch .....**S. bataviensis* Hardenberg, 1933

The new species which will be described by Mr. Ronquillo are here designated Species A, B and C. Species A and Species C are represented in the present material. Species B is very close to the Hawaiian *Stolephorus purpureus* but is found in the Philippines and Taiwan. The absence of *Stolephorus heterolobus* and *S. tri* from the present collection is surprising since the first is very common and widespread throughout the Indo-Pacific area, and the second has been recorded several times from India (Fowler, 1941 : 709).

Stolephorus buccaneeri Strasburg, 1960

Stolephorus buccaneeri Strasburg, 1960, *Pacific Sci.*, **14** (4) : 396 (Hawaii).

(*a*) 3 fishes, 18.5, 23.8 and 30.8 mm. S.L., off Matsumudu, Anjouan Is., Comoro group, 12°10′S : 44°23′30″E (12 : 7 : 64), Te Vega Exped., sta. 138, BMNH. 1967 11-20, 1-3.

(*b*) 4 fishes, 16.2-28.2 mm. S.L., off Dzaoudzi, Mayotte I., Comoro group, 12°50′S : 45°16′E (24 : 11 : 64), Anton Bruun cruise 9.

First described from Hawaii, this species was later recorded from the Red Sea area, Durban (Whitehead, 1965 : 269), and Mombasa (Losse, 1966 : 176), as well as from Formosa and Hong Kong (Whitehead, 1966 : 49). The present records slightly extend the range, but the absence of this species from the Arabian Sea and Bay of Bengal collections is striking. *Stolephorus buccaneeri* may be a more primitive form that has been forced to the fringes of the region by later and more specialized species. Mr. Ronquillo informs me that he has only a few specimens of *S. buccaneeri* from India (Calicut and Vizhingam), and that the species must be very rare in Indian waters.

Stolephorus Species A

(*a*) 22 fishes, 50.6-67.2 mm. S.L., Anton Bruun cruise 1, sta. 47B, 19°50′N : 92°55′E (5 : 4 : 63) (4 fishes alizarin stained). BMNH. 1967. 11-20. 4-25.

(*b*) 31 fishes, 49.2-60.0 mm. S.L., Anton Bruun cruise 4B, sta. 267A, 24°10′N : 57°05′E (2 : 12 : 63) (3 fishes alizarin stained). BMNH. 1967. 11-20. 26-36.

(*c*) 32 fishes, 48.2-58.2 mm. S.L., Anton Bruun cruise 4B, sta. 268A, 24°12′N : 57°26′E (3 : 12 : 63). BMNH. 1967. 11-20. 57-88.

Hardenberg (1933 : 261) seems to have based his new species *Stolephorus pseudoheterolobus* on specimens of *S. heterolobus* (Whitehead, 1965 : 268), while his description of *S. heterolobus* agrees with the present species (Ronquillo, *pers. comm.*). Hardenberg's types cannot now be traced and were probably destroyed during the war. To resolve the confusion surrounding these names a new name must be given to the present species and *S. pseudoheterolobus* must be placed in the synonymy of *S. heterolobus*.

Stolephorus commersonii Lacepède, 1803

Stolephorus commersonii Lacepède, 1803, *Hist. Nat. Poiss.*, **5** : 381, 382, pl. 12, fig. 1 (*ex* Mauritius ; on Commerson notes and drawing).

(*a*) 1 fish, 87.3 mm. S.L., fresh-brackish stream, Ambato Zavavy, Nosy Bé, Madagascar (25 : 1 : 64), in minnow seine. **BMNH. 1967. 11-20. 89.**

(*b*) 1 fish, 87.2 mm. S.L., Patong Bay, Phuket, Thailand (22 : 3 : 63) (Anton Bruun). BMNH. 1967. 11-20. 90.

(*c*) 2 fishes, 81.2-83.0 mm. S.L., Anton Bruun cruise 9, sta. FT-2, Mombasa fish market, Kenya (16 : 11 : 64). **BMNH. 1967. 11-20. 91-92.**

(*d*) 6 fishes, 29.5-41.0 and 64.6-66.2 mm. S.L., Anton Bruun cruise 9, sta. HA-10, brackish channel of Debeney river just below road bridge, E. side of Mayotta I., Comoro group, 12°49′56″S : 45°12′09″E (24 : 11 : 64).

An extremely widespread species, recorded from Hong Kong (Whitehead, 1966 : 49) to the eastern coasts of Africa (Losse, 1966 : 178).

It is noteworthy that two of the present four batches were from brackish water, the other two were from localities close inshore, and that no specimens came from the Bay of Bengal or Arabian Sea trawling stations. Fowler (1941 : 703) listed only three records of this species from India. Its presence off the eastern coast of India was confirmed by Babu Rao (1966), but the species seems to be rare in Indian waters (Ronquillo, *pers. comm.*).

Stolephorus Species C

a. 5 fishes, 25.5-40.0 mm. S.L., Baie d'Amboro, N.W. coast of Madagascar (12.2.64). **BMNH. 1967. 11-20. 93-97.**

This species, which will be described by Mr. Ronquillo, bears a very strong resemblance to *Stolephorus macrops* (=*S. baganensis* of authors), but it lacks a predorsal spine. The absence of a double line of melanophores behind the dorsal base in *Stolephorus holodon* and *S. andhraensis* (see key above) appears to be a stable character and one that clearly separates Species C from *S. holodon*.

Stolephorus indicus (van Hasselt, 1823)

Engraulis indicus van Hasselt, 1823, *Alg. Konst- en Letter-Bode*, **1**, No. 21 : 329 (Java, and on *Nattoo* of Russell, 1803, *Fishes of Coromandel*, **2** : pl. 187).

(*a*) 1 fish, 123.5 mm. S.L., Anton Bruun, cruise 8, sta. 408B, 16°40′S : 43°41′E (15.10.64), shrimp trawl at 60 m. BMNH. 1967. 11-20. 98.

(*b*) 2 fishes, 129.6-132.2 mm. S.L., Anton Bruun, cruise 8, sta. 403A, 19°09′S : 36°20′E (9 : 10 : 64), shrimp trawl at approx. 27-30 m.

Stolephorus indicus is recorded from the Red Sea (Whitehead, 1965 : 270) to Hong Kong (Whitehead, 1966 : 49) and from most intervening areas (Fowler, 1941 : 706). The absence of *S. indicus* from all except the two stations in the Mozambique-Channel may simply reflect seasonal or hydrological conditions.

Stolephorus macrops Hardenberg, 1933

Stolephorus baganensis macrops Hardenberg, 1933, *Nat. Tijdsch. Ned. Ind.*, **93** (2) : 260 (Indragiri river mouth, Sumatra).

(*a*) 5 fishes, 34.1-37.4 mm. S.L., Anton Bruun cruise 1, sta. 44A, 21°00′N : 91°33′E (4 : 4 : 63).

(*b*) 1 fish, 43.0 mm. S.L., Anton Bruun cruise 1, sta. 45, 21°32′N : 91°29′E (4 : 4 : 63). BMNH. 1967. 11-20. 99.

(*c*) 1 fish, 33.0 mm. S.L., Anton Bruun cruise A. sta. 3, 13°01′N : 50°04′E (25 : 2 : 63). BMNH. 1967. 11-20. 100.

Some confusion has surrounded the identity of this species. It is very similar to *S. tri*, and Hardenberg's descriptions (Hardenberg, 1933, 1934) strongly suggest that his material was mixed, only the *S. baganensis macrops* fraction being true *S. baganensis*. Mr. Ronquillo is investigating this problem.

Fowler (1941 : 709) recorded *S. tri* from the west coast of India, and *S. baganensis* from the East Indies. Dutt & Babu Rao (1959) extended the range of *S. baganensis* to the east coast of India and the species is now known from the west coast also (Ronquillo, *pers. comm.*). But neither *S. baganensis* nor *S. tri* were recorded by Losse (1966) from the East African coast, nor by Whitehead (1965) from the Red Sea, Persian Gulf and Gulf of Aden. Thus the single specimen in batch *c* from the Gulf of Aden considerably extends the range of this species. The specimen, however, is small and rather damaged, so that this record should be treated with caution.

Stolephorus bataviensis Hardenberg, 1933

Stolephorus insularis Hardenberg, 1933, *Nat. Tijdsch. Ned. Ind.*, **93** : 260 (along the Java coast ; Moluccas).

Stolephorus insularis bataviensis Hardenberg, *op. cit.* : 261 (Batavia).

(*a*) 6 fishes, 55.9-65.8 mm. S.L., Anton Bruun cruise 1, sta. 47B, 19°50′N : 92°55′E (5 : 4 : 63). BMNH. 1967. 11-20. 101-106.

As Fowler (1941 : 708) noted, Hardenberg's *insularis* is a junior primary homonym of *Stolephorus insularum* Jordan & Seale, 1926 (probably=*S. buccaneeri*), and Hardenberg's name *bataviensis* must be substituted. Authors have tended to keep the name *insularis*, however (e.g. Dutt & Babu Rao, 1959 ; Babu Rao, 1966).

This species is now known from the east coast of India (Dutt & Babu Rao, *loc. cit.*), and the present specimens merely extend the range to the northern part of the Bay of Bengal.

Stolephorus juveniles

(*a*) 1 fish, 28.1 mm. S.L., Anton Bruun cruise 4B, sta. 276A, 25°11′N : 66° 20′E (8 : 12 : 63), at 12½ fathoms.

(*b*) 33 fishes, 20.0-30.5 mm. S.L., Anton Bruun cruise 8, sta. 403C, 19°08′S : 36°41′E (9 : 10 : 64).

(*c*) 105 fishes, 14.0-25.0 mm. S.L., Te Vega Exped. cruise 1, sta. 53, 01°20′N : 128°01′E, entrance to Kau Bay, off Tg. Tunowe, Halmahera Is. (24 : 9 : 63), dip net.

Larval and juvenile *Stolephorus* cannot yet be identified with certainty, and the useful studies of Delsman (1931), which showed considerable differences in the eggs of species of *Stolephorus*, are unfortunately suspect because they were based on Hardenberg's identifications. Even at 30 mm. S.L. it is difficult to distinguish between closely related pairs of species (for example, *S. commersonii* and *S. insularis*, or *S. tri* and *S. baganensis*). The chance that more than one species is present in the samples examined here rules out the possibility of correlating juveniles with half-grown and adult fishes collected at the same time, except where a complete series is present (as in the next species).

Thrissina Jordan & Seale, 1925

This genus contains a single widespread species recorded from almost every part of the Indo-Pacific region.

Thrissina baelama (Forsskål, 1775)

Clupea baelama Forsskål, 1775, *Descript. Animal.* : 72 (*ex* Djidda, Red Sea).

(*a*) 214 fishes, 88.6-106.1 mm. S.L., just below road bridge over brackish channel of Debeney R., east side of Mayotta I., Comoro Is., 12°49′56″S : 42°12′09″E (24 : 11 : 64), Anton Bruun cruise 9, sta. HA-10. 50 fishes from above batch. BMNH. 1967. 11-20. 107-156.

(*b*) 1 fish, 71.9 mm. S.L., slough off Duruma R. emptying into Port Reitz, Kenya, 04°01′21″S : 39°34′48″E (17 : 11 : 64), Anton Bruun cruise 9, sta. HA-4, poison in 8 ins. of water.

(*c*) 2 fishes, 30.1-31.0 mm. S.L., beach just north of Pamanzi landing, 12°45′ 6″S : 45°17′12″E (25 : 11 : 64), Anton Bruun cruise 9, sta. 9, bag seine in 4ft. of water. BMNH. 1967. 11-20. 157-158.

(*d*) 3 fishes, 21.6-22.0 mm. S.L., anchorage 150 ft. off dock, Honiara, Guadalcanal (20 : 3 : 65), Te Vega Exped., cruise 6, sta. 251, by night light.

(*e*) 4 fishes, 20.0-22.0 mm. S.L., Kieta Harbour, Bougainville, Solomon Is., Te Vega Exped, cruise 6, sta. 246 (10 : 3 : 65), dip net under night light.

The larger juveniles were distinguished from *Stolephorus* and *Thryssa* respectively by the presence of post-pelvic scutes, but absence of pre-pectoral scutes. The smaller juveniles were identified by similarities in colouration. One or two small pre-pectoral scutes are present in certain Indo-Pacific specimens, but are absent in the adult material examined here (55 fishes). The specimens thus resemble those from the Red Sea, Gulf of Aden, Mauritius and the Cocos Keeling Is. (Whitehead *et alii*, 1966). Fowler (1941 : 686) recorded one specimen from Batavia with a single scute before the pectorals.

Thryssa Cüvier, 1829

This collection contains four species of *Thryssa*, all of them common in the Indian Ocean (*T. malabaricus*, *T. vitrirostris*, *T. dussumieri* and *T. setirostris*). The key given by Fowler (1941 : 670) is now inadequate as a result of subsequent studies (Dutt, unpublished ; also Whitehead, 1965, 1966, 1967 and Whitehead *et alii*, 1966). The following key summarizes recent work.

I. Lower jaw with high coronoid process ; maxilla reaching to beyond pectoral tip.....*T. setirostris* (Broussonet)

II. Lower jaw slender ; maxilla tip not beyond pectoral tip

A. Maxilla long, to pectoral base or beyond

1. Gillraker serrae uneven but not clumped ; gillrakers 14-18

(*a*) A 35-41 ; D 13-16 ; mouth nearly horizontal ; pre-pelvic scutes 17-19.....*T. mystax* (Schneider)

(*b*) A 43-49 ; D 12-14 ; mouth oblique ; pre-pelvic scutes 14-17.. .....*T. purava* (Ham. Buch.)

2. Gillraker serrae in distinct clumps ; gillrakers 16-23

(*a*) One supra-maxilla ; maxilla reaching ½-7/8 along pectoral ; post-pelvic scutes 7-9.....*T. dussumieri* (Val.)

(*b*) Two supra-maxillae ; maxilla reaching 0-⅓ along pectoral ; post-pelvic scutes 9-12.....*T. vitrirostris* (G. & T.)

B. Maxilla short, not reaching to pectoral base

1. Gillrakers 12-14 ; A 38-43.....*T. hamiltonii* (Gray)

2. Gillrakers 16-20

(*a*) A 38-43

(i) Maxilla to gill opening.....*T. malabarica* (Bloch)

(ii) Maxilla beyond gill opening.....*T. kempii* (Chaudhuri)

(*b*) A 43-50.....*T. annandalei* (Chaudhuri)

3. Gillrakers 27-29 ; A 34.....*T. kammalensis* (Blkr.)

Thryssa setirostris is quite distinct, showing a development of the coronoid process paralleling that found in some species of *Coilia* (key, p. xx-xx). *Thryssa mystax* requires proper definition, but if maxilla length varies a little with size of fish, then *T. hamiltonii* probably comprises the larger individuals of *T. mystax* in which the maxilla no longer quite reaches the pectoral base (Whitehead, 1966 : 43). Similarly, *Thryssa purava* may include *T. annandalei*. *Thryssa scratchleyi* (Ramsey & Ogilby) is very close to *T. malabarica* and may merely represent a New Guineanian member of that species.

Thryssa malabarica (Bloch, 1795)

Clupea malabaricus Bloch, 1795, *Naturg. ausländ. Fische*, 9 : 115, pl. 432 (Tranquebar).

(*a*) 2 fishes, 115.3-130.2 mm. S.L., Anton Bruun cruise 4B, sta. 276A, start 25°11′N : 66°20′E (8 : 12 : 63), starting depth 12½ fathoms. BMNH. 1967. 11·20. 159-160.

(*b*) 2 fishes, 116.7-132.6 mm. S.L., from above batch.

These specimens have retained dark brown pigmentation on :

—the lower half of the maxilla (2nd supra-maxilla shows up white against this).

—the humeral venules.

—the pectoral fins (lighter towards base of fin).

—the last unbranched dorsal ray and the margin of the dorsal fin.

—the last unbranched anal ray, and a light peppering along the margin of the fin.

—the caudal margin.

These dark markings do not appear in Bloch's figure, except for a slight darkening of the pectoral fins, but the species was well illustrated by Day (1878 : pl. 157, fig. 5).

The species occurs principally in Indian waters and was not recorded from the East African coast by Losse (1966) or from the Red Sea region by Whitehead (1965), the record by Menon (1960) from the Persian Gulf probably being referable to *T. hamiltonii* (Gray) (Whitehead, *loc. cit.*). Dutt (1961) has shown that the South African *T. malabarica* listed by Smith (1953) were in fact *T. vitrirostris*. The species does not occur in the extensive Bleeker material from the East Indies (Whitehead, Boeseman & Wheeler, 1966) and may thus be confined to the central Indian Ocean, the record of Meyer (1885 : 42) from Celebes being a misidentification based on the closely related *T. hamiltonii* or *T. kammalensis* (Bleeker).

Thryssa setirostris (Broussonet, 1782)

Clupea setirostris Broussonet, 1782, *Ichthyol.*, 1 : no pagination (Pacific near Tanna I., Society group).

(*a*) 1 fish, 115.2 mm. S.L., Anton Bruun cruise 1, sta. 46, 21°00′N : 91°59′E (5 : 4 : 63). BMNH. 1967. 11·20. 161.

(*b*) 5 fishes, 116.2-130.4 mm. S.L., Anton Bruun cruise 1, sta. 47, 20°27′N : 92°20′E (5 : 4 : 63).

(*c*) 1 fish, 114.7 mm. S.L., Anton Bruun cruise 4B, sta. 225A, starting at 23°16′N : 73°12′ E (19 : 11 : 63), starting depth 13 fathoms. BMNH. 1967. 11·20. 162.

This extremely widespread species is reported from almost all parts of the Indo-Pacific, from Natal to Polynesia (Whitehead, 1965 : 276). The extraordinarily long maxilla, reaching to the origin of the anal fin, makes this species unmistakable.

Thryssa dussumieri (Valenciennes, 1848)

Engraulis dussumieri Valenciennes, 1848, *Hist. Nat. Poiss.*, **21** : 69 (no locality, no specimens).

Thryssa dussumieri : Whitehead, 1967, *Bull. Br. Mus. nat. Hist.* (Zool.), Suppl. No. 2 : 142 (designation of putative neotype from material listed below).

(*a*) 3 fishes, 58.4-67.7 and 95.2 mm. S.L., Anton Bruun cruise 1, sta. 41A, 15° 04′N : 95° 51′E (31 : 3 : 63), depth 29-30 metres (photographed). BMNH. 1967. 11·20. 317-319.

(*b*) 5 fishes, 45.7-81.5 mm. S.L. (as above). BMNH. 1967. 11·20. 320-324.

(*c*) 3 fishes, 72.2-79.4 mm. S.L. (as above but labelled sta. 41) (photographed).

(*d*) 3 fishes, 51.7 and 88.8-91.8 mm. S.L. (as above).

(*e*) 3 fishes, 88.2-92.2 mm. S.L. Anton Bruun cruise 1, sta. 46, 21°00′N : 91° 29′E (5 : 4 : 63) (photographed).

(*f*) 1 fish, 88.2 mm. S.L. (as above).

(*g*) 163 fishes, 74.1-97.2 mm. S.L., Anton Bruun cruise 1, sta. 47, 20°27′N : 92° 20′E (5 : 4 : 63).

(*h*) 142 fishes, 77.8-95.2 mm. S.L. (as above). BMNH. 1967. 11·20. 163-304.

(*i*) 105 fishes, 104.4-114.0 mm. S.L., Anton Bruun cruise 4B, sta. 203C, 20° 22′N : 71°47′E (15 : 11 : 63), depth at start 14 fathoms (photographed).

1 fish, 110.4 mm. S.L., from above batch, designated PUTATIVE NEOTYPE of *Engraulis dussumieri* Valenciennes and registered BMNH. 1966.11.30.1.

(*j*) 3 fishes, 99.0-102.5 mm. S.L., Anton Bruun cruise 4B, sta. 212A, starting 21°29′N : 69°27′E (16 : 11 : 63), depth at start 19 fathoms.

(*k*) 6 fishes, 80.4-90.2 mm. S.L. (as above) (photographed).

(*l*) 1 fish, 110.2 mm. S.L., Anton Bruun cruise 4B, sta. 225A, starting 23°16′N : 63°12′E (19 : 11 : 63), depth at start 13 fathoms.

(*m*) 12 fishes, 86.0-102.3 mm., Anton Bruun cruise 4B, sta. 236A, starting 25° 10′N : 65° 50′E (22 : 11 : 63), depth at start 12 fathoms. BMNH. 1967. 11·20. 305-316.

(*n*) 2 fishes, 85.4-94.2 mm. S.L., Anton Bruun cruise 4B, sta. 242A, starting 25°00′N : 63°30′E (27 : 11 : 63), depth at start 20 fathoms.

(*o*) 1 fish, 97.5 mm. S.L., Anton Bruun cruise 4B, sta. 275A, starting 25°11′N : 66°11′E (8 : 12 : 63), depth at start 41 fathoms.

(*p*) 5 fishes, 92.9-93.9 mm. S.L., Anton Bruun cruise 4B, sta. 276A, starting 25° 11′N : 66°20′E (8 : 12 : 63), depth at start 12½ fathoms.

(*q*) 1 fish, 97.9 mm. S.L., Anton Bruun cruise 4B, 277A, starting 25° 06′N : 66°33′E (8 : 12 : 63), depth at start 17 fathoms.

No specimens were listed as types of this species by Bertin (1940), and two jars purporting to contain Dussumier specimens of *T. dussumieri* in Paris were found to contain a mixture of *T. mystax* and *T. purava* (Whitehead, 1967). Since the description of the species (especially maxilla length) did not fit the two latter species, a putative neotype was chosen and the most suitable specimen was one from batch *i* as listed here ; this fish has been fully described (Whitehead, *loc. cit.*).

This species resembles *T. vitrirostris* in having the gillraker serrae arranged in distinct clumps of longer serrae along the inner edge of each gillraker. It differs in having a much longer maxilla, and this is apparent in fishes from 55 to 110 mm. S.L.

T. dussumieri (Anton Bruun cruise 4B, Sta. 203C, 15 : 11 : 63)		*T. vitrirostris* (Anton Bruun cruise 4B and other material)	
S.L.	max. as % of S.L.	S.L.	max. as % of S.L.
45.7	40.9		
51.7	41.3		
55.5	38.0		
60.4	42.3		
76.5	43.0	73.0	31.1
78.5	41.6		
81.5	41.7		
85.2	39.1		
93.9	40.4	92.7	28.2
94.9	44.6		
107.2	40.0	107.0	28.7
110.4 (type)	43.8	109.0	29.7
		131.2	27.5
		149.0 (type)	30.1
		151.6	28.0
RANGE	38.0-44.6		27.5-31.1
Max. tip reaching :	½-7/8 along pectoral fin	0-1/3 along pectoral fin	

Thryssa dussumieri differs from *T. vitrirostris* (and all other species of *Thryssa* except *T. setirostris*) in lacking an anterior supra-maxilla. The supra-maxillae for these two species are shown in Figure 2.

The following ventral scute counts were made on 20 fishes from batch *i* listed above ;

14+8=22 (2 fishes)
15+7=22 (2 fishes)
15+8=23 (13 fishes)
15+9=24 (1 fish)
16+8=24 (2 fishes)

The following gillraker counts (1st arch, lower part of arm) were made on the same specimens :

$$\frac{17}{1}, \frac{18}{0}, \frac{19}{18}, \frac{20}{1}$$

The synonymy given by Fowler (1941 : 681) implies that *T. dussumieri* is a common and widespread species, although the paucity of specimens in the British

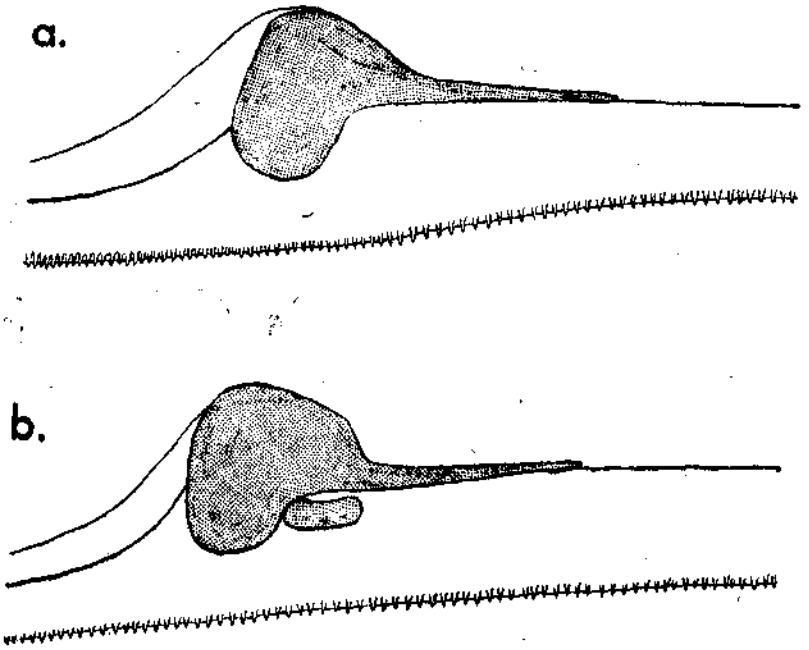

FIG. 2. Supra-maxillae (stippled, right side) in species of *Thryssa*.
a. *T. dussumieri*, 1100 mm. S.L., *ex* Anton Bruun cruise 4B, sta. 203C.
b. *T. vitrirostris*, 111.6 mm. S.L., *ex* Anton Bruun cruise 4B, sta. 244A.

Museum suggests that at least some records may have been misidentifications. The species is not recorded from the East African coast (Losse, 1966) or the Red Sea region (Whitehead, 1965), but occurs in the East Indies (e.g. 24 Bleeker specimens from Batavia—Whitehead *et alii*, 1966 : 127), and in Indian waters.

Thryssa vitrirostris (Gilchrist & Thompson, 1908-11)

Engraulis vitrirostris Gilchrist & Thompson, 1908-11, *Ann. S. Afr. Mus.*, **6** : 201 (Natal ; Durban).

(*a*) 1 fish, 132.5 mm. S.L., Anton Bruun cruise 4B, sta. 203C, 20° 22′N : 71° 47′E (15 : 11 : 63), depth at start 14 fathoms.

(*b*) 15 fishes, 103.2-134.1 mm. S.L., Anton Bruun cruise 4B, sta. 225A, starting at 23° 16′N : 63° 12′E (19 : 11 : 63), depth at start 13 fathoms. BMNH, 1967. 11·20, 325-339.

(*c*) 8 fishes, 109.5-130.5 mm. S.L., Anton Bruun cruise 4B, sta. 228A, starting at 23° 45′N : 67° 26′E (20 : 11 : 63), depth at start 12½ fathoms. BMNH. 1967. 11·20. 340-347.

(*d*) 8 fishes, 120.7-142.6 mm. S.L., Anton Bruun cruise 4B, sta. 241A, starting at 24° 54′N : 63° 52′E (22 : 11 : 63), depth at start 55½ fathoms.

(*e*) 6 fishes, 114.0-120.4 mm. S.L., Anton Bruun cruise 4B, sta. 243A, starting at 24° 54′N : 61° 54′E (28 : 11 : 63), depth at start 63 fathoms.

(*f*) 3 fishes, 111.6-132.5 mm. S.L., Anton Bruun cruise 4B, sta. 244A, starting at 24° 51′N : 61° 32′E (28 : 11 : 63), depth at start 11½ fathoms.

(*g*) 1 fish, 92.7 mm. S.L., Anton Bruun cruise 4B, sta. 248A, starting at 25° 10′N : 60° 27′E (29 : 11 : 63), depth at start 35½ fathoms.

(*h*) 10 fishes, 124.1-142.1 mm. S.L., Anton Bruun cruise 4B, sta. 274A, starting at 24° 57′N : 65° 56′E (7 : 12 : 63), starting depth 66 fathoms.

(*i*) 3 fishes, 133.3-151.6 mm. S.L., Anton Bruun cruise VI, off Bombay, 18° 48′N : 72° 37′E (12 : 5 : 64), depth 12½-14 fathoms, by bottom trawl from MVF Janjira. BMNH. 1967. 11·20. 348-350.

(*j*) 1 fish, 73.0 mm. S.L., Baie d'Amboro, N.W. coast of Madagascar, 13° 24′S : 48° 42′E (12 : 2 : 64), by shrimp trawl. BMNH. 1967. 11·20. 351.

First described from the eastern coasts of South Africa, the recorded distribution of *Thryssa vitrirostris* was extended to Madagascar (Fourmanoir, 1961), northwards along the East African coast to Malindi in Kenya (Losse, 1966), the Persian Gulf and Gulf of Oman, but not the Red Sea (Whitehead, 1965), and finally to Indian waters (Dutt, 1961). So far there have been no records of this species from the Indo-Australian Archipelago, in spite of good collections from Thailand and Singapore.

The IIOE specimens add little to the known range of *Thryssa vitrirostris* but they usefully confirm the gillraker difference found by Dutt (*loc. cit.*) between this species and the very similar *T. mystax* (Bloch).

T. vitrirostris	
IIOE, lots *b*—*j*.	12-17+17-24 (32 fishes)
Dutt, 1961 (India)	15-17+20-23
S. African Museum (the type and 8 others).	14-17+20-23 (9 fishes)
Persian Gulf, Gulf of Oman (Whitehead, 1965).	15-17+20-23 (10 fishes)
T. mystax	
Dutt, 1961 (India)	9-11+14-17

Dutt (*loc. cit.*) also found the gill arches a deeper and brighter orange in *Thryssa vitrirostris* compared with *T. mystax*, but the colour has faded in the IIOE specimens. A further important difference not mentioned by Dutt is the distinct clumping of the gillraker serrae into groups of longer serrae separated by an interspace of short serrae in *T. vitrirostris* (as in *T. dussumieri*). In *T. mystax* the serrae are uneven but not clumped, and this difference is apparent in fishes of about 80 mm. upwards.

Thryssa vitrirostris resembles *T. mystax* in having a small anterior supra-maxilla (absent in *T. dussumieri*).

Setipinna Swainson, 1839

Five species of *Setipinna* are known (key—Whitehead, Boeseman & Wheeler, 1966 : 128), from India and the Indo-Australian Archipelago. The IIOE collection includes two of the three Indian species ; the third, *Setipinna phasa* (Ham. Buch.) is principally an estuarine or freshwater form (Jones & Menon, 1952). The absence of specimens of *Setipinna* from collections made in the Arabian Sea (i.e. Anton Bruun cruise 4B) confirms the previously recorded distribution (Bay of Bengal to Korea—Fowler, 1941 : 689-690). The genus was not recorded from the East African coast by Losse (1966), nor from the Red Sea region by Whitehead (1965).

The present specimens have been identified according to the following key.

I. Dorsal origin nearer to snout than to caudal base ; g.r. 12-18 ; mouth slightly oblique.

A. G.R. 14-16+17-20

1. A 48-60 ; pre-pelvic scutes 18-26 ; gillraker serrae in distinct clumps of longer serrae.....*S. taty* (Val.)

2. A 72-75 ; pre-pelvic scutes 15-16 ; gillraker serrae a little clumped in smaller fishes.....*S. phasa* (Ham. Buch.)

B. G.R. 10-11+12-16 ; gillraker serrae not clumped.....*S. godavari* Babu Rao

II. Dorsal origin at midpoint or nearer to caudal base ; g.r. 11-13 ; mouth very oblique, lower jaw projecting

A. A 44-50.....*S. melanochir* (Blkr.)

B. A 60.....*S. breviceps* (Cantor)

Setipinna taty (Valenciennes, 1848)

Engraulis taty Valenciennes, 1848, *Hist. Nat. Poiss.*, **21** : 60 (Pondicherry).

(*a*) 6 fishes, 89.7-123.7 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 24′E (31 : 3 : 63) (photographed).

(*b*) 24 fishes, 89.5-124.2 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 24′E (31 : 3 : 63). BMNH. 1967. 11·20. 352-375.

(*c*) 4 fishes, 96.8-113.2 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 47′E (31 : 3 : 63).

(*d*) 6 fishes, 81.6-102.8 mm. S.L., Anton Bruun cruise 1, sta. 44, 21° 52′N : 91° 36′E (4 : 4 : 63).

(*e*) 1 fish, 26.0 mm. S.L., from the above jar, probably the same species.

(*f*) 4 fishes, 75.0-105.8 mm. S.L., Anton Bruun cruise 1, sta. 44A, 21° 43′N : 91° 33′E (4 : 4 : 63).

These examples confirm the previously recorded range for *Setipinna taty* (India to Korea *fide* Fowler, 1941 : 691). The species is well defined, and the types have been redescribed by Whitehead (1967 : 146).

Setipinna godavari Babu Rao, 1961

Setipinna godavari Babu Rao, 1961, *Proc. 1st all-India Congr. Zool.*, 1959 : 367 (Godavari estuary).

(*a*) 17 fishes, 52.7-98.5 mm. S.L., Anton Bruun cruise 1, sta. 39A, 14° 52′N : 96° 39′E (31 : 3 : 63).

(*b*) 2 fishes, 79.4-102.1 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 24′E (31 : 3 : 63).

(*c*) 29 fishes, 66.0-130.2 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 24′E (31 : 3 : 63). BMNH. 1967. 11·20. 374-404.

(*d*) 2 fishes, 80.0-85.1 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 24′E (31 : 3 : 63). BMNH. 1967. 11·20. 405-406.

(*e*) 1 fish, 89.4 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 47′E (31 : 3 : 63).

(*f*) 1 fish, 120.0 mm. S.L., Anton Bruun cruise 1, sta. 44, 21° 52′N : 91° 36′E (4 : 4 : 63).

(*g*) 1 fish, 102.2 mm. S.L., Anton Bruun cruise 1, sta. 44A, 21° 43′N : 91° 33′E (4 : 4 : 63).

Originally recorded from the Godavari estuary, the distribution of this species is extended by the present collection. *Setipinna godavari* may thus occur in all parts of the Bay of Bengal.

Setipinna godavari resembles *S. taty* superficially, but has a lower gillraker count (10-11+12-16 ; cf. 14-16+17-20), a shorter pectoral filament (36-42% of S.L. ; cf. 65-80%), and a slightly longer lower jaw. In addition, the serrae along the inner face of the gillrakers are uneven in length, but are barely clumped (Figure 3b). In *S. taty*, and in small specimens of *S. phasa* (up to 113 mm., but not at 150 mm.) the gillraker serrae are distinctly clumped (Figure 3a and c). In the characters mentioned above, *S. godavari* approaches *S. melanochir* (Bleeker) and *S. breviceps* (Cantor), but in these two the dorsal origin is behind the midpoint of the body, the lower jaw projects, and the opercular series fails to cover the gill opening posteriorly.

Munro (1964) described a new species from the Gulf of Papua, *Setipinna papuensis*. It resembles *S. taty* except that it has,

1. gillrakers 10+14-16 (cf. 14-16+17-20).
2. anal origin below dorsal origin (cf. a little behind).
3. pectoral filament reaching about ¼ along anal base (cf. ½ or more along anal base).

The form of the gillraker serrae is not mentioned, but the three above characters place *S. papuensis* in the synonymy of *S. godavari*. This is a remarkable extension to the range of the species, but its resemblance to *S. taty* suggests that specimens of intermediate provenance may well have been recorded as the latter species.

Coilia Gray, 1831

This genus is badly in need of revision. Fowler (1941 : 713) recognised 14 species of *Coilia*, but some of these have been placed in synonymy as a result of

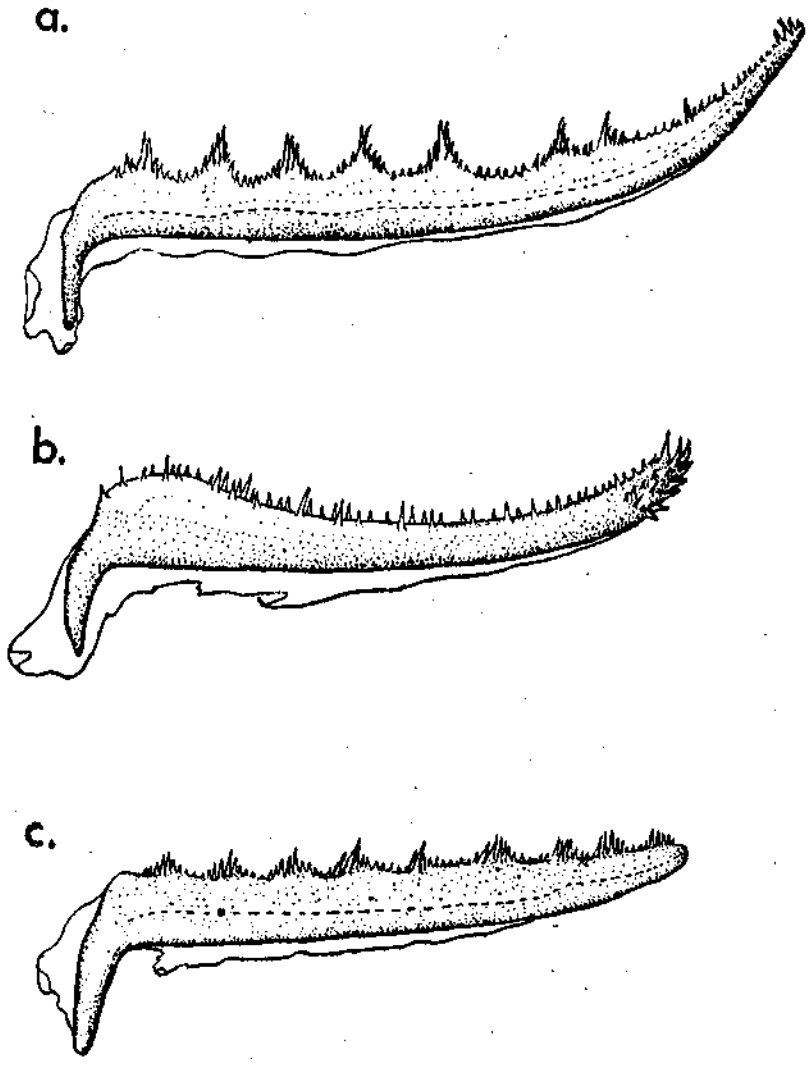

FIG. 3. Gillrakers in species of *Setipinna* (first ceratobranchial, 4-5th raker from angle of arch).
a. *S. taty*, 113.5 mm. S.L., *ex* Anton Bruun cruise 1, sta. 40.
b. *S. godavari*, 118.8 mm. S.L., *ex* Anton Bruun cruise 1, sta. 44.
c. *S. phasa*, 113.5 mm. S.L., *ex* Sittay R., BMNH. 1891.11.30.390.

subsequent studies (Jones & Menon, 1952b ; Whitehead, 1966, 1967 ; Whitehead *et alii*, 1966). Recent work can be summarised by the following key.

I. No pearly spots (light organs) along flanks

A. Pelvic rays i 8-9.....*C. ramcarati* (Ham. Buch., 1822.)

B. Pelvic rays i 6

1. Maxilla short, not reaching beyond gill opening

(*a*) No pre-pelvic scutes

(i) Pectoral filaments 19.....*C. rebentischii* Bleeker, 1859

(ii) Pectoral filaments 11.....*C. polyfilis* Volz (on original description only, no further record)

(*b*) Pre-pelvic scutes present

(i) Pectoral filaments 6

(α) Scutes 5-6+9-11.....*C. neglecta* sp. nov.

(β) Scutes 17+35.....*C. rendahli* Jordan & Seale, 1926

(ii) Pectoral filaments 10-14

(α) Scutes 4-6+8-9.....*C. reynaldi* Valenciennes, 1848

(β) Scutes 13-14+9-10.....*C. coomansi* Hardenberg, 1934

2. Maxilla long, reaching to and beyond gill opening

(*a*) Lower gillrakers 25-30; total scutes 36-39.....*Coilia mystus* (Linnaeus, 1758)

(*b*) Lower gillrakers 21-24; total scutes 46-53.....*Coilia macrognathos* Bleeker, 1852

II. Pearly spots along flanks (luminous organs); 4-6 free pectoral filaments; 4-6+6-8 scutes.....*Coilia dussumieri* Valenciennes, 1848

The species with a long maxilla (section 2 of the key) require further study. Until a proper definition can be given for *Coilia mystus* (reputed holotype in Uppsala *fide* Lönnberg, 1896), its probable junior synonyms must be,

Coilia clupeoides Lacepède, 1803 (based on *C. mystus*).

Coilia playfairii McClelland, 1844 (see Whitehead, 1966 : 41-42).

Coilia grayii Richardson, 1846 (type redescribed by Whitehead, 1966 : 40).

Coilia nasus Temm. & Schl., 1846 (syntypes redescribed by Boeseman, 1947 : 178).

Coilia lindmani Bleeker, 1858 (holotype redescribed by Whitehead *et alii*, 1966).

On described characters, *Coilia ectenes* agrees better with *C. macrognathos* than with the above species. Earlier keys (e.g. Fowler, 1941 : 713), which used

counts of scales and anal fin rays, are unrealistic because members of this genus often suffer caudal damage which is later masked by regeneration (Jones & Menon, 1952b), resulting in much lower counts.

Coilia ramcarati (Ham. Buch., 1822)

Mystus ramcarati Hamilton-Buchanan, 1822, *Fishes of Ganges*: 233 (Ganges estuaries).

Engraulis (*Coilia*) *hamiltonii* Gray, 1830 (Jan.), *Illustr. Ind. Zool.*, **1**: pl. 85, fig. 3 (Bengal rivers).

1 fish, 146.1 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′ N : 96° 47′E (31 : 3 : 63).

Coilia ramcarati is the only engraulid with a pelvic count of i 8-9 (i 6 in all other anchovies). The species is recorded from India (Fowler, 1941 : 716, Jones & Menon, 1952b, and Bleeker's *Coilia cantoris*—Whitehead *et alii*, 1966 : 136). It seems to have been caught mainly in rivers and estuaries, and the present fish may have belonged to a population frequenting the Irrawady river.

In attempting to identify the next species (see below), the identity of *Engraulis* (*Coilia*) *hamiltonii* Gray was reconsidered. Günther (1868 : 402) and subsequent authors have placed this nominal species in *Coilia ramcarati*, but the figure on which Gray based his species (Gray, 1830 : pl. 85, fig. 3) shows a fish with only i 7 (? error for i 6) pelvic rays. Because of the great superficial similarity between *C. ramcarati* and the species described below, it was important to positively identify the Gray figure. Fortunately the original Hardwicke water colour painting, from which the Gray figure was taken, is still extant (Zoological Library of this museum) and in it the artist has indicated counts in pencil, i.e.

pelvic rays 9 ; also, dorsal $\frac{2}{15}$

pectoral 6 (filaments only)

anal 60

scutes 15 (15 shown but 3 hidden by pelvic fin base).

This pelvic count is diagnostic of *Coilia ramcarati*, and other features in the drawing consistent with that species are :

1. Very short and few pectoral branched rays (22.1 per cent of head length and about 7 rays).
2. Long pelvic fin (64.8 per cent of head length).
3. Pelvic base a little before vertical from first dorsal ray.
4. Pelvic base much nearer to pectoral base than to anal origin.
5. Slightly dark pigmentation along whole of anal.

In his description of *Mystus ramcarati*, Hamilton-Buchanan (1822 : 233) mentioned the diagnostic pelvic count and also the few (6) and rather short pectoral branched rays. These features appear to be unique to *Coilia ramcarati*.

Hamilton-Buchanan gave descriptions of 13 elopoid and clupeoid fishes from the Ganges, all of them new species. In the case of *Coilia ramcarati*, Günther (1868 : 403) listed a type, citing it as "*a*. Type of the species. Ganges. Presented by G. R. Waterhouse Esq." (this specimen is registered BMNH. 1859.8.15.104, but with no further information in ledger or on bottle). The authenticity of this type is of some importance because no Hamilton-Buchanan types are otherwise known.

George Robert Waterhouse (1810-1888), who presented the 'type' of *Coilia ramcarati* (one of 168 specimens from the Ganges and Bengal), was at one time Curator of the Zoological Society's Museum in London, and later (1851-1880) Keeper of the department of Geology in the British Museum. The Zoological Society kept a number of early collections until 1855 when the fishes at least were donated to the British Museum. However, it seems that Waterhouse had his own private collections, which he in turn donated to the British Museum (fishes in 1858, Coleoptera in 1875).

Is it possible that Waterhouse, who was only 19 at Hamilton-Buchanan's death, later came into possession of the latter's specimens? Günther (1861 : iv), referring to the Waterhouse collection, was cautious, saying '... believed to contain many typical specimens of Hamilton-Buchanan's work ...' Nonetheless, Günther listed some of the Waterhouse specimens as types. Hora (1929) examined this question and concluded that there was absolutely no evidence to show that the Waterhouse collection contained Hamilton-Buchanan specimens. The only Waterhouse letters in this museum (Alder and Norman correspondence, General Library) deal with matters unconnected with fish collections, and there are no Hamilton-Buchanan letters. Hora (*loc. cit.*) presented good evidence to show that Hamilton-Buchanan based his species mainly, if not entirely, on drawings of fishes, and that the specimens were almost certainly not kept. It must be assumed that the Waterhouse collection merely contained such species as would occur in any collection of fishes from that area, and that the inclusion of 7 out of 13 of Hamilton-Buchanan's elopoid and clupeoid species would be expected.

Günther (1868) must, therefore, be considered to have designated a neotype for *Coilia ramcarati*. This was one of the species which was not figured in the *Fishes of the Ganges*, but Hora (1929 : pl. 21, fig. 2) reproduced an unpublished Hamilton-Buchanan drawing preserved in the Asiatic Society of Bengal. The drawing is clearly *Coilia ramcarati*, showing the five diagnostic features listed above (p. xxx).

The type of *Coilia ramcarati* has never been properly described and the opportunity is taken here to do so.

Neotype, a fish of 134.9 mm. S.L. (147.0 mm. tot. l.), *ex* Ganges, presented by G. R. Waterhouse, in fair condition, caudal complete, few scales, metal tag '104' sewn to hind part of body, BMNH. 1858.8.15.104 (designated type by Günther, 1868 : 403).

Br. St. 11, D I iii 11, P vi+7 (right) vi+5 (left), V i 9 (both), A iii 90, C 10+ 8, g.r. 23+30, scutes 5+10 (+a minute spicule).

In percentages of standard length : body depth 18.5, head length 18.9 ; snout length 3.5, eye diameter 3.5, length of upper jaw 14.9, length of lower jaw 12.9 ; pectoral fin length 53.5 (longest filament) 4.1 (longest branched ray), pelvic fin length 10.4,

length of anal base 58.6 ; pre-dorsal distance 29.4, pre-pelvic distance 26.2, pre-anal distance 43.7 ; distance between pectoral and pelvic bases 8.5, distance between pelvic and anal fins 19.3.

Body compressed, deepest under dorsal base, tapering evenly to caudal, with no sign of a regenerated tail. Belly rounded under pectoral base, becoming keeled and more compressed behind pelvic base. Head length about equal to body depth. Snout equal to eye. Lower jaw slender, without high coronoid process, but with prominent knob at dentary symphysis ; a single series of small conical teeth along jaw. Maxilla reaching posteriorly to articulation of lower jaw, pointed posteriorly and projecting a little beyond 2nd supra-maxilla ; a single series of small teeth along entire edge of maxilla. Two supra-maxillae, the 1st (anterior) 2½ times as long as deep and just over ½ eye diameter ; the 2nd (posterior) expanded posteriorly and tapering to slender shaft anteriorly. Fine teeth on edges of ecto- and endo-pterygoid, on tongue and on a basi-branchial plate.

Pseudobranch present, attenuated, almost equal to eye diameter, filaments short and exposed. Gillrakers slender, twice length of corresponding gill filaments and equal to eye-diameter; no rakers on posterior face of 3rd epibranchial. Muscular portion of isthmus reaching forward to hind margin of branchiostegal membrane.

Scutes trenchantly keeled, beginning midway between pectoral and pelvic bases ; pelvic scute forming slightly convex plate between the rather widely separated pelvic bases.

Dorsal fin preceded by a small scute-like spine. Pectoral fin with 6 free filaments, the longest reaching to the base of the 37th branched anal ray ; branched rays of pectoral short, reaching to about half-way to pelvic base. Pelvic fin long, equal to post-orbital part of head, its base twice as close to pectoral base as to anal origin ; bases of unbranched pelvic rays widely separated, the distance between them equal to eye diameter ; pelvic base slightly in front of vertical from dorsal spine. Anal origin behind vertical from last dorsal ray by 2 eye diameters.

Scales with reticulated striae on exposed portion, merging into horizontal striae on unexposed portion.

Colour : most of body light brown, gill covers and cheeks silvery as also areas where scales retained. Fins hyaline.

Coilia neglecta sp. nov.

Holotype and paratypes chosen from batch 1 are described below. The holotype is deposited in the U.S. National Museum and the paratypes in the British Museum (Natural History).

(*a*) 3 fishes, 127.4-134.4 mm. S.L., Anton Bruun cruise 1, sta. 39A, 14° 52′N : 96° 39′E (31 : 3 : 63) (photographed by Ralph W. Taylor).

(*b*) 18 fishes, 109.0-135.8 mm. S.L. (as above). BMNH. 1967. 11.20. 407-424.

(*c*) 2 fishes (caudal damaged), Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 24′E (31 : 3 : 63).

(*d*) 17 fishes, 77.2-132.0 mm. S.L. (as above).

(*e*) 87 fishes+7 fragments, 86.3-125.6 mm. S.L. (as above).

(*f*) 4 fishes, 88.2-111.7 mm. S.L., Anton Bruun cruise 1, sta. 40, 15° 20′N : 96° 47′E (31 : 3 : 63). BMNH. 1967. 11.20. 425-428.

(*g*) 1 fish, 121.5 mm. S.L., Anton Bruun cruise 1, sta. 44, 21° 52′N : 91° 36′E (4 : 4 : 63).

(*h*) 1 fish, 121.1 mm. S.L., Anton Bruun cruise 1, sta. 44A, 21° 00′N : 91° 33′E (4 : 4 : 63).

(*i*) 8 fishes, 78.5-120.7 mm. S.L., Anton Bruun cruise 1, sta. 45, 21° 32′N : 91° 29′E (4 : 4 : 63). BMNH. 1967. 11.20. 429-436.

(*j*) 268 fishes, 71.7-161.2 mm., S.L., Anton Bruun cruise 4B, sta. 203A, 19° 47′N : 72° 04′E (14 : 11 : 63) (many ripe ♂ and ♀ fishes).

(*k*) 25 fishes + 1 head, 102.7-153.8 mm. S.L., Anton Bruun cruise 4B, sta. 203C, 20° 22′N : 71° 47′E (15 : 11 : 63), depth 14 fathoms. BMNH. 1967. 11.20. 437-461.

(*l*) 97 fishes, 100.0-170.9 mm. S.L., Anton Bruun cruise 4B, sta. 211A, starting at 21° 23′N : 69° 46′E (16 : 11 : 63), starting depth 10 fathoms. BMNH. 1967. 11.20. 462-559.

1 fish, 160.8 mm. S.L. (as above), HOLOTYPE of species.

10 fishes, 141.5-169.5 mm. S.L. (as above), PARATYPES of species. BMNH. 1967. 11.20. 560-569.

(*m*) 21 fishes, 123.2-146.1 mm. S.L., Anton Bruun cruise 4B, sta. 217A, starting at 22° 21′N : 68° 42′E (18 : 11 : 63), depth at start 14 fathoms.

(*n*) 26 fishes, 70.8-143.0 mm. S.L., Anton Bruun cruise 4B, sta. 222A, starting at 22° 45′N : 68° 24′E (18 : 11 : 63), depth at start 14 fathoms.

(*o*) 4 fishes, 110.7-138.1 mm. S.L., Anton Bruun cruise 4B, sta. 223A, starting at 22° 54′N : 68° 36′E (19 : 11 : 63), depth at start 8½ fathoms.

(*p*) 18 fishes, 105.0-148.0 mm. S.L., Anton Bruun cruise 4B, sta. 224A, starting at 23° 00′N : 68° 36′E (19 : 11 : 63), depth at start 13 fathoms.

(*q*) 7 fishes, 122.7-147.2 mm. S.L., Anton Bruun cruise VI, off Bombay, 18° 48′N : 72° 37′E (12 : 5 : 64), depth 12½-14 fathoms, trawl by MVF Janjira.

Description :

Holotype, a fish of 160.8 mm. S.L. (175.0 mm. tot. l.), *ex* Arabian Sea (21° 23′N : 69° 46′E) at 10 fathoms, collected by Anton Bruun cruise 4B, sta. 211A on 16 : 11 : 63.

Paratypes, 10 fishes, 141.5-169.5 mm. S.L. from the same batch. BMNH. 1967. 11.20. 560-569. (Figures for paratypes given in parenthesis)

Br. St. 11 (10-12), D I iii 11 (10-11), P vi+10-12, V i 6 (i 6), A iii 91 (96-107), g.r. 18+25 (17-19+23-26), scutes 6+9 (5-6+8-9).

In percentages of standard length : body depth 18.9 (18.4-20.3), head length 17.9 (16.2-17.6) ; snout length 3.6 (2.6-3.6), eye diameter 3.6 (3.7-4.1), length of upper jaw 14.0 (14.9-16.0), length of lower jaw 14.0 (14.9-16.0), length of lower jaw 12.5 (11.5-12.6) ; pectoral fin length (longest filament) 44.1 (31.3 and 37.2-49.0), pelvic fin length 5.6 (5.5-6.3), length of anal fin base 61.5 (58.8-64.2 and 69.9) ; pre-dorsal distance 27.2 (26.3-27.7), pre-pelvic distance 28.7 (26.7-29.1), pre-anal distance 41.6 (37.0-41.0) ; pectoral-pelvic interspace 10.8 (n.r.), pelvic-anal interspace 13.7 (n.r.).

Body compressed, its width about 2½ times in its depth, deepest under dorsal origin then tapering evenly to tail, with no sign of a regenerated caudal fin. Belly rounded under pectoral base, becoming compressed and keeled towards vent. Head length about equal to body depth. Snout equal to eye. Lower jaw slender, without high coronoid process but with prominent knob at dentary symphysis ; a single series of small conical teeth along lower jaw. Maxilla reaching just beyond the articulation of lower jaw, maxilla tip (broken in holotype) pointed and projecting ¾ eye diameter behind 2nd supra-maxilla ; a single series of fine teeth on pre-maxillae and along entire edge of maxillae. Two supra-maxillae, the 1st (anterior) slender and long (about ⅔ eye diameter), the 2nd expanded posteriorly and tapering to a slender shaft anteriorly. Fine teeth on edges of endo- and ecto-pterygoid, on tongue and on a basibranchial plate.

Pseudobranch present, exposed, ⅓ eye diameter, with about 15-20 very short filaments. Gillrakers slender, ¾ eye diameter and twice length of corresponding gill filaments ; 0-3 stumpy gillrakers present on posterior face of 3rd epibranchial (sometimes present on one side only). Muscular portion of isthmus reaching forward to hind margin of branchiostegal membrane.

Scutes trenchantly keeled, beginning midway between pectoral and pelvic bases.

Dorsal fin preceded by small scute-like spine. Pectoral with 6 free filaments, the longest reaching about ⅓ along anal fin ; branched rays of pectoral long, equal to head length without snout, longest ray reaching beyond pelvic base. Pelvic fin short, much less than postorbital part of head, its base nearer to pectoral base than to anal origin by ¾ eye diameter ; pelvic base below dorsal spine ; pelvic axillary scale present, just longer than fin. Anal origin behind vertical from last dorsal ray by 2 eye diameters.

Scales with reticulated striae on exposed portion, merging into horizontal striae on unexposed portion.

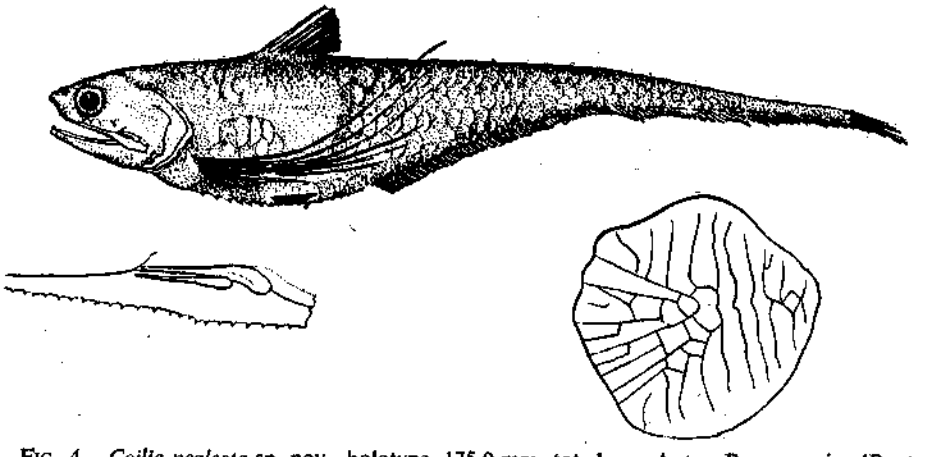

FIG. 4. *Coilia neglecta* sp. nov., holotype, 175.0 mm. tot. l., *ex* Anton Bruun cruise 4B, sta.

Colour : body light brown, with creamy discoloured areas on flanks and tail (probably a preservation artifact) ; fins hyaline except black border to anal fin, beginning at about 70th ray (i.e. final ¼ of fin).

Note :

Coilia neglecta closely resembles Bleeker's *Coilia cantoris*, but Bleeker's holotype has i 9 pelvic rays and is clearly *Coilia ramcarati* (Whitehead *et alii*, 1966 : 136). Day (1878 : 631) examined the Bleeker specimen and also miscounted the pelvic rays as i 6 (or perhaps he assumed the normal engraulid pelvic count). Fowler (1941 : 715) repeated Day's description and listed *Coilia cantoris* as a senior synonym. As shown above, *Engraulis* (*Coilia*) *hamiltonii* Gray is not the present species either.

Of the five described species with a slender lower jaw, *Coilia neglecta* most resembles *C. rendahli* Jordan & Seale but has many fewer scutes (see key). It also approaches *C. reynaldi* Valenciennes, but has fewer pectoral filaments (6, cf. 10-14). Jones & Menon (1952b : 23) have shown that although only 6 pectoral filaments are found in juvenile *C. reynaldi* of 27 mm., by 48 mm. there are 9 or 10 free rays. There is no evidence to suggest variation in scute numbers in fishes over about 50 mm.

A large number of the specimens are mature fishes with ripe or ripening gonads. Records of breeding in *Coilia* suggest that spawning occurs in estuaries, at least in *C. reynaldi* (Jones & Menon, 1952) and *C. dussumieri* Valenciennes (Hardenberg, 1931). The present specimens of *Coilia neglecta* may represent pre-spawning shoals prior to migration to the large river mouths.

Further specimens of *Coilia neglecta* have since been found in a collection of fishes made in Singapore (43 specimens, 50.6-143.0 mm. S.L.). It would seem that the species is fairly widespread and perhaps quite common, its neglect resulting from misidentification.

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