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By

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CHAETOGNATHS OF THE INDIAN OCEAN, WITH A KEY FOR THEIR IDENTIFICATION*

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ABSTRACT

The authors have recorded 33 species of Chaetognaths belonging to four pelagic genera (*Sagitta* Quoy and Gaimard; *Pterosagitta* Costa; *Krohnitta* Ritter-Zahony; and *Eukrohnia* Ritter-Zahony) and one benthic genus (*Spadella* Langerhans), from the Indian Ocean and contiguous Seas. The dependable specific characters useful in identification are discussed and an illustrated key to the identification of the genera and the species is provided.

INTRODUCTION

THE fairly intensive exploration of the Indian Ocean by several countries participating in the International Indian Ocean Expedition has given added importance to the study of marine plankton of this region. The chaetognaths form an important constituent of the marine zooplankton and some of the species are known to be good indicators of water masses, ocean currents and local hydrological changes (Bigelow, 1926; Russell, 1935 *a*, 1935 *b*, 1937, 1939; Fraser, 1952, and others), and of plankton communities (Russell, 1935 *a*, 1939; Fraser, 1949; Ponomareva, 1957, and others). Some recent works on Chaetognatha which need special mention are the discussions on some aspects of speciation in this group of animals by David (1963); a completely new classification of Chaetognatha proposed by Tokioka (1965 *a*); the review of 'Chaetognaths' by Alvarino (1965); and a comprehensive review on biological studies of the chaetognaths by Ghirardelli (1968). We have elsewhere given a resume of the earlier works on Chaetognatha from the Indian Seas (Silas and Srinivasan, 1969). To this may also be added the following recent works which have to be consulted for studies on chaeto-

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gnaths of the Indian Ocean: Alvarino (1964 *a*, 1964 *b*, 1965, 1967); David (1955, 1958 *a*, 1958 *b*, 1959, 1963, 1965); Furnestin (1958); Ghirardelli (1947, 1950 *a*, 1950 *b*, 1951, 1968); Pathansali and Tokioka (1963); Schilp (1941); Thomson (1947, 1948); Tokioka (1952, 1956 *a*, 1956 *b*, 1962, 1965 *a*, 1965 *b*), and Tokioka and Pathansali (1963).

The classification proposed by Tokioka (1965 *a*) divides Phylum Chaetognatha into two Classes, namely, Archisagittoidea (for the monotypic fossil genus *Amiskwia* Walcott, 1911 considered by Owre and Bayer (1962) to be most probably a pelagic nemertine), and Sagittoidea, the latter with two Orders Phragmophora and Aphragmophora. The former includes the families Spadellidae (genus *Spadella* Langerhans) and Eukrohnidae (genera *Eukrohnia* Ritter-Zahony, *Heterokrohnia* Ritter-Zahony, and *Bathyspadella* Tokioka). Order Aphragmophora is subdivided into two suborders—Flabellodontina (Family Krohnittidae, genus *Krohnitta* Ritter-Zahony) and Ctenodontina (Family Pterosagittidae for genus *Pterosagitta* Costa) and Family Sagittidae with eight genera—*Sagitta* s.str., *Zonosagitta* Tokioka, *Serratosagitta* Tokioka and Pathansali, *Parasagitta* Tokioka, *Aidanosagitta* Tokioka and Pathansali, *Mesosagitta* Tokioka, *Solidosagitta* Tokioka, and *Flaccisagitta* Tokioka). This classification envisages elevation of several species-groups into higher categories, recognising in all 15 genera for 65 taxa, including 3 subspecies, one variety and 3 forma.

Some earlier authors have attempted to group closely related species of Chaetognatha into " Couplets " (Michael, 1913) or species groups such as '*maxima*'-group, '*neglecta*'-group, '*hispida*'-group, and so on (Thiel, 1938; Thomson, 1947; Tokioka, 1952; Furnestin, 1957; Colman, 1959; and others). According to Alvarino (1965) many of the groupings proposed may be of little value unless such groups are based on sound taxonomy and are realistic both in their genetical and ecological relations.

Our studies indicate that at present 33 species of Chaetognatha are known to inhabit the Indian Ocean and contiguous Seas. We have made no attempt to fit them into the classification proposed by Tokioka, nor tried to segregate them into species-groups for which more information will be needed. At present they are placed under four pelagic genera (*Pterosagitta*, *Krohnitta*, *Eukrohnia*, and *Sagitta*), and a benthic genus (*Spadella*). The material forming the basis of this study has come from the abundant collections of over 5000 plankton samples collected during the cruises of R. V. VARUNA in the Indian Seas, and the collections made by the senior author during his participation in the V Cruise of the U.S. Research Vessel ANTON BRUUN in the Indian Ocean from January to May 1964. The species

that are present in our collections are marked with an asterisk (*) in the following list. Synonyms of the species are also indicated in the list in parenthesis with citation to relevant records from the Indian Ocean. The species are arranged alphabetically under each genus.

Genus *Spadella* Langerhans

1. *Spadella cephaloptera* (Busch), 1851

Genus *Pterosagitta* Costa

*2. *Pterosagitta draco* (Krohn), 1853

Genus *Krohnitta* Ritter-Zahony

*3. *Krohnitta pacifica* (Aida), 1897 [Syn. *K. subtilis* Ritter-Zahony, 1911 partim; Burfield and Harvey, 1926; *Krohnia pacifica* Varadarajan and Chacko, 1943; *Krohnia kerberti* Oye, 1918]

*4. *Krohnitta subtilis* (Grassi), 1881

Genus *Eukrohnia* Ritter-Zahony

5. *Eukrohnia bathyantarctica* David, 1958

*6. *Eukrohnia bathypelagica* Alvarino, 1962

*7. *Eukrohnia fowleri* Ritter-Zahony, 1909 [Syn. *E. richardi* Burfield and Harvey, 1926; *E. hamata* Thomson, 1947, partim]

*8. *Eukrohnia hamata* (Moebius) 1875 [Syn. *E. richardi* Germain and Joubin, 1912]

*9. *Eukrohnia minuta* Silas and Srinivasan, 1969 Genus *Sagitta* Quoy and Gaimard

10. *Sagitta bedfordii* Doncaster, 1903 [Syn. *S. pseudoregularis* Oye, 1918]

*11. *Sagitta bedoti* Beraneck, 1895

12. *Sagitta bipunctata* Quoy and Gaimard, 1827 [Syn. *S. hispida* (*nec* Conant, 1895) Burfield and Harvey, 1926; George, 1952]

*13. *Sagitta bombayensis* Lele and Gae, 1936 [Syn. *S. robusta* George, 1949, partim]

*14. *Sagitta decipiens* Fowler, 1905 [Syn. *S. neodecipiens* Tokioka, 1959]

15. *Sagitta demipenna* Tokioka and Pathansali, 1963

*16. *Sagitta inflata* Grassi, 1881 [Syn. *S. enflata* of various authors; *S. gardineri* Doncaster, 1903; John, 1933, 1937; Lele and Gae,

1936; *S. enflata* froma *gardineri* Tokioka, 1959; *S. australis* Johnston, 1909]

*17. *Sagitta ferox* Doncaster, 1903 [Syn. *S. robusta* (*nec* Doncaster, 1903) Burfield and Harvey, 1926; John, 1933; Varadarajan and Chacko, 1943, partim; Thomson, 1947, 1948; George, 1952, partim; Tokioka, 1956 *a*, 1956 *b*, 1959; Rao, 1958 *a*, 1958 *b*; Rao and Ganapati, 1958; *Sagitta ai* Tokioka, 1939; *S. planctonis* (*nec* Steinhaus, 1896) Delsman, 1939; *S. hispida* (*nec* Conant, 1895) John, 1937 (?); Ghirardelli, 1947]

*18. *Sagitta gazellae* Ritter-Zahony, 1909 [Syn. *S. lyra* (*nec* Krohn' 1853) Thomson, 1947]

*19. *Sagitta hexaptera* d'Orbigny, 1834 [Syn. *S. hexaptera* froma *magna* Germain and Joubin, 1916]

*20. *Sagitta hispida* Conant, 1895

21. *Sagitta johorensis* Pathansali and Tokioka, 1963

*22. *Sagitta lyra* Krohn, 1853 [Syn. *Pseudosagitta grimaldi* Germain and Joubin, 1912; *Sagitta lyra-gazellae* Ghirardelli, 1950; *Sagitta lyra typica* Ghirardelli, 1950]

*23. *Sagitta macrocephala* Fowler, 1905

*24. *Sagitta maxima* (Conant) 1896 [Syn. *Spadella maxima* Conant, 1896]

25. *Sagitta minima* Grassi, 1881

26. *Sagitta neglecta* Aida, 1897 (Syn. *Sagitta trichodermis* Oye, 1918; *S. tenuis* (*nec* Conant, 1896) John, 1933]

*27. *Sagitta pacifica* Tokioka, 1940 [Syn. *S. serratodentata* (*nec* Krohn, 1853) Burfield and Harvey, 1926; Schilp, 1941; Ghirardelli, 1947; Rao, 1958 *a*; *S. serratodentata* '*pacifica*' type Rao and Ganapati, 1958; Thomson, 1947, partim; *S. serratodentata* (variety '*Pacifica*') Rao, 1958 *b*; *S. serratodentata pacifica* Tokioka, 1952, 1962]

28. *Sagitta planctonis* Steinhaus, 1896 [Syn. *S. planktonis* of some authors]

*29. *Sagitta pulchra* Doncaster, 1903 [Syn. *S. weberi* Oye, 1918]

*30. *Sagitta regularis* Aida, 1897

*31. *Sagitta robusta* Doncaster, 1903 [Syn. *S. ferox* Thomson, 1947; Tokioka, 1956 *a*, 1959]

32. *Sagitta tasmanica* Thomson, 1947

*33. *Sagitta zetesios* Fowler, 1905 [Syn. *S. planctonis* (*nec* Steinhaus) Burfield and Harvey, 1926 (?); Schilp, 1941; Thomson, 1947 partim].

Characters Used in Specific Identification

The conventional meristic characters used in identifications, namely, hooks and teeth are variable with age. However, the determination of their variability based on graded series of material of different maturity stages will permit the use of these meristic characters. Besides the eye being pigmented or not, it is now known that in the former condition the arrangement of pigmented septa that separate the visual cupolae (pigmented cups) in the eye varies very little within the species, but differs from species to species. Other good systematic characters are: the presence of the collarette (lateral expansion of epidermis) and its nature and disposition; the relative lengths and sizes of lateral fins, the points of origin of the lateral fins (anterior fin in *Sagitta*) in relation to the ventral ganglion, the relative extension of the lateral fins on trunk and tail segment, and the rayed or rayless condition of the lateral fins; the ratio of tail segment in total length (varies with age, but can be relied upon when the range of variability for the species is known); the structure, shape, size and the position of the seminal vesicles; the arrangement of developed ova in the advanced stage of vitellogenesis; the disposition of the sympathetic nerve cords from the ventral ganglion; the presence or absence of intestinal diverticula; the presence or absence of pigmentation of the intestine (in bathypelagic species); and the presence or absence of oil globules in the intestine.

The corona ciliata, though considered important, is known to vary considerably within the species and is difficult to observe in preserved material as it usually does not persist. The nature of the tips of the hooks (straight or hooked), the presence or absence of serrations (partially variable with age), and the shape of the hook; the relative lengths of the ovaries in fully matured (Stage-IV) specimens; relative hispidity; the size of the ventral ganglion; and the relative width of the intestine are used as additional systematic characters. Some authors have also considered the general aspects of the body such as flabbiness or turgidity; opacity, translucency, or transparency; the relative thickness and width of muscles; and the width of the lateral fields in relation to the width of the animal.

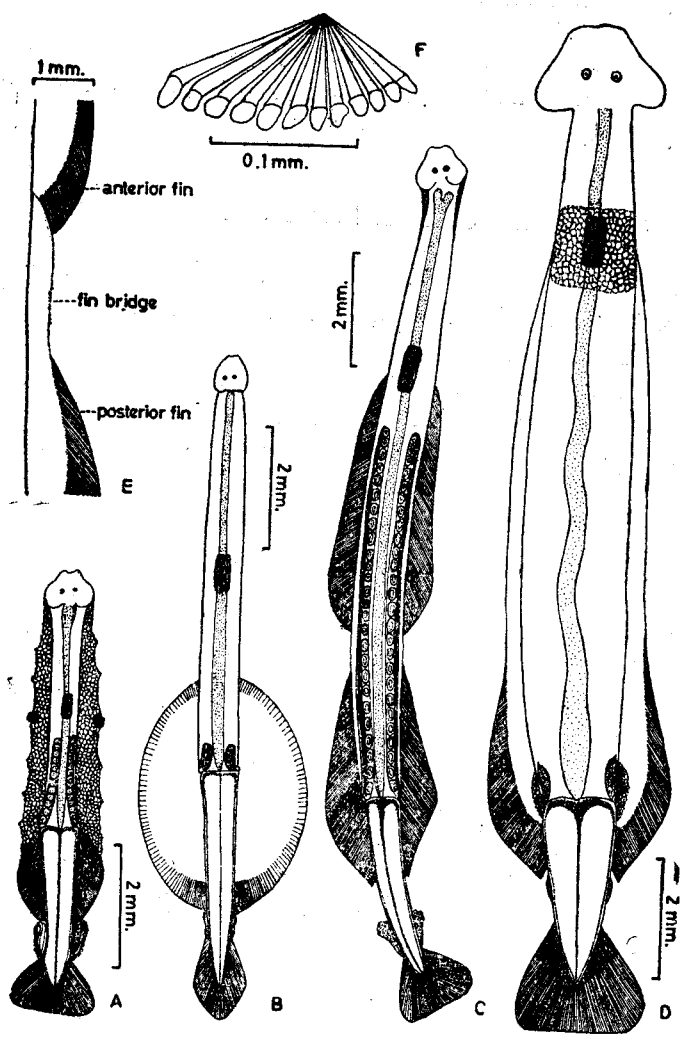

FIG. 1. A. *Pterosagitta draco*; B. *Krohnitta subtilis*; C. *Sagitta decipiens*; D. *Eukrohnia fowleri*; E. lateral fins of *Sagitta lyra*; and F. Arrangement of teeth in *Krohnitta subtilis*.

KEY TO THE GENERA AND SPECIES OF INDIAN OCEAN CHAETOGNATHA

1. Two pairs of lateral fins (Fig. 1 C: *Sagitta* Quoy and Gaimard).. 2

   One pair of lateral fins (Fig. 1 A, B and D: *Eukrohnia* Ritter-Zahony; *Krohnitta* Ritter-Zahony; *Pterosagitta* Costa; and *Spadella* Langerhans) 25

2. Collarette absent (Fig. 1 B) 3

   Collarette present (Fig. 1 A and C) 10

3. Eyes without pigment (Fig. 2 B).. *Sagitta macrocephala* Fowler
   Eyes with pigment (Fig. 2 C) .. 4

4. Finbridge connects anterior and posterior fins laterally (Fig. 1 E) 5
   Finbridge absent (Fig. 1 C) .. 7

5. Tail segment less than 19 per cent of total length, anterior fin starts distinctly behind ventral ganglion (ova arranged in 4 or 8 rows) 6

   Tail segment more than 19 per cent of total length; anterior fin starts opposite middle of ventral ganglion (ova arranged in 2 to 5 rows) .. .. *Sagitta maxima* (Conant)

6. Tail segment more than 15 per cent of total length; ova arranged in 4 rows (Fig. 2 O); distance between origin of anterior fin and ventral ganglion hardly exceeds length. of ventral ganglion .. .. *Sagitta lyra* Krohn

   Tail segment less than 15 per cent of total length; ova arranged in 8 rows; distance between origin of anterior fins and ventral ganglion almost three times or more length of ventral ganglion .. .. *Sagitta gazellae* Ritter-Zahony

7. Species minute, mature specimens (Stage-IV) not exceeding 10 mm; intestinal diverticula present; origin of anterior fin just behind ventral ganglion; ova arranged in one row (Fig. 2 L) .. 8

   Species large, mature specimens (Stage-IV) exceeding 10 mm and up to 40 mm; intestinal diverticula absent; origin of anterior fin far behind ventral ganglion, gap being more than $\frac{3}{4}$ anterior fin length; ova arranged in 3 rows (Fig. 2 N) 9

8. Tail segment 17 to 21 per cent of total length; lateral fins rayed along margin; seminal vesicles not prominent, touching tail fin and separated from posterior fin by wide gap; ovaries short reaching up to mid-length of posterior fin on trunk; ova few (3 or 4) .. .. .. *Sagitta minima* Grassi

   Tail segment 29 to 33 per cent of total length; lateral fins fully rayed; seminal vesicles conspicuously large and almost spherical, situated closer to posterior fins; ovaries long, extending beyond posterior end of anterior fins and even up to ventral ganglion; ova 9 or more .. ..
   .. .. *Sagitta johorensis* Pathansali and Tokioka

9. Maximum size up to 25 mm; anterior fin length more than 80 per cent of tail segment; origin of anterior fin almost midway between neck and tip of tail; seminal vesicles touching tail fin; anterior teeth 4 to 8; posterior teeth 4 to 13; ovaries not surpassing origin of anterior fins .. *Sagitta inflata* Grassi

Maximum size between 35 and 40 mm; anterior fin length less than 80 per cent of tail segment; origin of anterior fin about midway between anterior end of head and tip of tail; seminal vesicles separated from tail fin by gap equal to its length (Fig. 2, I); anterior teeth 2 to 4; posterior teeth 2 to 6; ovaries extending beyond origin of anterior fins .. .. *Sagitta hexaptera* d'Orbigny

10. Concave internal margin of hooks with well-defined serrations (Fig. 2 D) .. ..

Concave internal margin of hooks without serrations ..

11. Ova arranged in one row; seminal vesicles with 4 to 10 chitinous 'teeth' antero-laterally (Fig. 2 J) .. *Sagitta pacifica* Tokioka

Ova arranged in two rows; seminal vesicles without any chitinous 'teeth', but with soft protuberances or papillae .. .. *Sagitta tasmanica* Thomson

12. Seminal vesicles touching both posterior fins and tail fin (Fig. 2 E) .. ..

Seminal vesicles touching either posterior fins or tail fin or apart from both fins .. ..

13. Intestinal diverticula present; collarette well developed, extending from head to tail septum or even posterad; ova arranged in one or two rows .. ..

Intestinal diverticula absent; collarette short, restricted to neck region; ova arranged in 3 rows .. *Sagitta bedoti* Beraneck

14. Posterior teeth 10 to 15; hooks 5 to 8; collarette present from head to tail, but thickest from head to ventral ganglion from whence it extends backwards as a thin layer throughout body

Posterior teeth 18 to 23; hooks 9 or 10; collarette very conspicuous extending from head to slightly behind middle of posterior fin and more or less of uniform width throughout .. .. *Sagitta bombayensis* Lele and Gae

15. Anterior fin shorter than posterior fin and starts behind posterior end of ventral ganglion; ova arranged in one row (Fig. 2 L) .. .. .. *Sagitta robusta* Doncaster

    Anterior fin longer than posterior fin and starts opposite middle of ventral ganglion; ova arranged in two rows (Fig. 2 M) .. .. .. *Sagitta ferox* Doncaster

16. Seminal vesicles touching tail fin, but separated from posterior fins by wide gap (Fig. 2 H) 17

    Seminal vesicles touching posterior fins or close to them and separated from tail fin by wide gap 19

17. Intestinal diverticula absent; posterior teeth 8 to 16 18

    Intestinal diverticula present; posterior teeth 19 to 22 (Fig. 1 C) .. .. .. *Sagitta decipiens* Fowler

18. Lateral fins completely rayed; anterior fin slightly shorter than posterior fin; ova arranged in single irregular (appearing as two rows) row .. *Sagitta bipunctata* Quoy and Gaimard

    Lateral fins partially rayless along base (Fig. 2 K); anterior fin twice as long as posterior fin; ova arranged in 3 rows .. .. *Sagitta pulchra* Doncaster

19. Large, mesoplanktonic, mature specimens (Stage-IV) generally over 30 mm; ova arranged in 3 or more rows 20

    Small, neritic, mature specimens (Stage-IV) less than 15 mm; ova arranged in one row 21

20. Anterior fin starts opposite middle of ventral ganglion; ova arranged in 4 or 5 rows; posterior teeth 10 to 14 .. .. *Sagitta planctonis* Steinhaus

    Anterior fin starts at posterior end of ventral ganglion; ova arranged in 3 rows; posterior teeth 15 to 22 .. .. *Sagitta zetesios* Fowler

21. Posterior fin confined to tail segment only .. .. *Sagitta demipenna* Tokioka and Pathansali

    Posterior fin on trunk and tail segment 22

22. Tail segment 34 to 38 per cent of total length; posterior teeth 2 or 3; anterior teeth 1 to 3; posterior fin more than 1·5 times longer than anterior fin; ova large and few, elongate and distributed unequally in one row .. *Sagitta bedfordii* Doncaster

Tail segment 26 to 34 per cent of total length; posterior teeth 6 to 18; anterior teeth 4 to 10; posterior fin less than 1·5 times longer than anterior fin; ova oval to spherical and arranged in regular compact series in one row (Fig. 2 L) .. 23

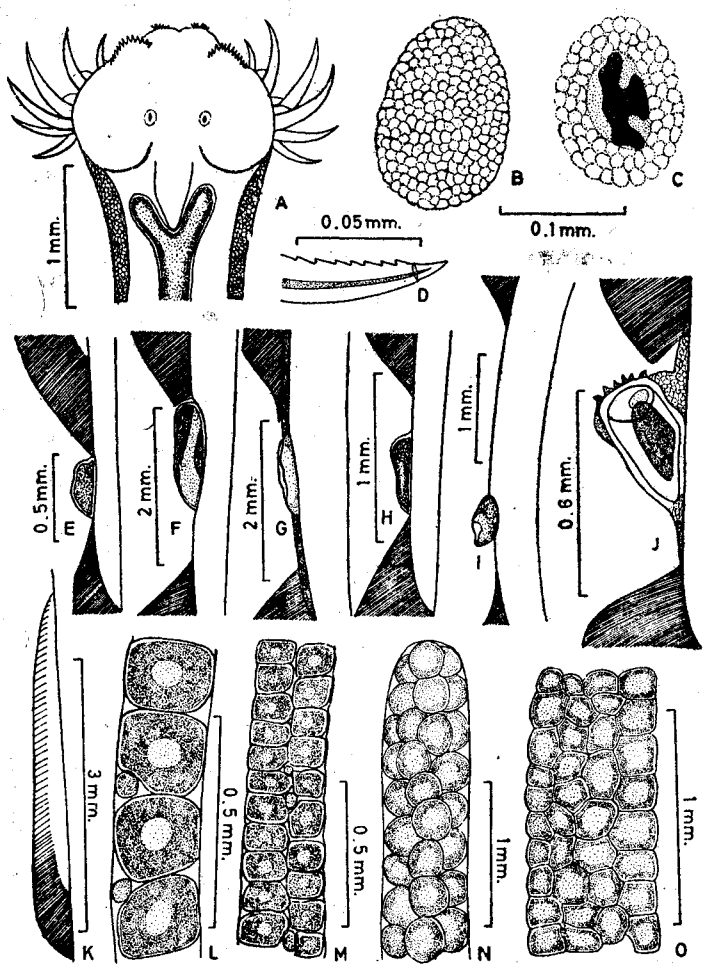

FIG. 2. A. Head of a typical *Sagitta* (*S. ferox*) showing details; B. Unpigmented eye (*S. macrocephala*); C. Pigmented eye (*S. robusta*); D. Portion of a serrated hook (*S. pacifica*); E. Seminal vesicle touching posterior lateral fin and tail fin (*S. bedoti*); F. Seminal vesicle touching posterior lateral fin (*S. hispida*); G. Seminal vesicle apart from posterior lateral fin and tail fin but closer to former (*S. zetesios*); H. Seminal vesicle touching tail fin (*S. pulchra*); I. Seminal vesicle apart from posterior lateral fin and tail fin but closer to latter (*S. hexaptera*); J. Seminal vesicle with chitinous "teeth" antero-laterally (*S. pacifica*); *K*. Anterior fin without fin rays along inner base (*S. pulchra*); L–O. Arrangement of ova in one row (*S. robusta*), in two rows (*S. ferox*), in three rows (*S. inflata*), and in four rows (*S. lyra*) respectively.

23. Collarette extends from head to tip of tail; hispid condition not conspicuous; mature specimens (Stage-IV) less than 8 mm. .. 24

Collarette extends from head to ventral ganglion; hispid condition conspicuous; mature specimens (Stage-IV) 8 to 12 mm. .. .. .. *Sagitta hispida* Conant

24. Collarette extends as a thick and wide layer from head to tail seminal vesicle eleongate; posterior teeth 2 to 6; anterior teeth 2 to 4; hooks 7 to 11 .. *Sagitta regularis* Aida

Collarette extends as a thin layer from head to tail; seminal vesicle roundish; posterior teeth 9 to 18; anterior teeth 5 to 7; hooks 6 to 8 .. .. .. *Sagitta neglecta* Aida

25. Digitate adhesive organs on tail segment present *Spadella* Langerhans) .. .. *Spadella cephaloptera* (Busch)

Digitate adhesive organs on tail segment absent 26

26. Two sets of teeth on either side of head; collarette massive extending as a conspicuous band from head to tail; lateral fin confined to tail segment (*Pterosagitta* Costa) (Fig. 1 A) .. .. *Pterosagitta draco* (Krohn)

One set of teeth on either side of head; collarette poorly developed or absent; lateral fins extending from tail segment to trunk 27

27. Tail spatula-shaped (Fig. 1 B); lateral fins anteriorly extending to midway between tail segment and ventral ganglion; teeth arranged in form of a cone (Fig. 1 F) *Krohnitta* Ritter-Zahony) 28

Tail posteriorly truncate or as in genus *Sagitta* (Fig. 1 D); lateral fins anteriorly extending up to ventral ganglion: arrangement of teeth as in genus *Sagitta* (*Eukrohnia* Ritter-Zahony).. 29

28. Lateral fins conspicuously broad and rayless except along margin; rays wide apart; ovaries in mature specimens (Stage-IV) do not surpass origin of anterior fin; ova arranged in two rows (Fig. 1 B) .. .. *Krohnitta subtilis* (Grassi)

Lateral fins normal; fin rays more well defined covering over half of fin leaving internal anterior part rayless; ovaries in mature specimens (Stage-IV) reach ventral ganglion; ova arranged in one row .. *Krohnitta pacifica* (Aida)

29. Eyes with pigment; collarette present as a conspicuous band surrounding body in region of ventral ganglion and extends backwards as a thin layer on to tail segment thickening behind seminal vesicles (Fig. 1 D) .. *Eukrohnia fowleri* Ritter-Zahony

Eyes without pigment; Collarette when present inconspicuous as a thin layer from ventral ganglion to seminal vesicles or only as a layer at base of tail fin 30

30. Collarette absent; hooks 11 or more (11 to 14) .. .. *Eukrohnia bathyantarctica* David

Collarette present; hooks less than 11 (7 to 10) 31

31. Tail segment less than 25 per cent of total length (19 to 25 per-cent); ova in mature specimens (Stage-IV) arranged in 4 rows .. .. *Eukrohnia hamata* (Moebius)

Tail segment 25 per cent or more of total length (25 to 35 per-cent); ova in mature specimens (Stage-IV) arranged in one or two rows 32

32. Ovaries long, 30 per cent or more in total length; ova in mature specimens (Stage-IV) arranged in two rows; maturing ovaries coiled, especially towards tip: eyes with about 100 ommatidia; tips of jaw hooks curved and at almost right angles to shaft .. .. *Eukrohnia bathypelagica* Alvarino

Ovaries short, hardly 10 per cent of total length; ova in mature specimens (Stage-IV) arranged in one row; maturing ovaries cylindrical and straight, eyes with less than 20 ommatidia; tips of jaw hooks almost straight .. .. *Eukrohnia minuta* Silas and Srinivasan

In the above key, the total length and the tail segment are meant to include the tail fin. The characters given in the key should help in the identification of matured specimens. In all cases, it will be desirable to examine graded series of specimens.

E. bathyantarctica is included in the key as it was described from the Indian Ocean Sector of the Antarctic close to the southern limits of the Indian Ocean from below 1150 metres ("Discovery" Stn. 1639 at 58°35'S 92°06'2" E). Further, recently it was recorded by Fagetti (1968) from the Gulf of Mexico and Caribbean Sea indicating its cosmopolitan occurrence in deeper waters.

General Remarks

The status and systematic position of some species recorded from Indian Seas are uncertain. For instance, the record of '*Sagitta planktonis*' by George (1952) considered by Alvarino (1965) to be a synonym of *Sagitta zetesios* needs further study. Both *S. planctonis* and *S. zetesios* are mesoplanktonic species, and the illustrations given by George does not agree with these species. Other such instances are discussed by Silas and Srinivasan (1969).

Apparently, only cursory examinations have been made of material of *Spadella* from the Indian Ocean resulting in the record of only a single species, *S. cephaloptera* by earlier workers. At present the genus is known from at least ten nominal species from the Atlantic and Pacific Oceans and the Mediterranean (Owre, 1963; Tokioka, 1965 *a*). More careful scrutiny of material of this benthic genus from the Indian Ocean is bound to bring to light additional records.

Alvarino (1965) expressed doubts regarding the validity of the pelagic genus *Heterokrohnia* Ritter-Zahony (1911) indicating that the type *H. mirabilis* Ritter-Zahony (1911) described from the Indian Ocean Sector of the Antarctic may be based on mutilated specimens of *Sagitta lyra.* However, recently Marumo and Kitou (1966) have described a new species of *Heterokrohnia* (*H. bathybia*) from the Western North Pacific giving more weight to the validity of this genus. The occurrence of this genus in the subtropical waters of the Indian Ocean cannot be ruled out.

The known distribution of *Sagitta friderici* Ritter-Zahony (1911), *S. marri* David (1956), *S. oceania* Grey (1930), and *S. tenuis* Conant (1896) are close to the boundaries of the Indian Ocean. Apparently, more intensive sampling may show the occurrence of some of these species within the limits of the Indian Ocean. Insufficient sampling is primarily responsible for our ignorance about the natural distribution of several species, particularly those inhabiting the mesopelagic and bathypelagic realms.

It is hoped that the aid to the identification of Chaetognatha of the Indian Ocean given here would facilitate the work of planktologists currently engaged in studying Indian Ocean zooplankton and in particular those interested in chaetognaths.

Acknowledgement

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The original references of species and synonyms in the list of Indian Ocean species mentioned earlier are available in standard works such as Thomson (1947) and Alvarino (1965). Hence, these are not included here unless referred to in the rest of the text.

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