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THE SYNONYMY OF SAGITTA PLANCTONIS AND SAGITTA ZETESIOS (CHAETOGNATHA)

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ABSTRACT

Sagitta planctonis Steinhaus, 1896 and Sagitta zetesios Fowler, 1905 are compared. The characters in which they differ have no specific value so that the two are considered to belong to one species: Sagitta planctonis Steinhaus, 1896.

Among the North Atlantic Chaetognatha collected by the weatherships "Cirrus" and "Cumulus" between 1962 and 1967 the only specimens giving taxonomic difficulties were those which seemed to belong to an intermediate form between Sagitta planctonis and Sagitta zetesios. Because of the scarcity of these specimens in the North Atlantic catches, the material of the Siboga Expedition (1899) from the Indian Ocean, identified by Fowler as Sagitta planctonis and Sagitta zetesios was included in the present study. The total number of specimens studied was 77. Twenty specimens were too small for comparison (under 15 mm in length) and 14 were too damaged to be included in the comparisons. Before comparing and synonymizing both taxa, their original descriptions and figures are given.

Sagitta planctonis Steinhaus, 1896

Medium size, 2 cm in length, collarette clearly developed, 8 pairs of hooks, smooth and plain, anterior teeth 5 - 6, posterior teeth up to 12. Anterior fins very small, extending as far as the middle of the ventral ganglion. Posterior fins triangular. Tail 1/4 of the total body length. (Translated from the German). Steinhaus (1896: 7, fig. 1), see fig. 1.

Sagitta zetesios Fowler, 1905

"Head medium size, marked neck, collarette present, tail 25 - 30%. Posterior fin triangular, widest part at or slightly behind septum. Anterior fin well separated, not quite or only just reaching hinder end ventral ganglion, tail fin truncate. Corona ciliate not observed. Anterior teeth 4 - 9; posterior teeth in 8 - 9 mm individuals 5 - 12, in 10 - 32 mm individuals 12 - 19". Fowler (1905: 67, figs. 22 and 23), see fig. 2.

Ritter-Zahony (1911) already regarded these two species as one: Sagitta planctonis. Later, David (1956) subdivided Sagitta planctonis s.l. into three species, Sagitta planctonis Steinhaus, 1896, Sagitta zetesios Fowler, 1905, and Sagitta marri David, 1956. Sagitta marri is not included in the present study as it is said to be restricted to the Antarctic Ocean. David (1956: 450) gives as the only observed taxonomical difference between Sagitta planctonis and Sagitta zetesios the number of the posterior teeth in individuals over 15 mm in length. There are usually more than 14 posterior teeth in Sagitta zetesios and less than 14 in Sagitta planctonis. For the anterior teeth he found a number of 6 to 8 in Sagitta planctonis and 8 to 10 (12) in Sagitta zetesios. In the original descriptions another difference is given,

viz., the position of the ventral ganglion in relation to the anterior fins. The anterior fins extend as far as the middle of the ventral ganglion in Sagitta planctonis Steinhaus, 1896, while in Sagitta zetesios they do "not quite or only just reach the hinder end of the ventral ganglion" Fowler, 1905). The characters mentioned above (number of anterior and posterior teeth and the position of the ventral ganglion in relation to the anterior fins) are compared in fig. 3 to show the overlap of characters in the two "species", these data being based upon 43 specimens over 15 mm in length. For the sake of simplicity the external characters which are considered here are indicated as follows:

ventral ganglion as normal for Sagitta zetesios: A
ventral ganglion " " " Sagitta planctonis: a
posterior teeth " " " Sagitta zetesios: B
posterior teeth " " " Sagitta planctonis: b
anterior teeth " " " Sagitta zetesios: C
anterior teeth " " " Sagitta planctonis: c

Each of the 43 circle segments in fig. 3 represents one specimen. The heavy lines are drawn for the features indicated by capitals, typical for Sagitta zetesios, the thin lines for the features indicated in lower case, typical for Sagitta planctonis. Thus 17 specimens show the combination ABC, 13 specimens the combination ABc, 4 specimens the combination Abc, 5 specimens the combination abc, one specimen the combination aBC, two specimens the combination aBc and one specimen the combination AbC.

According to Tokioka (1955) the TC value

$$(= \frac{\text{length posterior fin on trunk}}{\text{length posterior fin on tail}} \times 100)$$

is in general a good character to distinguish species. The species studied here gives TC values from 100 to 180, distributed over the specimens independently of the combinations of the other characteristics. Neither a division into two value groups, nor a correlation with certain types of specimens could be made.

Though some authors state that the two species are easily distinguished (Alvarino, 1964b), it is clear that this is true only if one considers one character at a time. A division into two distinct species based upon a correlation of features proves to be impossible. David (1956) uses the number of posterior teeth and Alvarino (1964b) the position of the ventral ganglion as the most typical character for identification. Eight of the above mentioned specimens, however, can not be identified with their keys. In this light the difference in the distributional records of David (1956) and of Alvarino (1964b) can be explained, since these authors splitted their material into two taxa on account of different criteria. According to Alvarino (1964b) the distribution of Sagitta planctonis is subantarctic, limited by the antarctic and subtropical convergencies, while Sagitta zetesios ranges from 40° N to 40° S, both species being mesoplanctonic. According to David (1956) the distribution of the epiplanctonic Sagitta planctonis is subtropical and tropical, while Sagitta zetesios would be a deep warm water form, never found in the Antarctic.

In the present material five specimens show all the "Sagitta planctonis" characters. These specimens come from 34° N 39° W, 45° N 30° W, and 34° N 30° W and consequently not from the area indicated by Alvarino as the range of this species. After comparison of the figures 4 to 11 of eight specimens with different combinations of characters, it is sufficiently clear that there are no correlated features. As is borne out by the figures, the larger specimens have a more developed collarette and a broader and more angular shaped anterior fin. This tendency agrees with the morphological changes during the development of the specimens as described by Ritter-Zahony (1911a).

Repeatedly, one finds the simultaneous occurrence of "distinguishing characters" in a single specimen (see fig. 3) as well as different combinations of them, so one can only conclude that the two species, Sagitta planctonis Steinhaus and Sagitta zetesios Fowler can not be separated. Neither the stages in sexual development, nor the geographic distribution appear to be correlated with the different combinations of characters, so it is not possible to make a division into sexual stages, formae or geographical races. Thus the taxon has to be considered a very variable species for which, according to the law of priority, the name Sagitta planctonis Steinhaus, 1896 has to be used.

Sagitta planctonis Steinhaus, 1896

Synonymy and references

Sagitta planctonis	Steinhaus, 1896 : 7, pl. 1 figs. 1 - 2 ; Fowler, 1905 : 71, pl. 6 figs. 36 - 40; Ritter-Zahony, 1909 : 790; 1911a : 29, figs. 32 - 33; 1911b : 16; 1911c : 25; Burfield, 1930 : 214; Grey, 1931 : 62; Thiel, 1938 : 42; Tokioka, 1938 : 133, fig. 2; Kramp, 1939 : 20; Tokioka, 1940 : 375, fig. 8; Schilp, 1941 : 37; Fraser, 1949 : 489; Tokioka, 1952 : 310, 314; David, 1956 : 441, fig. 3a; Fagetti, 1958 : 60, fig. 13; Colman, 1959 : 241; LeBrasseur, 1959 : 796 ; Furnestin, 1960 : 145 ; Owre, 1960 : 263 ; Furuhashi, 1961 : 27; Furnestin, 1962 : 39; Alvarino, 1964a : 344; 1964b : 69; 1964c : 53, fig. 33; Furnestin, & Radiquet, 1964 : 82; Furnestin, 1966 : 124.
Sagitta ? planctonis:	Fowler, 1906 : 26.
Sagitta zetesios	Fowler, 1905 : 67, pl. 5 figs. 22-27; 1906 : 22, pl. 2 figs. 73 - 79; David, 1956 : 443, fig. 3b; 1958 : 208; Colman, 1959 : 241; Furnestin, 1960 : 145 ; Alvarino, 1964a : 69; 1964b : 344; 1964c : 53, fig. 31; Furnestin, 1966 : 125 ; Alvarino, 1967 : 50, figs. 30 - 31.
Sagitta ? zetesios:	Fowler, 1907 : 5.
Sagitta planktonis:	Kramp, 1917 : 44; 1918 : 26; Michael, 1919 : 263; Burfield & Harvey, 1926 : 99, figs. 28 - 29; Hardy & Gunther, 1935 : 107; John, 1937 : 84; Moore, 1949 : 28.
Solidosagitta planctonis :	Tokioka, 1965 : 350.
Solidosagitta zetesios :	Tokioka, 1965 : 350.

Diagnosis

Habitus strong and muscular, length 8.5 - 40 mm. Anterior fins of young specimens narrow and rounded, in adults broader and more angular shaped, usually extending as far as posterior end of the ventral ganglion. Posterior fin triangular, broadest part near the tail septum. Anterior and posterior fins usually separated. Caudal fin broad. Tail 17.4 - 28.2 % of total length, measured without the caudal fin. Hooks 7 to 10, anterior teeth 5 to 12, posterior teeth 8 to 20. Seminal vesicles rounded and smooth touching neither posterior nor caudal fin. Ovaries extending to the neck region, ova fairly small, probable in three rows. Collarette present in young specimens, in adults clearly developed and reaching the anterior fin. Intestinal diverticulum present.

DISCUSSION

This species is quite variable. The form of the anterior fin and the collarette changes during growth, young specimens show a narrow and rounded anterior fin and only the vestige of a collarette, while the adults have a well-developed collarette and a more angular shaped anterior fin. However, sometimes fairly large specimens are found with the collarette and anterior fin still of the young type, or small specimens with an already well-developed collarette; to correlate these changes in characters with the state of maturity was impossible (see figs. 4 to 11). Although in most specimens, especially in the adults, the anterior fins extend as far as the posterior end of the ventral ganglion, they sometimes extend to the middle of the ventral ganglion. In the other species in the samples of the North Atlantic such differences between young and adults were never found and in literature I failed to find an example of a species comparable in this respect with Sagitta planctonis. The range in number of posterior and anterior teeth in Sagitta planctonis is

not exceptionnally wide. In literature for example, numbers from 4 to 13 anterior teeth and from 4 to 19 posterior teeth are recorded for *Sagitta enflata* Grassi, 1883 (Colman, 1959; Sund, 1959; Legara & Zoppi, 1961) and numbers from 3 to 13 anterior teeth and from 6 to 25 posterior teeth are given for *Sagitta serratodentata* Krohn, 1853 (Furnestin, 1957; Tokioka, 1938).

In the Atlantic Ocean, *Sagitta planctonis* is found between 65° N and 60° S. From fig. 12 it is clear that this oceanic species is rare in areas which are less fertile and in the areas influenced by cold currents in the North West and South East. Owing to the great depth (100 - 2000 m) in which this species lives, in particular at higher latitudes, many expeditions will have failed to obtain specimens. Moreover, this species is never very abundant. Since it is eurythermal (temperature range in nature from 4° to 15° C) as well as eurybathic (110 - 2000 m) (cf. Thiel, 1938), it has ample opportunities to realize a cosmopolitan distribution.

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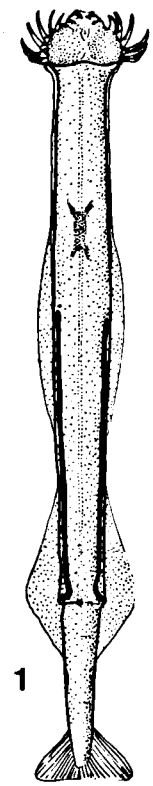

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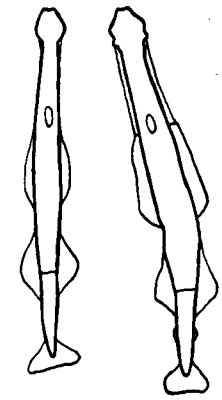

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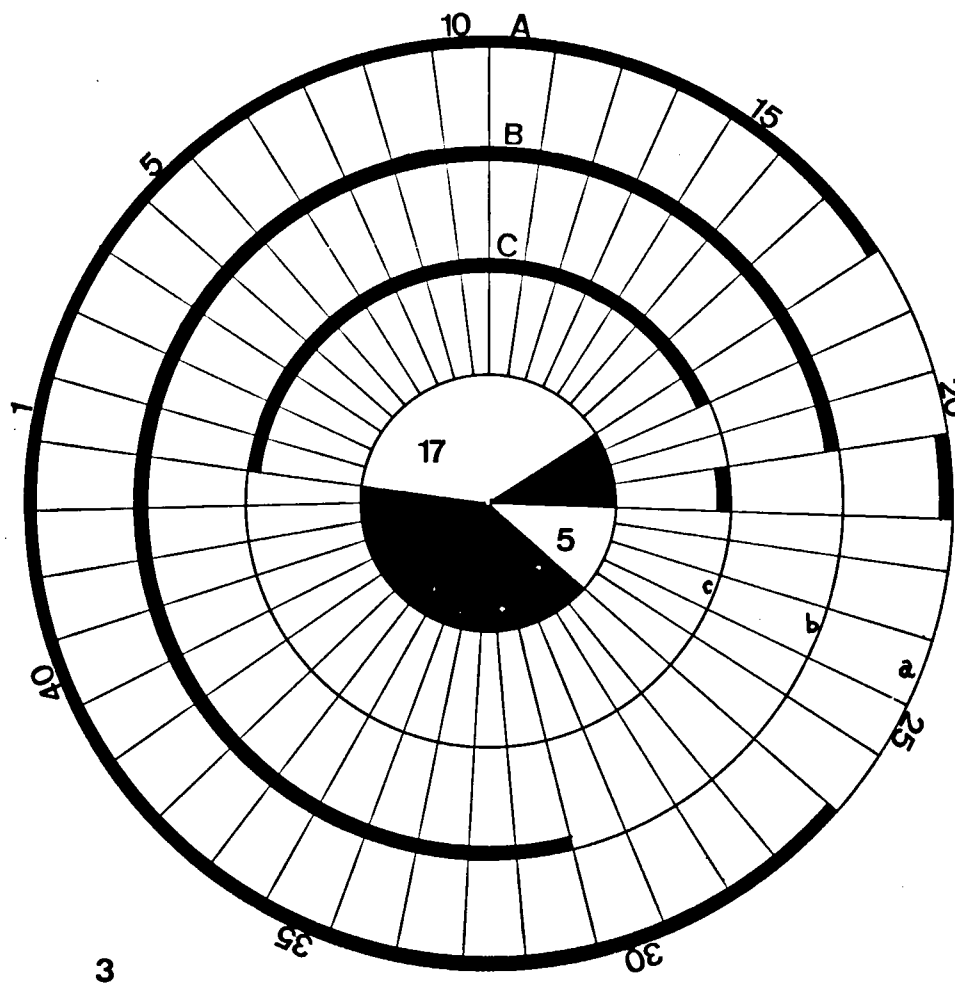

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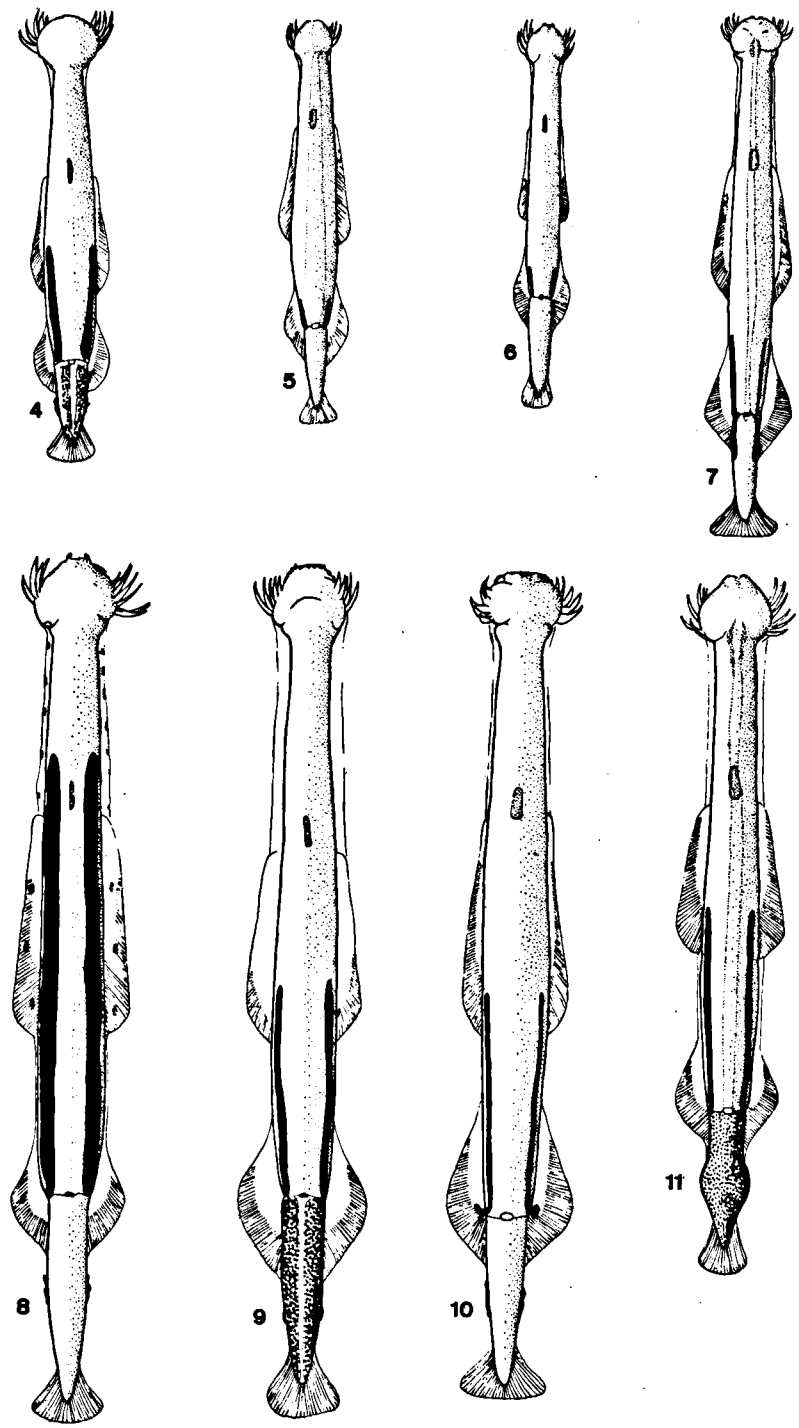
Figs. 1 - 3. 1, Sagitta planctonis after Steinhaus, 1896, fig. 1; 2, Sagitta zetesios after Fowler, 1905, pl. 5 figs. 22, 23; 3, the distribution of three characters in 43 specimens (thick lines represent those typical for Sagitta zetesios that have been indicated in the text by capitals, thin lines represent those typical for Sagitta planctonis, indicated in lower case in the text).



Figs. 4 - 11. Eight specimens of Sagitta planctonis showing different combinations of external characters (the capitals and small letters are not used in a genetical sense). 4, aBc, from 3° S 127° E; 5, abc, from 45° N 16° W; 6, aBC, from 45° N 16° W; 7, abc, from 34° N 32° W; 8, Abc, from 62° N 32° W; 9, ABc, from 62° N 32° W; 10, Abc, from 45° N 16° W; 11, ABC,from 45° N 16° W.

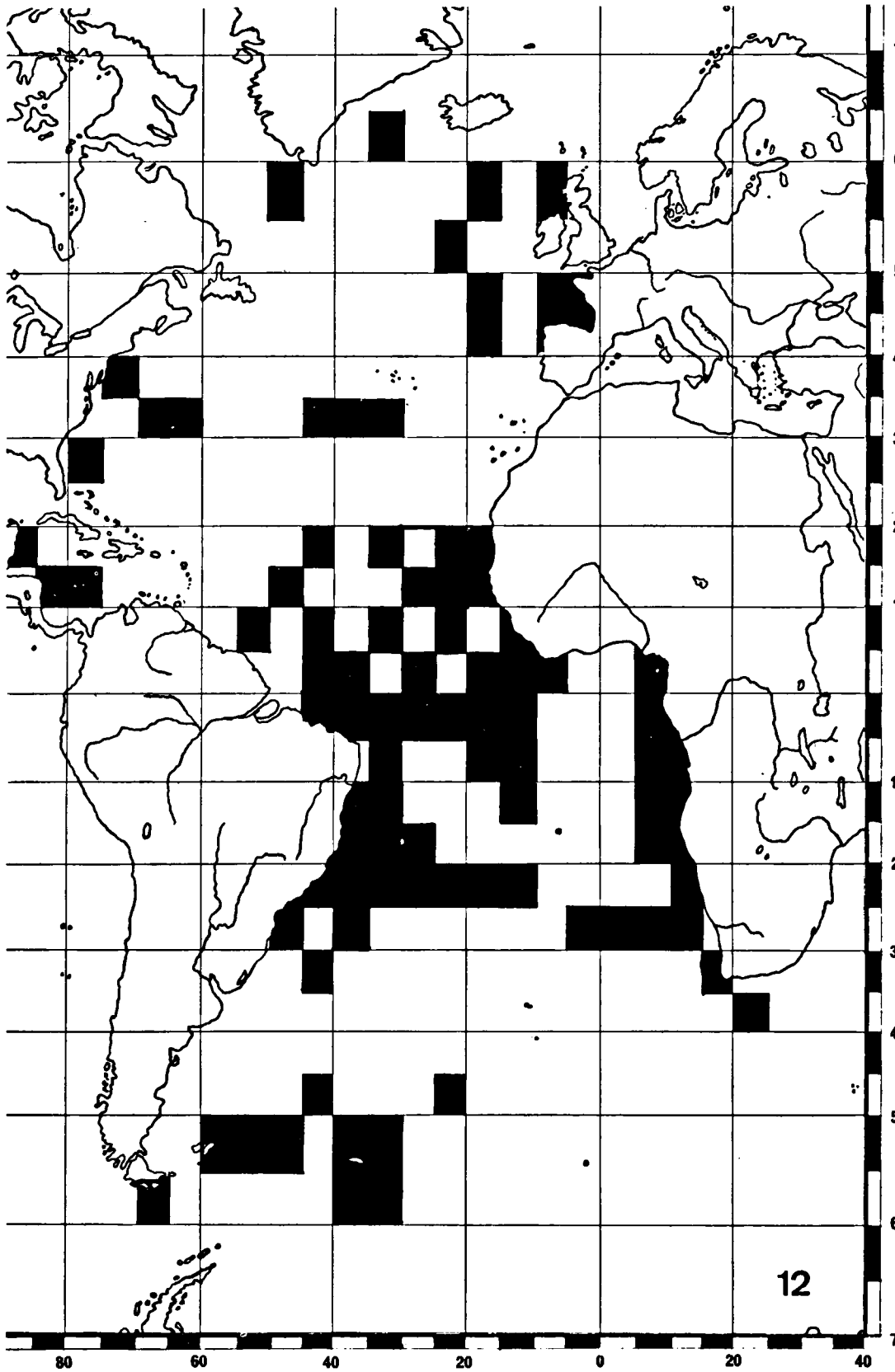


Fig. 12, The distribution of Sagitta planctonis in the Atlantic Ocean.