B O C A G I A N A

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OBSERVATIONS ON THE CHAETOGNATHS COLLECTED AT A STATION TO THE SOUTH OF THE ISLAND OF EL HIERRO (CANARY ISLANDS).

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With 3 figures and 2 tables

RESUMEN. En el presente trabajo se realizan una serie de observaciones sobre los Quetognatos, recolectados durante la campaña D.C.M. * III, en julio de 1984, en una estación al sur de la isla del Hierro (Islas Canarias, España). En el curso de dicha campaña se efectuaron pescas verticales diurnas y nocturnas a la misma hora y nivel batimétrico, realizándose también la toma simultánea de datos oceanográficos.

SUMMARY. A series of observations have been made on the Chaetognaths that were collected during the campaign D.C.M. * III, in July 1984, at a station to the south of the island of El Hierro (Canary Islands, Spain). During the course of the said campaign, diurnal and nocturnal vertical hauls were made at the same time and bathymetric level, together with the simultaneous taking of oceanographic data.

SOME OCEANOGRAPHIC CHARACTERISTICS OF THE CANARY ARCHIPELAGO (SPAIN)

In general terms, the surface water temperature in the Canaries oscillates between 17-18°C in winter and 22°C in summer. A gradient of temperature increase that can reach 1-2°C exists between the eastern and western Islands as a consequence of the u p w e l l i n g along the coast of Africa but these differences gradually disappear with the depth. On the other hand, the thermal structure of the surface layer of the Canarian waters

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is characterized by the presence of a seasonal thermocline that develops at the end of spring/beginning of summer at depths between 50 and 120 metres (as extreme values in the Western Islands, (BRAUN, 1981)). This thermocline is destroyed in winter/beginning of spring, the mixing layer attaining a depth of 100 metres as a maximum (MASCAREÑO, 1972).

With respect to the salinity, a somewhat similar situation to that of the temperature occurs. The salinity increases with distance from the African coast, a difference of 1 per mil being reached between the latter and the island of El Hierro, the yearly values lying between 36 and 37 per mil. Thus, in principle the island of El Hierro is the one with the warmest waters and greatest thermal stability as well as the highest salinity near the surface in the Canary Archipelago.

SAMPLING STATION

The sampling station (H) was situated to the south of the island of El Hierro (the most western and southern island of the whole Archipelago), one mile from the coast at 18°01'W and 27°38'N in the area denominated MAR DE LAS CALMAS (Sea of calms) for its peculiar climatological (protected from the Trade Winds) and oceanographical characteristics. Fig. 1.

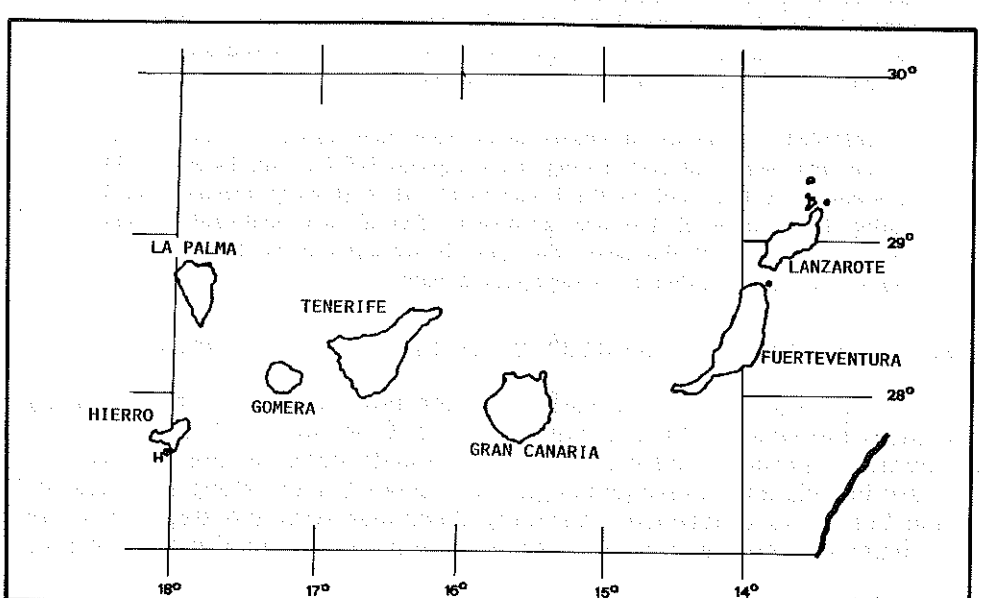

Fig. 1. — Situation of the sampling station in the Canary Islands.

STATION H	DATE	HOUR	ASCENT	T°C water surface	T°C air	S°/oo surface	DRAG
N.° 1	22-7-84	10:00	9 minutes	21° C	25° C	37'101°/oo	VERTICAL 200-0
N.° 2	22-7-84	10:45	12 minutes	21° C	25° C	37'101°/oo	VERTICAL 500-0
N.° 3	22-7-84	23:05	7 minutes	22' 4° C	21° C	36'904°/oo	VERTICAL 200-0
N.° 4	22-7-84	23:35	14 minutes	22' 4° C	21° C	36'904°/oo	VERTICAL 500-0
N.° 5	23-7-84	10:00	7 minutes	21° C	24° C	36'958°/oo	VERTICAL 200-0
N.° 6	23-7-84	11:00	13 minutes	21° C	24° C	36'958°/oo	VERTICAL 500-0
N.° 7	23-7-84	23:05	7 minutes	21° C	22° C	36'901°/oo	VERTICAL 200-0
N.° 8	23-7-84	23:30	14 minutes	21° C	22° C	36'901°/oo	VERTICAL 500-0

Table 1. — Characteristics of hauls at sampling stations.

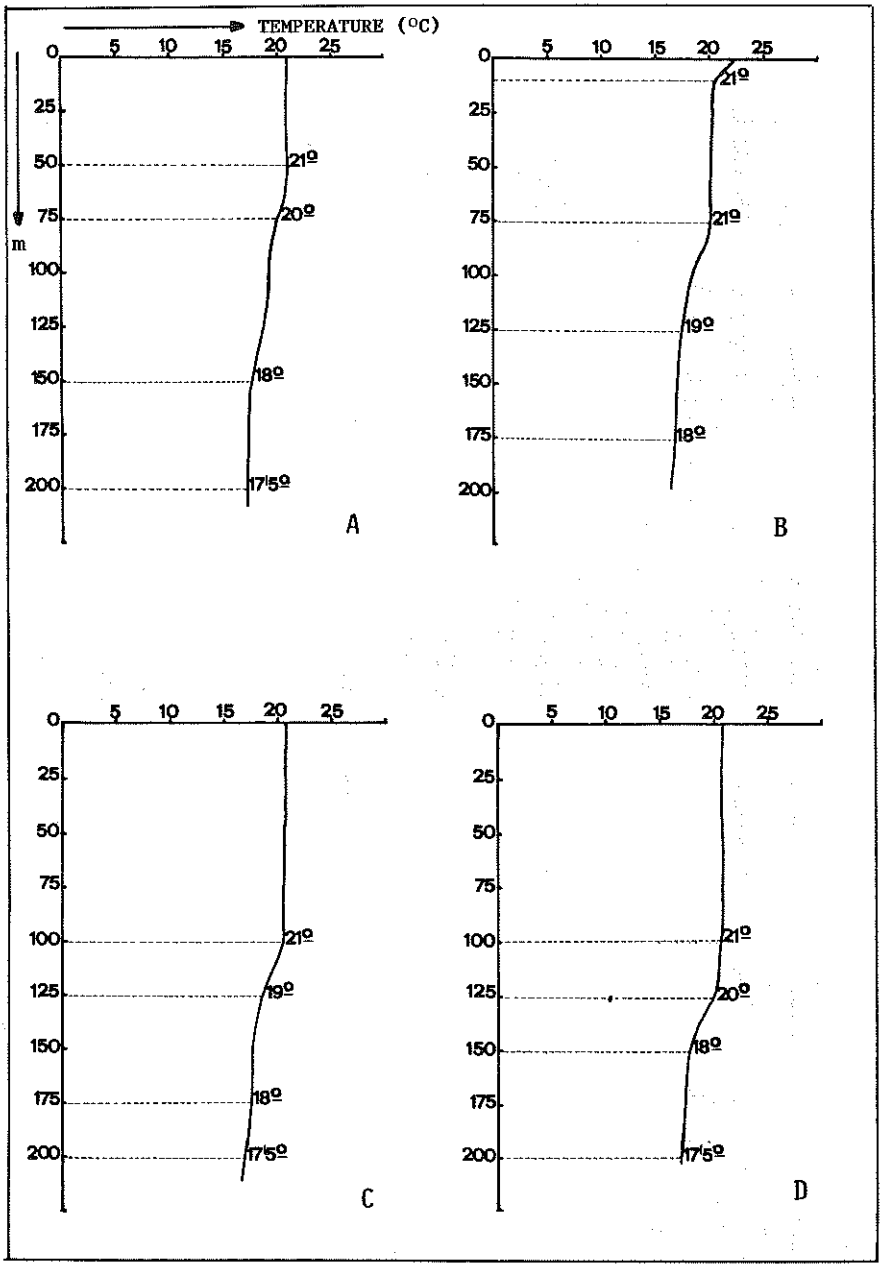

Fig. 2. — Graphical representation of the vertical distribution of the temperature during the hauls.

A — Diurnal on 22.VII.84; B — Nocturnal on 22.VII.84; C — Diurnal on 23.VII.84; D — Nocturnal on 23.VII.84.

MATERIAL AND METHODS

The samples of plankton, both diurnal and nocturnal, were collected from depths of 200 and 500 metres up to the surface, on the 22nd and 23rd July 1984 utilizing the standard international WP-2 net with a 250 μ light mesh. The salinity and temperature of the surface water were measured and by registering the depth temperature with a bathythermograph, the structure of the thermocline on the days of sampling was observed, (table 1 and figs. 2a, 2b, 2c, 2d).

The samples obtained were fixed in a 4 per cent formalin solution on the spot and stored in labelled bottles for later examination in the laboratories of the Dept. of Marine Science. Once there, all the Chaetognaths were carefully separated from the samples and subjected to study. The specimens were measured using a Teilung plate and a calibrated eye-piece, taxonomically determined and assigned a sexual condition for which a simplified scale comprising three states was used :

STATE I. — Ovaries and vesicles undeveloped or weakly outlined
STATE II. — Medium development
STATE III — Maximum development

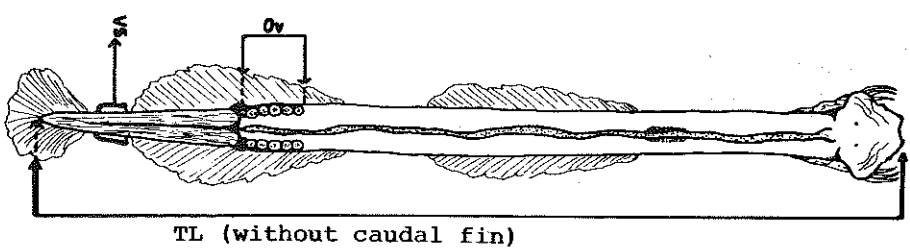

Fig. 3. — Method of measuring.

TABLE 2. — LIST OF SPECIES COLLECTED IN THE DIFFERENT DIURNAL AND NOCTURNAL HAULS, GIVING THE MEAN LENGTH FOR EACH STATE OF THE DIFFERENT SPECIES IN MILLIMETRES IN BRACKETS.

Table 2a. — SPECIES FROM VERTICAL *DIURNAL* HAULS FROM *200 METRES* DEPTH UP TO THE SURFACE ON 22 JULY 1984.

		I	II	III
Sagitta minima	47	4(5)	33(6.1)	10(6.5)
Sagitta serratodentata	20	2(8)	14(8.5)	4(9.6)
Sagitta hexaptera	9	7(15)	2(33.7)	—
Sagitta lyra	8	8(11.8)	—	—

Pterosagitta draco	8	4(5.1)	4(7.6)	—
Sagitta inflata	6	—	2(14)	4(14.8)
Sagitta sp. 1	3	—	3(8.6)	—
Sagitta decipiens	2	2(7.5)	—	—
Krohnitta subtilis	1	1(8)	—	—
	104			

+ 15 undetermined = 119

Table 2b. — SPECIES FROM VERTICAL *DIURNAL* HAULS FROM *500 METRES* DEPTH UP TO THE SURFACE ON 22 JULY 1984.

		I	II	III
Sagitta minima	74	18(5.2)	35(6.2)	21(6.4)
Sagitta serratodentata	30	3(7.6)	22(8.9)	5(9.3)
Sagitta decipiens	17	8(7.8)	7(8.2)	2(9)
Sagitta lyra	11	11(12.5)	—	—
Sagitta inflata	8	5(8.4)	1(11)	2(14.2)
Sagitta sp. 1	7	2(7.5)	3(8.5)	2(9)
Pterosagitta draco	7	6(5.4)	1(8)	—
Krohnitta subtilis	5	4(10.2)	1(14)	—
Eukrohnia hamata	4	4(7.5)	—	—
Sagitta hexaptera	2	2(16.5)	—	—
Sagitta bipunctata	2	1(7.5)	—	1(13)
Krohnitta pacifica	1	—	1(5.5)	—
Sagitta sp. 2	1	—	1(8.5)	—
	169			

Table 2c. — SPECIES FROM VERTICAL *NOCTURNAL* HAULS FROM *200 METRES* DEPTH UP TO THE SURFACE ON 22 JULY 1984.

		I	II	III
Sagitta serratodentata	27	19(7.2)	7(8.6)	1(9)
Sagitta minima	25	5(5.2)	9(6)	11(6.3)
Sagitta hexaptera	4	4(15)	—	—
Sagitta lyra	3	3(12.1)	—	—
Pterosagitta draco	3	3(6.3)	—	—
Sagitta decipiens	2	2(7.2)	—	—
Sagitta inflata	2	—	1(12)	1(14)
Sagitta bipunctata	1	—	1(10)	—
Sagita sp. 1	1	—	—	1(9)
	68			

+ 17 undetermined = 85

Table 2d. — SPECIES FROM VERTICAL *NOCTURNAL* HAULS FROM *500 METRES* DEPTH UP TO THE SURFACE ON 22 JULY 1984.

		I	II	III
Sagitta minima	47	7(4.8)	20(5.9)	20(6.1)
Sagitta serratodentata	32	10(7.4)	18(8.4)	4(9)
Sagitta tasmanica	9	9(6.7)	—	—
Sagitta decipiens	8	6(7.6)	1(8.5)	1(8.5)
Pterosagitta draco	8	7(5.7)	1(8)	—
Sagitta lyra	6	6(12.7)	—	—
Sagitta sibogae	4	4(10.7)	—	—
Eukrohnia hamata	4	4(8)	—	—
Krohnitta subtilis	4	3(7.8)	1(12)	—
Sagitta inflata	3	2(6.5)	1(12)	—
Sagitta bipunctata	2	2(8.2)	—	—
Sagitta sp. 1	2	—	1(8.5)	1(8.5)
Sagitta friderici	1	1(7)	—	—
Sagitta hexaptera	1	1(10)	—	—
	131			

Table 2e. — SPECIES FROM VERTICAL *DIURNAL* HAULS FROM *200 METRES* DEPTH UP TO THE SURFACE ON 23 JULY 1984.

		I	II	III
Sagitta serratodentata	37	20(6.6)	13(8.6)	4(8.8)
Sagitta minima	14	1(5)	3(6.1)	10(6.3)
Sagitta inflata	4	2(8)	2(12.5)	—
Pterosagitta draco	4	2(5.2)	2(8)	—
Sagitta hexaptera	2	2(22.2)	—	—
Krohnitta pacifica	1	—	—	1(7)
Sagitta sp. 1	1	—	—	1(8.5)
	63			

Table 2f. — SPECIES FROM VERTICAL *DIURNAL* HAULS FROM *500 METRES* DEPTH UP TO THE SURFACE ON 23 JULY 1984.

		I	II	III
Sagitta minima	49	8(5.2)	31(6.3)	10(6.5)
Sagitta serratodentata	47	3(7)	34(8.5)	10(9.2)
Sagitta decipiens	17	8(7.8)	5(8.2)	4(8.5)
Pterosagitta draco	16	10(7.2)	3(8)	3(8.3)
Sagitta lyra	9	9(11.2)	—	—
Krohnitta subtilis	8	8(7.8)	—	—

Sagitta hexaptera	4	4(19.2)	—	—
Eukrohnia hamata	3	3(7.8)	—	—
Sagitta tasmanica	2	1(7)	1(8.5)	—
Sagitta inflata	2	1(6)	1(13)	—
Sagitta sibogae	1	—	1(11)	—
Sagitta sp. 1	1	—	—	1(9)
	159			

Table 2g. — SPECIES FROM VERTICAL *NOCTURNAL* HAULS FROM *200 METRES* DEPTH UP TO THE SURFACE ON 23 JULY 1984.

		I	II	III
Sagitta serratodentata	55	15(7)	16(8.3)	24(8.9)
Sagitta minima	49	2(4.5)	25(6.3)	24(8.9)
Pterosagitta draco	17	11(6.3)	3(8.1)	22(6.3)
Sagitta lyra	2	2(9)	—	3(8.8)
Sagitta hexaptera	2	2(18.5)	—	—
Sagitta sp. 1	2	—	—	—
Krohnitta subtilis	1	1(7)	—	2(8.5)
Krohnitta pacifica	1	1(5)	—	—
Sagitta decipiens	1	1(9)	—	—
	130			

Table 2h. — SPECIES FROM VERTICAL *NOCTURNAL* HAULS FROM *500 METRES* DEPTH UP TO THE SURFACE ON 23 JULY 1984.

		I	II	III
Sagitta serratodentata	22	—	14(8.2)	8(8.9)
Sagitta minima	17	—	12(6)	5(6.2)
Sagitta tasmanica	13	13(6.8)	—	—
Sagitta decipiens	8	5(7.8)	—	3(8.8)
Pterosagitta draco	8	7(5.9)	1(8.2)	—
Krohnitta subtilis	7	5(8.9)	—	2(13.5)
Sagitta lyra	6	6(15.5)	—	—
Sagitta hexaptera	4	4(14.8)	—	—
Sagitta sibogae	3	3(11)	—	—
Eukrohnia hamata	1	1(9)	—	—
Sagitta friderici	1	—	1(9)	—
Sagitta bipunctata	1	1(9)	—	—
Sagitta inflata	1	—	—	1(16)
	92			

LIST OF SPECIES

Sagitta serratodentata Krohn, 1853
Sagitta minima Grassi, 1881
Sagitta hexaptera d'Orbigny, 1843
Sagitta lyra Krohn, 1853
Sagitta inflata Grassi, 1883
Sagitta decipiens Fowler, 1905
Sagitta bipunctata Quoy y Gaimard, 1827
Sagitta tasmanica Thomson, 1947
Sagitta sibogae Fowler, 1906
Sagitta friderici Ritter-Zahony, 1911
Sagitta sp. 1
Sagitta sp. 2

Pterosagitta draco (Krohn), 1853
Eukrohnia hamata (Möbius), 1875
Krohnitta subtilis Grassi, 1881
Krohnitta pacifica (Aida), 1897

RESULTS AND DISCUSSION

In the present study a total of 948 specimens of Chaetognaths have been analyzed from the batch of samples. Four genera and 16 species have been determined, among which qualitative and quantitative variations between the diurnal and nocturnal hauls having been observed. Such is the case with *Sagitta sibogae* for which certain bathymetric affinities are observed in as much as it appears to inhabit greater depths than *Sagitta decipiens*, since it is present in the samples taken in hauls from 500 metres and mainly in nocturnal ones.

In Table 2 the sexual state of each species found at the sampling station is given together with their mean length (mm) on the sampling dates.

Sagitta minima and *Sagitta serratodentata* are the two most abundant species in the samples, the former showing some cases of gigantism in specimens internally parasitized. Some examples of *Sagitta lyra* and *Sagitta decipiens* have also appeared parasitized though externally and by Copepods.

The individuals of *Sagitta tasmanica* show certain characteristics such as the strong serration of the hooks probably due to the temperature of the water which is higher in the study area than to the east of the Canary Archipelago.

Finally, we have denominated some specimens as *Sagitta sp. 1* and *Sagitta sp. 2* and these will be the subject of a separate treatment.

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