

**OBSERVATIONS ON CHAETOGNATHA COLLECTED TO THE
SW OF EL HIERRO (CANARY ISLANDS)
(PROJECT TFMCBM/91)**

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With 6 figures & 3 tables

RESUMEN: Se realizan observaciones sobre Chaetognatos recolectados durante la campaña TFMCBM/91 (Hiero) en septiembre de 1991, en una estación al SW de dicha isla. Dieciséis especies son halladas, examinándose su comportamiento nictimeral y comparándose con estudios anteriores en la misma área.

ABSTRACT: Observations on Chaetognatha collected during the TFMCBM/91 (Hiero) cruise in September 1991 at a station situated to the SW of the island. Sixteen species were found, and their nyctimeral behaviour was examined and compared with previous studies carried out in the same area (HERNANDEZ, 1985b).

INTRODUCTION

The Chaetognatha fauna of the Canary Islands has recently been the subject of taxonomic and ecological studies (HERNANDEZ and LOZANO, 1984; 1987a; HERNANDEZ, 1985a and b; 1986a and c; 1987b, 1990 and 1991).

At present, the Museo de Ciencias Naturales is executing project TFMCBM (Canary Islands). During the 1991 program, which dealt with the island of El Hierro, studies were carried out on Chaetognatha observed during the month of September at SW of the island, and the nyctimeral variations of the mesoplanktonic species during the course of the survey were pointed out. The data obtained were also compared with the information obtained in a previous campaign in July 1985 (HERNANDEZ, 1985b).

Characteristics of the island of El Hierro

In general, the water temperature of the Canary Islands varies between 17-18°C in winter and rises to 22°C in summer. An increase in temperature (1-2°C) is observed between the east and the west of the islands as a result of upwelling along the African coast, but these differences disappear with depth. Something similar

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happens with the salinity of the waters, which increases with the distance to the coast with a difference of up to 1‰, normal values being between 36 and 37‰. Thus, the island of El Hierro is the warmest of the archipelago, and the most stable from a thermal standpoint, as well as presenting the highest near-surface salinity values.

MATERIAL AND METHODS

Seventeen samples of plankton were studied, with a total of 763 specimens belonging to 4 genera and 16 species.

A WP-2 (modified) plankton-net with a 250 µm mesh was used. The specimens were collected on the 16th, 17th, 18th and 19th of September 1991, at a rate of four samples per day, two in the morning from a depth of 500 m. to the surface and between 500 and 400 m, as well as two in the afternoon at the same time and bathymetric levels as in the morning, with the purpose of observing the variations at the station and to compare the data obtained with the hauls of previous years. The samples were set in 4% formalin on board and were prepared for further study. See Tab. 1.

The sample station TFMCBM0004 was situated to the SW of the island of El Hierro, in the area called Mar de las Calmas (La Restinga), which features some specific characteristics (protection from the trade winds), with depths of 1,200 m and the following coordinates:

TFMCBM0004:	Latitude:	26° 38' 54" N
	Longitude:	18° 02' 54" W

(see Fig. 1)

Each specimen was taxonomically identified (ALVARIÑO, 1969; BOLTOVSKOY, 1981; HERNANDEZ, 1985a; MICHEL, 1984 and MORENO, 1973). The data obtained were processed using the following programs: dBASE III, plus version 1.0, IBM/MSDOS, HARVARD GRAPHICS and MICROSTAT. The results of this survey were compared to those previously obtained by HERNANDEZ (1985b) in the same area.

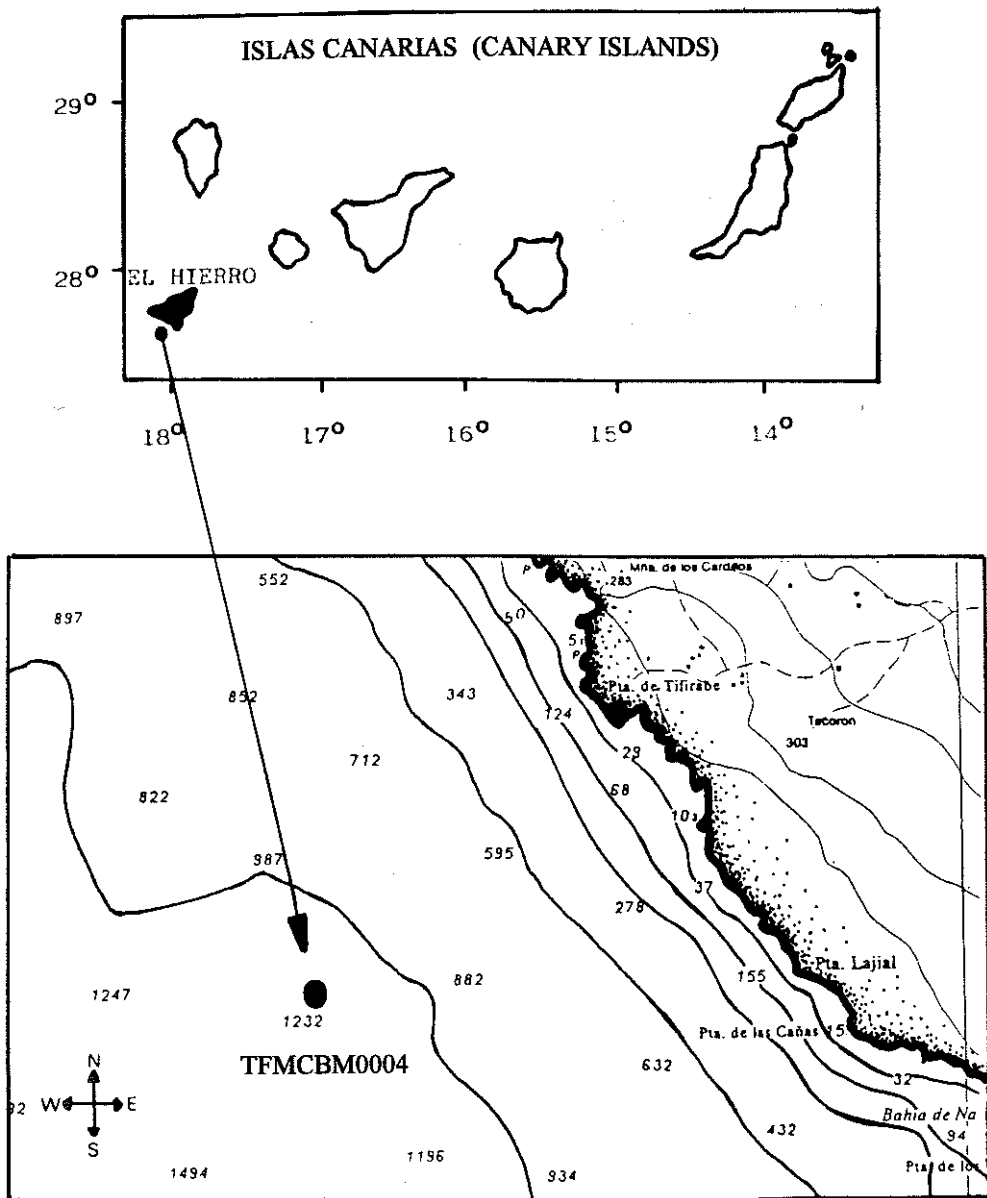


Figure 1.-Location of the sampling station.

RESULTS

Tab. 2 represents the number of specimens of each of the species of chaetognatha captured.

Tab. 3 presents the distribution of the specimens by species, as well as the total number of specimens and the percentage of abundance according to the index of MAIDANA and MOSTAJO (1980).

DATE	SAMPLE	SEA	SKY	WIND STRENGTH	WIND DIRECTION	t °C	TIME
16.9.91	16B/91D	calm	cloudy	calm	--	24	08,30
16.9.91	16B/91N	calm	cloudy	breeze	changeable	20	20,30
16.9.91	16hm/91D	calm	cloudy	calm	--	24	09,15
16.9.91	16hm/91N	calm	cloudy	breeze	changeable	20	02,15
17.9.91	17B/91D	calm	clear	calm	--	23	08,30
17.9.91	17B/91N	calm	clear	breeze	changeable	20	20,30
17.9.91	17hm/91D	calm	clear	calm	--	23	09,15
17.9.91	17hm/91N	calm	clear	breeze	changeable	20	21,15
17.9.91	17C/91N	calm	clear	breeze	changeable	20	22,15
18.9.91	18B/91D	calm	clear	breeze	changeable	24	08,30
18.9.91	18B/91N	rippy	clear	breeze	changeable	22	20,30
18.9.91	18hm/91D	calm	clear	breeze	changeable	24	09,15
18.9.91	18hm/91N	rippy	clear	breeze	changeable	22	21,15
19.9.91	19B/91D	calm	cloudy	breeze	changeable	21	08,30
19.9.91	19B/91N	calm	cloudy	breeze	changeable	20	20,30
19.9.91	19hm/91D	calm	cloudy	breeze	changeable	21	09,15
19.9.91	19hm/91N	calm	cloudy	breeze	changeable	20	21,15

Table 1.-Characteristics of hauls of TFMCBM0004 station B= haul (500-0) m.,
D= diurnal, hm= haul (500-400) m, N= nocturnal.

	16 B/91 D	16 B/91 N	16 hm/91 D	16 hm/91 N	17 B/91 D	17 B/91 N	17 hm/91 D	17 hm/91 N	17 C/91 N	18 B/91 D	18 B/91 N	18 hm/91 D	18 hm/91 N	19 B/91 D	19 B/91 N	19 hm/91 D	19 hm/91 N	TOTAL SPEC./ST.
<i>S. serratodentata</i>	4	8	4	0	2	3	0	0	4	2	2	1	2	7	1	3	6	49
<i>S. tasmanica</i>	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
<i>S. bierii</i>	8	7	3	4	5	4	2	0	5	2	2	0	0	1	4	4	11	62
<i>S. sibogae</i>	6	4	8	7	6	2	6	2	8	6	4	0	6	3	1	1	9	79
<i>S. decipiens</i>	10	5	8	10	3	2	6	5	4	6	3	17	23	1	8	6	8	125
<i>S. inflata</i>	10	13	6	0	3	12	2	5	25	21	7	1	0	7	0	5	2	119
<i>S. hexaptera</i>	1	0	0	0	1	0	0	1	1	0	0	1	0	1	1	2	1	10
<i>S. lyra</i>	22	12	0	5	3	8	3	6	24	2	18	1	4	4	3	0	2	117
<i>S. minima</i>	2	6	0	0	8	3	5	4	16	3	12	0	0	12	3	0	11	85
<i>S. bipunctata</i>	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>E. fowleri</i>	0	0	0	0	0	0	0	0	4	1	2	2	0	2	0	1	0	12
<i>E. hamata</i>	0	2	3	3	4	1	2	0	0	0	0	0	0	0	0	0	0	15
<i>P. draco</i>	4	3	0	0	2	1	0	2	1	3	1	0	0	1	4	0	2	24
<i>K. subtilis</i>	0	0	3	3	2	8	1	1	2	4	1	9	4	1	3	5	1	48
<i>K. pacifica</i>	1	2	0	0	1	2	0	1	2	3	0	0	1	1	0	0	0	14
<i>E. sp.</i>	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
TOTAL/HAUL	68	63	35	32	40	46	27	27	98	53	53	32	40	41	28	27	53	763
SPEC./m³	0,58	0,53	1,52	1,39	0,34	0,39	1,17	1,17	0,41	0,45	0,45	1,39	1,73	0,35	0,23	1,17	2,30	
SPEC./100³	58	353	152	139	34	39	117	117	41	45	45	139	173	35	23	117	230	

Table 2.-Number of specimens of each of the species of chaetognatha captured.

LIST OF SPECIES	CODE	n	%
<i>Sagitta decipiens</i>	5	125	16.38
<i>Sagitta inflata</i>	6	119	15.59
<i>Sagitta lyra</i>	8	117	15.33
<i>Sagitta minima</i>	9	85	11.14
<i>Sagitta sibogae</i>	4	79	10.35
<i>Sagitta bierii</i>	3	62	8.12
<i>Sagitta serratodentata</i>	1	49	6.42
<i>Krohnitta subtilis</i>	18	48	6.29
<i>Pterosagitta draco</i>	17	24	3.14
<i>Eukrohnia hamata</i>	16	15	1.96
<i>Krohnitta pacifica</i>	19	14	1.83
<i>Eukrohnia fowleri</i>	15	12	1.57
<i>Sagitta hexaptera</i>	7	10	1.31
<i>Eukrohnia sp.</i>	20	2	0.26
<i>Sagitta tasmanica</i>	2	1	0.13
<i>Sagitta bipunctata</i>	12	1	0.13
TOTAL		763	

Table 3.-Distribution of the specimens by species and the index of MAIDANA Y MOSTAJO (1980).

CONCLUSIONS

Sagitta decipiens, *Sagitta inflata* and *Sagitta lyra* were the most abundant chaetognatha in the survey carried out in September 1991 to the SW of the island of El Hierro. Previous surveys (HERNANDEZ, 1985b) revealed the dominance of *Sagitta serratodentata* and *Sagitta minima*.

Sagitta sibogae, which had already previously received special attention (HERNANDEZ, *op.cit.*) seems to continue preferring deeper waters than *Sagitta decipiens*, which seems to be a more abundant and superficial species. Both these species are present by day and by night in their three sexual stages.

Among the species of the “*serratodentata* group”, we must point out the scarcity of *Sagitta tasmanica* (belonging to colder waters) and which in previous surveys (HERNANDEZ, 1986) seems to prefer the east of the archipelago, where the lower temperatures offer better conditions for its development and where larger sizes

are obtained (HERNANDEZ, 1986). *Sagitta bierii* has only been observed in stages II and III and is well represented, which indicates that together with *Sagitta serrodentata* (which shows a behaviour similar to that of other stations surveyed in the islands) are the most typical chaetognaths of the *serratodentata* group. It must also be pointed out that, contrary to what was observed by HERNANDEZ (1985b) in July 1984, *Sagitta bierii* appears regularly. As is pointed out by FURNESTIN (1969), *Sagitta serrodentata* and *Sagitta bierii* seem to share behaviour and habitat, which is confirmed by the surveys carried out at other stations of the islands (HERNANDEZ, 1987).

Sagitta inflata has been particularly abundant, with a predominance of small size (10 mm) in stage III, as well as those in stage I and large size (corresponding to the different cycles of the species). Three stages have been observed, with stage III predominating clearly during the daylight hauls.

Sagitta lyra has been abundant, although all specimens were in stage I (immature).

Sagitta bipunctata, a typically oceanic specimen, appeared sporadically in the samples.

Among the species of the genus *Krohnitta*, *Krohnitta subtilis* is more abundant than *Krohnitta pacifica*, which was found in small numbers and always in stage III of maturity.

Sagitta minima, as in 1984, has not been abundant during this survey, although it appeared in all three stages of maturity, especially in stage II, which classifies it as a well represented species in Canarian waters.

It is necessary to point out the absence of deep-water specimens, especially taking into account that night catches were carried out at a depth of one thousand metres, and which were found in previous catches at the same depth and under the same conditions at stations situated at the centre and to the east of the archipelago. This could indicate its preference for the deep waters of the island of El Hierro where, as has already been mentioned, temperatures are higher. See figures, 2, 3 and 6.

Among the absent species were *Sagitta planctonis*, *Sagitta zetesios* and *S. macrocephala*, which in the course of previous surveys had been found at other stations of the islands at a depth of five hundred metres (HERNANDEZ, 1986).

With regard to mesoplankton, we have found the following species without coming across very abrupt variations between day and night: *Sagitta serrodentata*, *Sagitta bierii*, *Sagitta sibogae*, *Sagitta decipiens*, *Sagitta inflata*, *Sagitta hexaptera*, *Sagitta lyra*, *Sagitta minima*, *Eukrohnia fowleri*, *Eukrohnia hamata*, *Pterosagitta draco*, *Krohnitta subtilis* and *Krohnitta pacifica*. See figures 4 and 5.

CHAETOGNATHS CAPTURED DURING THE DIURNAL HAUL 500-0

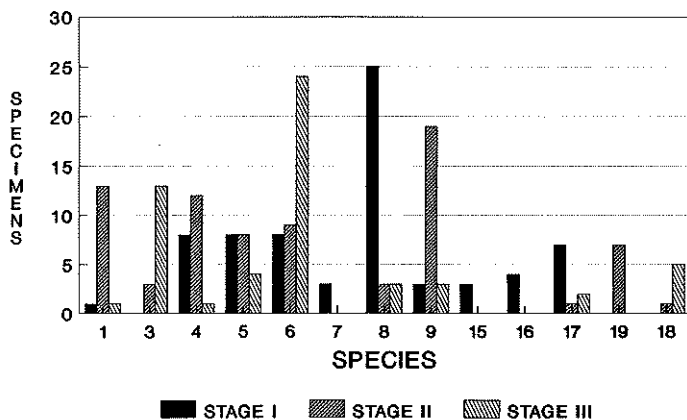


Figure 2

CHAETOGNATHS CAPTURED DURING THE NOCTURNAL HAUL 500-0

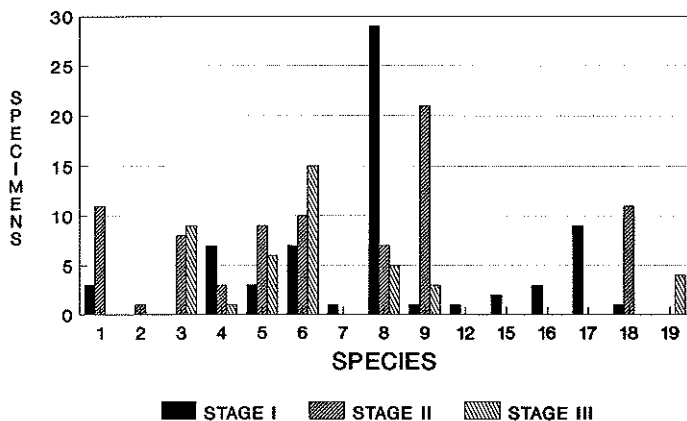


Figure 3

CHAETOGNATHS CAPTURED DURING THE DIURNAL HAUL 500-400

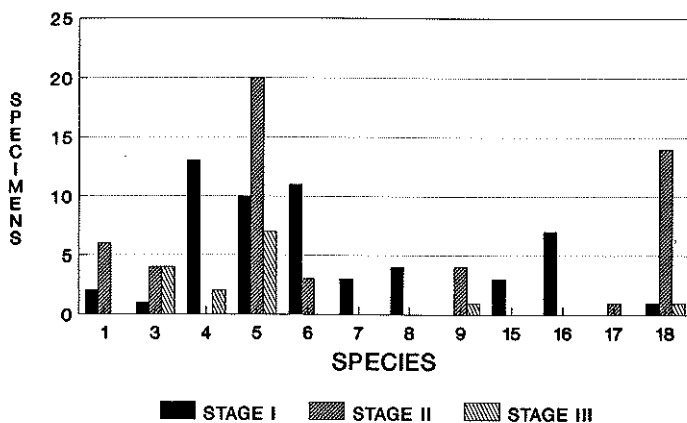


Figure 4

CHAETOGNATHS CAPTURED DURING THE NOCTURNAL HAUL 500-400

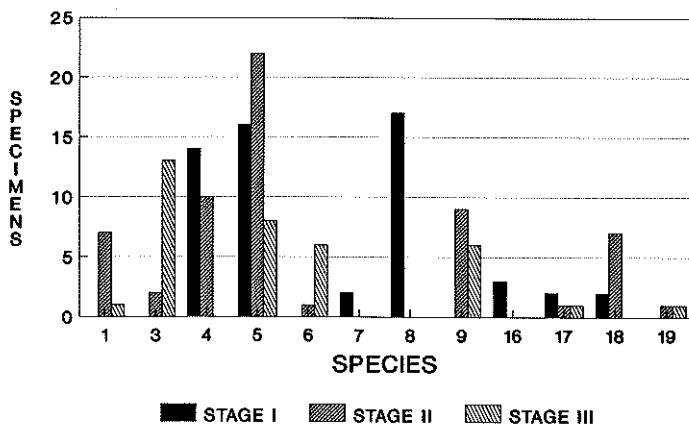


Figure 5

CHAETOGNATHS CAPTURED DURING THE NOCTURNAL HAUL 1000-0

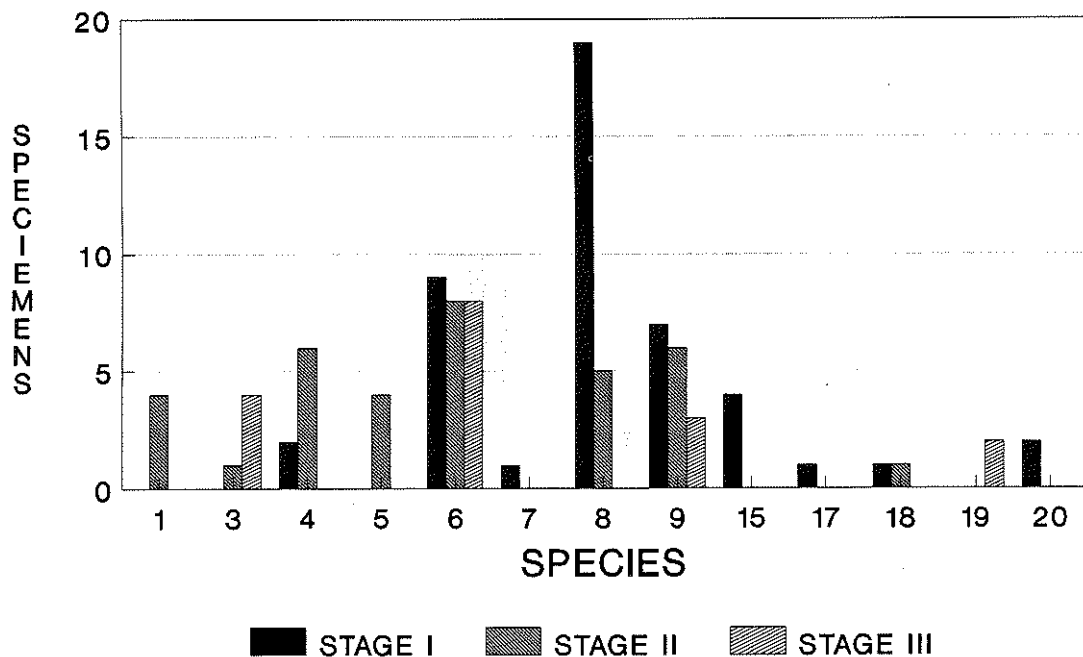


Figure 6

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BIBLIOGRAPHY

ALVARIÑO, A.:

1969. Los Quetognatos del Atlántico. Distribución y notas esenciales de sistemática. *Trab. Inst. Esp. Oceanogr.* (37): 1-290.

BOLTOVSKOY, D.:

1981. Atlas del zooplancton del Atlántico sudoccidental y métodos de trabajo con zooplancton marino. (Ed. D. Boltovskoy), INIDEP. (Argentina). 933 p.

DIXON, N.J. *et. al.*, Eds. :

1984. BMDP-PC Statistical Software. University of California Press. Berkeley.

ECOSOFT INC:

1985. Microstat.

FURNESTIN, M.L.:

1966. Chaetognathes des eaux africaines. *Atlantide Rep.*, (9): 105-135.

HARVARD GRAPHICS (Versión 2.10):

1987. Software Publishing Corp.

HERNÁNDEZ, F.:

- 1985a. Clave para identificar los Quetognatos presentes en aguas del Archipiélago Canario. *Vieraea* 14 (1-2): 3-10.
- 1985b. Observations on the Chaetognaths collected at a station to the south of the island of El Hierro (Canary Islands). *Bocagiana* 89: 1-10.
- 1986a. Chaetognatha at the surroundings of Madeira in February 1979. *Bol. Mus. Funchal* 38 (181): 166-219.
- 1986c. Los Quetognatos del Archipiélago Canario y aguas adyacentes. Tesis Doctoral. Universidad de La Laguna. 362 p.
- 1987b. Las especies del grupo "*serratodentata*" (Chaetognatha) en aguas del Archipiélago Canario. *Vieraea* 17: 209-216.
1990. El género *Krohnitta* (Chaetognatha) en aguas de las islas Canarias. *Vieraea* 19: 267-270.
1991. Sobre la presencia de *Sagitta decipiens* Fowler, 1905 y *Sagitta sibogae* Fowler, 1906 en aguas

de las islas Canarias. *Anales Fac. Ciencias* (Tomo Homenaje Dr. Telesforo Bravo). Tomo I: 419-423.

HERNÁNDEZ, F., S. JIMENEZ, C. STØP-BOWITZ y E. SANCHEZ:

1991. Preliminary list of collected zooplankton at Los Cristianos (SW of Tenerife, Canary Islands Spain). *Plankton Newsletter* 14: 15-20.

HERNÁNDEZ, F. y G. LOZANO:

1984. Contribución al estudio de los Quetognatos de Tenerife. *Inv. Pesq.* 48 (3): 371-376.

1987. Observaciones sobre Quetognatos recolectados en una estación al sur de la isla de Gran Canaria. *Bol. Inst. Esp. Oceanogr.* 4 (1): 69-74.

LOZANO, F., et al.

(1988). Preliminary list of zooplankton of the Canary islands. I. Cladocera, Copepoda, Euphausiacea, Chaetognatha and Salsps. *Bol. Mus. Mun. Funchal* 40 (196): 55-64.

MAIDANA, N. & E. MOSTAJO:

1980. Fauna de Quetognatos de las costas este y oeste de la península de Florida (EE.UU.). *Rev. Mus. Argentino Ciencias Naturales "Bernardino Rivadavia"* (Zoología) 12 (12): 153-159.

MICHEL, H.B.:

1984. Chaetognatha of the Caribbean Sea and Adjacent areas. *NOAA Technical Report NMFS* 15: 33 p.

MORENO, I.:

1973. Clave de la identificación de los Quetognatos de los mares de la península Ibérica. *Bol. Inst. Esp. Oceanogr.* (159): 1-29.

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