SOME ASPECTS OF THE BIOLOGY OF BATHYPOLYPUS SPONSALIS (MOLLUSCA, CEPHALOPODA) IN THE NORTH AEGEAN SEA (EASTERN MEDITERRANEAN SEA)

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SOME ASPECTS OF THE BIOLOGY OF *BATHYPOLYPUS SPONSALIS* (MOLLUSCA, CEPHALOPODA) IN THE NORTH AEGEAN SEA (EASTERN MEDITERRANEAN SEA)

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CEPHALOPODA
NEW RECORDS
BIOLOGY
AEGEAN SEA
MEDITERRANEAN SEA

ABSTRACT – The presence of the Cephalopod *Bathypolypus sponsalis* (P. & H. Fischer, 1892) in the North Aegean Sea (Greece) is recorded. Specimens of this species were found during four trawl surveys carried out from 1990 to 1991 in the Aegean Sea. Some biological aspects of the species are reported.

CÉPHALOPODES
MER ÉGÉE
MÉDITERRANÉE
BIOLOGIE

RÉSUMÉ – La présence du Céphalopode *Bathypolypus sponsalis* (P. & H. Fischer, 1892) dans la Mer Egée septentrionale (Grèce) est signalée pour la première fois. De nombreux exemplaires (94) de cette espèce ont été capturés pendant quatre croisières effectuées de 1990 à 1991 dans la Mer Egée. Quelques aspects de la biologie de cette espèce ont été analysés.

INTRODUCTION

Although the presence of *Bathypolypus sponsalis* (P. & H. Fischer, 1892) in the Mediterranean Sea was first recorded in 1954 (Wirz, 1954), there are some areas, mostly in the eastern basin, in which the species had not been previously recorded and its presence was therefore considered uncertain (Mangold & Boletzky, 1987).

Recent research, aiming at the assessment of the demersal resources of the Aegean Sea, has led to the finding of some rare species including *B. sponsalis*.

This report gives some information on the biology of this species.

MATERIALS AND METHODS

The following data were collected during four trawl surveys carried out, respectively, in August-September 1990, November-December 1990, February-March 1991 and June 1991 within the EEC financed programme "Investigation of the abundance and distribution of demersal stocks of primary importance to the Greek fishery in the North Aegean Sea (Greece)", with which the Institute of Zoology and Comparative Anatomy of the University of Bari (Italy) and the National Center for Marine Research of Athens (Greece) cooperate.

The area investigated, shown in Fig.1, covers two zones of the North Aegean Sea. One lies near the Sporades Islands and has an area of 1 800 km^2; the other, in the eastern area south of the island of Limnos, has a surface of about 6 000 km^2.

A professional trawler of 115 tons, equipped with a nylon net with 16 mm meshes to the cod-end, was hired.

The sampling was random-stratified and the area investigated was divided into three depth strata : 0-100 m, 100-200 m, 200-500 m. The minimum and maximum depths trawled were 60 and 440 m respectively in the western area and 32 and 437 m in the eastern one.

The hauls, 11 in the western area and 21 in the eastern one, lasted each about 1 hour.

The specimens of *B. sponsalis* found during the surveys were kept aboard in 5 % formol and their dorsal mantle length (DML) in mm and weight (in grams) were measured. For the specimens for which it was technically possible, sex and stage of maturity of the gonads (Mangold-Wirz, 1963) were assessed and the eggs or spermatophores present in mature individuals were counted.

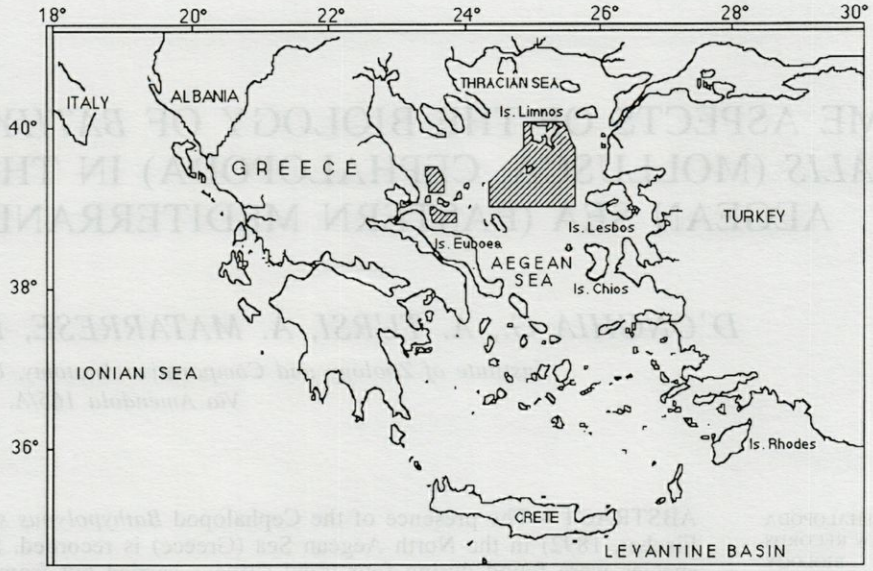

Fig. 1. – Areas investigated during four trawl surveys carried out in the North Aegean Sea during 1990-91.

RESULTS

The 94 individuals of both sexes caught during the trawl surveys are listed in table I with the geographical position, depth of the station, body size of the individuals and stage of maturity of their gonads.

Bathypolypus sponsalis was found in both areas on muddy bottoms starting from 300 m to the maximum depth investigated (440 m). In the catches, together with this octopod, the species *Sepietta oweniana*, *Rossia macrosoma*, *Octopus salutii* and, in deeper stations, *Neorossia caroli*, *Todarodes sagittatus* and *Pteroctopus tetracirrhus* were frequently present. Sometimes *Sepia orbignyana*, *Illex coindetii* and *Eledone cirrhosa*, which have a wide bathymetrical distribution, were also found together with *B. sponsalis*.

The minimum and maximum dorsal mantle lengths were 20 and 50 mm for females and 18 and 40 mm for males, respectively. The number of females and males found in each trawl survey and their average sizes are given in table II. Because in the first two surveys only a few specimens were fished, the comparison between the mean sizes of the two sexes is reliable only with regard to the last two surveys. Evidence arises from the comparison that females have a greater mean size than males ($t = 4.17$, d.f. = 39, $p < 0.001$ in February; $t = 2.28$, d.f. = 35, $p = 0.029$ in June). The specimens fished in the Aegean Sea had rather stumpy mantles, nearly as wide as long, comparable to the type of the Balearic Islands (Wirz, 1955) which are also found in the Tuscan archipelago (Lumare, 1970).

In mature females, fished during the surveys carried out in February-March and in June, up to 60 pear-shaped eggs were found, ranging from 6 to 13 mm in length. Sometimes smooth eggs were found together with eggs with longitudinal striping. In sexually mature male individuals from 4 to 8 spermatophores were counted, their maximum length was 22 mm, i. e. over 50 % of the dorsal mantle length.

The smallest mature female individual had a size of 30 mm and the smallest male a size of 27 mm. The hectocotylus arm was distinct, with developed *ligula* and *calamus*, even in immature individuals, and its length was 60 % of that of the opposite arm.

The size/weight ratio for *B. sponsalis* was calculated pooling both sexes, because of the small number of individuals fished and also to be able to compare data with those recently reported by some authors for individuals fished in the Tyrrhenian Sea and in the Channel of Sicily (Jereb *et al.*, 1989). The ratio was : $W = 0.005201 * L^{2.37}$, from which the allometric nature of the growth of *B. sponsalis* can be recognized. The size/weight ratio calculated separately for each sex, although it must be considered as scarcely reliable due to the small number of individuals for which it was established, stresses the tendency that, females tend to weigh more than males with equal mantle length.

DISCUSSION AND CONCLUSIONS

The finding of *Bathypolypus sponsalis* in the North Aegean Sea broadens its geographical distribution in the Mediterranean Sea. Within this distribution a geographical void exists in the Ion-

Table I. – List of specimens of *Bathypolypus sponsalis* found during four trawl surveys carried out in the North Aegean Sea from 1990 to 1991, with indication of fishing zone, depth, individual size (in mm DML) and reproductive stage in both females and males.
I = immature; m = maturing; M = mature.

Survey	Latitud./Longitud.	Depth (m)	Females DML(mm)	Females Repr. Stage	Males DML(mm)	Males Repr. Stage
Aug./Sept.'90	39°23'/23°18'	385	34	m	31	M
			39	M	32	
					35	I
Nov./Dec.'90	39°13'/24°37'	437	32		30	
			40		32	
			30		36	
			25		30	
			25			
			29			
			20			
Feb./Mar.'91	39°23'/23°18'	385	35	M	35	M
			38	M	40	M
			45	M	38	M
			40	M	35	M
			40	M	35	M
			25	I	30	M
					30	M
					30	m
					25	m
					25	I
	39°20'/25°08'	300	50			
			42			
	39°25'/24°42'	364	35	m		
	39°13'/24°37'	437	40	M	35	M
			30	M	32	M
			35	M	35	M
			32	M	22	m
			42	M	22	m
			37	M	27	M
			33	m	22	m
			32	M	28	m
			30	m	18	m
					28	M
					22	m
					25	m
					23	m
June '91	39°17'/23°26'	440	37	m	34	M
			45	M	32	m
			32	m	36	M
			33	m	31	m
			35	M	25	m
			30	m	25	m
			28	m	28	m
			36	m	28	m
			28	m	23	m
			42	M	24	m
			38	M	35	M
			30	m	35	M
			30	m	36	M
			28	m	32	M
					31	M
					31	M
					29	m
					23	m
					35	M
					25	m
					27	m
	39°13'/24°37'	437			38	M
					22	m

ian Sea in which the species has not yet been found even after nine experimental trawl surveys carried out with the same sampling techniques as used in the Aegean Sea (Tursi and D'Onghia, 1992). The reasons for the absence of *B. sponsalis* from the Ionian Sea, while it is present in two neighbour areas, namely the Channel of Sicily and the Aegean Sea, are still unknown. In the Aegean Sea in particular, the water temperature at depths greater than 200 m ranges over the seasons between 13°C and 14°C and its salinity is nearly always around 38.7 ‰ reaching, in some stations, the maximum value of 39.0 ‰. Such chemical-physical values, being only slightly different from those found in the western Mediterranean Sea

Table II. – Number of individuals of *Bathypolypus sponsalis*, with average size (DML) and standard deviation, found during four trawl surveys carried out in the North Aegean Sea from 1990 to 1991.

	Aug.-Sept. '90	Nov.-Dec.'90	Feb.-March '91	June '91
Females	2	7	18	14
DML (mm)	36.5±3.5	28.7±6.4	36.7±6.1	33.7±5.4
Males	3	4	23	23
DML (mm)	32.7±2.1	32.0±2.8	28.8±6.0	29.8±4.9

(Wirz, 1955), should not ban any species of cephalopod from the Aegean Sea. Moreover, although only a small number of individuals of *B. sponsalis* have been found, its presence at greater depths than those investigated, should not be excluded. Its batyhmetrical distribution does not seem to be related to sex, as far as our data suggest.

The bathymetrical distribution of *B. sponsalis* in the North Aegean Sea is also limited to the bathyal zone; yet this species, rather than being bathy-benthic as reported by Mangold-Wirz (1973), seems to be distributed on epi– and mesobathyal bottoms, in accordance with the findings of Torchio (1968), Perez-Gandaras and Guerra (1978) and Jereb *et al.* (1989). Furthermore, this cephalopod is rather uncommon in the environment in which it lives, as are *Neorossia caroli* and other bathyal species living in the investigated area (D'Onghia *et al.*, in press). *B. sponsalis* was rather uncommon in the demersal catches carried out in the Italian seas (AA. VV., 1988), possibly due to the fact that a trawl net, if not suitably equipped, might not be the best method to fish small cephalopods.

Females are generally larger than males. The mean lengths observed on the individuals of the Aegean Sea are, however, inferior to those reported by the aforementioned authors. Such smaller dimensions might be caused by contraction in formol that, according to Nixon (1971), can lead, in *Octopus vulgaris*, to a reduction of the mantle length by about 26 % compared to that of fresh specimens. Jereb *et al.* (1989) assert that in both specimens of *B. sponsalis* preserved in alcohol and in those preserved at –20°C, the weight reduction compared to that of fresh specimens is approximately 40 %.

The size/weight ratio reported for *B. sponsalis* in the Aegean Sea shows a greater allometry (b = 2.37) compared to that of the specimens fished in the Tyrrhenian Sea (b = 2.49) and in the Channel of Sicily (b = 2.79) (Jereb *et al.*, 1989).

The reproduction of this cephalopod in the North Aegean Sea takes place in late winter and in spring. The small number of individuals found in August-September and November-December does not however allow us to define exactly the length of the reproduction period. A good correspondence with the data reported by Wirz (1954; 1955), Mangold-Wirz (1963) and Perez-Gandaras and Guerra (1978) was noted for the number and

dimensions of eggs and spermatophores of *B. sponsalis* found in the North Aegean Sea.

The low number of eggs produced by mature females, which can be as low as 25 in *Octopus joubini* (Boyle, 1990), as well as their large dimensions can be considered as reflecting a reproductive strategy also adopted by many other species of cephalopods (Caddy, 1983). Often these species spawn more eggs than those present at the onset of egg-laying (Boletzky, 1986). Large eggs, rich in yolk, together with parental care of the eggs themselves, ensure higher larval survival as compared to that of other marine organisms having a higher fertility. Moreover, many species of the family Octopodidae, to which *B. sponsalis* belongs, reduce aggregation during the reproductive stage and females show solitary behaviour during to the preparation of the den (Hatanaka, 1979). Obviously this behaviour results in the species being less vulnerable during the reproductive period to predators and fishing activities. Considering the territorial nature of octopus, *B. sponsalis* may create its den in holes and pits it digs in the mud, as is known for other octopus species from experiments carried out in the laboratory, for example *Octopus defilippi* (Hanlon *et al.*, 1985). Finally, it can not be excluded that *B. sponsalis* might use structures of a different nature already existing on the bottom, including those of anthropic origin, in order to build its den.

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