

## Distribution and Reproductive Biology of *Sepietta neglecta* (Naef, 1916) (Cephalopoda: Sepioidea) in the North Aegean Sea (Eastern Mediterranean)

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**Abstract.** *Sepietta neglecta* (Naef, 1916) is the most rarely caught species of the genus *Sepietta* (Sepiolidae). Its presence in the North Aegean Sea (Eastern Mediterranean) is recorded for the first time, on the basis of 56 specimens, collected at depths from 24 to 262 m, during six seasonal trawl surveys carried out from September 1992 to December 1992. Specimens were dissected, weighed, and assigned a maturity stage. The weight-length relationship was found to be allometric. Mature individuals were caught during all six cruises. In mature males, from 150 to 240 spermatophores were counted, whereas in females, up to 127 oocytes were counted of which only a fraction (6–36%) were in the last stage of development. The ovaries of mature females contained oocytes at three vitellogenetic stages: primary oögonia, maturing oocytes, and smooth ripe oocytes ready to be released. The diameter of ripe oocytes, in the major axis, ranged from 1.4 to 2.8 mm.

### INTRODUCTION

*Sepietta neglecta* (Naef, 1916) is a small, nectobenthic species with a maximum mantle length of about 30 mm. It is found in the Mediterranean Sea and on the coasts of the Eastern Atlantic from the southern coasts of Norway (Wirz, 1958) to Morocco (Guerra, 1992). Although it was described by Naef as early as 1916, it is very rarely caught, in contrast to the other two species of the genus *Sepietta* (*S. oweniana* [d'Orbigny, 1840] and *S. obscura* [Naef, 1916]). Its presence in the Eastern Mediterranean (east of 23°E) was doubtful (Digby, 1949) until 1972 when one male specimen was identified by G. Ruby & J. Knudsen, in Cyprus waters. More recently, it was recorded in the Sea of Marmara (Katagan et al., 1993). The present records represent the first occurrence of *Sepietta neglecta* in Greek waters. Most of the published records of *Sepietta neglecta* concern males, perhaps because of the great resemblance of females to those of *Sepietta oweniana* (Naef, 1923), which does not ensure the identification of the species unless individuals of both sexes are found. Very little information on the biology of this species is available in the literature. Its embryonic and post-embryonic development to a final mantle length of 15 mm has been studied by Boletzky et al. (1971) by rearing animals in the aquarium, from eggs collected from bivalve shells trawled off Banyuls-sur-Mer, France (Western Mediterranean). The present report contributes to the knowledge of the biology of this species by giving some

information on length-weight relationships, maturity stages, and oocyte size frequencies in mature females.

### MATERIALS AND METHODS

Fifty-six specimens of *Sepietta neglecta* were caught from trawlable bottoms in the North Aegean Sea (Figure 1) during six seasonal cruises in 1992–1993. A commercial trawler of 115 tons gross tonnage, equipped with twin 250 Hp engines, echosounder, radar, and plotter, was hired. The trawl used was a nylon net with a cod-end mesh of 16 mm from knot to knot. The bottom area investigated was subdivided into four depth strata: 0–50 m, 50–100 m, 100–200 m, 200–500 m; and the sampling was based on random-stratified design. The minimum and maximum depths trawled were 16 m and 416 m, respectively. For each trawl survey, 65 hauls, ranging from 45 min to 60 min in duration, were performed.

The specimens of *Sepietta neglecta*, together with other sepiolids found during the surveys, were preserved in 5% formalin. They were identified in the laboratory under a dissecting microscope, according to the suggestions of Naef (1923), i.e., mainly by observing the hectocotylied arm of the males and, for the females, by comparing the tentacle and tentacular club sizes with those of equally large *Sepietta oweniana*, which have longer and more robust tentacles.

For 48 specimens, dorsal mantle length (DML, mm) and weight (gr) were measured; sex and stage of maturity of the gonads (Lipinski, 1979) were assessed. Oocytes

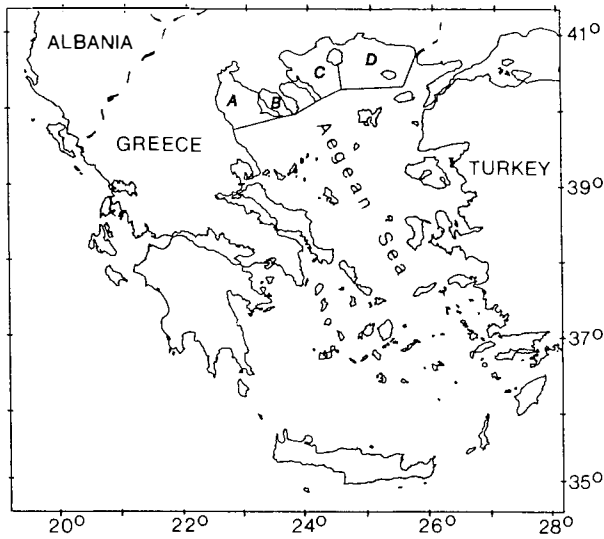


Figure 1

Sampling areas in the North Aegean Sea. A: Thermaikos Gulf; B: Toroneos Gulf; C: Strymonikos Gulf; D: Thracian Sea.

and spermatophores were counted in 10 mature females and eight males, respectively. Development of the oocytes of *Sepietta neglecta* was divided into three stages: (I) primary oogonia, (II) maturing oocytes, reticulated by invading follicular epithelium, and (III) smooth ripe oocytes ready to be released. Oocyte lengths (longest dimension) were measured for each stage, to the nearest 0.01 mm with an ocular micrometer in a stereoscope.

RESULTS

The 48 specimens examined are listed in Table 1, indicating geographical zone, date of capture, depth of the station, dorsal mantle length and weight of the individuals, and maturity stage of their gonads.

*Sepietta neglecta* was found in all the subareas on sand-muddy bottoms, sometimes covered by Crinoidea, and at depths ranging from 24 m to 262 m. Together with this sepiolid, other cephalopods were found that have a wide bathymetrical distribution, like *Sepietta oweniana*, *Sepioloa rondeleti* (Leach, 1817), *Rondeletiola minor* (Waef, 1912), *Alloteuthis media* (Linnaeus, 1758), *Illex coindetii* (Vérany, 1839), *Eledone cirrosa* (Lamarck, 1798), *Sepia orbignyana* (Férussac, 1826), and *Sepia elegans* (Blainville, 1827). *Loligo vulgaris* (Lamarck, 1798), *Octopus vulgaris* (Cuvier, 1797), and *Eledone moschata* (Lamarck, 1798) were also found together with *Sepietta neglecta* in shallower stations.

Dorsal mantle lengths ranged from 12 mm to 23 mm for females and from 13 mm to 23 mm for males (fixed specimens). Mature individuals were caught throughout the year. Minimum spawning sizes were 16 mm DML in the male and 15 mm DML in the female. In mature males

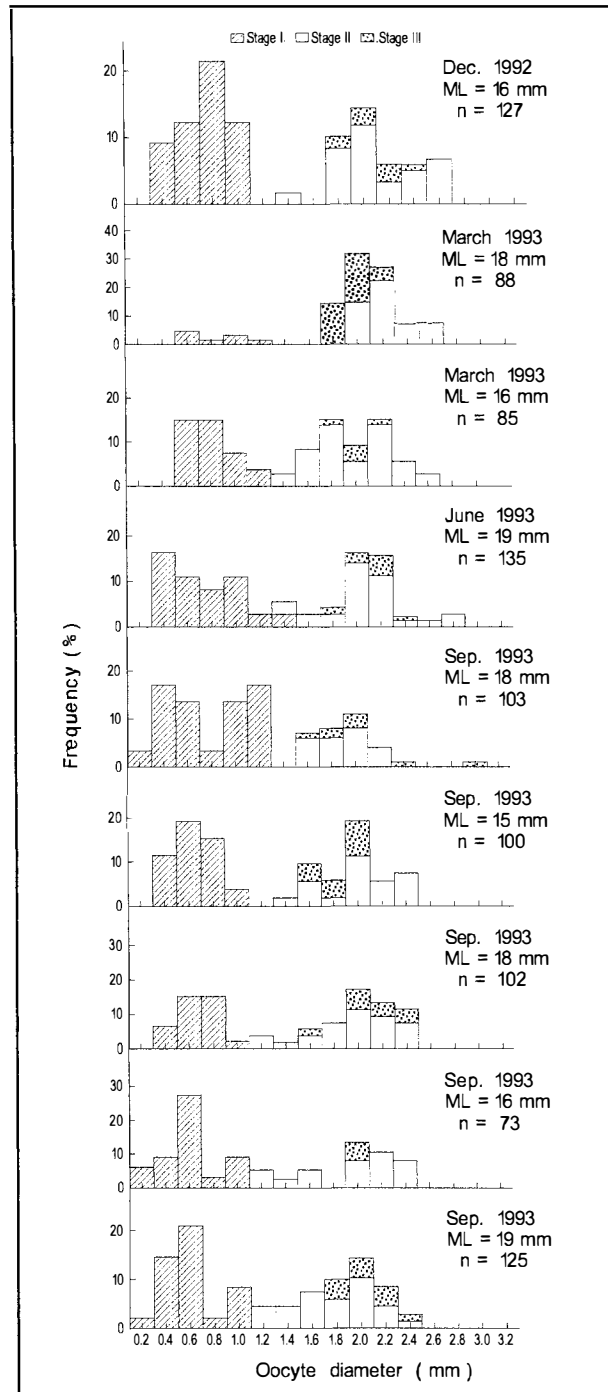


Figure 2

Frequency distribution of oocyte diameter (longest dimension) of three vitellogenic oocyte stages in ovaries of mature (stage IV–V) *Sepietta neglecta* collected seasonally in the North Aegean Sea. Each panel represents the ovary from one female.

Table 1

List of specimens of *Sepietta neglecta* caught during six trawl surveys carried out in the North Aegean sea from 1992 to 1993, with indication of fishing zone, depth, individual size (in mm DML), weight (in gr) and maturity stage in both females and males. A = Thermaikos Gulf; B = Toroneos Gulf; C = Strymonikos Gulf; D = Thracian Sea.

Date	Depth (m)	Zone	Females			Males		
			DML (mm)	Weight (gr)	Maturity stage	DML (mm)	Weight (gr)	Maturity stage
29 Aug. 92	66	A	15.5	2.9	III	19.4	2.4	V
						17.5	1.5	V
07 Dec. 92	73	C	18.0	3.5	VI	13.0	1.5	IV
						18.8	3.8	V
08 Dec. 92	115	C	16.7	2.0	IV	18.0	2.8	IV
						16.0	2.7	V
						18.9	2.7	V
						18.5	2.4	V
08 Mar. 93	262	B	18.0	2.2	V			
09 Mar. 93	167	B	16.0	2.4	IV			
			13.0	1.5	IV	18.0	2.3	V
12 Mar. 93	115	C	15.0	2.4	IV	21.0	2.7	V
			22.1	2.8	V	23.0	3.6	V
14 Mar. 93	136	C	16.0	1.8	V	17.0	2.6	IV
			19.0	2.8	V			
			17.4	2.1	V	15.0	1.7	II
			13.0	1.1	III			
04 Jun. 93	102	A	12.0	1.3	IV	19.0	2.4	III
05 Jun. 93	71	A	21.0	3.5	V	15.0	1.9	II
						18.0	1.8	
04 Sep. 93	229	A	15.0	1.7	V	18.0	2.9	
						14.0	1.7	
						15.0	1.5	II
						17.0	2.1	
08 Sep. 93	79	C	17.0	2.3	IV	13.0	1.2	
			16.0	2.1	IV	15.0	1.6	IV
			19.0	1.9	V			
			23.0	3.4	V			
			17.0	1.9	V			
			18.0	2.7	V			
12 Sep. 93	80	D	17.4	2.5	V			
			16.3	2.1	V	19.0	2.3	IV
17 Dec. 93	24	D				22.0	3.2	

(Lipinski stage IV), from 150 to 240 spermatophores were found, the maximum length of which was 5.9 mm. Maximum oocyte count in the ovaries of 10 mature (Lipinski stages IV, V) females was 127. However, only a fraction of the ova, ranging from 6% to 36%, were in the last stage of development. The ovaries contained oocytes at all three stages. Size frequencies of the oocytes in nine mature females are presented in Figure 2. The maximum diameter of oocytes ranged from 0.1 to 1.2 mm in stage I, from 1.2 to 2.75 mm in the stage II, and from 1.4 to 2.83 mm for the smooth oocytes at stage III.

A least square regression equation was calculated from the logarithmically transformed dorsal mantle length (DML, mm) and body weight (W, gr) data, pooling both

sexes given the small number of individuals available. The resulting power function was:

$$W = 0.000285 * ML^{1.528} \quad r^2 = 0.614$$

from which the allometric nature of the growth of *Sepietta neglecta* can be recognized.

## DISCUSSION

The records of *Sepietta neglecta* in the North Aegean Sea confirm the wide distribution of the species in the Mediterranean Sea. The bathymetric distribution in the North Aegean Sea does not seem to be correlated with sex, as far as our data suggest. The species was found from in-

fralittoral to bathyal grounds, as was expected from other records in Cyprus waters: 135 m (Ruby & Knudsen, 1972), in the Gulf of Cadiz: 70–475 m (Guerra, 1982), in the Adriatic Sea: 30–200 m (Bello & Motolese, 1983; Guescini & Manfrin, 1986), off Taragona: 315–363 m (Sanchez & Morales, 1986), in the Ligurian Sea: 30–300 m (Relini & Bertuletti, 1989), in the Sea of Marmara: 50–140 (Katagan et al., 1993), and in the Strait of Sicily: 86–335 (Jereb & Di Stefano, 1995).

The presence of mature animals in every season indicates continuous spawning throughout the year, as observed by Relini & Bertuletti (1989). However, because of the small number of individuals caught and the lack of samples in intermediate months, it is not possible to define a peak or a pause of spawning.

In the ovaries of females ready to spawn, as in other cephalopods of small size (Mangold, 1987), only a fraction of the total number of ova are mature at any one time. Therefore, fecundity estimates are misleading; one does not know the number of eggs that can mature during a prolonged spawning period (Gabel-Deickert, 1995)

The low number of eggs produced by mature females may reflect a reproductive strategy also adopted by other species of cephalopods (Caddy, 1983). Large yolky eggs under maternal protection would provide better chances of survival of the young individuals than is the case in many marine fish species.

The maximum oocyte diameter is similar to that noted by Relini & Bertuletti (1989). It has to be mentioned, however, that some oocytes in stage III were found to have smaller diameters than others in stage II, which means that oocytes, after the disappearance of follicular folds, may decrease in size. Such observations have been made in other sepiolids too (Lefkaditou, unpublished data). In the major-axis length frequency distribution of eggs in the ovary and oviduct of a mature female of *Illex argentinus* (Rodhouse & Hatfield, 1990), the largest eggs appear in the ovary, which could also enforce this hypothesis.

#### ACKNOWLEDGMENTS

The authors wish to thank Dr. C. Papaconstantinou, head of the research program "Assessment of Demersal Stocks of Primary Importance in the Thermaikos Gulf and Thracian Sea" of the National Center for Marine Research of Athens (Greece), within the framework of which we collected the present material.

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