

Preliminary Biological Data of Silvery Pout (*Gadiculus argenteus argenteus*) in the Northern Euboean Gulf (Greece)

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INTRODUCTION

Gadiculus argenteus argenteus is a Gadidae species quite abundant in depths from 250 to 500m in Greek seas. Age and growth data of the species are not available. However, there are a few studies concerning ichthyoplankton (LANDINI & VAROLA, 1985; HALBEISEN, 1983; IZETA, 1985) and bathymetric distribution (MANCHLINE & GORDON, 1984).

MATERIAL and METHODS

Samples were collected seasonally between December 1986 and June 1987 in the northern Euboean Gulf. In each fish, total length and weight were recorded to the nearest respectively millimetre and gramme. Determination of age was based on otolith reading.

RESULTS

Total lengths ranged from 3.5 to 15cm and the main body of the stock was comprised between 8 and 11cm (Fig. 1a), corresponding to ages II and III (Fig. 1b).

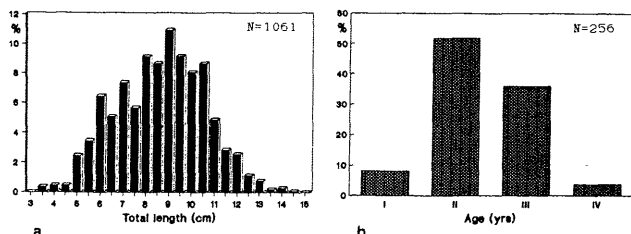


Figure 1. Length frequency polygons (a) and age composition (b) of silvery pout caught in the northern Euboean Gulf from December 1986 till June 1987.

The relationship between otolith radius (S) and total length (TL) was: $TL = -0.39 + 1.38S$ ($r = 0.89$). On the basis of this formula Table 1 was calculated. The 49.8% of the maximal size of the silvery pout was attained during the first year of its life, while an abrupt reduction of growth rate occurred during the second year and continued in a smoother way over the next two years. The parameters of von Bertalanffy's equation were calculated according Ford-Walford's method, yielding $L_{\infty} = 19.72$ cm, $k = 0.19$ and $t_0 = -0.94$.

Table 1. Back calculated total lengths of silvery pout *Gadiculus argenteus argenteus*, in the northern Euboean Gulf (1986-1987).

Age	N	Mean Observed Length (TL)	Back calculated length			
			I	II	III	IV
IV	10	12.56	5.60	8.39	10.44	12.04
III	92	11.00	6.00	8.45	10.38	
II	133	9.27	6.02	8.41		
I	21	6.82	6.06			
Mean TL			6.00	8.42	10.39	12.04
Mean annual increm.			6.00	2.42	1.97	1.65
" " (%)			49.83	20.10	16.36	13.70
N			256	235	102	10

The computation of the total length (TL) - weight (W) relationship, based on 317 individuals, gave: $W = 0.0000336 * TL^3.72$ ($r = 0.87$). The confidence interval of the exponent, being 2.73 ± 0.17 , had a statistically significant difference from the value 3 ($P < 0.05$) implying an allometric growth of the species. The condition factor, estimated for the total sample was $K = 1.82 \pm 0.36$ (mean \pm confidence interval, $P = 0.05$).

The 69% of the individuals caught in December were sexually mature; this proportion dropped to 21.9% in February and to 1.2% in June.

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Notes about *Schedophilus ovalis* (Osteichthyes, Centrolophidae) in the Ligurian Sea

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Schedophilus ovalis lives both in surface waters (juvenile phase associated with floats such as wreckage and jellyfish) and on slope bottoms in habitats which have not yet been defined. Many aspects of its biology remain obscure (Haedrich 1986), especially in the Mediterranean, where it has for a long time been supposed that this species is rare (Tortonese 1975).

The recent development of a specific sport fishery in the Ligurian Sea has given us the opportunity to make some preliminary observations about reproduction and growth. Other information derives from the underwater observation of young specimens in offshore surface waters and from the capture of some specimens by spearfishing.

A total of 31 fish, caught in the period July - March were examined; 29 of them were obtained by gear called "filaccioni", i.e. lines weighted at their ends, about 600 m long, with some 30 hooks, baited with clupeids, attached to the distal 60 m. Fishing took place on rocky bottoms about 30 miles from the coast. Fish were measured (total, standard and fork length), weighted and sexed by inspection of gonads. Gonads, sagittae, scales and gastric contents were preserved for further laboratory examinations.

Underwater observations. While scuba diving in a range 0-40 m one of us (M.Relini) observed several young specimens of 25-45 cm T.L., associated with an artificial structure, positioned about 35 miles offshore and moored on a bottom at 1100 m. The substratum was inspected in different seasons; the smaller fishes were observed in March - June and the larger ones in September - December. They displayed no fear of the observer and showed variable colour patterns with a uniformly dark grey or silvery colour or with black blotches or black stripes on a silvery background. Two of them were caught in order to verify the meristic characters. On the basis of the Haedrich and Horn key (1972), they were definitely *S. ovalis*, also when the colour pattern was like that of *S. maculatus* (Gunther). In the killed specimens another kind of dark stripes appeared, which correspond to the zig-zag arrangement of the somites.

Reproduction. Among the fishes obtained by lines, males were 7 in number, ranging from 60.5 to 84 cm T.L. Females, 18 in number, ranged from 66 to 106 cm T.L.. Six specimens, from 43 to 61 cm T.L. remain undetermined.

The examined materials include two females fished in August with almost mature ovaries. They weighed 11 and 13 kg (T.L. 93.5 and 103 cm) and had a gonadosomatic index of 8.04 and 8.92. Two spent / recovering females were obtained in August and February: the first, 100 cm T.L., 13.5 kg had a g.s. index of 1.03; the second 106 cm T.L., 12 kg had 1.29 of g.s.. It is interesting to note that seven other females of the size range 72 - 86 cm T.L., fished in summer, had immature ovaries. The minimum female reproductive size derived from the present material is therefore close to 90 cm T.L..

Fluent males were fished in July (1) and August (3): they were 75 - 84 cm T.L. with a weight of 5.5 - 6 kg and showed a g.i. of 1.13, 1.45, 0.36, 1.54.

Food items. Maul (1964) found in the intestine of *S. ovalis* several indigested *Pyrosoma* sp. We can add to this frequent prey also the pteropod *Cymbulia peroni* (to 8 in one stomach) and, in one case, the Euphausiid shrimp *Meganyctiphanes norvegica*.

Morphology of sagitta and growth. The sagitta of the young fish living in surface waters is chalky white, with regular minute bands which apparently are uninfluenced by the seasons. The specimen fished on deep bottoms have an additional, almost hyaline contour, whose extension increases with the size of the fish. In the latter the tracks of periodic deposition are scarce and are difficult to interpret. The chalky area is therefore common to all fish and its maximum width corresponds to a growth of about 45 cm T.L., which is the largest size of the fish living in surface waters and the smallest size found in fish caught by lines. The latter were fished from September onwards.

Padoa (1956) reported a 44 mm long specimen caught in November 1914 at Messina. Maul (1964) observed a young 10 cm long specimen double its size in two months (May - June) in captivity. Considering our underwater observations in addition to these data, we suppose that growth to about 45 cm T.L. corresponds to the first year of life. The fish, born at the end of the summer would descend to its bathyal habitat the following autumn. Supposing that the chalky white area of sagitta corresponds to about one year of life, the reading of the remaining part suggests that our large mature females are four years old. Applying the same assumptions, males resulted mature when three years old.

Length - weight relationship. Using the Ricker method (1975) we have calculated the following fork length - weight relationship for both sexes: $P(kg) = 0.00477 * l(cm)^3.3001$.

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