CRUSTACEAN FISHERY IN GREEK WATERS, 1928-1981

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RESUME : Une revue des captures des crustacés dans les eaux Grecques en 1928-81 est entreprise dans ce étude. La capture moyenne annuelle a augmenté de 175 tns en 1928-39 à 1260 tns en 1964-81. D' ailleurs, les variations à long terme semble être liées plutôt aux facteurs naturels qu' aux facteurs anthropogénes.

ABSTRACT : The crustacean fishery in Greek waters in 1928-1981 is reviewed. The mean annual crustacean catch rose from 175 tonnes (shrimps= 54.4%) in 1928-39 to 1260 tonnes (shrimps= 44.4%) in 1964-81 as the result of the increased effort and efficiency of the fleet. Moreover, the variations in the crustacean catches seem to be related to natural rather than anthropogenic effects.

INTRODUCTION : Although the potential of crustacean in the Mediterranean Sea amounts some 50,000 tns (1), the mean (1975-81) Mediterranean catch did not exceed 22,000 tns (2). In the present work, the crustacean fishery in Greek waters for 1928-81 is reviewed

MATERIAL AND METHODS : Catches of crustaceans in Greek waters have been recorded on a monthly basis through the local custom authorities since 1928, with a gap in the record between 1940 and 1963 (3, 4).

RESULTS AND DISCUSSION : Two thousand tonnes of crustaceans, caught in Greek waters, were landed during 1928-1939, (Table 1). The mean annual crustacean catch was 175.3 metric tonnes. Shrimps dominated the landings, comprising the 54.4% (95.4 tns), whereas "other crustacean" shared 45.6% (80.9 tns). The total production of crustacean in 1964-81 amounted 48,324 tonnes, 22,682 (46.9%) of which were fished in Greek waters and 25,642 (53.1%) in the Atlantic ocean and the north African coast. The mean annual crustacean catch in Greek waters was 1,260 tonnes, representing 2.2% of the total mean annual fishery landings [=58,950 tns, (5)] fished in Greek waters and 6% of the mean (1975-81) Mediterranean crustacean catch [=21,000 tns, (2)]. The proportion of shrimps (44.4%) was lower than that in 1928-1939.

Table 1. Annual catches, in tns, of shrimps and "other crustacean" in Greek waters, and total number of trawlers and seiners, 1928-1939.

Year	Shrimps	Other	Boats
1928	43.5	24.7	449
1929	75.2	58.4	696
1930	87.8	90.9	555
1931	107.1	120.5	638
1932	81.2	85.8	665
1933	88.9	61.4	543
1934	103.8	14.7	518
1935	37.8	22.5	500
1936	86.4	20.1	627
1937	143.0	20.0	611
1938	189.6	256.7	665
1939	100.8	183.3	582

Total crustacean catches (in Greek waters) exhibited cyclic variations, with maxima in 1969, 1973 and 1978 and minima in 1966, 1971, 1976 and 1980 (Fig.1). The landings of shrimps increased from a low in 1966 to a maximum in 1969, and gradually declined ever since. "Other crustacean", on the other hand, exhibited an opposite trend than that of shrimps.

There is a sevenfold increase in the mean crustacean catch from 1928-1939 to 1964-1981, which must be associated with the rise of the fishing effort [mean number of boats was 579 in 1928-1939 (Table 1), 1151 in 1964-1981 (5)], the improved efficiency of fishing tools in recent years and changes in the length of the fishing season.

The fluctuation in the catches in 1964-1981 does not seem to be related to a varying fishing effort. Trawlers and boats involved in the inshore fishery (=seiners and "other boats") contributed about 40% and 60% of the total crustacean yield respectively till 1969 (Stergiou, unpublished data). The number of "other boats" (and corresponding catches) with an engine lower than 20 HP, however, are not recorded from 1970 and onwards (5). Hence the drop in the catches of total crustacean and shrimps after 1969 (Fig.1) may be associated with the concurrent decline of the recorded boats. "Other crustacean" catches do not seem to be affected by that decline (Fig.1). For the years following 1969, however, catches fluctuate greatly (Fig. 1), in contrast to the gradual increase of the number of trawlers, boats involved in the inshore fishery and total horsepower of the Greek fishing fleet (5). Hence it seems that factors other than anthropogenic also influence the long term changes in the catches.

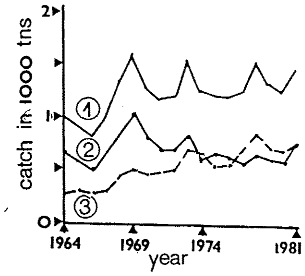

Fig.1. Total (1) and "other" crustacean (3) and shrimp (2) catches in Greek waters, 1964-1981.

It has been extensively shown that hydrometeorological variations greatly affect the abundance and/or distribution of crustaceans, namely, that of lobsters [e.g. in Maine (6), Newfoundland (7, 8) and Quebec (9)], crabs [e.g. in the Barents Sea (10, 11), Newfoundland (8) and S. Catalina Island (12)] and shrimps [e.g. Bear Island (11)]. Unfortunately, there is not any relevant information for the Mediterranean Sea. It was pointed out (15), however, that hydrological variations, among other factors, may be responsible for the extinction of the red shrimp fishery in the Ligurian Sea after the 1950's.

To sum up, crustacean production seems to be affected by both natural and anthropogenic changes, so that future research must oriented towards monitoring, on an annual basis, the biological (catch per fishing effort, extent of spawning and nursery grounds, distribution and abundance of larvae etc) and abiotic enviroment (nutrients, T, So/oo, direction and intensity of currents etc). This will ultimately contribute to the assessment of the relative impact of natural and anthropogenic changes on marine populations, and, hence, to a rational management of fishery resources.

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OBSERVATIONS ON PARAPANDALUS NARVAL (FABRICIUS, 1787) (CRUSTACEA, DECAPODA, PANDALIDAE) FROM RHODOS ISLAND (GREECE)

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RESUMÉ

La population de Parapandalus narval a montré une forte zonation verticale qui est en corrélation avec le sex ratio, avec la taille des femelles ainsi qu' avec la proportion des femelles ovigères.

The presence of Parapandalus narval in Eastern Mediterranean has been verified during two diving surveys (October 1984, January 1985) in submarine caves of Rhodos. This paper deals with preliminary observations on the biology of the species in relation to depth (August 1985), based on material obtained by baited traps.

In the catches, two species were found: Parapandalus narval and Plesionika edwardsii. The percentage of Plesionika edwardsii is increasing as depth increases (Fig. IB). This species is not found in 5 m. and only one specimen (in a total of 259 shrimps) was found in 80 m.

Table I summarizes our data: the percentage of Plesionika edwardsii in the total number of shrimps in the catch, and for P. narval the proportion of females in the population (sex ratio), the mean carapace length for males and females and the percentage of the ovigerous females in the females are recorded according to depth.

TABLE I

Depth m.	P.e. %	Parapandalus narval			
		sex ratio	mean CL ± SD		% ovig. females
			males	females	
5	0.0	1.00	-	9.84±1.45 (N=149)	59.73
80	0.4	0.75	11.93±1.32 (N=64)	13.20±1.94 (N=194)	76.80
140	6.6	0.48	12.65±1.25 (N=103)	15.25±2.04 (N=94)	90.42
220	27.4	0.02	11.98±1.42 (N=44)		

No juveniles of P. narval were collected. Transitional males were not observed. Figure IA shows the change of the sex ratio of P. narval in relation to depth. There is a clear dependence of sex ratio on depth (x^2=172.98 P<<0.001 for the propotions of males and females). All propotions of females in the total population of each depth have a statistically high difference from each other (P<0.001). In 5 m. depth there are only females while the figure is totally reversed in the 220 meters with only one female.

For the females the non parametric ANOVA (Kruskal-Wallis test by ranks of CL values) showed a very high significance difference (P<0.001) of mean CL relation to depth. By Student-Newman-Keuls test for multiple comparisons all means proved to differ from each other (P<0.001). The same tests for the males showed that there is a difference of mean CL with lower significance (0.001<P<0.005) which is due to the sample of 140 m. that has greater mean CL (at 0.05 level) from these of 80 and 220 m. which have equal mean CL.

The difference of female size according to depth is reflected on the percentage of the ovigerous females which increases according to depth almost linearly (Fig. IC). The propotion of ovigerous females is depended on depth (x^2=29.67,P<0.001) all propotions beeing different from each other (P<0.001). The smallest ovigerous female observed has a CL=7.85 mm. The overall ovigerous females are 74.4% of the total females

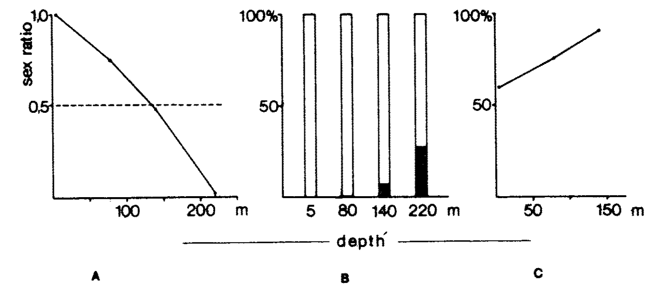

Fig. I. Change according to depth: A. Sex ratio (Females to all individuals) of P. narval, B. Percentage of Plesionika edwardsii in the catch (black: Plesionika edwardsii, white: Parapandalus narval) and C. Percentage of ovigerous females of P. narval.

The differences in the size of females and in the sex ratio of P. narval in relation to depth are so intense that we could speak of a zonation of the population. Such a phenomenon occurs in other pandalids as Pandalus montagui (Allen 1963a, 1966), Heterocarpus ensifer (King 1980, 1981) and Heterocarpus sibogae (King 1984).

As far as we know, very little is known about the life history of P. narval. Crosnier and Forest (1973) report that the juveniles are caught by pelagic nets while the adults are benthic. Our data -although preliminary and restricted only to the reproductive period- do not come in contrast with the idea that P. narval could have a similar life history pattern to that of other Pandalids (protandrous hermaphrodites with seasonal migrations). If this suggestion is true, then the females of the 5 m. depth could be primary females and the males have not yet become transitional. Certainly we consider all samples as components of the same population and a further research must be undertaken over the whole range of depth distribution for a sufficient period of time.

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