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Food preferences of juvenile Red Mullet Mullus barbatus in Western Adriatic nursery ground (Osteichthyes : Mullidae)

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Red mullet (*Mullus barbatus*) is a very important species for the Mediterranean fishery, and food preferences of adults (Total Length >9 cm) were investigated by several Authors (Wirzubsky, 1953; Planas and Vives, 1956; Haidar, 1970; Jukic, 1972; Focardi *et al.*, 1980; Caragitsou and Tsimenidis, 1982a-b).

Food preferences of juveniles, that in summer months concentrate in coastal nursery grounds, are briefly discussed only by Garbi and Ktari (1979).

To investigate this topic, samples of Red mullet were collected with a bottom trawl at 3 selected depths (7-10-13 m) in a coastal area about 10 miles NW of Ancona (central Adriatic Sea) between August and November 1975, in daylight hours, when feeding activity and vulnerability of Red mullet are the highest (Caragitsou and Tsimenidis, 1982b; Froglia and Gramitto, 1986).

A total of 474 stomachs from fish in the size range 5 - 9 cm (T.L.) were examined; only 13 were found empty (Vc = 0.03).

Standard techniques (for a review see: Berg, 1979) were followed in the analysis of stomach contents, but frequently I found impossible to number individuals in the bulk of Polychaete and Bivalve remains.

Peracarid Crustaceans were found to be by far the most important food item, followed by small Decapods (size range 1-20 mm T.L.), Polychaete worms and Bivalves ("pullus" and juveniles measuring 0.8 - 4 mm shell length).

For the 8 most important food items observed, the "Frequency of occurrence" and the "Percentage of (wet) weight" are summarized in Fig. 1 separately for the three depths considered.

Importance of different food items remarkably changes among the depths considered also if the sampled areas are only one mile apart from each other and the depth range is only 5 meters.

Grab samples of benthic communities collected contemporaneously to trawl samples, suggest a density-dependent prey selection by the young Red mullets, at least for some Crustacean food items (Tanaids and Apeliscidae).

Moreover, as predator grows, it shifts its diet to larger preys.

In samples collected at 10 m depth small Peracarids, like Cumacea, were recorded with a mean number of 6.1 individuals per stomach in 96% of the Red mullets of 6 cm length, whereas their mean number decreased to 2.7 individuals and the frequency dropped to 22% in the Red mullets of 9 cm TL.

In samples obtained at 13 m depth, predation on large shrimps (*Processa* sp.) was found higher among larger fishes: mean number 1.7, frequency 13% for Red mullets of 6 cm, and mean number 2.5, frequency 36% for Red mullets of 9 cm.

Wthin a single food item, the largest sizes recorded in the stomachs increased with the predator size, whereas the smallest sizes were roughly constant, but their abundance markedly decreased, as if larger Red mullets would search for larger preys but not disregard the small one encountered by chance.

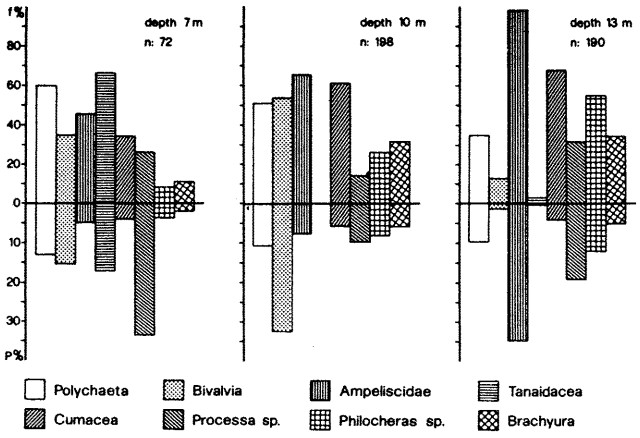

Fig. 1 - Food preferences of juvenile Red mullet.

For example the largest prawns recorded in stomachs of Red mullets of 5 and 9 cm (TL) measured respectively 5 and 20 mm in total length, whereas the size of the smallest Cumacean was about 2 mm throughout the whole size range of predators. Such a feeding behavior seems to me the most efficient in terms of energy gain from available food resources.

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Food habits and dietary overlap of Lepidotriglia cavillone in Greek Seas

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INTRODUCTION

Lepidotrigla cavillone (Large scale gurnard) is among the most abundant triglid fish species in demersal communities in the Greek seas (PAPACONSTANTINOU, 1982, 1983). In order to know more about the role of this fish in its ecological communities, including competitive- predatory relationships, more data are required on their food habits. The objectives of this study were 1) to describe the food habits of the L. cavillone that is very common in trawl catches in the Greek seas, 2) to evaluate the possible effects of size of fish, season of capture and geographic area on its food habits.

MATERIAL AND METHODS

A total of 1437 stomach samples from L.cavillone was collected during a bottom trawl survey in Greek waters from summer 1977 to spring 1978. Samples of stomachs were taken in four areas: Saronikos Gulf (437) Pagassitikos Gulf (270); Thermaikos Gulf (303); Thracian Sea (427). In the laboratory the preserved stomachs were individually opened and their contents emptied onto a 0,25 mm mesh openinmg screen sieve to permit washing without loss of any food items. The stomach contents were shorted, identified and counted. Major prey items and commonly occurring but relatively minor prey, in terms of weight and number, were identified to species whenever possible. The weight of all stomach content groups was determined to the nearest 0,01g and all information recorded. A stomach was considered empty when no food items could be identified and the mate- rial found in the stomach weighted <0.01 g. Niche overlap was calculated using the formula proposed by PIANKA(1973)

$$Aij = \frac{[\Sigma pihpjh]}{[\Sigma p^2ih\ \Sigma p^2jh]}$$

where Aij is the overlap of species j on species i, Pih is the porpotion (percentage weight) of a particular food h (h=1...,s) in the diet of species i; and Pjh is the proportion of the same food h in the diet of species j. Values for the overlap index may vary between 0, if no overlap occurs, and 100 for complete overlap.

TABLE I. Percent by weight, number and frequency of occurrence that mysidacea food taxa composed the diet of L.cavillone in Greek Seas

	THERMAIKOS			PAGASSITIKOS			SARONIKOS			THRAKIKON		
	f	W	N	E	f	W	N	E	f	W	N	E
winter	91	80	92	27	95	85	84	26				
spring	77	57	64	15	77	68	88	9	77	76	88	11	74	67	50	10
summer	91	79	97	6	61	36	46	6	77	72	67	10	100	100	100	3
fall	94	87	98	10	45	36	59	8	91	88	95	14	94	86	93	40

f= frequency of occurrence, W= percentage weight, N=number percentage. E= % empty stomachs.

RESULTS AND DISCUSSION

Of the 1434 stomachs that were examined, 211 were empty. The proportion of empty stomachs was remarkably varied among the four geographical areas throught the year. The summer shows a lower proportion in empty stomachs, while the winter a larger one (Table I). The proportion (by weight) of the major taxa in the diet of L.cavillone were sometimes markedly different among areas. Prey composition and availability may be functions of sediment, depth and season. The first two parameters characterize each geographical area. Mysids constituted over 75% of the diet on a weight basis in Thermaikos, Saronikos Gulf and Thracian sea almost all round the year, while in Pagassitikos gulf only during winter arrived 85% (Table I). In the last area decapods were the major food items in the diet for the three other seasons. A complete list of mysids prey items in term of numbers, weight and frequency is presented by season and geographical area in Table I. Lophotes typicus and Paramysis helleri were the dominant mysids consumed, while the Siriella clausi occurred among the proportion of prey taxa of secondary importance.

Within these geographical areas, differences occurred among the proportions of prey taxa of secondary importance. Cumacea were more abundant during spring and summer in the Pagassitikos Gulf and Thracian Sea, during winter and spring in the Thermaikos Gulf and summer in the Saronikos Gulf. Gammaridea were rarely found in the diet. The capture of a fish prey suggests that they may also prey on small fish. From the feeding spectrum analysis of L.cavillone it is suggested that it feeds as an active predator on the just above the bottom utilizing mainly nectonic or pelagic invertabrates.

TABLE II. Similarity indices for the diets of L.cavillone within different seasons in the study area.

classes		fish No:	code	2	3	4	5	6	7	8	9	10	11	12	13	14
Sar/kos,	spring	140	(1)	49	49	50	49	31	35	49	46	50	50	49	48	50
"	summer	162	(2)		49	55	49	37	39	50	48	48	49	50	47	49
"	fall	135	(3)			50	48	44	33	50	44	49	50	48	49	50
Pags/kos	winter	53	(4)			49	31	33	50	45	48	50	48	49	50	
"	spring	54	(5)			36	39	49	66	48	48	50	46	48		
"	summer	78	(6)			49	35	54	29	31	36	26	31			
"	fall	85	(7)			37	46	33	33	39	28	33				
Ther/kos	winter	79	(8)			47	48	50	49	48	50					
"	spring	118	(9)			44	44	48	41	45						
"	summer	49	(10)			50	47	48	48							
"	fall	57	(11)			48	49	50								
Thracian	spring	269	(12)			45	49									
"	summer	30	(13)			49										
"	fall	128	(14)													

To illustrate the similarities of the food habits of L.cavillone among season and geographical areas we constructed a matrix using the PIANKA (1973) index. A value >30 is significant and ones >70 are considered high (KRAST, 1978). The L.cavillone communities in Greek seas showed a considerable degree of food overlap (Table II). This is a reflection of the dominance of mysids and decapods in its diet. The greatest dietary overlap occurred between Pagassitikos and Thracian Sea during spring and summer. In addition, only three code-pairs had overlap value <30. This is attributed to feeding priority from mysids in the Thracian Sea during summer.

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