

Feeding habits of Piper, *Trigla lyra* (LINNAEUS, 1758) inhabiting the Aegean Sea

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Stomach contents of 476 Trigla lyra collected from the Aegean Sea during four seasonal trawl surveys from July 1991 to February 1993, were studied. Quantitative analysis of the stomach contents revealed the species to be carnivorous from < 10 cm onward, feeding on benthic and epibenthic prey. During all seasons Crustacea were the most important food source by number and frequency of occurrence, and dominance. Mollusca, the second most important food category, showed seasonal fluctuations, while Echinodermata ranked third. Feeding intensity of this species was higher in spring.

Key words: *Trigla lyra*, feeding habits, Aegean Sea

INTRODUCTION

Trigla lyra (LINNAEUS, 1758) is a demersal fish inhabiting muddy bottoms to a maximum depth of 400 m (PAPACONSTANTINOU, 1981). Except the Black Sea, it is widely distributed in the Mediterranean and the eastern Atlantic, from North of the Great Britain and the North Sea to Walvis Bay (WHITEHEAD *et al.*, 1986).

Although it is the most commercially important species among gurnards, a limited research has been carried out on *T. lyra*. SVE-TOVIDOV (1936) described the taxonomic status of the Black Sea species. TSIMENIDES *et al.*, (1992) studied ecology and distribution of triglids on the Cretan shelf. Growth characteristics of the species in Saronikos Gulf and the

ecology of different gurnard species in Greek Seas were studied by PAPACONSTANTINOU (1981, 1983). The feeding habits of *T. lyra* have been reported for Gulf of Lion (REYS, 1960), Catalan coasts (MACPHERSON, 1979), South Adriatic Sea (JARDAS and ŽUPANOVIĆ, 1983) and Saronikos Gulf (CARAGITSOU and PAPACONSTANTINOU, 1994).

Considering Turkish Seas, no detailed biological studies were carried out, except for those dealing with the distribution of the species, i.e. DEVEDJIAN (1926), ERAZI (1942), AKŞIRAY (1987) and ÜNSAL (1988). In spite of the economic importance of *T. lyra*, no study has been done before on its feeding habits in Turkish Seas.

The objective of this paper is to provide information on the feeding habits of *T. lyra* in the Aegean Sea. This data would be useful to derive conclusion on the benthic prey-predator interactions in the marine ecosystem of the Aegean Sea, and hopefully it will provide a basis for future studies on this topic.

MATERIAL AND METHODS

Samples of *T. lyra*, a total of 476 specimens, ranging from 6.2 cm to 52.4 cm, were collected during four seasonal bottom trawl surveys off Turkish Aegean Sea coast between 1991 and 1993.

All samples were taken using a demersal trawl with a cod-end liner of 22 mm stretched mesh size. The duration of each haul (depth ranging from 25 m to 525 m) was 30 minutes and the trawling speed was 2.5 knots. All samples were taken during daylight.

The fork length (*FL*) of the fish was measured to the nearest mm and they were weighted to the nearest g. The sex was determined macroscopically in the field.

The stomach contents were directly examined under a stereoscopic binocular microscope (x 40) by immersing the food items in distilled water in a back-lighted petri dish on board. The number of empty stomachs was also recorded.

Since it was impossible to identify the stomach contents into the species level, the identifications were assigned at the group level. The

food items of the major systematics groups were calculated as frequency of occurrence (*f* %), numerical occurrence (*Cn* %), and dominance (*D* %) (HOLDEN and RAITT, 1974). The coefficient of vacancy (*CV* %) and index of nutrition (*IN* %) were calculated to reveal differences in feeding densities in the different seasons (HUREAU, 1970).

In order to examine the feeding habits and influence of fish length on diet composition, *T. lyra* specimens were sorted into 6 groups within 10 cm size classes (< 10 cm; 10.1-20.0; 20.1-30.0; 30.1-40.0; 40.1-50.0 > 50.1 cm) and composition of the prey among each size class is determined.

One-way variance analyses (ANOVA) were used to compare the percentage occurrences of food items between sexes, size classes and seasons.

RESULTS

The contents of *T. lyra* stomachs, belonging to 269 females, 160 male and 47 unsexed specimens, were analyzed. Of the total number of stomachs examined, 130 were empty (27.31 %) and 52 were regurgitated (10.92 %).

The coefficient of Vacancy of *T. lyra* varied according to seasons. This coefficient attained its highest value in autumn (*V* % = 39.16), followed by winter (*V* % = 33.33), summer (*V* % = 21.50) and spring (*V* % = 20.24) (Fig 1).

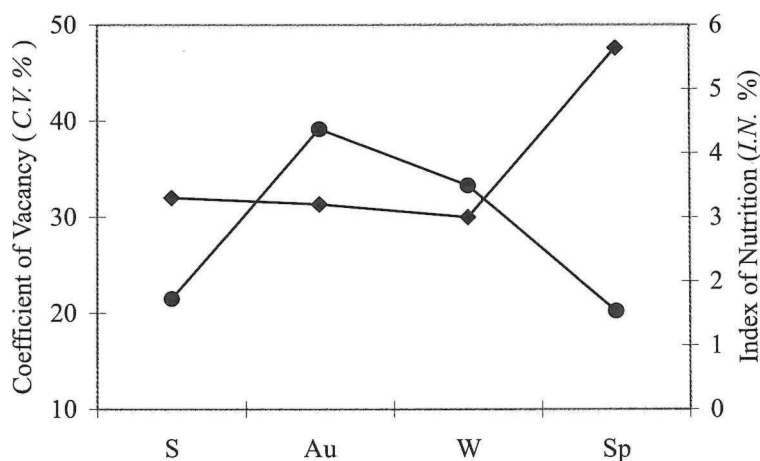


Fig 1. Index of nutrition (I.N.) and Coefficient of Vacancy (C.V.) in specimens analyzed by sampling seasons

Table 1. Frequency of occurrence (F), numerical (Cn) and dominance (D) values of prey groups in the seasonal diet of *T. lyra* in Aegean Sea

	AUTUMN			WINTER			SPRING			SUMMER			TOTAL		
	f	n	b	f	n	b	f	n	b	f	n	b	f	n	b
Polychaeta	2.30	0.94	1.40	0	0	0	5.88	3.45	4.76	1.17	0.31	0.91	2.31	1.14	1.67
Crustacea	54.47	66.03	34.97	90.48	91.03	61.29	76.47	77.93	61.90	74.85	81.00	58.18	71.76	78.01	52.09
Mollusca	18.39	21.23	11.19	19.05	7.69	12.90	5.88	6.21	4.76	11.11	7.85	8.64	13.83	9.61	10.04
Echinoder-mata	3.45	1.42	2.10	0	0	0	22.06	11.72	17.86	12.87	6.44	10.00	11.43	6.30	8.37
Pisces	14.94	9.91	9.09	4.76	1.28	3.23	2.94	0.69	2.38	9.34	4.40	7.73	9.51	4.21	6.90
Undefined	1.15	0.47	0.70	0	0	0	0	0	0	0	0	0	0.29	0.73	0.21
Total prey	213			78			290			637			1218		
Examined stomachs	143			30			84			219			476		
Empty stomachs	56			10			17			47			130		

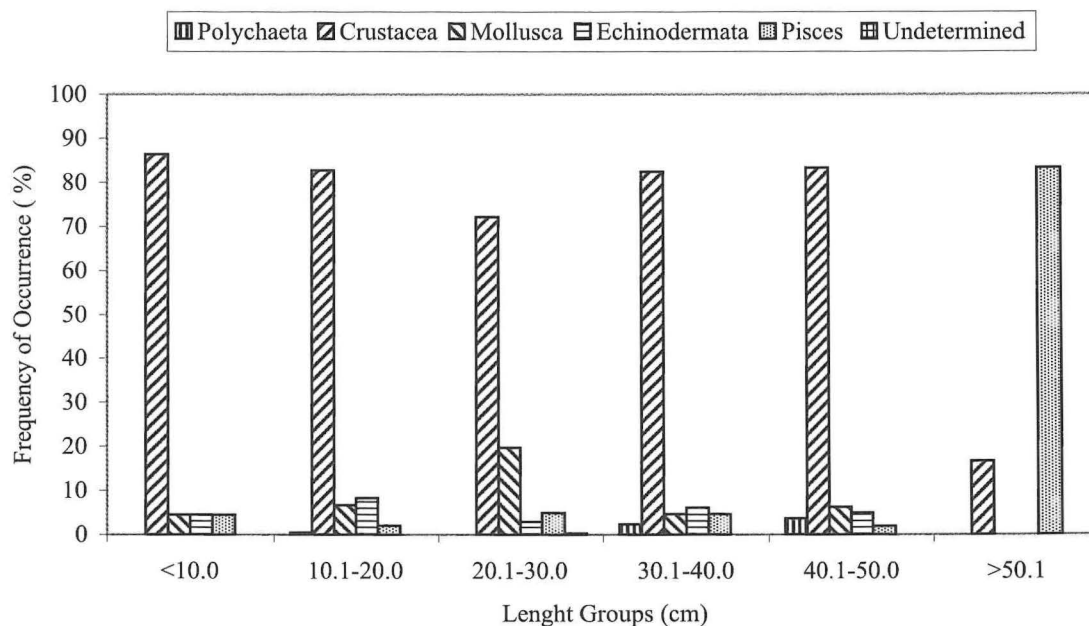
The proportion of empty stomachs varied significantly in all seasons ($f=60.56$, $p < 0.005$) (Fig1). Although empty stomachs were found throughout the year, the seasonal vacuity coefficient differ significantly over the sampling periods ($f=11.05$, $p < 0.005$ for winter; $f=22.13$, $p < 0.005$ for spring; $f=62.25$, $p < 0.005$ for summer) except for autumn ($f=0.056$, $p > 0.005$).

The prey groups found in the stomachs contents of *T. lyra* are given in Table 1. It was observed that Crustacea are the most abundant food ($f=71.76$), followed by Mollusca

($f=13.83$), Echinodermata ($f=11.43$) and Pisces ($f=9.51$) respectively. Polychaeta were determined with a relatively low frequency of occurrence ($f=2.31$).

When the prey composition in fish of the different size classes was examined, Crustacea were found to be dominant in each size class, whereas Echinodermata, Pisces and Mollusca were relatively important in large *T. lyra* (Fig. 2).

Comparison of the percentage occurrences showed that there was no significant difference

Fig 2. The feeding habits of *T. lyra* in respect to length groups

between the percentage occurrences among sex ($f=0.02$, $p>0.005$), size classes ($f=0.31$, $p>0.005$) and seasons ($f=0.127$, $p>0.005$).

CONCLUSIONS

T. lyra in Aegean Sea is carnivorous, feeding on epibenthic and benthic animals, primarily Crustacea. Following the Crustacea, Mollusca and Echinodermata represented main prey components of *T. lyra*, whereas Pisces and Polychaeta were found seldom and in small quantities.

REYS (1960) reported that all major prey taxa were epibenthic. MACPHERSON (1979) stated that the main prey items were ophiuroids and Crustacea (decapods). JARDAS and ŽUPANOVIĆ (1983), as well as CARAGITSOU and PAPACONSTANTINO (1994) produced the same conclusion for *T. lyra* in the Adriatic Sea and the Saronikos Gulf.

In fact, all studies on Triglidae stated that they feed on epibenthic and benthopelagic zooplankton; infauna being of the very secondary importance. The most abundant organisms of the infauna of the Aegean Sea were polychaets (CINAR *et al.*, 1998), which did not affect the diets of these fishes.

The presence of empty stomachs was generally higher when compared with other areas such as the Saronikos Gulf (CARAGITSOU and PAPACONSTANTINO, 1994), where it ranked from 3 to 12 % and in winter exceeded

41.00 % and 21.05 % in the Southern Bay of Biscay (VELASCO *et al.*, 2001). However, *T. lyra* brought to the surface sometimes regurgitate. It is possible that differences in hauling depth contribute to the regurgitation rate.

Feeding intensity is positively related to the index of nutrition and negatively related to the percentage of empty stomachs (BOWMAN and BOWMAN, 1980). While the high percentage of empty stomachs was observed in winter, the feeding intensity increased to a maximum in spring (Fig 1). The reduction of feeding activity of fish may depend on many factors (NIKOLSKY, 1976). Many demersal fish show a decrease in the feeding rates as the temperature drops (TYLER, 1971). Whatever food is scarce or abundant, it could be difficult to locate and be captured by the fish in winter. It is assumed that the low feeding intensity in cold seasons seemed to be related to the low temperature, which affects negatively the metabolic rates of fish (CARAGITSOU and PAPACONSTANTINO, 1994). The results found here indicate that differences in feeding intensity may be depending on temperature or/and gonadal development (CARAGITSOU and PAPACONSTANTINO, 1994), as well as on seasonal changes of in habitat.

It was found that the feeding habits of *T. lyra* did not differ between sexes, seasons and size classes in terms of qualitative aspects, but some changes were found in percentages of occurrence of the prey groups.

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Ishrana lastavice prasice, *Trigla lyra* (LINNAEUS, 1758) nastanjene u Egejskom moru

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SAŽETAK

Analiziran je sadržaj želudaca kod 476 primjeraka ribe *Trigla lyra* iz Egejskog mora, ulovljenih tijekom četiri sezonska kočarenja između lipnja 1991. i veljače 1993. godine. Analizom hrane ustanovljeno je da je ova vrsta od 10 cm dužine nadalje mesožder, hraneći se bentoskim i epibentoskim organizmima. U svim sezonama u ishrani prevladavaju rakovi kako brojem tako i učestalošću pojave. Druga važna prehrambena kategorija su mekušci, kod kojih su uočene sezonske fluktuacije, a na trećem mjestu su ehinodermi. Intenzitet ishrane kod ove vrste je najveći u proljeće.

Ključne riječi: *Trigla lyra*, prehrambene navike, Egejsko more
