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Diet Composition of the Blotched Picarel *Spicara flexuosa* Rafinesque, 1810 (Actinopterygii: Sparidae) from the Aegean Sea, Turkey

Tuncay Murat Sever

Faculty of Fisheries, Ege University, 35100 Bornova-İzmir, Turkey; E-mail: tmsever66@gmail.com

Abstract: Stomach content of *Spicara flexuosa* from the Sığacık Bay (400 individuals) was studied. Overall, 64 taxa were identified belonging to 16 prey groups. The relative importance analysis identified crustacean groups (mostly pelagic copepods) as the most important prey in the diet of all size groups in all seasons. In addition, larvae of Decapoda and Mysidacea were also important in certain seasons and size groups. Based on the results of the study*, S. flexuosa* is a pelagic zooplanktivorous species that feeds with meso- and macrozooplankton, with pelagic copepods being the main food item for this species.

Key words: *Spicara flexuosa,* diet, zooplanktivore, Sığacık Bay.

Introduction

Species of the genus *Spicara* Rafinesque, 1810 are schooling littoral fishes occurring in the Eastern Atlantic, throughout the Mediterranean Sea and part of the Black Sea. Although their commercial value is relatively low, they represent one of the major components of the Turkish coastal fisheries. Currently, there are indications of overfishing of *Spicara* spp. stocks in Turkey, which annual production has drastically decreased from a total of 2,250 tonnes in 2001 to 329 tonnes in 2016, with a mean production of 770 tonnes during the last decade (TUIK 2016).

The taxonomical discrimination between *Spicara maena* and *S. flexuosa* has long been a matter of dispute, primarily due to distinct colour changes reinforced by protogynous hermaphrodite sexual inversion (Minos et al. 2013). Previous research on karyology (Vasiliev 1980), genetics (Imsiridou et al. 2011, Turan 2011, Bektas et al. 2018) and morphology (Minos et al. 2013) have undoubtedly proved that *S. maena* and *S. flexuosa* are distinct species. This has also been accepted by renowned databases such as the Catalog of Fishes (Eschmeyer et al. 2017) and World Register of Marine Species (WORMS 2017).

Spicara flexuosa Rafinesque, 1810 (blotched picarel) is distributed widely along the Turkish coastline (Bilecenoğlu et al. 2014). It prefers sandy or muddy bottoms in the coastal shelf up to 130 m (Fischer et al. 1987). There are several studies on the biology of the species in the Mediterranean: age and growth – Ionian Sea (Mytilineou 1987, Mytilineou & Papaconstantinou 1991), Aegean Sea (Arampatzi-Ziamou et al. 2011), Tunisian coast (Hattour et al. 1985), north-eastern Mediterranean Sea (Özvarol 2014); genetics and morphology – Black Sea (Vasiliev 1980; Vasilieva & Salekhova 1983), Aegean Sea (Ilkyaz et al. 2007, Imsiridou et al. 2011, Turan 2011, Minos et al. 2013, Bektaş et al. 2018); reproduction – Ionian Sea (Mytilineou 1987). However, little work has been done on the feeding habits of the species, with examples available from the Ionian Sea (Mytilineou 1987) and the Black Sea (Lipskaya & Salekhova 1980).

The aim of the present study was to examine the feeding habits of the blotched picarel from the Sığacık Bay of the central Aegean Sea by providing detailed information on the diet of the species based on different size groups and seasons and using qualitative and quantitative analyses.

Materials and Methods

Blotched picarels were caught seasonally in the Sığacık Bay between May 2005 and June 2006 (Fig. 1) with the F/V Hapuloğlu commercial trawler. Sampling in the Sığacık Bay was at 100-200 m depth. After length measurements were done, the stomachs were removed and preserved in 4% formalin solution. At the laboratory, stomach content was examined and identified at the lowest possible taxonomic level group or at the species level using SZX7 Olympus stereomicroscope. Body parts that were not digested were used to count the prey organisms in stomachs (Katağan 1990). Species identification for copepods was done following Rose (1933), Brodskii (1967) and Razouls et al. (2017). Items separated by either group or species were weighted as wet weight with precision of 0.0001 g sensitivity after being left on dry blotting paper for 10 min.

Quantitative representation of the stomach contents and estimation of the relative importance of different preys were done by using relative number of total gut content (%N), frequency of occurrence (%F) and relative weight (%W) (Hyslop 1980). The participation of the main food items was estimated using the Index of Relative Importance (IRI); IRI=%F*(%N+%W) (Pinkas et al. 1971). It was calculated and expressed as a percentage: IRI%=100*IRI*$(\Sigma \mathrm{IRI})^{-1}$ (Cortes 1998). The values were estimated for both seasonal and length groups, which were selected as ≤11.9 cm, 12.0-13.9 cm, 14.0-15.9 cm and ≥16.0 cm according to the length distribution in the samples.

The similarities between seasons and length groups were determined using the Bray–Curtis Similarity Index based on IRI% data and significant groups were identified using the SIMPROF test (Washington 1984, Clarke et al. 2014).

Fig. 1. Study area and stations.

Fig. 2. Dendogram showing seasonal similarities in stomach contents of *Spicara flexuosa* based on the Bray-Curtis Index in the Sığacık Bay.

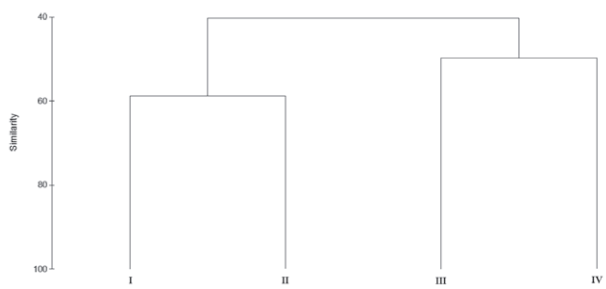

Fig. 3. Dendogram showing size similarities in stomach contents of *Spicara flexuosa* based on the Bray-Curtis Index in the Sığacık Bay.

Results

Stomachs of 400 individuals of *S. flexuosa* (total length (TL) range=9.6–16.8 cm) were examined from the Sığacık Bay. Sixty-one stomachs were empty (15.25%): six from spring, 18 from summer, 16 from autumn and 21 from winter. According to the results of the analyses, 16 prey groups were identified belonging to eight taxonomic groups: Siphonophora, Polychaeta, Crustacea, Mollusca, Chaetognatha, Appendicularia, Thalliacea and Actinopterygii.

The pelagic copepods were the most important prey item in terms of IRI%, N%, F% and W% (in summer with Mysidacea for the 3rd and 4th length groups) for all seasons and length groups in the Sığacık Bay (Tables 1 and 2). The remainder of the diet composition, on the other hand, varied between seasons and length groups. It consisted, in different ratios, of Cladocera, larvae of Decapoda, Bivalvia, Appendicularia, larvae of Brachyura, Chaetognatha, Cirripedia, Gastropoda, fish larvae and eggs, Siphonophora, Ostracoda, Stomatopoda, Thalliacea and Polychaeta. As a result, 64 taxa were found (Tables 1 and 2).

The abundance of pelagic copepods, which were the main prey in the diet of the blotched picarel (with 46 species) in the Sığacık Bay, exhib-

Table 1. Diet composition of *Spicara flexuosa* in the Sığacık Bay in sampling periods

	Spring (n=96)				Summer (n=77)				Autumn (n=66)				Winter (n=100)			
	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%
Siphonophora	0.20	0.69	25.00	0.20					0.58	2.81	33.33	0.81	0.50	1.69	10.00	0.24
Polychaeta					0.79	24.27	10.39	1.70	0.15	3.12	16.67	0.39				
Crustacea																
Cladocera	0.17	0.17	8.33	0.02									4.31	2.28	35.00	2.41
Penilia avirostris													0.59	0.64	12.00	0.16
Podon intermedius	0.17	0.17	8.33	0.02									3.72	1.64	30.00	1.77
Ostracoda	0.68	0.41	41.67	0.40					6.56	2.11	83.33	5.17				
Copepoda	81.12	58.45	100.00	83.03	19.43	4.80	37.66	5.82	87.63	80.98	98.48	91.65	82.11	48.04	65.00	88.26
Calanoida	13.13	7.76	100.00	18.25	2.06	0.61	28.57	0.50	8.01	3.52	98.48	8.13	5.63	3.33	65.00	6.40
Acartia clausi													1.45	1.58	21.00	0.70
Acartia negligens													7.49	5.73	33.00	4.80
Nannocalanus minor	0.88	1.20	25.00	0.46					2.34	3.12	50.00	1.96				
Neocalanus gracilis	0.07	0.13	16.67	0.03												
Neocalanus tenuicornis									0.16	0.82	16.67	0.12				
Paracalanus parvus	3.26	2.39	58.33	2.88	0.88	0.32	11.69	0.09					0.54	0.53	11.00	0.13
Paracalanus nanus	0.10	0.21	8.33	0.02												
Clausocalanus arcuicornis	4.08	1.75	66.67	3.40	0.98	0.39	11.69	0.10	1.02	1.38	66.67	1.15				
Clausocalanus furcatus	3.88	2.29	58.33	3.14					0.72	1.63	50.00	0.84	0.50	0.64	12.00	0.15
Clausocalanus spp.	19.29	14.25	66.67	19.53					0.73	0.98	68.18	0.84	1.45	1.99	37.00	1.40
Mecynocera clausi	0.07	0.12	16.67	0.03					1.05	1.80	66.67	1.36				
Calocalanus pavo	0.03	0.05	8.33	0.01												
Ctenocalanus vanus	0.10	0.20	16.67	0.04												
Ischnocalanus plumulosus	0.10	0.19	16.67	0.04					0.30	0.68	16.67	0.12				
Temora stylifera	11.94	6.76	41.67	6.81					0.16	0.28	18.18	0.06	0.95	0.94	20.00	0.42
Pleuromamma abdominalis	0.41	0.78	33.33	0.35					4.00	3.74	66.67	3.70				
Pleuromamma gracilis	0.44	0.87	33.33	0.38					2.66	6.33	83.33	5.37				
Candacia armata	0.65	1.70	50.00	1.02					0.17	1.46	18.18	0.21				
Candacia simplex	0.92	2.26	41.67	1.16					0.44	2.76	33.33	0.76				
Centropages typicus	4.59	2.26	50.00	2.99									59.58	30.04	71.00	69.95
Lucicutia flavicornis	1.29	1.02	50.00	1.01	0.98	0.41	9.09	0.08	13.88	7.26	81.82	12.39				
Lucicutia spp.									0.33	1.29	16.67	0.19				
Haloptilus longicornis	0.10	0.30	8.33	0.03					4.66	2.17	43.94	2.15				
Scolecithrix bradyi									0.15	0.39	15.15	0.06				
Diaixis pygmoea	0.03	0.08	8.33	0.01												
Euaetideus giesbrechti									0.32	0.68	15.15	0.11				
Isias clavipes	0.14	0.26	16.67	0.06	0.88	0.17	10.39	0.07								
Corycaeus giesbrechti	0.58	0.57	50.00	0.50					0.19	0.14	18.18	0.04				
Corycaeus typicus	2.31	1.27	66.67	2.09	6.97	1.41	37.66	2.05	7.74	5.40	100.00	9.41	0.50	0.64	12.00	0.15
Corycaeus flaccus	0.20	0.24	16.67	0.06					2.50	1.91	66.67	2.11				
Ditrichocorycaeus brehmi	0.65	0.42	33.33	0.31					0.73	1.18	50.00	0.68	0.95	0.70	20.00	0.36
Corycaeus clausi	0.20	0.25	16.67	0.07					1.91	2.14	50.00	1.45				
Corycaeus ovalis	0.41	0.26	41.67	0.24												
Corycaeus lautus	0.07	0.10	16.67	0.02												
Urocorycaeus furcifer	0.44	0.49	33.33	0.27					2.49	3.12	50.00	2.01				
Farranula rostrata	0.71	0.35	58.33	0.54	4.12	0.80	19.48	0.62	0.16	0.20	16.67	0.04	0.95	0.58	20.00	0.34

Table 1. Continuation.

	Spring (n=96)				Summer (n=77)				Autumn (n=66)				Winter (n=100)			
	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%
Corycaeus spp.	0.17	0.19	33.33	0.11					0.29	0.98	33.33	0.30				
Vettoria parva									0.45	0.51	33.33	0.23				
Oncaea media	5.51	2.49	75.00	5.24	0.88	0.13	11.69	0.08	3.79	1.21	83.33	2.98	1.50	0.64	31.00	0.73
Oncaea mediterranea	2.18	1.75	58.33	2.00	0.88	0.37	10.39	0.08	5.99	2.25	83.33	4.92				
Oncaea venusta	0.24	0.44	33.33	0.20												
Triconia conifera	0.85	0.66	50.00	0.66	0.79	0.19	9.09	0.06	10.97	7.26	100.00	13.05				
Oithona plumifera	0.07	0.18	16.67	0.04					0.87	1.60	66.67	1.18	0.59	0.70	12.00	0.17
Lubbockia squillimana	0.34	0.62	25.00	0.21					0.60	1.24	36.36	0.48				
Lubbockia aculeata	0.07	0.18	16.67	0.04					1.30	2.84	51.52	1.53				
Pontoeciella abyssicola									0.15	0.62	16.67	0.09				
Sapphirina metallina	0.54	1.09	58.33	0.83					5.67	6.84	98.48	8.82				
Microsetella rosea	0.07	0.08	8.33	0.01					0.44	0.73	30.30	0.25				
Microsetella gracilis									0.16	0.25	15.15	0.04				
Harpacticoida									0.15	0.28	16.67	0.05				
Lucifer sp.	0.24	0.31	8.33	0.04												
Cirripedia nauplii													0.50	0.23	11.00	0.09
Cypris larvae	0.07	0.04	16.67	0.02					0.15	0.20	16.67	0.04	1.36	0.82	11.00	0.26
Mysidacea	5.48	32.17	58.33	19.19	79.00	69.82	97.40	94.45								
Stomatopoda									0.16	2.87	18.18	0.39				
Decapoda larvae	1.02	0.81	83.33	1.33									1.45	23.85	21.00	5.84
Brachyura larvae	0.92	1.90	41.67	1.03									0.50	15.08	10.00	1.71
Mollusca																
Gastropoda	8.23	1.84	16.67	1.47					1.74	2.11	16.67	0.46				
Bivalvia	0.03	0.04	8.33	0.01												
Chaetognatha	0.78	0.76	33.33	0.45									5.09	4.50	11.00	1.16
Appendicularia	0.92	0.33	50.00	0.55					1.75	0.79	68.18	1.24	3.72	2.81	41.00	2.94
Thaliacea																
Salpa sp.					0.79	1.10	9.09	0.11	1.30	5.01	51.52	2.33				
Teleostei																
Fish larvae	0.03	1.70	8.33	0.13												
Fish eggs	0.10	0.35	25.00	0.10									0.45	0.70	10.00	0.13

ited seasonal changes. The dominant food items were: in spring – *Temora stylifera*, *Oncaea media, Centropages typicus, Clausocalanus arcuicornis* and *Clausocalanus furcatus*; in summer – *Corycaeus typicus* and *Farranula rosrata*; in autumn – *Lucicutia flavicornis, Triconia conifera, Corycaeus typicus, Oncaea mediterranea, Sapphirina metallina, Haloptilus longicornis* and *Pleuromamma abdominalis*; in winter – *Centropages typicus, Acartia negligens* and *O. media* (Table 1).

According to the Bray-Curtis cluster analysis, the highest similarity was detected between summer and winter (40.56%; Fig. 2) and between the 1st and 2nd length groups (58.71%; Fig. 3). These groupings were statistically significant (SIMPROF test, $P<0.05$).

Discussion

In the Mediterranean, stomach content studies on blotched picarel' are limited. Lipskaya & Salekhova (1980) have reported that, even though copepods are dominant in the Black Sea, in blotched picarel stomach contents mysids, amphipods and decapods have also been observed in high ratios. Mytilineou (1987) has reported that the species in the Gulf of Patraikos is feeding on zooplankton and copepods are dominant. He has also indicated that *S. flexuosa* feeds more between September and November than during the other months.

Two studies on this species from the Mediterranean, by Stergiou & Karpouzi (2002) on 332 species and by Navarro et al. (2009) near

Table 2. Diet composition of *Spicara flexuosa* in the Sığacık Bay by length groups.

	10.0-11.9 cm (n=72)				12.0-13.9 cm (n=126)				14.0-15.9 cm (n=91)				≥16.0 cm (n=50)			
	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%
Siphonophora	0.57	2.50	16.67	0.63	0.14	0.59	19.05	0.18	8.89	1.58	14.29	1.33				
Polychaeta									0.29	2.34	14.29	0.33	0.79	58.53	20.00	18.01
Crustacea																
Cladocera	0.42	0.38	15.28	0.09	0.39	0.35	14.29	0.08								
Penilia avirostris					0.04	0.07	4.76	0.01								
Podon intermedius	0.42	0.38	15.28	0.15	0.35	0.28	14.29	0.12								
Ostracoda	0.14	0.10	15.28	0.05	1.77	0.74	33.33	1.10	3.82	0.46	14.29	0.54	0.87	0.05	20.00	0.28
Copepoda	96.61	87.99	70.83	95.57	79.48	60.74	80.95	87.23	47.61	17.75	57.14	27.68	67.33	19.72	40.00	45.45
Calanoida	15.83	12.33	65.28	22.55	11.24	6.49	80.95	18.77	4.41	0.91	57.14	2.70	9.57	1.56	40.00	6.76
Acartia clausi					0.11	0.18	9.52	0.04								
Acartia negligens	0.57	0.87	31.94	0.56	0.43	0.48	4.76	0.06								
Nannocalanus minor	0.42	0.76	15.28	0.22	1.03	1.36	19.05	0.59	2.94	1.45	14.29	0.56				
Neocalanus gracilis	0.14	0.35	15.28	0.09	0.04	0.07	4.76	0.01								
Neocalanus tenuicornis					0.04	0.19	4.76	0.01								
Paracalanus parvus	3.84	3.72	48.61	4.51	2.52	1.89	28.57	1.65								
Paracalanus nanus					0.11	0.21	4.76	0.02								
Clausocalanus arcuicornis	0.85	0.49	33.33	0.55	4.25	2.08	42.86	3.55	0.59	0.15	16.48	0.11	0.87	0.10	20.00	0.30
Clausocalanus furcatus	1.43	1.04	15.28	0.46	3.79	2.42	38.10	3.09	0.59	0.46	15.38	0.14	0.79	0.21	20.00	0.30
Clausocalanus spp.	0.85	1.35	65.28	1.76	20.10	14.67	42.86	19.48					1.74	0.57	42.00	1.48
Mecynocera clausi	0.14	0.31	15.28	0.09	0.21	0.35	19.05	0.14	0.59	0.40	14.29	0.13				
Calocalanus pavo					0.04	0.05	4.76	0.01								
Ctenocalanus vanus					0.11	0.20	9.52	0.04								
Ischnocalanus plumulosus	0.14	0.31	13.89	0.08	0.14	0.29	9.52	0.05								
Temora stylifera	44.53	32.78	31.94	30.29	1.38	0.88	28.57	0.84								
Pleuromamma abdominalis	0.28	0.69	16.67	0.20	0.96	1.17	28.57	0.80	3.53	1.16	13.19	0.55				
Pleuromamma gracilis	0.57	1.42	15.28	0.37	0.74	1.55	28.57	0.86	1.47	1.24	14.29	0.34	1.66	1.25	24.00	1.06
Candacia armata	1.27	4.34	13.89	0.96	0.39	1.25	23.81	0.51								
Candacia simplex	0.71	2.26	30.56	1.11	0.82	2.09	19.05	0.72	0.59	1.39	14.29	0.25				
Centropages typicus	8.60	7.78	63.89	12.84	7.13	4.20	42.86	6.35								
Lucicutia flavicornis	0.99	1.01	15.28	0.37	3.08	1.95	42.86	2.82	7.94	1.54	14.29	1.20	10.36	1.88	22.00	4.09
Lucicutia spp.									0.59	0.97	13.19	0.18				
Haloptilus longicornis					0.92	0.66	14.29	0.30	2.65	0.46	15.38	0.43				
Scolecithrix bradyi													0.87	0.73	18.00	0.44
Diaixis pygmoea					0.04	0.08	4.76	0.01								
Euaetideus giesbrechti													1.66	1.25	18.00	0.80
Isias clavipes	0.28	0.69	13.89	0.17	0.07	0.14	4.76	0.01	0.29	0.17	14.29	0.06				
Corycaeus giesbrechti	0.28	0.35	29.17	0.23	0.57	0.54	23.81	0.35								
Corycaeus typicus	2.54	1.81	27.78	1.48	3.30	2.21	61.90	4.46	3.82	1.01	42.86	1.84	6.49	1.51	24.00	2.91
Corycaeus flaccus					0.46	0.43	19.05	0.22	0.88	0.25	14.29	0.14	5.62	1.46	18.00	1.93
Ditrichocorycaeus brehmi	1.70	1.53	33.33	1.32	0.50	0.49	33.33	0.43								
Corycaeus clausi					0.46	0.52	14.29	0.18	0.59	0.25	14.29	0.11	3.24	1.20	20.00	1.35
Corycaeus ovalis	0.57	0.45	18.06	0.23	0.28	0.18	19.05	0.12								
Corycaeus lautus					0.07	0.10	9.52	0.02								
Urocorycaeus furcifer	0.42	0.63	16.67	0.21	0.89	1.03	23.81	0.60	0.59	0.27	14.29	0.11				
Farranula rostrata	1.55	1.18	62.50	2.10	0.53	0.33	28.57	0.32	0.88	0.38	14.29	0.16	0.95	0.37	22.00	0.44

Table 2. Continuation.

	10.0-11.9 cm (n=72)				12.0-13.9 cm (n=126)				14.0-15.9 cm (n=91)				≥16.0 cm (n=50)			
	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%	N%	W%	F%	IRI%
Corycaeus spp.	0.14	0.21	15.28	0.07	0.18	0.27	19.05	0.11					0.87	0.94	24.00	0.66
Vettoria parva					0.11	0.12	9.52	0.03								
Oncaea media	3.86	3.78	70.83	6.65	4.96	2.10	42.86	3.96	0.88	0.19	42.86	0.41	4.11	0.47	24.00	1.67
Oncaea mediterranea	2.69	2.81	34.72	2.34	2.59	1.72	42.86	2.41	2.35	0.34	14.29	0.34	4.83	0.57	22.00	1.80
Oncaea venusta	0.42	1.01	13.89	0.24	0.14	0.26	14.29	0.08								
Triconia conifera	0.57	0.56	16.67	0.23	2.52	1.68	38.10	2.09	6.76	1.77	27.47	2.08	2.37	0.63	40.00	1.82
Oithona plumifera	0.14	0.42	18.06	0.12	0.21	0.44	19.05	0.16	0.29	0.19	15.38	0.07	0.87	0.47	22.00	0.45
Lubbockia squillimana					0.46	0.85	19.05	0.33	0.29	0.23	14.29	0.07				
Lubbockia aculeata					0.25	0.55	19.05	0.20	1.18	0.95	14.29	0.27				
Pontoeciella abyssicola					0.04	0.14	4.76	0.01								
Sapphirina metallina	0.28	0.76	13.89	0.18	1.21	1.72	38.10	1.46	2.06	1.03	28.57	0.79	9.57	4.12	38.00	7.90
Microsetella rosea					0.07	0.09	4.76	0.01	0.59	0.38	13.19	0.11	0.87	0.42	20.00	0.39
Microsetella gracilis									0.29	0.19	14.29	0.06				
Harpacticoida					0.04	0.07	4.76	0.01								
Lucifer sp.													5.62	2.50	20.00	2.47
Cirripedia nauplii					0.04	0.03	4.76	0.01								
Cypris larvae					0.18	0.14	14.29	0.05	0.29	0.15	13.19	0.05				
Mysidacea	0.14	1.08	13.89	0.21	4.64	25.73	33.33	13.24	34.98	74.81	85.71	83.68	19.78	3.81		35.81
Stomatopoda					0.04	0.67	4.76	0.04								
Decapoda larvae	1.13	5.69	63.89	5.35	0.74	2.32	28.57	1.15	0.29	0.08	13.19	0.04	2.45	0.63	20.00	0.93
Brachyura larvae	0.57	1.53	31.94	0.82	0.82	3.27	14.29	0.76					0.79	0.57	20.00	0.41
Mollusca																
Gastropoda					9.00	2.37	19.05	2.83								
Bivalvia					0.04	0.05	4.76	0.01								
Chaetognatha					1.17	1.25	19.05	0.60					0.79	0.26	24.00	0.38
Appendicularia	0.28	0.10	16.67	0.08	1.31	0.70	52.38	1.38	2.06	0.34	14.29	0.30	0.79	0.10	20.00	0.27
Thaliacea																
Salpa sp.					0.14	0.73	14.29	0.16	1.76	2.49	13.19	0.50				
Teleostei																
Fish larvae													0.79	13.82	22.00	4.88
Fish eggs	0.14	0.63	16.67	0.16	0.11	0.32	14.29	0.08								

the Balearic Islands on 16 species reported results on feeding preferences of the blotched picarel. Both studies have shown that this fish species is planktivorous.

The present study shows that the food composition of *S. flexuosa* is relatively rich and includes diverse zooplanktonic groups and species. Nonetheless, certain groups are preferred: pelagic copepods (for all seasons) and mysids (for some seasons). Feeding habits of planktivorous fishes are affected directly by their behaviour and food quantity in their habitat (Maurin 1966). Hela & Laevastu (1961, cited after Furnestin et al. 1966) have reported that pelagic fish species are abundant in a zone where phytoplankton and zooplankton are also abundant.

The size groups I and II of the blotched picarel feed on small-sized prey (copepods such as *Oncaea* spp., *Corycaeus* spp. and *T. stylifera*, gastropods and small mysids), while the size groups III and IV prefer larger-sized prey (big mysids, larger copepods such as *Lucicutia flavicornis*, *Pleuromamma* spp. and others). As a conclusion, copepods were the most important prey group for all size groups of the species. For a planktivore fish, copepods are an indispensable source (Sorbe 1972). The blotched picarel, being a benthopelagic fish, is known to generally feed on zooplankton species and occasionally on benthic invertebrates (Coll et al. 2006, 2008), which are less important source in trophic web (Stergiou & Karpouzi 2002, Navarro et al. 2009). Findings of our study show that the blotched picarel feeds on mostly holoplanktonic (especially copepods and mysids) and, to a smaller extent, on meroplanktonic larvae (decapods, brachyurans and polychaetes).

A wide spectrum of prey items have been found in the stomachs of the blotched picarel in the Sığacık Bay. There are also rarely consumed prey items such as Isopoda, Stomatopoda, Bivalvia, Gastropoda, Thaliacea, Siphonophora and Chaetognatha.

Pelagic copepods have been reported as the dominant group by zooplankton studies from various areas of the Aegean Sea (Pavlova 1966, Pasteur 1976, Matsakis et al. 1978, Moraitou-Apostolopoulou 1985, Sever 1997, 2009, Benli et al. 2001, Aker 2002, Işınıbilır 2009). Sever (1997) reported for the Aegean Sea that while *C. arcuicornis, C. typicus, C. giesbrechti, H. longicornis, F. rostrata, O. media* live in neritic and oceanic zone, *A. clausi* and *T. stylifera* are abundant only in the neritic zone. *C. typicus, O. media, A. clausi* and *T. stylifera* are dominant in the same area in all seasons (Aker 2002) but other species are seasonally abundant. In the Sığacık Bay, the abundant copepod species are *Centropages typicus, T. stylifera, Corycaeus typicus, L. flavicornis, T. conifera, A. negligens, H. longicornis, F. rostrata, O. media* and *C. arcuicornis*. The species found in stomachs of the examined fish individuals have been reported to be abundant in the zooplankton in the area by Sever (1997) and Aker (2002).

According to the stomach content analyses, blotched picarel is identified as a meso-macro zooplankton feeder and pelagic zooplantivore, with pelagic copepods being the most important prey group. In addition, this species is important food for bentho-pelagic predators such as *Merluccius merluccius, Synodus saurus* and *Zeus faber*, which occupy higher positions in the food web (Carpentieri et al. 2005, Esposito et al. 2009; Stergiou & Fourtouni 1991). In this sense, it plays a very important role in the energy flow between the lower and upper trophic levels of benthic and pelagic food webs.

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