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RESEARCH ARTICLE

Feeding habits of oriental sole (*Brachirus orientalis*) on the Bushehr coast of the Persian Gulf

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Abstract. The feeding habits of oriental sole, *Brachirus orientalis* (Bloch & Schneider) were investigated using 300 male and female specimens collected from coastal waters of Bushehr Province (Persian Gulf) between June 2015 and July 2016. The total length of females and males ranged from 16.2 to 38.5 cm and 14.1 to 29.1 cm, respectively. Of the total number of stomachs examined, 225 were empty (vacuity index = 77%). This index varied significantly over the year ($P < 0.05$), with maximum values in April and September and minimum in October and May. The *B. orientalis* diet was composed of nine prey species belonging to five classes. The most important prey items were Crustacea and Mollusca (Bivalvia and Gastropoda). Diet composition showed little seasonal variation, and Crustacea, Bivalvia, and Gastropoda were the most important prey items in all seasons. Sex did not appear to have any significant effects on dietary composition, and the main prey items were consumed by both males and females ($P > 0.05$).

Keyword: Diet composition, feeding pattern, resource utilization, flatfish

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Introduction

Soleid fishes are one of the by-catches of shrimp trawls and other fishing methods in the Persian Gulf. This is why they have not been investigated thoroughly, and there is little information available on their biology (Yasemi et al. 2007, Keivany et al. 2020). *B. orientalis* is widely distributed in the Persian Gulf and the Makran Sea. They mostly inhabit depths of 10–200 m and reach 40 cm in length and 1 kg in weight (Carpenter et al. 1997). Young fish inhabit depths of less than 3 m with soft substrate as nurseries (Dias de Astarola and Munroe 1998). Adults inhabit coastal areas at depths of about 35 m (Cortes 1997). The Persian Gulf provides these conditions. Feeding habits are an important biological characteristic in fish biology, fishery management, and aquaculture. In practice, the feeding habits of fishes are studied by examining gut contents at monthly intervals.

To design a feeding system model for management, information on food composition, quantity, biomass, and mortality is necessary (Begg and Hopper 1997). Studying feeding ecology can shed light on the way fishes evolve to resist environmental pressures. It is known that food and feeding habits of fishes in different habitats vary at different growth stages. Gut content analysis gives a general perspective of fish condition, but it can differ with regard to the food available, depth, location, habitat, and season. In general, fishes occupy all feeding levels, and this complicates studying them. Mohammadi and Khodadadi (2008) and Keivany et al. (2020) studied growth parameters, Bagherpour et al. (2011) parasitic infections, and Moghdani et al. (2014) the effects of petroleum on nickle concentrations in muscles of *B. orientalis* in the region. Thus, the aim of this study was to obtain some information on the feeding biology of this species in the Bushehr area of the Persian Gulf. The main question was what the main food and diet of oriental sole were, and our hypothesis was that benthic invertebrates would be the main food found in the stomachs of this fish.

Material and Methods

From August 2015 to July 2016, 30 random samples per month were collected from a fisher who caught this fish regularly in the coastal areas of Bushehr province with bottom trawls. The samples were transferred to the laboratory for further studies. Bushehr is an important fishing area of the Persian Gulf that is located almost in the northern Persian Gulf (Fig. 1). Total and standard lengths were measured to the nearest 1 mm, and body and liver weights were measured to the nearest 0.01 g. Fish age determinations were performed using otoliths that were removed, washed in water, dried, and sectioned after they had been embedded in resins (Campana and Neison 1985). The gut was removed, its length and weight was measured, and its content was collected. The stomach content was preserved in 4% formalin for further examination and identification. The relative gut length (RGL) was estimated by dividing the gut length by total length of the body. The RGL < 1 indicates carnivorous diet, 1 < RGL < 3 indicates omnivory, whereas values of RGL > 3 indicate diet based on plant material or detritus (herbivore). Of course, this index is a general guideline and

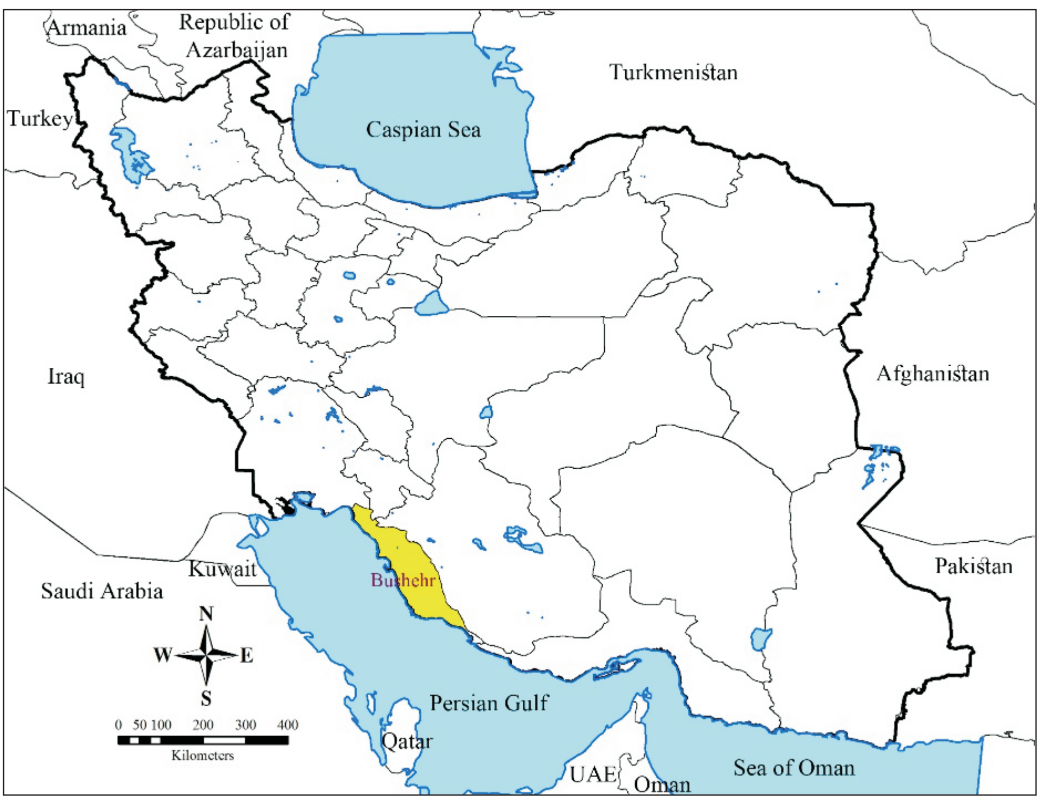

Figure 1. Map of Iran and Bushehr area where the oriental sole (*B. orientalis*) specimens were collected in 2015-2016.

must be confirmed by examinations of the digestive system contents. Condition factor was calculated with the following equation, where, CF = condition factor, BW = body weight (g), TL = total length (cm).

$$CF = BW \times TL^{-3} \times 100$$

Monthly variations in the gastrosomatic index (GaSI), feeding intensity index (FII) or stomach fullness index (SFI), and vacuity index (VI) were calculated using the following equations (Hyslop 1980):

$$GaSI = \frac{Stomach\ weight\ of\ gut\ and\ contents\,(g)}{Total\ fish\ weight\,(g)} \times 100$$

$$FII = \frac{Fresh\ weight\ of\ gut\ contents\,(g)}{Total\ fish\ weight\,(g)} \times 100$$

$$VI = \frac{Number\ of\ empty\ stomachs}{Number\ of\ examined\ stomachs} \times 100$$

The index was interpreted as follows (Euzen 1987):

if 00≤VI<20 full stomach, the fish is voracious;

if 20<VI≤40 relatively full stomach, the fish is relatively voracious;

if 40<VI≤ 60 moderately full stomach, the fish is moderately voracious;

if 60<VI≤ 80 relatively empty stomach, the fish is slightly voracious;

if 80<VI≤ 100 empty stomach, the fish is not voracious.

The frequency of the occurrence of food items (Cortes 1997) and their numerical abundance were calculated with the following equations. Where %O = frequency of occurrence of food items, n = number of stomachs in which a food item was found, p = total number of full stomachs, N = numerical abundance, E = the number of each prey item in all full stomachs, F = total number of food items observed.

$$\%O = \frac{n}{p} \times 100$$

$$N = \frac{E}{F} \times 100$$

To assess possible changes in diet with respect to size, the individuals were classified in to eight size classes.

The normality of the data was assessed with the Kolmogorov–Smirnov test. The values obtained from the means of sexes and seasons (paired samples) were compared with the Independent-Samples *t*-test. One-way ANOVA followed by Duncan's post-hoc test was used to compare the means of biological indices (%O, GaSI, CF N, and RGL). The variation of the vacuity index was tested with the chi-square test. All tests were performed at significance level of 0.95 in SPSS 19 and charts were produced in Excel 2016.

Results

Biometric data, condition factor, and relative gut length

Among the 300 specimens examined, 205 were females (68%), while 95 were males (32%), indicating a sex ratio of about 1:2.2. The total length and weight of the specimens ranged between 141–385 mm (257.6 ± 49.7; mean ± SD) and 50.4–757 g (294.2 ± 158.5); for females from 162 to 385 mm (277.4 ± 44.2) and from 70.9 to 757 g (353.3 ± 152.4), and for males from 141 to 291 mm (213.0 ± 50.4) cm and from 50.5 to 389.8 g (166.7 ± 74.0). Significant differences were noted in male and female total lengths ($P < 0.05$). The average condition factor of females and males and all fishes during different months showed no significant difference ($P > 0.05$). The mean condition factor in males and females was 1.59 ± 0.62 and 1.58 ± 0.20, respectively. The condition factor in both sexes showed almost the same pattern and was not significantly different between them. The average RGL for all specimens was 1.18, which indicated it was a carnivore that fed on fish and large invertebrates. This index was significantly different in different age classes ($P < 0.05$). The relative gut length in the 35.6–39.1 length class, the smallest length class, was significantly shorter compared to other length classes (Table 1).

Table 1
Range of total length (in mm), number of specimens (n) examined to assess diet, and relative gut length (RGL, mean ± SD) in different length classes (in mm) of 300 oriental sole (*B. orientalis*) specimens collected from Bushehr coastal waters in the Persian Gulf in 2015-2016

Size classes (cm)	n	RGL
140-175	12	1.11 ± 0.22
176-211	45	1.18 ± 0.25
212-247	76	1.19 ± 0.24
248-283	71	1.17 ± 0.21
284-319	57	1.20 ± 0.21
320-355	34	1.17 ± 0.20
356-391	5	0.82 ± 0.032

Gastrosomatic index, stomach fullness index, and vacuity index

The comparison of the mean values of GaSI for males and females and all fish in different months showed no significant differences in most months ($P < 0.05$). The highest GaSI value in all fish was recorded in September (0.009) (Fig. 2). The stomach fullness index was different in different months ($P<0.05$) (Fig. 3). The highest value was in September (0.36) ($P > 0.05$) and the lowest was in August, February (0.03), and June (0.04). The comparison of the stomach fullness index (SFI) in different seasons indicated that the highest value is in fall and winter and the lowest was in spring and summer ($P < 0.05$). The comparison of the SFI in different length classes (Fig. 4) indicated that the highest value was in 17.6–21.1 cm, and there was no difference between the sexes ($P > 0.05$).

Among the 292 examined stomachs, 225 were empty and 67 were full. The mean vacuity index for all specimens was calculated as 77%, indicating that this species fed at a relatively low intensity and was slightly voracious. This index did not show a significant difference in males (VI = 34%) or females (VI = 42%) or in any month ($P > 0.05$). The highest index values were in February (94%) and August (87%) and the lowest were in April (67%) and September (61%) (Fig. 5).

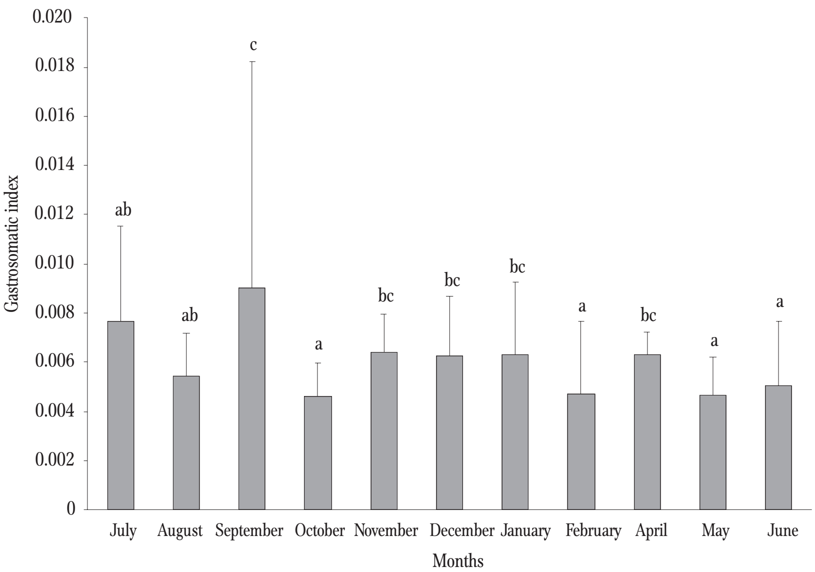

Figure 2. Mean monthly variation of gastrosomatic index in oriental sole (*B. orientalis*) specimens collected from Bushehr coastal waters in the Persian Gulf in 2015-2016.

Frequency of occurrence and numerical composition of prey

The diet consisted of nine taxa belonging to five major categories, dominated by Crustacea, Mollusca (Bivalvia (Turritelidae, Veneridae), Gastropoda (Olividae, Turritelidae), Schaphopoda, Cephalopoda), Echinodermata, Nematoda, and Teleostei. The numerical composition of prey was 76% for Crustacea in 83% of guts followed by the Mollusca (%O = 38, N = 9). Teleosts, nematodes, and ecinoderms were insignificant (Table 2). Among the Mollusca, Bivalvia (Verenidae and Tellinidae), and Gastropoda (Olividae and Turritelidae) were dominant. Of Bivalvia, Verenidae was the most important taxa. The frequency of occurrence indicated that Crustacea was the main food (%O > 50), Mollusca was secondary (%O > 10), and echinoderms and nematodes were incidental foods (%O < 10).

Monthly and seasonal variations in food items showed that Crustacea, Gastropoda, and Bivalvia appeared in the stomachs examined in all seasons

Table 2
Major food organisms eaten by oriental sole (*B. orientalis*) specimens (n = 300) collected from Bushehr coastal waters in the Persian Gulf in 2015-2016. %O – percent frequency of occurrence index, N – numerical abundance

Food item	%O	N
Crustacea	83.1	75.8
Mollusca	38.5	8.7
Bivalvia	31.2	12.4
Verenidae	26.7	9.0
Tellinidae	11.7	3.8
Gastropoda	14.9	3.4
Olividae	10.4	1.8
Turritelidae	3.9	1.9
Schaphopoda	2.8	0.4
Nematoda	0.0	5.6
Echinodermata	2.3	1.3
Teleostei	4.5	1.7

(Tables 3 and 4). Among the food groups, Crustacea was the main food (%O > 50), but there was no significant difference among the seasons (P > 0.05). Mollusca was a secondary prey in all seasons (10 > %O < 50), especially Bivalvia (Verenidae). Mollusca occurred more in June and August (Table 3). Bivalvia and Gastropoda were present in all the months. Bivalvia occurred more in July and Gastropoda in April and September. Based on numerical frequency, in most months, Crustacea and Mollusca were the most abundant (Table 5).

It appeared that sex had no significant effect on %O, and the main prey groups were present in male and female stomachs. However, there were significant differences in numerical frequency (N) of all the food groups between the sexes. In all three size classes of the fish, Crustacea and Mollusca were the main prey items. Among the length classes, the 28.1–34 was the highest in %O and N for Crustacea and 22.1–34 for Mollusca. All main prey items were found in all length classes, Teleostei was found in the smallest class, and Echinodermata was present only in this class (Table 6).

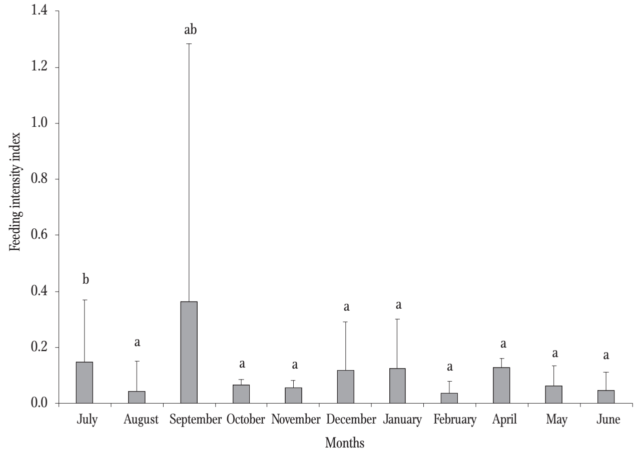

Figure 3. Monthly variation of mean feeding intensity in oriental sole (*B. orientalis*) specimens collected from Bushehr coastal waters in the Persian Gulf in 2015-2016. Different letters in the figure point statistical significance.

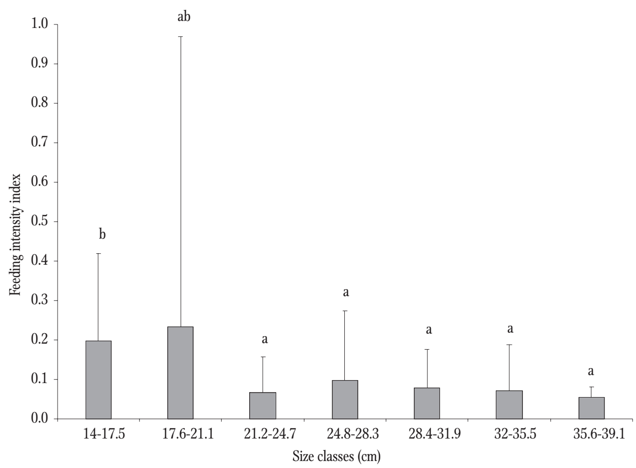

Figure 4. Variation of mean feeding intensity in different length classes of oriental sole (*B. orientalis*) specimens collected from Bushehr coastal waters in the Persian Gulf in 2015-2016. Different letters in the figure point statistical significance.

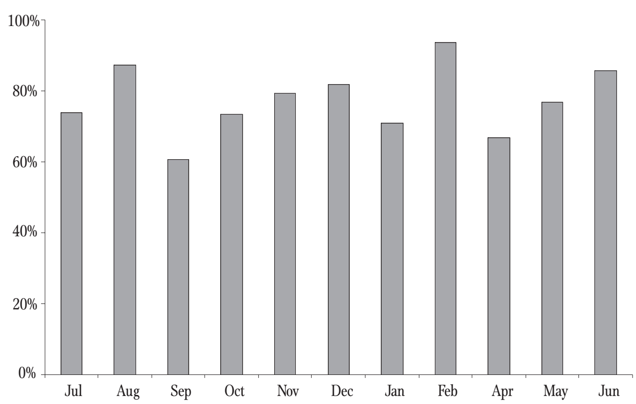

Figure 5. Monthly variation in frequency of empty stomachs in oriental sole (*B. orientalis*) specimens collected from Bushehr coastal waters in the Persian Gulf in 2015-2016.

Table 3
Monthly frequency of occurrence (%O) of different prey types in oriental sole (*B. orientalis*) specimens (n = 300) collected from Bushehr coastal waters in the Persian Gulf from August 2015 to July 2016

	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Apr	May	Jun	Jul
Crustacea	83	100	91	9	100	7	71	100	70	86	50
Mollusca	3	25	27	25	2	5	29	50	60	57	50
Bivalvia	33	0	18	25	17	50	15	50	50	86	50
Gastropoda	17	25	9	13	17	0	0	50	20	14	0
Schaphopoda	17	0	0	0	0	0	14	0	0	0	0
Echinodermata	0	0	0	0	0	2	0	0	0	0	0
Fishes	0	25	9	13	0	0	0	0	0	0	0

Table 4
Seasonal variation in frequency of occurrence (%O) and numeral abundance (N) of food items in oriental sole (*B. orientalis*) specimens (n = 300) collected from Bushehr coastal waters in the Persian Gulf in 2015-2016

	Spring		Summer		Fall		Winter	
Food items	%O	N	%O	N	%O	N	%O	N
Crustacea	85	72	78	72	93	83	73	77
Mollusca	56	8	28	13	23	8	39	4
Bivalvia	62	17	11	9	20	10	32	16
Verenidae	54	13	11	5	20	6	20	14
Tellinidae	16	4	6	4	13	3	13	2
Gastropoda	28	7	14	2	13	4	0	0
Olividae	11	1	14	2	13	3	0	0
Turritelidae	3	6	6	0	6	1	0	0
Schaphopoda	0	0	6	0.5	0	0	7	2
Nematoda	-	7		14	-	0	-	0
Echinodermata	0	0	0	1	0	0	13	6
Fishes	0	0	8	3	7	4	0	0

Table 5
Monthly variations in numerical composition (N) of major food items in oriental sole (*B. orientalis*) specimens (n = 300) collected from Bushehr coastal waters in the Persian Gulf from August 2015 to July 2016

Food items	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Apr	May	Jun	Jul
Crustacea	38	88	84	81	83	67	6	70	68	78	89
Mollusca	34	2	6	7	11	5	4	1	12	12	2
Bivalvia	15	0	7	12	10	25	6	10	24	17	11
Verenidae	9	0	5	7	7	25	3	10	16	12	6
Tellinidae	5	0	2	5	4	0	3	0	8	5	6
Gastropoda	1	4	5	2	5	0	0	10	8	2	0
Olividae	1	4	2	2	4	0	0	0	4	0	0
Turritelidae	0	0	2	0	0	0	0	10	4	2	0
Schaphopoda	1	0	0	0	0	0	3	0	0	0	0
Nematoda	42	0	0	0	0	0	0	20	0	0	0
Echinodermata	3	0	2	0	0	8	3	0	0	0	0
Fishes	0	1	5	5	2	0	0	0	0	0	0

Table 6
Variation in frequency of occurrence (%O) and numerical composition (N) of prey items in different sexes and length classes of oriental sole (*B. orientalis*) specimens collected from Bushehr coastal waters in the Persian Gulf in 2015-2016

	%O		N		%O			N		
Food items	Female	Male	Female	Male	14-22	22.1-28	28.1-34	14-22	22.1-28	28.1-34
Crustacea	60	34	23	48	88	93	95	73	63	90
Mollusca	19	20	5	10	29	61	16	24	34	6
Echinoderm	2	0	0.8	0.5	20	0	0	3	0	0
Fishes	3	2	0.6	2	0	7	10	0	3	4

Discussion

There are very few studies on oriental sole available for comparison, so in most cases we had to compare our data with those of other sole species. Although we provide useful and relatively comprehensive information on the feeding habits and diet of the oriental sole, our findings may suffer from some shortcomings. For example, the number of specimens, though enough for such studies, is the minimum, and doubling or tripling this number could increase the reliability of the data from a statistical point of view and reduce bias in the number of the two sexes examined in different months. Another issue is that since the specimens were collected from a fisher who caught specific sizes for sale, obtaining the complete size range was difficult. Another issue that might affect this kind of study is the time between fishing and landing that could have resulted in the digestion of the food items, especially that of the soft ones. Thus, these limitations should be considered when interpreting the results.

Biometric data, condition factor, and relative gut length

The oriental sole is generally a long-lived fish with a slow growth rate (Keivany et al. 2020). The largest specimen caught in this study was a female measuring 38.5 cm total length and 757 g weight. Yasemi et al. (2007) reported the largest female specimen at 27.6 cm total length and 696 g weight and Mohammadi and Khodadadi (2008) at 40 cm total length. The average condition factor of the fish showed no significant differences in different months and showed almost the same pattern in both sexes, which indicated continuous feeding throughout the year and during the reproductive season.

The mean relative gut length (RGL) was above 1 (1.2), which indicated an omnivorous fish; however, the minimum index was 0.8, and stomach contents indicated it was a carnivore as reported by Devadoss et al. (1977), Das and Mishra (1990), and Hussain (1990) for other flat fishes. Although there is usually a correlation between RGL and feeding habits, some exceptions are expected. Azh et al. (2015) found similar data for *Psettodes erumei* (Bloch & Schneider) (mean RGL = 0.43) in the Persian Gulf and concluded that this species was a carnivore.

Gastrosomatic index, stomach fullness index, and vacuity index

Comparing the gastrosomatic index of males and females did not show significant variation throughout the year. The analysis of the gastrosomatic index also revealed little monthly differences between males and females. Higher values were recorded in September. This was most probably related to the gonadosomatic build-up need, as it coincided with the pre-spawning period of this species in the Persian Gulf (Hamzeh et al. 2017). The gastrosomatic index decreased in the reproduction season and increased before and after reproduction, indicating a reverse relationship between feeding and reproduction time. The same results were found in *P. erumei* in the

Persian Gulf (Azh et al. 2015) and the Indian Ocean (Das and Mishra 1990).

The amount of food consumed by fishes depends on their energy needs, and they adjust it accordingly (Bagenal and Tesch 1978). Feeding intensity is negatively related to the percentage of empty stomachs and is affected by internal and external factors. Feeding intensity increased before and after reproduction. Since there are two reproduction seasons, one in April and another in September, the maximum intensity was observed in fall and the lowest in spring. This could have been due to requirements before and after reproduction (Lucifora et al. 2009). Kosha (1996) reported the lowest intensity in males from September to November with a fast increase in December. Feeding intensity was the highest in the 14.5–21.0 cm length class, which was probably due to faster growth rates and higher energy needs for growing muscles and doing faster movements. It appears that this species feeds throughout the year and that feeding intensity varied throughout the year. Continuous feeding behavior could have been due to prolonged advantageous environmental conditions and productivity, which led to intensive feeding throughout the year. There are several reasons feeding intensity in fish species sometimes decreases, among these is low food availability. Feeding intensity was lower in fish with mature gonads and also in post-spawning periods. These findings concur with those in Figueiredo et al. (2005), who observed that the feeding intensity of *Diplodus sargus* (L.) was relatively constant throughout the year and that the slight increases observed in it during the winter corresponded with the pre-spawning period of this species in the Azores. Fehri-Bedoui et al. (2009) also observed increased feeding intensity in *Pagellus acarne* (Risso) during early stages of maturity and decreased feeding intensity during spawning and post-spawning periods.

The variation in vacuity index can be related to daily feeding cycles, the availability and abundance of prey, seasons, photoperiods, tidal conditions, and the reproductive activity of the predator (Thijssen et al. 1974, Goncalves et al. 1998, Pallaoro et al. 2006). Based on Euzen (1987), *B. orientalis* is in the group of relatively less voracious feeders (VI = 77%). The fullest guts were found in April and September and the least in February and August, and there was no significant difference between the sexes. In carnivores, proteases are stronger and meat is digested faster, while Crustacea remain in the stomach much longer (Valinassab et al. 2011). Fishing time, periods between fishing and fixation or examination, stress created by fishing gears, and food competition can all affect the VI (Thijssen et al. 1974). Rajaguru (1993) found the emptiest stomachs of *Cynoglossus arel* (Bloch & Schneider) in October and December, which he attributed to the reproduction season.

The distribution, migration, and growth of fishes are influenced by feeding and foraging. Fishes can change their behavior according to food availability. Several methods have been developed for the quantitative estimation of fish diet composition, and the abundance and the occurrence of different food items are the most popular (Osman and Mahmoud 2009). Generally, there is a deficit of information on the feeding habits of *B. orientalis*. This study revealed that Crustacea and Mollusca (Gastropoda and Bivalvia) were the most general prey in the stomach contents. Other prey, such as Echinodermata and Cephalopoda were of minor importance. The main findings about the general diet revealed that this fish is carnivorous and relies on different prey. This carnivorous type of diet conforms to that of other sole species reported by other authors. *B. orientalis* is also considered to be an euryphagous species, because the range of its food is wide, and it forages among endofauna (Mollusca and Echinodermata), which demonstrated that the species of this family often ingest a wide range of food items, including macrophytes, diverse invertebrate taxa, and fish.

The diets of some fishes change as they grow in length (Osman and Mahmoud 2009). All *B. orientalis* size-classes consumed Bivalvia, and Teleostei, but the presence of these was more significant in the larger size-classes. Other prey groups were only consumed by certain *B. orientalis* size-classes. The numbers of Bivalvia per stomach was significantly higher (>50) in the 22.1–28 size-class. As with numerous other fish species

(Ghanbarzadeh et al. 2014, Ghafoori et al. 2018), the dietary composition of *B. orientalis* changed frequently and markedly as body size increased, which was attributable to the increased size and strength of their jaws and to ontogenetic changes in their dentition (Tancioni et al. 2003). Several studies have linked mean prey size increase with increasing predator size in order to optimize the energy per unit effort. This difference in feeding behavior in different size-classes is noted in other fishes (Pallaoro et al. 2006, Fehri-Bedoui et al. 2009).

Frequency of occurrence and numerical composition of prey

Seasonal variations in the food spectrum were probably linked to changes in habitat or the seasonal abundance of various food items. The effects of temperature could have been confounded with effects on other abiotic factors and/or changes in food availability. Some of these differences were likely related to the life histories and ecology of invertebrate prey. If the hatch of prey items coincided with the sampling season, there were probably fewer larvae of them available as prey during those sampling periods.

In the present study, some prey groups were affected by season. Schaphopoda appeared in the stomachs examined in August and February only and Nematoda in August and April. Other prey groups were present throughout the year. Seasonal variations in the food items in the stomachs of other marine fishes are reported by various authors (Figueiredo et al. 2005, Osman and Mahmoud 2009). Although the diets of some fish species differ markedly with season, the limited amount of available data suggest that such changes are, at best, minimal in certain fishes. No significant seasonal variation was found in the occurrence of the main prey groups. This could be attributed either to natural fluctuations or to the nutrient enrichment of coastal areas, as well as to the adequate food available over a larger part of the year (Pallaoro et al. 2006). Differences in food types of males and females of different fish species are reported, but sex did not appear to have any significant effect on diet composition in the present study. The main prey groups were consumed by both males and females. This could have stemmed from the consistent spatial overlap of the sexes (Osman and Mahmoud 2009).

Monthly and seasonal diet composition is closely related to changes in the food items in habitats, the life cycles of prey items, the condition of feeding grounds, and fish life cycles. The occurrence of Crustacea in all seasons, but especially in spring and fall, and Mollusca, especially in winter and spring, could be related to water temperature. Echinoderms were noted mostly in winter and nematodes in summer. Bivalvia were dominant in spring, but, along with gastropods, they fluctuated throughout the year probably because of variations in salinity, temperature, bottom structure, currents, and reproduction (Coles and Mcain 1990), although it is reported that bivalves reproduce throughout the year (Urban 2001).

The highest occurrence and numerical frequency index was noted in the 28.9–35.5 cm length class. Fishes grow throughout their lives, and their food regime and the ability to consume foods differs as they grow. Mouth size is a crucial factor in the size of prey consumed; smaller fish catch smaller, slower prey, while large fish catch larger, faster prey (Werneer and Gilliam 1984). In the first year, fish grow faster, which results in rapid changes in their diets. While it might be slower in other species, these changes result in fishes choosing larger prey more efficiently. Changes in diet can also be related to habitats (Jobling 1995, Keivany et al. 2014). In the current study there was little difference in the diet of different length classes probably because there was little change in mouth size. It is possible that the feeding changes happened in first year fish, which we did not examine. Additionally, the similarity between the diets of the sexes indicated that they inhabit the same feeding grounds, feed from the same resources, and are caught in equal measure (Jobling 1995, Keivany and Daneshvar 2016).

In general, there is little information on the feeding habits of soles. Foraging and feeding are responsible for fish distribution, migration, and growth (Osman and Mahmoud 2009, Aalipour et al. 2019). Obviously, the frequency of prey determines its frequency and importance in diets (Mohammed 1995, Ghanbarzadeh et al. 2014). Teleosts are the preferred prey, with shrimps are secondary prey, and squids are incidental for *P. erumi* in the Persian Gulf (Azh et al. 2015), pelagic fishes are the main prey on the Sindh coast of Pakistan (Hussain 1990), and Cephalopods are secondary prey in the Indian Ocean. Crustaceans and Mollusca play the most important role for *C. arel* followed by Diatoms, algae, and copepods (Atabak et al. 2011). In general, *B. orientalis* is a carnivore that feeds on a wide range of prey including Crustacea, Mollusca (Bivalvia, Gastropoda, Schaphopoda), and other items like Nematoda and Echinodermata.

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