THE FEEDING HABITS OF SPOTTED SAND BASS (*PARALABRAX MACULATOFASCIATUS*) IN PUNTA BANDA ESTUARY, ENSENADA, BAJA CALIFORNIA, MEXICO

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ABSTRACT

The feeding habits of spotted sand bass (*Paralabrax maculatofasciatus*) and their seasonal changes are described for the Punta Banda Estuary, Baja California (B.C.). Samples were collected monthly from April 1992 to March 1993, yielding 92 specimens ranging from 80 to 330 mm standard length. In the entire survey, decapods, fish, and mollusks were the major food items of spotted sand bass, with total indexes of relative importance (IRI) of 37.2% (1,828), 32.0% (1,572), and 13.4% (658), respectively. Prey groups with high numeric importance were eggs of topsmelt (*Atherinops affinis*) and gammarids. In summer, the decapods had the highest IRI value (6,234), representing 58.4% of total IRI; followed by gammarids (2,255), 21.1% of total; and mollusks (1,234), 11.5% of total. In winter, fishes were the most important item, with 42.3% (1,964) of total IRI, followed by decapods (910), 21.9% of total. Other seasonal changes were the variation in the numeric importance of gammarids (major in summer, minor in winter) and topsmelt eggs (absent in summer, high in winter). The difference in spotted sand bass diet and its seasonal changes probably reflect differences in available prey and the trophic flexibility of the species. The diet of spotted sand bass indicates foraging close to the substrate, frequently in seagrass beds, as indicated by the high occurrence of eelgrass (*Zostera marina*) fragments in gut contents.

INTRODUCTION

In the last decade, spotted sand bass (*Paralabrax maculatofasciatus*) and other serranids have acquired a high economic importance in nearshore and recreational fisheries of Ensenada, B.C., Mexico (Hammann and Rosales-Casián 1990; Rodriguez-Medrano 1993). These fishes live in areas such as bays, estuaries, and harbors (Allen et al. 1995) and, like other fish species, play a significant role in the energetic balance and the structural progression of the marine environment. Therefore, the study of their ecology is important for improving resource management. Studies of spotted sand bass diet help determine trophic relations with other economically important species, interpret the dynamics of the estuarine environment, and indicate how this species uses the resources of its habitat.

Most studies of spotted sand bass feeding habits have been done along the southern California coast (Feder et al. 1974; Ono 1992; Allen et al. 1995). Only two studies have been made along the Baja California coast, one in Los Angeles Bay (Ferry et al. 1997) and another in Punta Banda Estuary (Navarro-Mendoza 1985). The latter study, which used a small number of stomachs (53), yielded useful but limited information; its data were not analyzed quantitatively. In addition to expanding the information of Navarro-Mendoza and emphasizing quantitative aspects, the study reported here considers seasonal variations in diet.

METHODS

Study Area

The Punta Banda Estuary is located in the North Pacific, off the Baja California Peninsula, in the southern part of Todos Santos Bay, Ensenada, B.C., Mexico (fig. 1). This lagoon covers an area of 21 km^2, has a median depth of 5 m, is characterized by salt marshes (Ibarra-Obando and Poumian-Tapia 1992), and has both muddy and sandy bottoms. During most of the year, evaporation exceeds precipitation, yielding hypersaline conditions; tides are the main avenue of water exchange. The estuary meets true estuarine conditions only during intense winter rains (Acosta-Ruiz and Alvarez-Borrego 1974; Celis-Ceseña and Alvarez-Borrego 1975).

Sampling Methods

The sampling period started in April 1992 and ended in March 1993. Samples were collected with a beam trawl (with a mouth 0.36 m high and 1.70 m wide, and of 3 mm mesh) and an otter trawl (with a mouth 2.5 m high and 7.5 m wide; 19 mm mesh in body and 5 mm in bag end). Five-minute tows were made along the 5 m depth contour at approximately 0.75–1.0 m/sec (1.5–2.0 knots). Four replicate samples were collected each month with each trawl. Once per month, a variable mesh monofilament gill net (50 m long and 2.5 m

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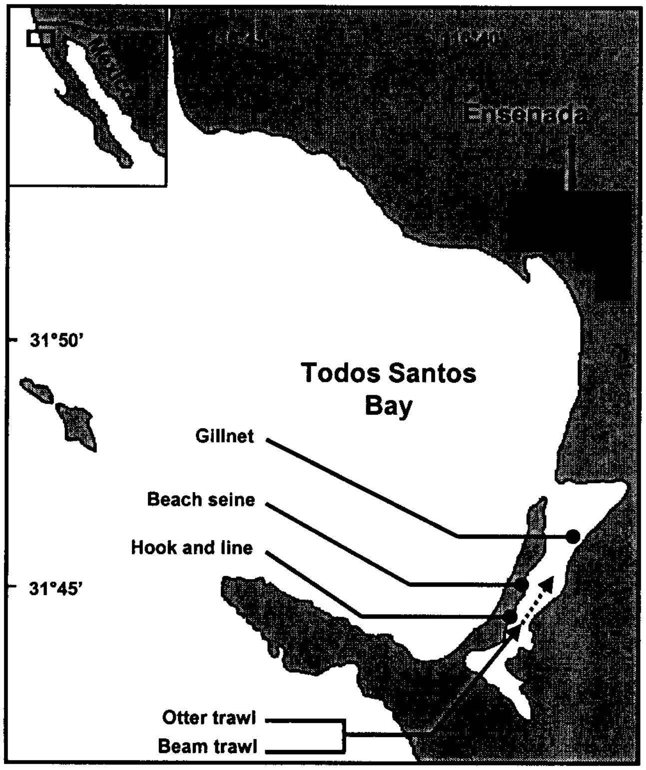

Figure 1. Punta Banda Estuary in Todos Santos Bay, with locations and methods used for collecting spotted sand bass during 1992–93.

high) was fished for 12–14 hours at night (<6 m depth). Hook and line sampling with cut bait or lures was also done after the gill net was recovered. From September to March 1993 only, four replicate samples were collected with a 3 cm mesh beach seine net (33 m long and 3 m high) from depths less than 3 m.

After each monthly sampling, spotted sand bass were identified from the Miller and Lea (1972) key. Each fish was measured (standard and total length) to the nearest millimeter, and weighed (total and somatic weight) to the nearest gram. The stomachs were extracted by cutting the anterior side of the esophagus and pylorus; they were fixed in 10% formaldehyde neutralized with sodium borate.

Seasonal Classification

Spotted sand bass were classified into two seasonal groups based on differences in monthly surface temperature (measured with a bucket thermometer) to test for possible variation in diet. We poststratified the data into two seasonal periods: summer (April–October), with warm temperatures; and winter (November–March), with cold temperatures. We used the analysis of variance (ANOVA) test (Zar 1984) to test for statistical differences between monthly temperatures of the two periods and for differences in average standard lengths of fish between the two seasons.

Stomach Content Analysis

The contents of 92 (34 summer, 58 winter) spotted sand bass stomachs were examined. Each item found was identified to the lowest possible taxon, counted, and weighed (wet weight) to the nearest 0.001 g. After data collection, items were grouped into higher-level taxonomic categories. To determine if the number of stomachs was sufficient to describe the spotted sand bass diet, we determined minimum sample size by plotting the cumulative stomach number (x axis) against the cumulative number of prey groups (y axis). The point at which the curve becomes level is considered the minimum sample size (Smith 1976; Roberts et al. 1984). Relative importance of each type of prey was represented with the index of relative importance (modified from Pinkas et al. 1971):

$$IRI = (\%N + \%W) * \%F$$

where N = numerical abundance of each prey type
W = wet weight of each prey type
F = frequency of occurrence of each prey type.

Diet difference in prey abundance between seasons (summer, winter) was tested with the G statistic (Crow 1981; Sokal and Rohlf 1981). We estimated feeding intensity index in summer and winter by dividing the total wet weight of food by the somatic weight expressed in percentage. We used a Mann-Whitney ANOVA (Zar 1984) to test for statistical differences.

RESULTS

The mean surface temperature throughout the year was 18.84°C (±2.01 SD). The maximum monthly temperature was 22.07° (±0.38 SD) in September, corresponding to summer (April to October), and the minimum monthly temperature was 15.90° (±0.10 SD) in December, corresponding to winter (November to March). The mean surface temperature during summer was 19.91° (±1.38 SD), and 16.63° (±1.09 SD) in winter (fig. 2). Seasonal monthly temperatures were statistically different (ANOVA, $p < 0.05$).

The mean standard length (SL) of all spotted sand bass collected was 249.47 mm (±51.04 SD). The mean standard length was 262.20 mm (±34.31 SD) in summer and 244.61 mm (±55.49 SD) in winter (fig. 3). Seasonal means were significantly different (ANOVA, $p < 0.05$). Fish smaller than 200 mm SL were not collected in winter.

The cumulative prey curves constructed from annual, summer, and winter data indicated that sufficient numbers of stomachs were examined to describe the spotted sand bass diet in the Punta Banda Estuary (fig. 4).

Fourteen major taxonomic prey groups were identified in the stomachs: eelgrass fragments (*Zostera marina*);

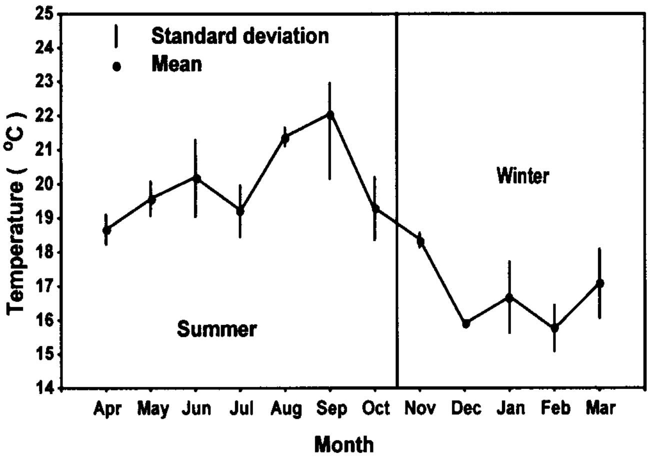

Figure 2. Monthly surface temperature variation during study period (April 1992–March 1993).

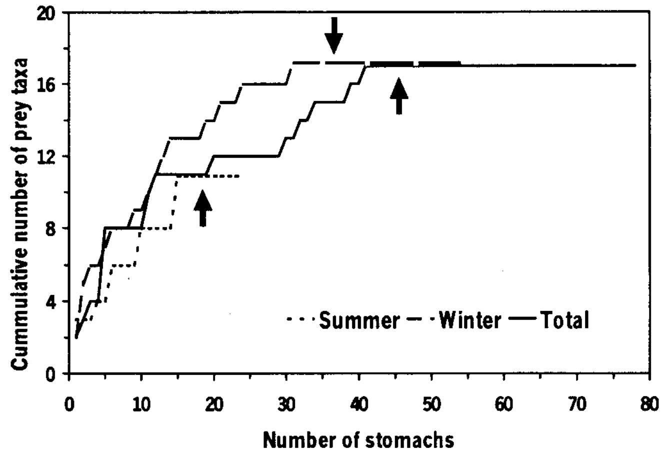

Figure 4. Cumulative numbers of prey taxa with increasing numbers of spotted sand bass stomachs. Arrows indicate the minimum number of stomachs.

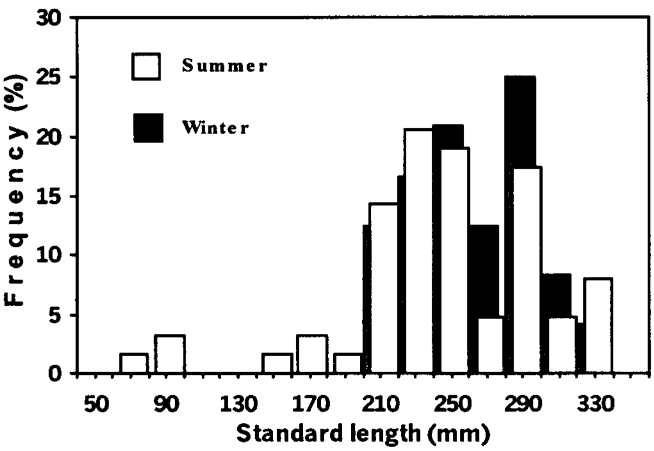

Figure 3. Length-frequency distribution of spotted sand bass (*Paralabrax maculatofasciatus*) from Punta Banda Estuary.

sponges; hydrozoans; nemerteans; polychaetes; mollusks; decapods; gammarids; caprellids; isopods; echinoderms; ascidians; fishes; and topsmelt (*Aterinops affinis*) eggs.

Decapods and fishes were the most important food items in the annual diet of spotted sand bass, and had the highest values: 37.2% of total IRI (IRI = 1,828) for decapods, and 32.0% (IRI = 1,572) for fishes. Mollusks ranked third, with 13.4% of IRI (IRI = 658; fig. 5).

The highest percentage by weight was attributed to fishes, with 40.7% of annual diet values. The eggs of topsmelt dominated by percentage of numbers (67.5%), followed by gammarids, with 16.7%. The most frequently occurring items were the decapods (51.9%), fragments of eelgrass (45.4%), and mollusks (44.1%).

The principal species of decapods were yellow shore crab (*Hemigrapsus oregonensis*); arched swimming crab (*Callinectes arcuatus*); and tuberculate pear crab (*Pyromaia tuberculata*). Principal food fishes were topsmelt (*Atherinops affinis*); silversides (atherinidae); and gobies (gobiidae). Important species of mollusks were California jacknife (*Tagelus californicus*); rosy jacknife (*Solen rosaceus*); and California bubble (*Bulla gouldiana*; see Appendix).

In the summer season, decapods were the dominant food item (IRI = 6,234), representing 58.4% of total IRI. Gammarids were second, with an IRI of 2,255, representing 21.1% of the total. Mollusks placed third, with an IRI of 1,234 (11.5%), and fishes ranked fourth, with an IRI of 439 (4.1%; fig 5). Decapods represented the highest percentage of weight (64.0%) and frequency of occurrence (84.2%). Gammarids constituted the highest numeric percentage (70.7%). Mollusks and fragments of eelgrass occurred in almost 52.6% and 47.3% of all stomachs. The most important decapods were the tuberculate pear crab and the yellow shore crab. *Corophium acherusicum* was the most important species of gammarid (Appendix).

In winter, fishes dominated the diet of spotted sand bass, with 47.31% of total IRI (IRI = 1,964). Decapods and mollusks ranked second and third, with IRIs of 910 (16.5%) and 494 (11.9%; fig 5). In numbers, fishes contributed a low percentage (2.4%), but were the highest in percentage of weight (51.8%). The main species contributing to the weight were topsmelt and silversides (Appendix). Topsmelt eggs dominated the numerical percentage (86.5%). The most important decapod species were the yellow shore crab and the arched swimming crab. The California bubble and the bivalve Pacific eggcockle (*Laevicardium substriatum*) were the most important prey species in the mollusk category.

In summary, decapods and fishes were the most important groups in the annual diet of the spotted sand bass. The main seasonal differences were the dominance of decapods in summer, and of fishes in winter. In summer, the gammarids occupied the highest numerical

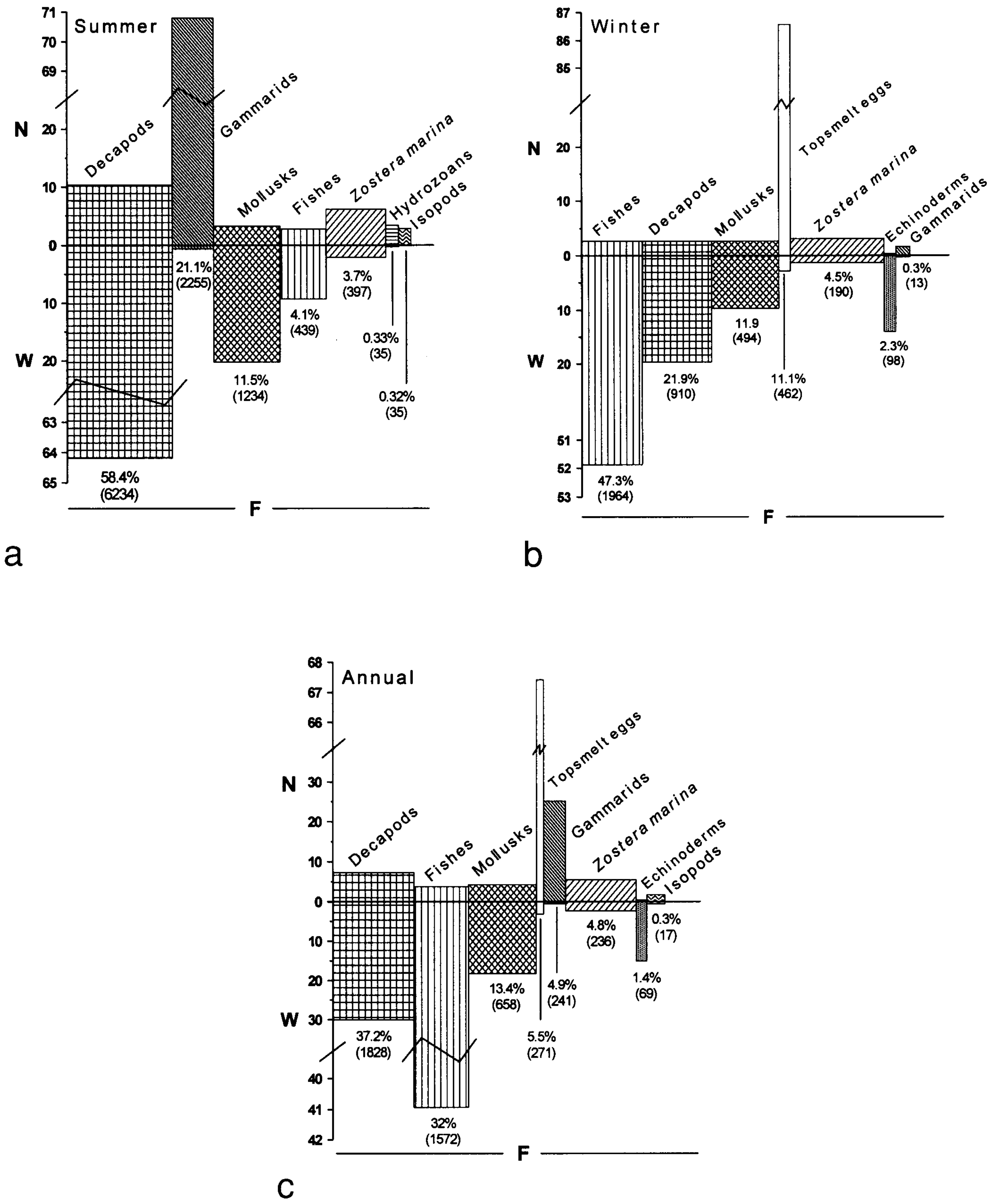

Figure 5. Relative importance by percent number (*N*), percent weight (*W*), and percent frequency of occurrence (*F*) of principal prey of spotted sand bass (*Paralabrax maculatofasciatus*) from Punta Banda Estuary during the 1992–93 annual survey (*a*), the summer survey (*b*), and the winter survey (*c*). Below bars: IRI percentage and IRI value (parentheses).

percentage, but were replaced by topsmelt eggs in winter. The frequency of occurrence of eelgrass fragments in the stomach contents was high in the annual survey; by season, it increased from summer to winter. Significant differences in the diet were determined in the total numerical abundance of groups between winter and summer (X^2, $p < 0.05$). The difference can be attributed to the high variation in abundance of topsmelt eggs between seasons. Other groups that contributed to the seasonal difference were gammarids, decapods, and caprellids.

The mean feeding intensity of spotted sand bass was lower in summer (1.07% ± 1.0 SD) than in winter (1.28% ± 2.42 SD). No significant differences in seasonal feeding intensity were observed. There were more empty stomachs in summer (20.8%) than in winter (7.9%).

DISCUSSION

Decapods and fishes dominated the diet of spotted sand bass for the entire survey, with medium-high occurrence and a high weight contribution. Other important foods were mollusks, topsmelt eggs, gammarids, and fragments of eelgrass; there were eight more groups of minor relative importance.

Ono (1992) noted small fishes as the highest-ranked food item, followed by cephalopods and crustaceans. Ferry et al. (1997) listed fishes, crustaceans, echinoderms, and mollusks as the main food items for spotted sand bass from Los Angeles Bay in the Gulf of California. Our results show that fish was an important food for spotted sand bass in Punta Banda Estuary only during winter, with high weight contribution but low occurrence.

On the other hand, Allen et al. (1995) mentioned that Ono's characterization of spotted sand bass diet seemed to be in error, since they found that brachyurans, crabs, and clams dominated the diet. Feder et al. (1974) listed possible food items for spotted sand bass, citing crabs and small fishes as important prey. In Punta Banda Estuary, another study (Navarro-Mendoza 1985) indicated that spotted sand bass fed basically on fishes, crustaceans, and mollusks; his findings were similar to those of the study reported here.

Included among the items eaten by spotted sand bass were the siphons and whole bodies of jacknife clams. Allen et al. (1995) posed the question of how spotted sand bass managed to capture these clams, since most of the time they are buried 15–18 cm in the mud. It may be that sometimes during the day (possibly at daybreak) the clam is close to the sediment surface, so it can be pulled out of sediment when the fish bites the siphon. The fact that our samples were obtained during morning supports this assertion.

Spotted sand bass food items differed between seasons. In summer, decapods, gammarids, and mollusks were important; in winter the most important prey were fish, decapods, and topsmelt eggs. Seasonal changes in feeding have been observed in the kelp bass (*Paralabrax clathratus*) and barred sand bass (*P. nebulifer*), which have a feeding morphology similar to that of spotted sand bass (Quast 1968; Love and Ebeling 1978; Mendoza-Carranza 1995).

The different characterizations of spotted sand bass diet, and seasonal changes in it probably reflect differences in available prey over time and space, as well as the trophic flexibility of the species. Spotted sand bass are opportunistic predators, capable of feeding on a wide variety of prey (more than 60 species). Physical and chemical conditions influence the abundance and availability of prey, in this case the general temperature increase attributed to ENSO (El Niño–Southern Oscillation) by Hayward (1993). On the other hand, eelgrass fragments in the stomach contents indicate this species' close relation to eelgrass habitat. Eelgrass beds contain large quantities of small and medium size invertebrates that are eaten by many fishes, and in this case probably explain the large number of prey species.

Although prey is diverse, the main items in the diet of spotted sand bass in Punta Banda Estuary are associated with the benthos and suprabenthos. Muddy, muddy-sandy, and sandy bottoms as well as eelgrass beds are important components of this habitat, where spotted sand bass can feed on a great diversity of prey.

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APPENDIX

Importance of Annual and Seasonal Prey Species in the Diet of Spotted Sand Bass in Punta Banda Estuary, Ensenada, B.C., Mexico

		Annual				Summer				Winter			
Taxon	Prey	%*N*[a]	%*W*[b]	%*F*[c]	%IRI[d]	%*N*	%*W*	%*F*	%IRI	%*N*	%*W*	%*F*	%IRI
Plantae	***Zostera marina***	**3.77**	**1.50**	**45.46**	**4.8018**	**6.2**	**2.18**	**47.36**	**3.71**	**3.08**	**1.15**	**44.83**	**4.56**
Porifera	**Porifera UI**[e]	**0.03**	**0.01**	**1.3**	**0.0012**	—	—	—	—	**0.04**	**0.01**	**1.72**	**0.002**
Hydrozoa		**0.14**	**0.99**	**5.19**	**0.1144**	**0.32**	**3.03**	**10.52**	**0.33**	**0.09**	**0.21**	**3.45**	**0.02**
	Obelia sp.	0.04	0.003	1.3	0.004	0.16	0.01	5.26	0.04	—	—	—	—
	Sertularella turgida	0.11	0.99	3.9	0.34	0.16	3.02	5.26	0.78	0.09	0.21	3.45	0.07
Nemertea	**Anopla**	**0.21**	**0.22**	**6.49**	**0.05**	—	—	—	—	**0.27**	**0.27**	**8.62**	**0.11**
Mollusca		**2.61**	**12.3**	**44.15**	**13.4**	**3.35**	**20.11**	**52.63**	**11.56**	**2.42**	**9.54**	**41.37**	**11.91**
Gastropoda	Prosobranchia UI	0.12	0.05	1.3	0.02	0.64	0.17	5.26	0.2	—	—	—	—
	Opisthobranchia UI	0.04	0.03	1.3	0.01	0.16	0.11	5.26	0.07	—	—	—	—
	Nudibranchia UI	0.51	0.55	3.89	0.34	—	—	—	—	0.71	0.60	5.17	0.51
	Bulla gouldiana	0.32	4.29	12.48	4.83	0.64	6.39	10.53	3.43	0.31	3.40	12.07	3.22
	Aplysia californica	0.03	0.32	1.3	0.04	—	—	—	—	0.04	0.31	1.72	0.05
	Lacunidae UI	0.07	0.03	2.6	0.02	—	—	—	—	0.09	0.04	3.45	0.03
	Crepidula sp.	0.03	0.02	1.3	0.00	—	—	—	—	0.04	0.02	1.72	0.01
	Astraea undosa	0.03	0.03	1.3	0.01	—	—	—	—	0.04	0.04	1.72	0.01
Bivalvia	Pectenidae UI	0.04	0.03	1.3	0.01	0.16	0.11	5.26	0.07	0.04	1.12	1.72	0.15
	Tagelus californicus	0.1	1.58	3.89	0.58	0.32	3	10.53	1.62	0.04	1.12	1.72	0.15
	Solen rosaceus	0.11	1.43	3.90	0.48	0.16	3.46	5.26	0.88	0.09	0.52	3.45	0.17
	Lasaea sp.	0.04	0.16	1.3	0.02	0.16	0.57	5.26	0.18	—	—	—	—
	Laevicardium substriatum	0.62	2.02	9.09	1.99	—	—	—	—	0.80	2.2	12.07	2.99
	Bivalve remains	0.35	1.52	11.69	2.18	1.11	6.3	26.32	9.04	0.22	0.17	6.90	0.24
Polychaeta	**Sabellariidae UI**	**0.03**	**0.06**	**1.3**	**0.002**	—	—	—	—	**0.04**	**0.07**	**1.72**	**0.004**
Decapoda		**4.08**	**31.11**	**51.94**	**37.24**	**10.01**	**64.02**	**84.21**	**58.41**	**2.41**	**19.59**	**41.37**	**21.92**
Caridea	*Crustacea caridea*	0.07	0.82	2.6	0.15	0.32	2.43	10.53	1.34	—	—	—	—
	Hippolite californiensis	0.14	0.23	5.19	0.09	0.48	0.19	15.79	0.49	0.04	0.04	1.72	0.01
	Palaemonella holmesi	0.04	0.20	1.3	0.01	0.32	0.18	5.26	0.12	—	—	—	—
	Alpheus sp.	0.14	0.54	3.89	0.17	—	—	—	—	0.18	0.50	5.17	0.25
Thalassinidea	*Callianasa* sp.	0.03	0.17	1.3	0.005	—	—	—	—	0.04	0.02	1.72	0.01
	C. californiensis	0.10	0.93	2.6	0.18	—	—	—	—	0.13	1.00	3.45	0.27
Anomura	*Isocheles pilosus*	0.04	0.59	1.3	0.05	0.16	1.61	5.26	0.43	—	—	—	—
	Pagurus sp.	0.07	0.53	1.3	0.05	—	—	—	—	0.09	0.48	1.72	0.07
	Pagurus granosimanus	0.03	0.30	1.3	0.02	—	—	—	—	0.04	0.20	1.72	0.03

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Taxon	Prey	%*N*[a]	%*W*[b]	%*F*[c]	%IRI[d]	%*N*	%*W*	%*F*	%IRI	%*N*	%*W*	%*F*	%IRI
Decapoda *(continued)*													
Brachyura	*Portunus xantusii*	0.04	1.37	1.3	0.13	0.32	4.46	5.26	1.17	—	—	—	—
	Callinectes arcuatus	0.18	6.26	5.19	2.59	0.32	5.46	5.26	1.41	0.18	5.89	5.17	2.20
	Pyromaia tuberculata	0.34	2.48	7.79	1.66	1.43	8.4	26.32	12	0.04	0.04	1.72	0.01
	Pugettia sp.	0.04	0.20	1.3	0.01	0.16	0.17	5.26	0.08	—	—	—	—
	Pachigrapsus crassipes	0.20	3.13	2.59	0.66	0.79	10.04	5.26	2.64	0.04	0.30	1.72	0.04
	Hemigrapsus oregonensis	0.90	1.83	16.88	3.47	0.95	5.3	15.79	4.58	0.89	7.55	17.24	10.21
	H. nudus	0.07	0.62	2.6	0.11	—	—	—	—	0.09	0.60	3.45	0.17
	Lophopanopeus sp.	0.07	0.26	1.3	0.02	0.32	0.4	5.26	0.18	—	—	—	—
	L. bellus bellus	0.11	1.24	3.9	0.37	0.48	3.99	15.79	3.27	—	—	—	—
	L. leucomanus leucomanus	0.04	0.28	1.3	0.02	0.16	0.46	5.26	0.15	—	—	—	—
	L. leucomanus heathi	0.07	0.43	1.3	0.04	0.32	1.03	5.26	0.33	—	—	—	—
	Cancer sp.	0.24	1.32	6.49	0.73	0.64	2.96	10.53	1.76	0.13	0.46	5.17	0.22
	C. antennarius	0.03	0.51	1.3	0.04	—	—	—	—	0.04	0.46	1.72	0.06
	C. gracilis	0.03	0.78	1.3	0.07	—	—	—	—	0.04	0.80	1.72	0.10
	C. anthonyi	0.07	0.46	1.3	0.05	—	—	—	—	0.09	0.48	1.72	0.07
	Pinnixia barnharti	0.04	0.53	1.3	0.04	0.16	1.42	5.26	0.39	—	—	—	—
	Brachyuran remains	0.97	5.10	9.09	4.18	2.68	15.52	10.53	9.14	0.35	0.76	8.62	0.65
Gammaridea		**16.71**	**0.19**	**14.28**	**4.92**	**70.75**	**0.67**	**31.57**	**21.13**	**1.52**	**0.03**	**8.62**	**0.32**
	Gammaridea sp. 1	0.56	0.02	7.79	0.36	0.95	0.11	21.05	1.03	0.45	0.01	3.45	0.11
	Gammaridea sp. 2	0.49	0.01	3.9	0.15	0.48	0.04	5.26	0.12	0.49	0.01	3.45	0.12
	Gammaridea sp. 3	0.04	0.0003	1.3	0.004	0.16	0.001	5.26	0.04	—	—	—	—
	Gammaridea sp. 4	0.07	0.001	1.3	0.01	0.32	0.002	5.26	0.08	—	—	—	—
	Corophium sp.	0.17	0.003	1.3	0.02	0.79	0.01	5.26	0.2	—	—	—	—
	C. acherusicum	14.89	0.15	7.79	9.33	67.41	0.5	5.26	16.57	0.13	0.003	1.72	0.02
	Erichtonius sp.	0.04	0.001	1.3	0.004	0.16	0.002	5.26	0.04	—	—	—	—
	Hyalidae UI	0.04	0.0003	1.3	0.004	0.16	0.001	5.26	0.04	—	—	—	—
	Hyale sp.	0.07	0.001	1.3	0.007	0.32	0.002	5.26	0.08	—	—	—	—
	Gammaridean remains	0.35	0.01	1.3	0.04	—	—	—	—	0.45	0.01	1.72	0.06
Caprellidea	*Caprella* sp.	**0.94**	**0.09**	**6.49**	**0.13**	**3.65**	**0.24**	**10.53**	**0.38**	**0.18**	**0.03**	**5.17**	**0.02**
Isopoda		**1.26**	**0.25**	**11.68**	**0.35**	**2.86**	**0.48**	**10.53**	**0.32**	**0.80**	**0.16**	**12.06**	**0.28**
	Paracerceis cordata	0.49	0.10	7.79	0.37	—	—	—	—	0.62	0.14	10.34	0.55
	Cirolana harfordi	0.77	0.15	3.89	0.28	2.86	0.48	10.53	1.63	0.18	0.02	1.72	0.02
Echinodermata		**0.21**	**10.96**	**6.49**	**1.39**	**0.16**	**0.03**	**5.26**	**0.01**	**0.22**	**13.98**	**6.89**	**2.35**
Ophuiroidea	*Amphiodia* sp.	0.07	0.02	2.59	0.02	0.16	0.03	5.26	0.05	0.04	0.02	1.72	0.01
Holothuroidea	Holothuroidea UI	0.14	10.93	3.89	3.43	—	—	—	—	0.18	13.96	5.17	5.13
Ascidiacea	**Ascidiacea UI**	**0.03**	**0.21**	**1.30**	**0.006**	—	—	—	—	**0.04**	**0.26**	**1.72**	**0.01**
Actinopterygii		**2.5**	**43.31**	**36.36**	**32.06**	**2.71**	**9.22**	**36.84**	**4.11**	**2.41**	**51.84**	**36.2**	**47.31**
	Syngnathidae UI	0.04	0.02	1.3	0.005	0.16	0.06	5.26	0.05	—	—	—	—
	Sciaenidae UI	0.04	0.003	1.3	0.004	0.16	0.01	5.26	0.04	—	—	—	—
	Labridae UI	0.04	0.003	1.3	0.004	0.16	0.01	5.26	0.04	—	—	—	—
	Gobiidae UI	0.38	0.76	6.49	0.59	1.43	1.38	15.79	2.06	0.09	0.48	3.45	0.14
	Atherinidae UI	0.17	6.79	3.89	2.15	—	—	—	—	0.22	8.67	5.17	3.22
	Atherinops affinis	0.17	28.88	3.89	8.99	—	—	—	—	0.22	36.89	5.17	13.46
	Paralabrax nebulifer	0.04	1.23	1.3	0.13	0.16	4.49	5.26	1.13	—	—	—	—
	Fundulus parvipinnis	0.07	1.17	2.59	0.26	0.16	3.26	5.26	0.83	0.04	0.36	1.72	0.05
	Ilypnus gilberti	0.17	0.19	6.49	0.18	—	—	—	—	0.22	0.24	8.62	0.28
	Hypsoblennius sp.	0.03	0.60	1.3	0.06	—	—	—	—	0.04	0.76	1.72	0.10
	Fish remains	1.32	3.47	16.88	6.44	0.48	0.01	5.26	0.12	1.58	4.44	20.69	8.70
	***Atherinops affinis* eggs**	**67.56**	**2.23**	**3.89**	**21.60**	—	—	—	—	**86.46**	**2.85**	**5.17**	**11.12**

[a]%*N* = numeric percentage
[b]%*W* = weight percentage
[c]%*F* = frequency of occurrence percentage
[d]%IRI = percentage of index of relative importance
[e]UI = unidentified species