Feeding of Fish at the Seamounts of the Whale Ridge (South-Eastern Atlantic Ocean). 2. Splendid alfonsino *Beryx splendens* (Berycidae)

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Abstract—The feeding characteristics of splendid alfonsino *Beryx splendens* from the seamounts of the Whale Ridge have been studied. A wide range of food organisms in feeding of splendid alfonsino has been confirmed, comprising meso- and macroplankton of the sound-scattering layers of the mesopelagial. Benthic organisms have not been found in the food spectra of splendid alfonsino. The food spectra of splendid alfonsino differ in populations inhabiting distant groups of the seamounts of the Whale Ridge due to the difference in the composition of the available food items and environmental conditions, fish body size, season, and sampling period. Splendid alfonsino has a pronounced diurnal feeding dynamics: the fish feed most intensively in the evening and at the beginning of the night, when the organisms of the sound-scattering layers migrate to the upper water layers. At this time, maximum feeding and minimum digestion of food are noted. Splendid alfonsino selects organisms of 0.9–130.0 mm (on average, 36.1 mm) in size for feeding. As the body length increases, splendid alfonsino switches to feeding on larger prey, while the ratio of the size of the prey to the size of splendid alfonsino changes little (9.7–11.5%).

Keywords: splendid alfonsino *Beryx splendens*, feeding, seamounts, Whale Ridge, Atlantic Ocean

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INTRODUCTION

The seamounts of the Whale Ridge stretch from the African continent from the northeast to the southwest; they comprise three groups of the seamounts that have geological and oceanological differences and create an area of increased biological productivity (Ilyin, 1976; Dubravin, 2001, 2013; Lomakin, 2014). A number of the peaks of these seamounts are characterized by high hydrodynamic activity of near-bottom waters, as a result, there are no loose sediments on the peaks (Lomakin, 2014), so sedentary forms of organisms dominate here (Fedorov and Karamyshev, 1991). The species composition of the fish community of the Whale Ridge has been well studied (Pakhorukov, 1980, 2003; Pakhorukov et al., 2014), but the issues of feeding and trophic relationships of fish have not previously been addressed, except the data on the feeding of four species of fish living here (Dudochkin and Kotlyar, 1989; Gushchin, 2021).

Splendid alfonsino is an abundant commercial fish species found in the Atlantic Ocean from the bays of Maine to the Patagonian shelf and from southwestern Europe and the Canary Islands to South Africa. It is common on the uplifts of underwater ridges, including the seamounts of the Whale Ridge of the Atlantic Ocean. The present study of the feeding of splendid alfonsino serves as a continuation of a series of the publications aiming to study the feeding of key fish species of the seamounts of the Whale Ridge. This report expands our understanding of the feeding of splendid alfonsino inhabiting the waters above the Whale Ridge by presenting a large material collected on five seamounts of three groups of the Whale Ridge.

MATERIALS AND METHODS

Material on the diet of the splendid alfonsino *Beryx splendens* was collected from the catches on the cruises of the Atlantic freezing-type fishing trawler *Zund* in October 1988 and the R/V *Sadko* in December–January 1989–1990. The sampling was performed at three groups of the seamounts of the Whale Ridge: the northern group comprising the uplift of the Severnaya Bank (20°46′ S 08°43′ E), the central group comprising the uplift of the Shchedraya Bank (25°39′ S 06°12′ E) and the Valdivia Seamount (26°07′ S 06°20′ E), and the southern group, comprising the Beta Bank (31°47′ S 02°11′ E) and Alpha-2 Bank (32°50′ S 02°35′ E). Most of the trawlings were carried out with a Hek-4M bottom trawl and a pelagic cable trawl designed by Bureau of Commercial Fisheries for fish concentrations recorded by an echo sounder. The periods of the day were set according to local time, h: morning, 04–09; afternoon, 09–19; evening, 19–22; night, 22–04. During the daytime, bottom trawling was performed...
on the tops of flat seamounts. The pelagic trawl was used in the evening and at night for trawling in the pelagic zone above the seamounts. Several hauls made by a bottom trawl without echo sounder readings at night and by a pelagic trawl during the day did not produce commercial catches. The trawling time was 25–30 min. The start of trawling was noted after the trawl entered the trawling route.

The fish were taken for biological analysis randomly from the sample. Absolute length body (TL) and body weight, sex, the stage of gonad maturity (6-point scale), the degree of digestion of food, and condition factor (CF, 5-point scale) were measured (Instruktsiya..., 1977). The guts of splendid alfonsino were also removed from fish body by random selection and completely fixed with a 6% formaldehyde solution for the analysis of the feeding in the laboratory.

The gut contents were analyzed according to the standard method (Metodicheskie... 1974). The total weight of the food bolus and individual food components was weighed with a 10-mg accuracy. All food organisms were identified to a possible taxon, counted, and their individual weight and size were determined if the state of digestion allowed to do this. A total of 390 stomachs were analyzed, of which 288 contained food.

In order to characterize the fish condition, the stomach fullness index (FI, %) was used; it was calculated as the ratio of the total mass of food to the total mass of fish in the sample, including non-feeding fish. Based on the individual FI, an average FI was calculated for the sample. The share of the individual food components was evaluated in regard to their weight (% of the total mass of the food bolus). The frequency of occurrence of individual food components (FO, %) was calculated as the ratio of the number of occurrences of a given food component to the total number of all food components.

The prey length index (PLI, %) was calculated as the ratio of prey length to predator length. The degree of similarity in feeding of splendid alfonsino caught on different elevations was determined using the Chekanovsky-Sørensen index (Pesenko, 1982): 

\[ I_c = \frac{2c}{(2c + a + b)} \]

where \(a\) is the number of food components in the fish from the stations of group A; \(b\) is the number of food components in the fish from the stations of group B; \(c\) is the number of food components common to both groups.

RESULTS

The Northern Group of the Seamounts

Splendid alfonsino fishing was carried out with a bottom trawl in the evening along the accumulation of fish on the bottom and with a pelagic trawl at night and in the morning along the accumulation in the pelagic zone. All accumulations of fish were recorded with an echo sounder. The catches included splendid alfonsino (80% by weight), oilfish Ruvettus pretiosus (15%), and silver scabbardfish Lepidopus caudatus (5%); sharks of the Etmopteridae family were found sporadically. The length of splendid alfonsino was 19–51 cm, weight, 130–1,350 g. Most of the fish were immature; among females, individuals with gonads of maturity stage II (84.9%) and stage III (15.1%) predominated; in males, these were stage II (77.4%) and stage III (22.6%).

The maximum FI of splendid alfonsino (98%ce) was recorded in the evening in the near-bottom layer at the top of the seamount. In the pelagic zone, its feeding rate decreased, so FI was 30%ce by the morning. The degree of food digestion of splendid alfonsino was 2.4–2.6, CF, 1.7–1.9 (Table 1).

The main food of splendid alfonsino was fish (56.1% of the food mass). The share of fish in food gradually decreased from 66.8% in the evening to 27.6% in the morning. In the food spectrum of splendid alfonsino, myctophids, including Diaphus sp. and Lampadena sp., dominated among the fish. The largest number of fish species in the food of splendid alfonsino was noted in the evening, when representatives of the families Bathylagidae and Myctophidae, Epigonus sp., Melanostomias sp., Chlorophthalmus agassizi, Maurolicus muelleri, and Tetragonurus cuvieri were found in the stomachs; by morning, the number of fish species in the food bolus of splendid alfonsino decreased.

The share of crustaceans in food increased in the evening and reached a maximum in the second half of the night (51.3% by weight), when crustaceans became the main food of splendid alfonsino, and they decreased again to 38.9% in the morning. Shrimp Oplophorus novaeeelandiae was the dominant (29%) species among crustaceans in the diet of splendid alfonsino in the second half of the night; however, in the morning it was absent in the diet. Another shrimp, Acanthephyra acanthitelsonis (16.8%), was found in food bolus only in the evening. The share of Funchalia woodwardi shrimp in splendid alfonsino food increased in the evening and reached a maximum (10.1%) in the second half of the night. In the morning, F. woodwardi was absent in the food of splendid alfonsino. The mass and frequency of occurrence of other crustaceans were low. The shrimp Robustosergia robusta was found in the stomachs at the beginning of the night, the shrimps of the family Sergestidae, in the evening and at night. Shrimps of the genus Systellaspis sp. and Plesionika richardi were found in small numbers in the stomachs of splendid alfonsino at night. Hyperiids were a minor food item of splendid alfonsino by weight. Share of hyperiids Platyscelus ovoiides increased in the evening and reached a maximum (16.2%) in the morning. Some individuals of P. ovoiides were found inside salps Vibilia sp. found in the stomachs in the evening and at night. Tunicates in splendid alfonsino stomachs were represented by Appendicu-
Table 1. Feeding of splendid alfonsino *Beryx splendens* at the seamounts of the northern group (Severnaya Bank)

| Food components and other indicators | Date, time of trawling start, and trawling depth | Total |
|-------------------------------------|-----------------------------------------------|-------|
|                                     | Jan 13, 1990 19:20, 215 m* | Jan 14, 1990 22:50, 170 m | Jan 15, 1990 02:50, 190 m | Jan 15, 1990 04:30, 200 m |       |
|                                     | M | FO | M | FO | M | FO | M | FO |       |
| Teuthida                            | 2.0 | 20.8 | 4.3 | 2.0 | 2.0 | 7.7 | 2.5 | 2.5 |       |
| Squids (total)                      | 2.0 | 4.3 | 4.7 | 26.9 | 22.3 | 55.0 | 2.3 | 18.9 |       |
| Crustacea                           | 0.4 | 4.0 | 0.1 | 4.0 | 7.1 | 28.0 | 2.0 | 7.4 |       |
| Copepoda                            | 0.4 | 4.2 | 1.5 | 4.0 | 4.6 | 3.8 | 1.3 | 3.2 |       |
| Decapoda                            | 0.3 | 4.0 | 0.3 | 4.0 | 0.1 | 1.1 |       |
| Systellaspis sp.                    |       |       |       |       |       |       |       |
| *Acanthephyra acanthitelsonis*      | 16.8 | 25.0 | 3.1 | 8.0 | 10.1 | 3.8 | 3.3 | 4.2 |       |
| *Funchalia woodwardi*               | 2.0 | 4.2 | 3.1 | 8.0 | 18.6 | 40.0 | 29.9 | 38.5 | 15.2 | 31.6 |
| *Oplopoborus novaezeelandiae*       | 11.3 | 41.7 | 18.6 | 40.0 | 29.9 | 38.5 |       |
| *Robustosergia robusta*             | 0.9 | 4.0 | 1.6 | 7.7 | 16.2 | 35.0 | 0.2 | 1.1 |       |
| *Plesiornika richardi*              | 1.5 | 4.0 | 0.4 | 1.1 | 0.9 | 1.1 |       |
| Hyperiida                           |       |       |       |       |       |       |       |
| *Phronima sp.*                      |       |       |       |       |       |       |       |
| *Vibilia sp.*                       | 0.1 | 8.3 | 0.5 | 8.0 | 0.4 | 15.4 | 0.2 | 8.4 |       |
| *Platysceles ovoides*               | 0.2 | 8.3 | 0.5 | 8.0 | 1.6 | 7.7 | 1.7 | 13.7 |
| Crustaceans (total)                 | 0.4 | 9.0 | 11.3 | 33.5 | 40.0 | 5.4 | 17.9 |
| Appendicularia                      |       |       |       |       |       |       |
| Pyrosomatidae                       | 0.1 | 4.0 | 0.4 | 4.0 | 0.2 | 1.1 |       |
| *Salpa sp.*                         | 0.0 | 4.0 | 10.4 | 19.2 | 33.5 | 40.0 | 5.4 | 17.9 |
| Tunicata (total)                    | 0.4 | 4.9 | 11.3 | 33.5 | 5.7 |       |
| Osteichthyes                        | 12.7 | 29.2 | 30.0 | 12.0 | 11.0 | 7.7 | 4.4 | 10.0 | 16.4 | 14.7 |
| Bathylagidae                        | 1.6 | 4.2 | 6.3 | 8.0 | 21.7 | 7.7 | 23.2 | 5.0 | 8.1 | 6.3 |
| Myctophidae                         | 5.0 | 8.3 |       |       |       |       |       |       |       |
| *Diaphus sp.*                       | 0.1 | 8.3 | 0.5 | 8.0 | 1.6 | 7.7 | 1.7 | 13.7 |
| *Lampadena sp.*                     |       |       |       |       |       |       |       |
| Stomiida                            |       |       |       |       |       |       |
| *Melanostomias sp.*                 | 1.0 | 4.2 | 6.8 | 4.0 | 1.9 | 1.1 |       |
| *Chauliodus sp.*                    |       |       |       |       |       |       |
| *Epigonus sp.*                      | 12.6 | 12.5 | 30.0 | 12.0 | 11.0 | 7.7 | 4.4 | 10.0 | 16.4 | 14.7 |
| *Nansenia sp.*                      | 2.6 | 4.0 | 6.3 | 8.0 | 21.7 | 7.7 | 23.2 | 5.0 | 8.1 | 6.3 |
| *Paralepis sp.*                     | 3.4 | 4.0 | 0.4 | 1.1 | 0.9 | 1.1 |       |
| *Maurolicus muelleri*               | 1.6 | 8.3 | 0.8 | 1.1 | 0.9 | 1.1 |       |
| *Chlorophthalmus agassizi*          | 2.5 | 4.2 | 2.6 | 4.0 |       |       |       |
| *Tetragonurus cuvieri*              | 27.0 | 8.3 | 6.3 | 8.0 | 21.7 | 7.7 | 23.2 | 5.0 | 8.1 | 6.3 |
| Fish (total)                        | 66.8 | 56.1 | 35.1 | 27.6 | 56.1 |       |
| Digested food                       | 0.2 | 4.0 | 0.3 | 7.7 | 0.5 | 2.1 |       |
| Number of stomachs                  | 25/24 | 25/25 | 30/26 | 27/20 |       |       |       |
| Condition factor, points            | 1.9 ± 0.2 | 1.7 ± 0.1 | 1.9 ± 0.1 | 1.9 ± 0.2 | 1.9 ± 0.1 |       |
| Degree of food digestion, points    | 2.6 ± 0.1 | 2.4 ± 0.1 | 2.5 ± 0.1 | 2.4 ± 0.1 | 2.5 ± 0.1 |       |
| Stomach fullness index, ‰           | 98.2 ± 13.0 | 68.7 ± 14.2 | 38.6 ± 9.3 | 30.5 ± 7.6 | 61.5 ± 6.3 | 61.0 |       |

Here and in Tables 2, 3: M is the share of the component by weight, %; FO is the frequency of occurrence of the component, %; asterisk * indicates bottom trawling, in other cases, pelagic trawling. Here and in Tables 2—4: values above the line is the mean value and its error, below the line, standard deviation; “+”—component share is less than 0.1%.
laria, Pyrosomatae, and Salpa sp. The share by weight and the frequency of occurrence of salps in the food of splendid alfonsino increased at night and reached a maximum (33.5 and 40.0%, respectively) in the morning. Other tunicates (Appendicularia and Pyrosomatinae) were found in food bolus singly. Squids were registered in the stomachs of splendid alfonsino in the evening and at night, their share was low (2.5%); they were absent in the stomachs in the morning. Other tunicates (Appendicularia and Pyrosomatinae) were found in food bolus singly.

The Central Group of the Seamounts

Samples for studying the diet of splendid alfonsino were taken from bottom trawl catches on the seamount of the Shchedraya Bank and on the Valdivia Seamount. Samples were taken at the Shchedraya Bank late in the evening and at night. Trawling was carried out along the bottom along the accumulations fixed by the echo sounder in the form of a “brush”. At Valdivia Seamount, the trawling was carried out at the end of the day on pelagic accumulations recorded by an echo sounder in the form of a “cloud”. At night, trawling was carried out along the bottom (with low efficiency) under the accumulations of fish observed in the pelagic. In the morning, trawling was carried out along the accumulation at the bottom, fixed by the echo sounder in the form of a “brush”. The catches comprised pelagic armourhead Pentaceros richardsoni (80% by weight), splendid alfonsino (5%), rosefish Helicolenus mouchezi (12%), Cape bonnetmouth Emmelichthys nitidus nitidus (3%). Oilfish, swordfish and sharks of the family Etmopteridae were met singly. In the catches, splendid alfonsino was 19–56-cm long, weighting 60–1740 g. On the Valdivia Seamount, females of splendid alfonsino had gonads of stages II (83.3%) and III (16.7%), males, of stages II (70.0%) and III (30.0%) of maturity. On the Shchedraya Bank, the gonads of females were at the stages II (2.8%) and III (97.2%), males, of stages III (33.3%) and IV (66.7%).

In the waters of the Valdivia Seamount, the average FI of splendid alfonsino was 23.1‰. The maximum FI (39.5‰) was noted at the end of the day with an average degree of food digestion of 2.1. The minimum FI (7.1‰) was observed in the morning with an average degree of food digestion of 2.9. At the Shchedraya Bank, the average FI of splendid alfonsino was 28.9‰, the maximum one (37.0‰) was recorded at the end of the evening with an average degree of food digestion of 2.5. The main food items of splendid alfonsino here were crustaceans (38.2% by weight), followed by fish (33.0%), squids (11.8%), and tunicates (11.6%) (Table 2). At the Valdivia Seamount, the main food of splendid alfonsino was fish (29.4%), among which M. muelleri predominated (26.5%); the share of crustaceans (29.1%) was similar to that of fish. All crustaceans in the food were represented by strongly digested fragments and became the main food of splendid alfonsino at night (47.8%) and in the morning (45.1%). In the morning, hyperiids P. ovoides (11.3%) were found in food with an FO of 8.3%. The digestion index of most P. ovoides specimens was 1.1. The squids (22.0%) in splendid alfonsino’s stomachs were strongly digested. Tunicates, represented by salps (18.1%) with a FO of 19.6%, occurred at the end of the day (26.9%) and at night (17.2%) (Table 2). At the Shchedraya Bank, the main food of splendid alfonsino were crustaceans (43.2%); their share in the evening increased up to 53.7% due to the shrimp O. novaezelandiae (31.6%) with a FO of 27.3%. At night, the main food of splendid alfonsino was fish (33.6%), represented mostly by myctophids, among which Diaphus sp. dominated. The share of Diaphus sp. in the evening it was 31.0%, at night, 33.6%; FO, 9.6 and 7.7%, respectively. At night, the share of squids in the food of splendid alfonsino increased (23.2%), while that of crustaceans decreased down to 18.2%. In the evening, tunicates in the food bolus of splendid alfonsino were represented by fragments of the pyrosome Pyrosoma atlanticum (7.4%) and salps (21.1%) with FO 9.1 and 18.2%, respectively. At night, the share of tunicates was 4.6%.

The Southern Group of the Seamounts

On the Alpha-2 Bank, samples were taken from the catches with a bottom trawl in the evening and with a pelagic trawl at night. Trawling was performed on accumulations of fish recorded by an echo sounder. On the Beta Bank, samples were taken from pelagic trawl catches at the end of the day and in the evening. The catches consisted of pelagic armourhead (45% by weight), splendid alfonsino (25%), Cape bonnetmouth (18%), rosefish (10%), and oilfish (2%). Silver scabbardfish and sharks of the family Etmopteridae have been met sporadically. Splendid alfonsino was 25–50-cm long weighting 230–1650 g in the catches. At the Alpha-2 Bank, females were at II (60%), III (38%), and IV (2%) gonad maturity stages, males, at II (65%), III (30%), and IV (5%). On the Beta Rise, females of splendid alfonsino were at stages II (53%), III (46%), and IV (1%), males, II (52%), III (46%), and IV (2%). The average FI of splendid alfonsino from the southern group was 80.3‰. At the Alpha-2 Bank, the maximum FI (106.6‰) was recorded in October 1988. In January 1990, the maximum FI (70.0‰) was recorded in splendid alfonsino taken from a night catch by a pelagic trawl. A day later, at night, the FI was 31.3‰. In the evening, this parameter increased to 49.4‰. At the Beta Bank, the maximum FI (84.2‰) was observed in the evening by a pelagic trawl; the degree of food digestion was 2.3. The minimum FI (7.8‰) was recorded in the daytime in splendid alfonsino caught by a pelagic trawl near the
Table 2. Feeding of splendid alfonsino *Beryx splendens* at the seamounts of the central group (Schedraya Bank, Valdivia Seamount)

| Food component and other indicators | Schedraya Bank | Valdivia Seamount | Total |
|-------------------------------------|----------------|-------------------|-------|
| date, time of trawling start, and trawling depth | | | |
| Dec 12, 1989 | Dec 29, 1989 | total | Dec 30, 1989 | Dec 31, 1989 | Jan 01, 1990 | total | |
| M | FO | M | FO | M | FO | M | FO | M | FO | M | FO | M | FO | M | FO |
| Teuthida | 0.3 | 27.3 | 23.2 | 30.8 | 8.5 | 19.4 | 5.0 | 6.3 | 34.9 | 33.3 | 32.3 | 25.0 | 22.0 | 19.6 | 11.8 | 24.3 |
| Squids (total) | 0.3 | 23.2 | 8.5 | 5.0 | 34.9 | 32.3 | 22.0 | 11.8 |
| Crustacea | 3.0 | 9.1 | 7.7 | 23.1 | 4.6 | 11.1 | 3.7 | 18.8 | 41.8 | 44.4 | 33.8 | 41.7 | 24.5 | 31.4 | 10.0 | 28.6 |
| Decapoda | 18.9 | 36.4 | 5.1 | 7.7 | 14.3 | 13.9 | 6.0 | 11.1 | 2.4 | 3.9 | 11.0 | 10.0 |
| *Oplophorus novaeezeelandiae* | 31.6 | 27.3 | | | | | 11.3 | 8.3 | 2.0 | 2.0 | 0.6 | 1.4 |
| Euphausiidae | 5.4 | 23.1 | 1.8 | 8.3 | 0.6 | 6.3 | 0.2 | 2.0 | + | 0.1 | 1.4 |
| Hyperiidae | | | | | | | | |
| *Phronima* sp. | 0.2 | 9.1 | 0.1 | 2.8 | 11.3 | 8.3 | 2.0 | 2.0 | 0.6 | 1.4 |
| Platycedrus ovoides | | | | | | | | |
| Crustaceans (total) | 53.7 | 18.2 | 43.3 | 4.3 | 47.8 | 45.1 | 29.1 | 38.2 |
| Tunicata | 1.8 | 9.1 | 4.6 | 7.7 | 2.7 | 5.6 | |
| *Salpa* sp. | 2.1 | 18.2 | 1.4 | 15.6 | 26.9 | 31.3 | 17.2 | 22.2 | 18.1 | 19.6 | 6.0 | 15.7 |
| *Pyrosoma atlanticum* | 7.4 | 9.1 | 4.9 | 2.8 | 15.3 | |
| Tunicates (total) | 11.3 | 4.6 | 9.0 | 26.9 | 17.2 | 18.1 | 11.6 |
| Osteichthyes | | | | | | | | |
| Myctophidae | 3.7 | 9.1 | | | | | 15.9 | 16.7 | 2.9 | 3.9 | 0.8 | 2.9 |
| *Diaphus* sp. | 31.0 | 9.1 | 33.6 | 7.7 | 32.8 | 5.6 | |
| *Maurolicus muelleri* | 34.7 | 33.6 | 35.3 | 63.8 | 50.0 | 26.5 | 15.7 | 7.3 | 11.4 |
| Fish (total) | | | | | | | | |
| Digested food | + | 9.1 | 20.4 | 13.8 | 3.9 | 5.8 | 0.1 | 11.1 | 6.7 | 8.3 | 1.4 | 2.0 | 5.4 | 1.4 |
| Number of stomachs | 24/11 | 29/13 | 53/24 | 25/16 | 25/18 | 25/12 | 75/30 | 128/70 |
| Condition factor, points | 1.2 ± 0.1 | 2.1 ± 0.1 | 2.8 ± 0.1 | 1.6 ± 0.1 | 1.5 ± 0.1 | 2.7 ± 0.1 | 1.7 ± 0.1 | 1.5 ± 0.1 |
| Degree of food digestion, points | 0.6 | 0.4 | 0.5 | 0.6 | 0.7 | 0.5 | 1.1 | 0.8 |
| Stomach fullness index, % | 2.5 ± 0.2 | 3.0 ± 0.2 | 2.9 ± 0.2 | 2.1 ± 0.2 | 2.9 ± 0.1 | 2.9 ± 0.3 | 2.7 ± 0.1 | 2.7 ± 0.1 |
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bottom of the seamount. The degree of food digestion was 2.9 (Table 3).

Crustaceans (53.9%) were the main food of splendid alfonsino in the southern group of seamounts, followed by tunicates (20.3%), fish (16.0%), and squids (9.3%) (Table 3). At the Alpha-2 Bank, crustaceans (48.2%) were the main food, among which the shrimp _F. woodwardi_ (share 20.4%; FO 10.3%) and shrimps of the genus _Pasiphaea_ (14.5%) predominated. The share and frequency of occurrence of isopods were 5.4 and 24.1%, respectively. The share of other shrimps, mysids, and euphausiids in the food of splendid alfonsino did not exceed 3.2% in total. Hyperiids _P. armatus_, _P. ovoides_, _Clytus magellanicus_, and _Vibilia_ sp. totaled 1.3% by weight. Tunicates (20.8%) in splendid alfonsino diet included pyrosomes _P. atlanticum_ (4.6%), salps, and appendicularia. Tunicates were found in the stomachs of fish caught in the evening and at night; they were the main food (48.4%) of splendid alfonsino in the bottom trawl sample in the evening.

Among fish (20.4% by weight) in the stomachs of splendid alfonsino, myctophids (share 8.3%, FO 8.0%) and _Diaphus dumerili_ (7.1, 5.7%) were predominant. Squids (10.2%) were found in splendid alfonsino in the evening and at night. Most of the squids were strongly digested, they were represented by beaks, hooks, and mantle fragments, which made it difficult to identify them (Table 3). The main food of splendid alfonsino on the Beta Bank were crustaceans (60.4%), mainly decapods; the shrimp _F. woodwardi_ occupied the leading position (40.6, 21.8%). The secondary food were tunicates (20.9%) with the leading species _P. atlanticum_ (share 12.4%, FO 1.8%). Salps (5.7% by weight) dominated by frequency of occurrence (12.7%). The share of fish prey was 14.9%, myctophids predominated (12.3%). Share of _Vinciguerria_ sp. and _M. muelleri_ was low. Squid were found in small numbers (2.6%), but in the daytime, their share was 33.5% in the sample of splendid alfonsino from the catch of pelagic trawling near the bottom of the top of the seamount.

**Feeding of splendid alfonsino at different periods of the day** differed in terms of feeding, composition of food organisms, and degree of food digestion. The available material made it possible to combine data by the periods of the day (Fig. 1). In the morning, stomach fullness index was minimal (FI 18.8‰), average degree of food digestion was 2.65. The diet of splendid alfonsino during this period consisted of crustaceans (38.9%), tunicates (33.5%), and fish (27.5%). In the daytime, the feeding rate of splendid alfonsino slightly increased (FI 23.6‰), the degree of food digestion decreased to 2.50. During this period, squid (83.7%) dominated in diet; fish (9.5%), tunicates (3.6%), and crustaceans (3.2%) served as secondary food. The evening period was characterized by the maximum feeding activity (FI 68.5‰) of splendid alfonsino with the minimum average degree of food digestion of 2.42. During this period, crustaceans (45.2%) dominated in food; fish (28.5%), tunicates (13.4%), and squids (12.9%) were secondary food. During the night period, FI slightly decreased (41.5‰), but the average degree of food digestion increased up to 2.67. The food composition of splendid alfonsino was similar to that in the evening and consisted of crustaceans (46.4%), fish (29.3%), tunicates (13.6%), and squids (10.7%).

**Food composition by size groups.** The species and size composition of the food of splendidalfonsino differed in different size groups. Crustaceans (88.1% by weight) served as the main food of small individuals of splendid alfonsino (TL 190–249 mm). Among the crustaceans, the shrimp _Pasiphaea_ sp. was the dominant species (66.3%). Share of shrimps _O. novaeeelandiae_ and _F. woodwardi_ was low (3%). Hyperiids, represented by _P. ovoides_, _C. magellanicus_, _P. armatus_, and _Vibilia_ sp., totaled 10.0% in the food of splendid alfonsino. Among tunicates (6.1%), unidentified fragments of tunicates (4.8%) and intact salps (1.3%) predominated in the food. In splendid alfonsino stomachs, fish (2.6%) were represented by _Nansenia_ sp. (1.9%) and _M. muelleri_ (0.7%). The share of squids was low (1.3%). The feeding activity of splendid alfonsino of this size group was the highest compared to other groups: FI was 141.0‰, 84% of splendid alfonsino individuals had food in the stomach. The average degree of food digestion was minimal (2.1) compared to other size groups (Table 4).

Fish (42.0%) formed the basis of the diet of splendid alfonsino of TL 250–299 mm. Unidentified myctophids (12.7%), _Diaphus_ sp. (5.9%), _M. muelleri_ (9.7%), and _Chlorophthalmus agassizi_ (6.3%) made the most of food bolus. The share of crustaceans in the food was slightly lower (40.0%), among which the shrimp _O. novaeeelandiae_ dominated (23.2%). Tunicates (14.4%), mostly salps (13.5%), constituted the third largest food group of splendid alfonsino. The share of squids (2.7%) was insignificant. The average FI was 28.0‰; 71% of splendid alfonsino individuals of this size group were feeding; an average degree of food digestion was 2.2.

Splendid alfonsino TL 300–349 mm fed on crustaceans (42.9%), which were the main food, followed by fish (27.5%), tunicates (23.3%), and squids (3.5%). The shrimps _O. novaeeelandiae_ (10.2%) and _F. woodwardi_ (8.8%) dominated among the crustaceans in splendid alfonsino stomachs. Myctophids were dominant among fish (7.8%). _Epigonus_ sp. (7.6%) and _M. muelleri_ (5.7%) had similar shares. Tunicates were represented by salps (11.3%) and _P. atlanticum_ in splendid alfonsino stomachs. The share of squids
## Table 3. Feeding of splendid alfonsino *Beryx splendens* at the seamounts of the southern group (Beta Bank, Alpha-2 Bank)

| Food component and other indicators | Beta |          | Alpha 2 |          | Total |          |
|-------------------------------------|------|----------|---------|----------|-------|----------|
|                                     |      | date, time of trawling start, and trawling depth | date, time of trawling start, and trawling depth |          |       |          |
|                                     |      | Jan 01, 1990 16:30, 510 m | Jan 01, 1990 21:10, 630 m | Jan 03, 1990 03:15, 150 m | Jan 03, 1990 21:00, 600 m | Jan 04, 1990 01:50, 570 m |       |       |       |
| M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO | M F | FO |
| Teuthida | 33.5 | 27.3 | 1.3 | 15.0 | 2.1 | 10.9 | 0.3 | 15.4 | 6.1 | 7.1 | 8.8 | 41.2 | 7.9 | 64.0 | 2.8 | 11.5 | 6.0 | 28.9 |
| Oegopsida | 6.9 | 3.6 | 0.1 | 3.6 | + | 4.0 | 4.3 | 14.9 | 0.1 | 2.6 |
| *Abraliopsis* sp. | 33.5 | 1.8 | 0.3 | 13.1 | 8.8 | 11.4 | 111.2 | 7.9 | 64.0 | 2.8 | 11.5 | 6.0 | 28.9 |
| Squids (total) | 34.5 | 45.5 | 0.2 | 5.0 | 1.2 | 10.9 | 0.7 | 7.7 | 9.7 | 32.1 | 0.3 | 5.9 | 6.2 | 80.0 | 3.4 | 9.2 | 5.2 | 32.5 |
| Crustacea | 0.5 | 2.6 | 2.2 | 10.9 | 0.1 | 30.8 | + | 40.0 | 0.1 | 5.7 | + | 3.5 |
| Copepoda | 15.5 | 15.0 | 15.0 | 5.5 | 15.4 | 1.0 | 17.9 | 0.5 | 28.0 | 0.4 | 8.0 | 2.6 | 14.9 |
| Decapoda | 0.5 | 7.7 | 0.1 | 1.8 | + | 4.0 | + | + | + | 0.9 |
| *Gennadas* sp. | 76.3 | 92.3 | 16.6 | 52.0 | 14.5 | 13.8 | 15.1 | 21.9 |
| *Funchalia woodwardi* | 43.9 | 60.0 | 40.6 | 21.8 | 45.2 | 32.1 | 6.1 | 5.9 | 23.7 | 40.0 | 20.4 | 10.3 | 27.9 | 28.1 |
| *Oplophorus novaezeelandiae* | 0.3 | 5.0 | 0.3 | 1.8 | 0.2 | 15.4 | + | 8.0 | 0.5 | 9.2 | 0.1 | 4.4 |
| Euphausiidae | 0.4 | 38.5 | 0.4 | 8.0 | 1.1 | 8.0 | 1.0 | 8.0 | 0.5 | 6.1 |
| *Thysanoessa* sp. | 0.5 | 5.0 | 0.5 | 1.8 | 7.5 | 11.8 | 0.1 | 20.0 | + | 6.7 | 0.2 | 6.1 |
| *Eucopia* sp. | 0.1 | 5.0 | 0.1 | 1.8 | + | 15.4 | 0.1 | 5.9 | 0.5 | 15.4 | 0.1 | 5.9 | 0.5 | 28.0 | + | 3.4 | 0.2 | 9.6 |
| *Vibilia* sp. | 0.3 | 5.0 | 0.3 | 1.8 | + | 4.0 | + | 0.9 |
| *Platyscelus armatus* | 11.5 | 9.1 | 0.7 | 11.8 | 0.1 | 20.0 | + | 6.7 | 0.2 | 6.1 |
| *Platyscelus ovoides* | 0.2 | 5.0 | 0.2 | 1.8 | + | 3.6 | + | 4.0 | 0.3 | 9.6 |
| *Cyllops magellanicus* | 0.2 | 5.0 | 0.2 | 1.8 | 0.3 | 6.1 | 0.5 | 20.0 | + | 3.4 | 0.2 | 9.6 |
| Ostracoda | 0.3 | 3.6 | + | 3.6 | + | 4.0 | 0.3 | 0.1 | 9.6 |

Note: M = date, time of trawling start, and trawling depth.
Table 3. (Contd.)

| Food component and other indicators | Beta | Alpha 2 |
|-------------------------------------|------|---------|
| date, time of trawling start, and trawling depth | date, time of trawling start, and trawling depth | total |
| Jan 01, 1990 16:30, 510 m | Jan 01, 1990 21:10, 630 m | Oct 27, 1988 21:45, 490 m* | Jan 03, 1990 03:15, 150 m | Jan 03, 1990 21:00, 600 m* | Jan 04, 1990 01:50, 570 m | total | Total |
| M | FO | M | FO | M | FO | M | FO | M | FO | M | FO | M | FO | M | FO |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Isopoda | 46.5 | 60.7 | 60.4 | 78.2 | 57.0 | 16.4 | 8.0 | 5.4 | 24.1 | + | 8.0 | 5.4 | 24.1 | + | 3.5 |
| Crustaceans (total) | 46.5 | 60.7 | 60.4 | 78.2 | 57.0 | 16.4 | 8.0 | 5.4 | 24.1 | + | 8.0 | 5.4 | 24.1 | + | 3.5 |
| Tunicata | 2.4 | 2.9 | 10.0 | 2.8 | 3.6 | 19.7 | 84.6 | 8.2 | 14.3 | 5.4 | 24.1 | + | 8.0 | 5.4 | 24.1 | + | 3.5 |
| Appendicularia | 2.4 | 2.9 | 10.0 | 2.8 | 3.6 | 19.7 | 84.6 | 8.2 | 14.3 | 5.4 | 24.1 | + | 8.0 | 5.4 | 24.1 | + | 3.5 |
| Salpa sp. | 6.9 | 35.0 | 5.7 | 12.7 | 0.2 | 4.0 | 3.7 | 11.5 | 0.1 | 0.9 | 0.2 | 4.0 | 3.7 | 11.5 | 0.1 | 0.9 |
| Pyrosoma atlanticum | 12.8 | 5.0 | 12.4 | 1.8 | 1.1 | 3.6 | 24.2 | 35.3 | 4.1 | 28.0 | 4.6 | 18.4 | 5.3 | 12.3 | 5.3 | 12.3 |
| Tunicates (total) | 2.4 | 2.9 | 10.0 | 2.8 | 3.6 | 19.7 | 84.6 | 8.2 | 14.3 | 5.4 | 24.1 | + | 8.0 | 5.4 | 24.1 | + | 3.5 |
| Osteichthyes | 14.2 | 18.2 | 0.4 | 5.5 | 0.9 | 15.4 | 7.1 | 7.1 | 5.4 | 24.1 | + | 8.0 | 5.4 | 24.1 | + | 3.5 |
| Myctophidae | 12.6 | 15.0 | 12.3 | 5.5 | 0.4 | 7.7 | 8.1 | 7.1 | 24.2 | 52.9 | 8.5 | 100.0 | 3.9 | 5.7 | 6.7 | 36.8 |
| Diaphus dumerilii | 5.1 | 3.6 | 2.6 | 1.8 | 0.1 | 0.9 | 0.2 | 0.9 | 0.0 | 0.1 | 0.2 | 0.9 | 0.0 | 0.1 | 0.2 | 0.9 |
| Vinciguerria sp. | 0.7 | 5.0 | 0.7 | 1.8 | 0.7 | 1.8 | 0.7 | 1.8 | 0.7 | 1.8 | 0.7 | 1.8 | 0.7 | 1.8 | 0.7 | 1.8 |
| Maurolicus muelleri | 1.1 | 5.0 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 | 1.1 | 1.8 |
| Fish (total) | 14.2 | 14.8 | 14.9 | 1.3 | 20.3 | 26.2 | 16.2 | 20.4 | 16.0 | 20.4 | 16.0 | 20.4 | 16.0 | 20.4 | 16.0 | 20.4 | 16.0 |
| Fish eggs | 0.1 | 7.7 | 0.1 | 7.7 | 0.1 | 7.7 | 0.1 | 7.7 | 0.1 | 7.7 | 0.1 | 7.7 | 0.1 | 7.7 | 0.1 | 7.7 | 0.1 | 7.7 |
| Digested food | 3.4 | 9.1 | 0.1 | 5 | 1.2 | 3.6 | 0.4 | 7.7 | 0.3 | 10.7 | 0.2 | 4.0 | 0.4 | 20 | 0.4 | 5.7 | 1.0 | 9.6 |
| Number of stomachs total/with food | 20/11 | 25/20 | 45/31 | 29/13 | 31/28 | 20/17 | 26/25 | 106/83 | 151/114 | 20/11 | 25/20 | 45/31 | 29/13 | 31/28 | 20/17 | 26/25 | 106/83 | 151/114 |
| Condition factor, points | 2.8 ± 0.1 | 2.6 ± 0.2 | 2.8 ± 0.3 | 2.1 ± 0.2 | 2.1 ± 0.1 | 2.6 ± 0.1 | 2.4 ± 0.1 | 2.4 ± 0.2 | 2.8 ± 0.1 | 2.6 ± 0.1 | 2.4 ± 0.1 | 2.4 ± 0.2 |
| Degree of food digestion, points | 0.5 | 0.9 | 0.8 | 0.9 | 0.6 | 0.5 | 0.6 | 0.7 | 0.6 | 0.7 | 0.6 | 0.7 | 0.6 | 0.7 | 0.6 | 0.7 | 0.6 | 0.7 |
| Stomach fullness index, % | 7.8 ± 5.7 | 84.2 ± 15.1 | 43.2 ± 18.1 | 106.6 ± 17.0 | 70.0 ± 13.0 | 49.4 ± 11.0 | 31.3 ± 4.0 | 64.3 ± 13.5 | 2 | 80.3 ± 11.6 | 2 | 80.3 ± 11.6 |
| “—”—no data.
The food of splendid alfonsino TL 350–399 mm consisted mainly of tunicates (26.0%). Crustaceans (25.3%), fish (25.2%), and squids (23.3%) were present in the stomachs in similar shares. The pyrosome *P. atlanticum* (11.6%) and salps (9.5%) dominated among the tunicates. Shrimps *F. woodwardi* (6.9%) and *O. novaezeelandiae* (5.5%) had the largest share among crustaceans. The fish in the food of splendid alfonsino were represented by *Diaphus* sp. (7.5%), unidentified myctophids (5.2%), *T. cuvieri* (4.8%), and some other species. Unidentified squids (23.0%) accounted for most of the total squid weight in the diet of splendid alfonsino; 71.6% of splendid alfonsino individuals fed, FI was 49.9%eo with an average degree of food digestion of 2.3.

Crustaceans (63.1%) were the main food of splendid alfonsino TL 450–499 mm, among which the shrimp *F. woodwardi* dominated (47.4%). The second-
Table 4. Food composition (% by weight) of different size groups of splendid alfonsino *Beryx splendens* from the Whale Ridge in 1989–1990

| Food component and other indicators | Size group, mm |
|-----------------------------------|---------------|
|                                   | 190–249 | 250–299 | 300–349 | 350–399 | 400–449 | 450–499 | 500–559 |
| Oegopsida                         |          |         |         |         |         |         |         |
| *Abraliopsis atlantica*           |          |         |         |         |         |         |         |
| Teuthida                          | 1.3      | 2.7     | 3.5     | 4.0     | 23.0    | 2.6     | 4.3     |
| Squids (total)                    | 1.3      | 2.7     | 3.5     | 4.1     | 23.3    | 10.7    | 4.3     |
| Copepoda                          | 0.1      | +       | 0.4     |          |         |         |         |
| *Acanthephyra acanthielsenis*     |          |         |         |         |         |         |         |
| *Systella* sp.                    |          |         |         |         |         |         |         |
| *Oplophorus novaeseelandiae*      | 1.9      | 23.2    | 10.2    | 7.1     | 47.4    | 67.2    |
| *Funchalia woodwardi*             | 1.1      | 8.8     | 13.7    | 6.9     |         |         |
| *Pasiphaea* sp.                   | 66.3     | 4.6     |          |         |         |         |         |
| *Sergestes* sp.                   |          |         |         |         |         |         |         |
| *Plesionika richardi*             |          |         |         |         |         |         |         |
| *Gennadas* sp.                    |          |         |         |         |         |         |         |
| Decapoda                          | 2.5      | 3.2     | 2.4     | 1.8     | 3.1     | 11.7    |
| *Thysanoessa* sp.                 |          |         |         |         |         |         |         |
| *Eucopia* sp.                     |          |         |         |         |         |         |         |
| Mysida                            |          |         |         |         |         |         |         |
| Euphausiidae                      | 0.5      | 0.2     |          |         |         |         |         |
| *Platyscelus armatus*             | 0.2      | 0.8     | +       | 0.4     | 0.1     |
| *Platyscelus ovoides*             | 5.4      | 1.7     | 0.8     |          | +       |
| *Vibilia* sp.                     | 0.5      | 0.2     | 2.4     | 0.2     | 0.1     |
| *Cyliopus magellanicus*           | 1.9      |         |         |         |         |         |
| Hyperiidae                        | 2.0      | 0.3     | 0.2     | 0.1     |         |
| Crustacea                         | 6.2      | 10.5    | 8.2     | 2.2     | 4.7     | 3.9     |
| Crustaceans (total)               | 88.1     | 40.3    | 42.9    | 30.5    | 25.4    | 63.1    | 67.2    |
| Appendicularia                    |          |         |         |         |         |         |         |
| *Pyrosoma atlanticum*             | 0.9      | 1.7     |          |         | 11.6    | 6.6     |
| *Salpa* sp.                       | 1.3      | 13.5    | 11.3    | 10.5    | 9.5     | 1.0     |
| Tunicata                          | 4.8      | 10.3    |          |         | 4.9     | 1.0     |
Table 4. (Contd.)

| Food component and other indicators | Size group, mm |
|-------------------------------------|----------------|
|                                     | 190–249 | 250–299 | 300–349 | 350–399 | 400–449 | 450–499 | 500–559 |
| Tunicates (total)                   | 6.1     | 14.4    | 23.3    | 10.5    | 26.0    | 8.6     | + |
| Chaullodius sp.                     |         |         |         |         |         |         |     |
| Vinciguerria sp.                    |         |         |         |         |         |         |     |
| Maurolicus muelleri                 | 0.7     | 9.7     | 5.7     | 2.0     |         |         |     |
| Stomiatidae                         |         |         |         |         |         |         |     |
| Diaphus sp.                         |         |         |         |         |         |         |     |
| Diaphus dumerili                    |         |         |         |         |         |         | 28.5 |
| Lampadina sp.                       |         |         |         |         |         |         |     |
| Myctophidae                         | 12.7    | 7.8     | 18.9    | 5.2     | 7.0     |         |     |
| Tetragonurus cuvieri                |         |         |         |         |         |         |     |
| Chlorophthalmus agassiz            | 6.3     |         |         |         |         |         |     |
| Bathylagidae                        |         |         |         |         |         |         |     |
| Paralepis sp.                       |         |         |         |         |         |         |     |
| Epigonus sp.                        | 7.6     |         |         |         |         |         | 3.3  |
| Nansenia sp.                        | 1.9     |         |         |         |         |         | 1.3  |
| Pisces indeterminate                |         |         |         |         |         |         |     |
| Fish (total)                        | 2.6     | 42.0    | 27.5    | 54.5    | 25.2    | 17.1    | 28.5 |
| Digested food                       | 1.9     | 0.6     | 2.8     | 0.4     | 0.1     | 0.5     |     |
| Degree of food digestion, points   | 2.1 ± 0.2 | 2.2 ± 0.2 | 2.6 ± 0.9 | 2.6 ± 0.1 | 2.3 ± 0.2 | 2.3 ± 0.1 | 2  |
| Weight of fish, g                   | 170.6 ± 5.9 | 256.2 ± 6.1 | 452.2 ± 7.6 | 712.8 ± 16.1 | 1018.8 ± 14.4 | 1447.7 ± 43.2 | 2120.0 ± 123.4 |
| Fish length (TL), mm                | 42.3    | 54.9    | 65.5    | 126.0   | 122.9   | 193.1   | 213.8 |
| Stomach fullness index, ‱          | 141.8 ± 31.1 | 28.0 ± 4.5 | 34.3 ± 4.8 | 63.1 ± 9.2 | 49.9 ± 7.7 | 74.1 ± 18.9 | 72.7 ± 42.9 |
| Number of stomachs total/with food | 52/44   | 80/56   | 74/65   | 61/50   | 74/48   | 20/15   | 3/3   |
| Food component size, mm            | 21.3 ± 2.5 | 33.7 ± 3.6 | 23.0 ± 1.9 | 43.0 ± 3.4 | 44.6 ± 4.0 | 50.9 ± 5.0 | 42.0 ± 23.4 |
| Prey length index, %               | 0.09 ± 0.01 | 0.12 ± 0.01 | 0.10 ± 0.01 | 0.11 ± 0.09 | 0.10 ± 0.01 | 0.11 ± 0.01 | 0.08 ± 0.04 |
|                                   | 0.07    | 0.08    | 0.05    | 0.08    | 0.08    | 0.05    | 0.09  |
ary food were fish (17.1%), squids (10.7%), and tunicates (8.7%). Representatives of the order Oegopsida (8.2%) had the largest share among squids. The pyrosome *P. atlanticum* (6.6%) dominated among the tunicates; 75% of splendid alfonsino fed, FI was 74.1‰ with an average degree of food digestion of 2.3.

The feeding of splendid alfonsino of the size group *TL* 500–559 mm was studied according to the data of three stomachs and it is of a reference nature (Table 4).

**DISCUSSION**

The food composition of splendid alfonsino in the waters of the Atlantic Ocean is similar at the level of the main taxa (classes, orders, and families). Splendid alfonsino in the waters of the Uglovoi and Azores ridges feeds on mesopelagic fish, squid, crustaceans, echinoderms, and polychaetes (Pshenichnyi et al., 1986; Vinnichenko, 1997; Kozlov, 2004; Vinogradov et al., 2005). In the waters of the Canary Islands, the food of splendid alfonsino consists of small fish, crustaceans, and cephalopods (Dürr and González, 2002). Off the coast of Brazil, splendid alfonsino feeds on mesopelagic crustaceans, squid, and fish (Muto et al., 2005). A similar range of feeding is observed in the area of the seamounts of the Whale Ridge, where splendid alfonsino feeds on mesopelagic crustaceans, fish, tunicates, cephalopods, pteropods, and polychaetes (Dudochkin and Kotlyar, 1989). A similar composition of food organisms of splendid alfonsino at the seamounts of the Whale Ridge is confirmed by the present study based on the data of 1988–1990.

In all water areas, the food of splendid alfonsino is dominated by meso- and macroplanktonic organisms that are a part of the fauna of the sound-scattering layers (SSL). Under certain conditions, when there is a rich benthic fauna on the tops of the seamounts, splendid alfonsino partially uses benthic organisms as food (Pshenichnyi et al., 1986). On the seamounts of the Whale Ridge, benthic organisms were not found in the food of splendid alfonsino in 1988–1990, but there is information about the finding of polychaetes (0.5%) in the food of splendid alfonsino at one of the seamounts of the Whale Ridge (Dudochkin and Kotlyar, 1989). The authors of this report did not attribute the found polychaetes to benthic or pelagic fauna communities, which does not allow us to exclude benthic organisms from the food of splendid alfonsino of the Whale Ridge.

The food spectrum of splendid alfonsino, based on the materials of the catches on five seamounts of the Whale Ridge, comprises 45 food components (i.e., the possibly lowest taxons identified): crustaceans (23), fish (15), tunicates (4), and squids (3). Previously, Dudochkin and Kotlyar (1989) have found 44 food components in the diet of splendid alfonsino at one of the seamounts of the Whale Ridge: crustaceans (28), fish (9), molluscs (5, including cephalopods and pteropods), tunicates (1), and polychaetes (1). The revealed differences are associated with a large number of studied splendid alfonsino stomachs collected on five seamounts within the present study, which expanded the food spectrum of splendid alfonsino feeding in the waters of the Whale Range.

**Peculiarities of feeding of splendid alfonsino in the studied area.** When assessing the similarity of feeding of splendid alfonsino in regard to the food components on different seamounts of the Whale Ridge, the degree of similarity was low between the Severnaya Bank and the Schedraya, Valdivia, Beta, and Alpha-2 seamounts. There was a high degree of similarity between the Shchedraya seamount and the Beta and Alpha-2 seamounts, and between the Beta and Alpha-2 seamounts (Table 5). It is likely that between the seamounts, the different degree of similarity in the diet of splendid alfonsino is associated with the composition of the available fauna suitable for its feeding, which depends on the environmental conditions at each of the seamounts.

In the food of splendid alfonsino, crustaceans made up the largest share by weight at the seamounts of the southern group (53.9%); this parameter was lower at the central (38.2%) and northern (35.2%) groups (Fig. 2). Fish were the main food of splendid alfonsino (56.0%) at the seamount of the northern group. In the waters of the central (33.0%) and southern (16.0%) groups of the seamounts, the share of fish in the food of splendid alfonsino decreased. The tuni-
cates were more common at the seamounts of the southern group (20.3%), its share in the waters of the central group was 11.6%, of the northern group, 5.7%. Small volume of squids were found in the food of splendid alfonsino at all groups of the seamounts of the Whale Ridge: in the northern one (2.5%), central (11.8%), and southern (9.3%). All found food organisms of splendid alfonsino were characteristic of meso- and macroplankton of the SSL fauna (Parin, 1968, 1986; Lomakina, 1978; Nesis, 1982; Oven et al., 1984).

Comparing the feeding spectrum of splendid alfonsino in December—January 1989–1990 with the data published for October 1979 by Dudochkin and Kotlyar (1989), there is a significant similarity with the feeding of splendid alfonsino in the waters of the central group of the seamounts. While food is similar at the level of higher taxa, the species composition of food organisms at the level of genera and species differs (Tables 1–3, Fig. 2). Firstly, these differences may be associated with the fishing season, which was September—October (Dudochkin and Kotlyar, 1989) and December—January in our report. Secondly, in 1989–1990, the feeding of a larger splendid alfonsino ($TL$ 190–560 mm) was studied comparing to that of 160–330 mm reported by Dudochkin and Kotlyar (1989). Thirdly, the composition of the food organisms consumed by splendid alfonsino largely depends on their availability. In turn, the latter depends on the patchy distribution of plankton (Beklemishev, 1969; Mechanisms..., 2017) in the waters of the seamounts, associated with water turbulence (Darnitsky and Boldyrev, 1987; Stavn, 1971), the concentration of meso- and macroplankton organisms of the SSL during their descent to the seamount in the process of diurnal vertical migration, as well as on the fact that plankton organisms may be transported by the current to the seamount (Kashkin, 1977; Pakhorukov et al., 2014). There are reports that the composition of food objects (shrimps, fish) of splendid alfonsino largely depends on the phase of the moon (Vinnichenko, 1997; Salini et al., 2001). Special attention has been paid to the separation of the SSLs and their composition (Vinnichenko, 1997). The upper layer consists mainly of euphausiids, while the lower one is the accumulations of small mesopelagic fishes. The small splendid alfonsinos feed in the upper SSL, while the large ones, in the lower one (Vinnichenko, 1997). The division of the fauna of the SSL into sub-layers may explain the presence of a small number of copepods, mysids, and euphausiids from the upper SSL in the food of splendid alfonsino, since the larger splendid alfonsino of the Whales Ridge selects larger food and feeds in the deeper SSL. An important factor is the greater amount of the material used for this work, which made it possible to identify rather rare food components of splendid alfonsino that have not been taken into the account earlier. Thus, the different degree of similarity

Fig. 2. Feeding spectra (share of the food component by weight) of splendid alfonsino *Beryx splendens* on the seamounts of the Whale Ridge: 1—northern group, 2—central group, 3—southern group, 4—entire Whale Ridge (according to: Dudochkin and Kotlyar, 1989); ( )—other food; see designations at Fig. 1.
in the diet of splendid alfonsino from different groups of the seamounts is most likely associated with the entire complex of factors affecting the feeding behavior of splendid alfonsino, such as the composition of the available food fauna, the environmental conditions of this complex, which determine the migration of SSL, and the size and physiological state of splendid alfonsino, as well as with the time of fishing and the amount of collected material.

**Trophic characteristics of splendid alfonsino of different sizes.** The transition from small to larger prey is characteristic of splendid alfonsino (Dudochkin and Kotlyar, 1989; Dühr and González, 2002; Vinogradov et al., 2005; Horn et al., 2010), which is confirmed by our study. As the size of splendid alfonsino increases from 190 to 449 mm, the share of crustaceans decreases from 88.1 to 25.4%, while the share of tunicates and squid increases (Table 4). Such changes are associated with an increase in the availability of larger prey as the size of splendid alfonsino increases. Splendid alfonsino selects organisms of 0.9–130.0 mm (36.1 mm on average) for feeding (standard error 1.7, standard deviation 28.3), while the range of the ratio of prey size to splendid alfonsino body size is quite narrow (9.7–11.5%) for all size groups of this fish species.

**Diel changes in the diet of splendid alfonsino.** Most authors associate the feeding of splendid alfonsino and its vertical migrations with the daily vertical migrations of SSL organisms (Galaktionov, 1984; Vinnichenko, 1997; Horn et al., 2010). No strict relationship has been reported between the time of day and the diet of splendid alfonsino at the study site earlier (Horn et al., 2010), but the authors noted that splendid alfonsino fed both during the day and at night. There are studies linking the migration and feeding of fish with the phases of the moon (Salini et al., 2001) and illumination, which predetermines the availability of food for splendid alfonsino during the day (Vinnichenko, 1997). Thus, there is a connection between the feeding of splendid alfonsino and its vertical migrations, but the mechanism of this connection has not yet been studied in detail.

It was not possible to fulfill the daily station recommended by the methods for studying the dynamics of feeding. An idea of the changes in the diet of splendid alfonsino during the day was obtained when all available data on the composition of food, feeding activity, and the degree of food digestion were grouped by the periods of the day (morning, afternoon, evening, and night). The highest FI (68%) of splendid alfonsino with the lowest degree of food digestion (2.40) was noted in the evening hours. The FI decreased at night (41%) with minimal degree of food digestion (2.42).

In the evening, splendid alfonsino formed commercial accumulations in the pelagic zone above the seamounts. Such accumulations disintegrated in the second half of the night, and the catches of splendid alfonsino decreased. The composition of food in the evening and night periods was similar: the main objects were crustaceans, followed by fish, tunicates, and squids (Fig. 1). The minimum FI (18.8%) with high degree of food digestion (2.65) was noted in the morning. The composition of food during this period was similar to that in the evening and at night. In some cases, during the daytime, the echo sounder showed accumulations of fish at the bottom in the form of a “brush”. Such aggregations consisted of rosefish and pelagic armourhead; splendid alfonsino was found in the catches singly (Gushchin, 2021). During the day, the main food of splendid alfonsino was squid (83.7%), the secondary food was fish, tunicates, and crustaceans. The weight of squids in the food bolus of splendid alfonsino in the daytime seems to be overestimated, since only two samples were analyzed for this period. Thus, the connection between the feeding of splendid alfonsino and the migrations of the SSL organisms is confirmed, when the maximum feeding and the minimum degree of food digestion in splendid alfonsino coincide with the rise of the SSL organisms into the upper water layers.

**CONCLUSIONS**

Splendid alfonsino, inhabiting the zone of the seamounts of the Whale Ridge, has a wide food spectrum, consisting of 45 components, including crustaceans, fish, tunicates, and squids, belonging to the meso- and macroplankton of the mesopelagic zone and making daily vertical migrations as a part of the SSL. In terms of food composition, there is a high degree of similarity (Chekanovsky-Sørensen index) between the food spectra of splendid alfonsino in the waters of the Shchegraya Bank and the banks of Beta and Alpha-2, as well as between the banks Beta and Alpha-2. Low degree of similarity is observed between the feeding of splendid alfonsino at the Severnaya Seamount and at the Shchegraya Bank, Valdivia Seamounts, Beta and Alpha-2 banks. It is assumed that the different degree of similarity in the food spectra of splendid alfonsino on these seamounts is associated with the differences in the composition of the fauna, the availability of food organisms during their daily vertical migration, the environmental conditions specific in each group of the seamounts, the body size of splendid alfonsino, the season, and the time of fishing. The benthic organisms are absent as the food components of splendid alfonsino at all seamounts. By weight, crustaceans are the main food of splendid alfonsino (53.9%) in the waters of the southern and central (38.2%) groups of the seamounts. Fish are the main food of splendid alfonsino (56.0%) on the seamount of the northern group. Tunicates and squids are secondary food in
splendid alfonsino of all seamount groups. Splendid alfonsino selects organisms of size range of 0.9–130.0 mm (36.1 mm on average) for feeding. As the size of splendid alfonsino increases, the size of its prey increases also, that changes the food components; however, at the same time, the ratio of the sizes of prey and individuals of splendid alfonsino changes little (9.7–11.5%). The connection between the feeding of splendid alfonsino and the diel migrations of meso- and macroplankton as a part of SSL has been confirmed. The highest feeding activity of splendid alfonsino and the minimum degree of food digestion are observed in the evening and early night, when the SSL organisms begin to rise to the upper water layers. Crustaceans are the main food of splendid alfonsino in the evening and at night.

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