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Food of the yellowtail amberjack *Seriola lalandi* from the south-west Atlantic

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Food of Seriola lalandi *was mainly composed of juveniles of horse mackerel* (Trachurus lathami) *(%IRI = 99.66) showing the species as carnivorous feeders predating on small pelagic organisms.*

Keywords: food, yellowtail amberjack, *Seriola lalandi*, south-west Atlantic, Argentina

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The stomach contents of 66 adult (50–86 cm total length) *Seriola lalandi* were examined, and were found to be comprised primarily of *Trachurus lathami*, with some small pelagic cephalopods also consumed. Yellowtail amberjack (*Seriola lalandi*, formerly *S. dorsalis*; Carangidae) (Schmitt & Strand, 1982; Poortenaar *et al.*, 2001) is a cosmopolitan carangid inhabiting tropical and sub-tropical waters, between 40°N and 40°S. It is exploited in commercial and recreational fisheries in several regions of the world, and is also used in aquaculture in Japan, Australia, New Zealand and Hawaii (Poortenaar *et al.*, 2001). Its biology and life-history are poorly known, with little published information on its food and feeding habits. The few existing reports show that the entire diet comprises schooling species (Schmitt & Strand, 1981; Marín, 1993).

Historically, two species of yellowtail amberjack (*S. lalandi* and *S. rivoliana*) were thought to occur in the south-west Atlantic (see Cosseau *et al.*, 1975). However, those authors based on the homogeneity found in morphometric and meristic characters of 186 specimens, concluded that *S. lalandi* is the only species occurring in Argentine waters.

Adult *S. lalandi* migrate to Argentine waters during the summer months (January–April), as also noted in other pelagic fish, and is reported as associating with Atlantic bonito *Sarda sarda* (Bloch) in commercial catches. They have been reported from Argentine waters in depths of 20–36 m between 36°S and 38°S (Figure 1) and, as reported elsewhere in the world, are often associated with rocky reefs (Cousseau *et al.*, 1975; Marín, 1993).

Samples of *S. lalandi* were caught using trolling lines during daytime (08:00–18:00 h), around rocky reefs at 35° 52′–35° 58′S and 54° 45′–54° 48′W, on 15 to 22 February 2002 (Figure 1). These sparse rocky reefs may concentrate *S. lalandi* schools, but our knowledge on their role as fish habitat is limited. Surface and bottom water temperatures at the study site ranged from 22.2–22.5°C and 19.6–19.9°C respectively, with a seasonal thermocline at 15–16 m depth. A weak halocline was also present at the same depth, with salinities of 29.17–31.41 at the surface, and 32.72–32.86 at the bottom, showing the influence of the freshwater discharge from the Río de la Plata.

Sixty-six adult *S. lalandi* were analysed, with specimens measured (L_T) and weighed (W_T) on board and the stomachs labelled and frozen. In the laboratory, stomachs were weighed and their contents identified to the lowest possible taxon. Total length and total weight ranged from 50–86 cm, and 1000–3770 g, respectively (L_T mean value 59.30 +/− 7.36 cm, W_T mean value 1918.35 +/− 611.33 g). Based on these data, the length–weight relationship was estimated as: $W_T = 0.2112\ TL^{2.2224}$. The low value of b (<3) may be associated with high energetic costs after spawning and/or migrations.

The following indices were estimated from the stomach samples: (i) coefficient of repletion (C_R), the proportion of stomachs containing food; (ii) numerical index (N_I), percentage of specimens of a particular prey species in relation to the total number of all prey; (iii) frequency index (F_I), percentage of stomachs with prey of a particular species in relation to the number of stomachs with food; (iv) weight index (W_I), percentage by weight of all specimens of a particular prey species in relation to the total weight of all prey; and (v) index of relative importance, $IRI = F_I(N_I + W_I)$, which was subsequently expressed as a percentage (%IRI).

Seventy-six per cent of stomachs contained food, indicating a relatively high feeding activity during the study period. The number of prey items per stomach ranged between 7 and 45 (mean value 16.9 +/− 6.3). Total length and food weight (stomach free) were negatively correlated ($r = -0.545$; $P < 0.0001$), while total length and number of prey items showed no correlation ($P > 0.05$).

Seriola lalandi fed almost exclusively on juvenile horse mackerel *Trachurus lathami* (%IRI = 99.66), and this prey species occurred in all the stomachs containing food (Table 1), and ranged from 42–74 mm L_T, with a mean length of 60.4 mm +/− 6.15. Other prey items were *Loligo sanpaulensis* and *Serranus auriga* (F_I = 14% and 2% respectively).

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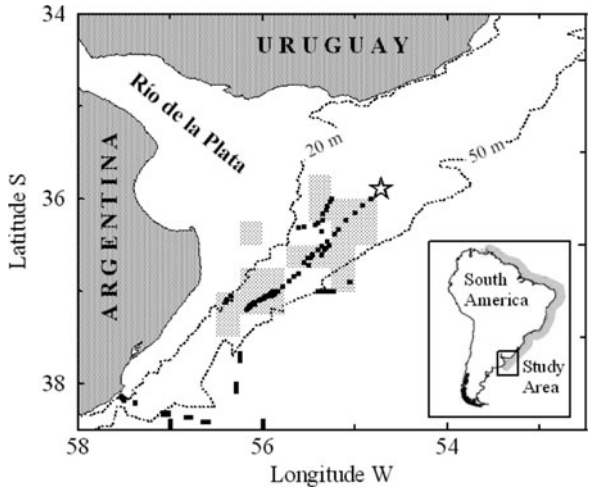

Fig. 1. Sampling site (☆) and rocky bottoms distribution (•) at the study area. Greyed squares (15° latitude × 15° longitude) show *Seriola lalandi* occurrence from the Argentine purse-seine fleet during January to May. Insert: geographical distribution of *S. lalandi* in South American waters.

Table 1. Diet composition of adult *Seriola lalandi;* number of fish examined = 66; coefficient of repletion = 76%; average number of prey per stomach = 16.9.

Food items	F_I	N_I	W_I	IRI	%IRI
Trachurus lathami (TELEOSTEI)	100	97.92	85.10	18301.8	99.66
Loligo sanpaulensis (CEPHALOPODA)	14	1.22	1.19	33.7	0.18
Serranus auriga (TELEOSTEI)	2	0.17	2.73	5.8	0.03
Unidentified fish remains	2	0.69	10.96	23.3	0.13

F_I, frequency index; N_I, numerical index; W_I, weight index; IRI, index of relative importance.

The coastal waters of the Buenos Aires province are a nursery ground for juvenile horse mackerel, with spawning occurring in coastal waters during spring and summer, and juveniles remaining there until reaching sexual maturity (Saccardo & Katsuragawa, 1995).

The percentage of the stomach with contents showed two peaks during daytime: one in the morning (08:00–10:00 h C_R = 91%) and other during the afternoon (16:00–18:00 h C_R = 95%). The lowest values of C_R (40%) were observed between 11:00 and 15:00 h. Schmitt & Strand (1982) observed a similar pattern in feeding activity for *S. lalandi* in the Gulf of California.

Predation by *S. lalandi* on small schooling pelagic fish (e.g. sardines, anchovies, jack mackerel and Pacific mackerel) and cephalopods has been reported off California, Australia, New Zealand and in the Gulf of Mexico, and has also been observed in related species, including *S. quinqueradiata*, *S. dumerili* and *S. rivoliana* (Schmitt & Strand, 1982; Poortenaar *et al.*, 2001). There have been fewer studies on the diet of *S. lalandi* food in the south-western Atlantic, with Marín (1993) reporting the diet as comprising juvenile Argentine anchovy *Engraulis anchoita* (81%), *T. lathami* (7%) and *Scomber japonicus* (1.9%).

The coastal waters of the study area are productive, due in part to the outflow from the Río de la Plata, and these waters have a high biomass of small pelagic fish such as anchovy and horse mackerel (e.g. Saccardo & Katsuragawa, 1995). As a consequence, the region may be an important summer feeding ground for migratory species such as *S. lalandi*, *S. sarda* and *Pomatomus saltatrix*, which come from the continental shelf of southern Brazil and neighbouring oceanic regions. In Argentinean waters, *S. lalandi* tend to be restricted to rocky reefs, which have a scarce and patchy distribution in the region, and this affinity to reef habitats may be related to their feeding behaviour. Observations by Schmitt & Strand (1982) on the feeding tactics of *S. lalandi* in the Gulf of California showed a high degree of cooperation among individuals while performing well-coordinated foraging behaviour that involved fish enclosing schooling prey against the rocky reefs prior to feeding.

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