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8.1 Coastal fish from the austral Chilean channels and fjords

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Recent studies of the fish collected in the Chilean austral channels and fjords have focused on obtaining a complete, objective ichthyogeographic vision of the study area. This has been achieved with more homogeneous sampling, both from north to south and from the coast to the open ocean. The new samples taken from these austral waters include individuals of species both known and unknown for Chilean waters, constituting new records for previously unstudied geographic sites.

Studies of the fish in Chilean interior waters began in the nineteenth century with European expeditions that concentrated largely on the Strait of Magellan and Canal Beagle (e.g., Jenyns, 1842; Günther, 1880). In the first half of the twentieth century, other similar expeditions were carried out, including North American contributions (e.g., Thompson, 1916). The lack of coordination among these expeditions resulted in visits to different regions where samples were taken in different seasons and at different depths with a variety of fishing gear. Thus, the fish samples contained a variety of taxa and provided a fragmented global vision of the study area. The second half of the twentieth century saw a greater effort by Chilean scientists in this area, resulting in a series of publications (Navarro & Pequeño, 1979; Pequeño & Lamilla, 1995; Pequeño *et al.*, 1995; amongst others).

The CIMAR Program broadened coastal fish sampling in the austral Chilean channels and fjords to include the capture of specimens at sites in the northern (Puerto Montt to Laguna San Rafael), central (Golfo de Penas to Strait of Magellan), and southern (Strait of Magellan to Cape Horn) zones within this area (Fig. 1).

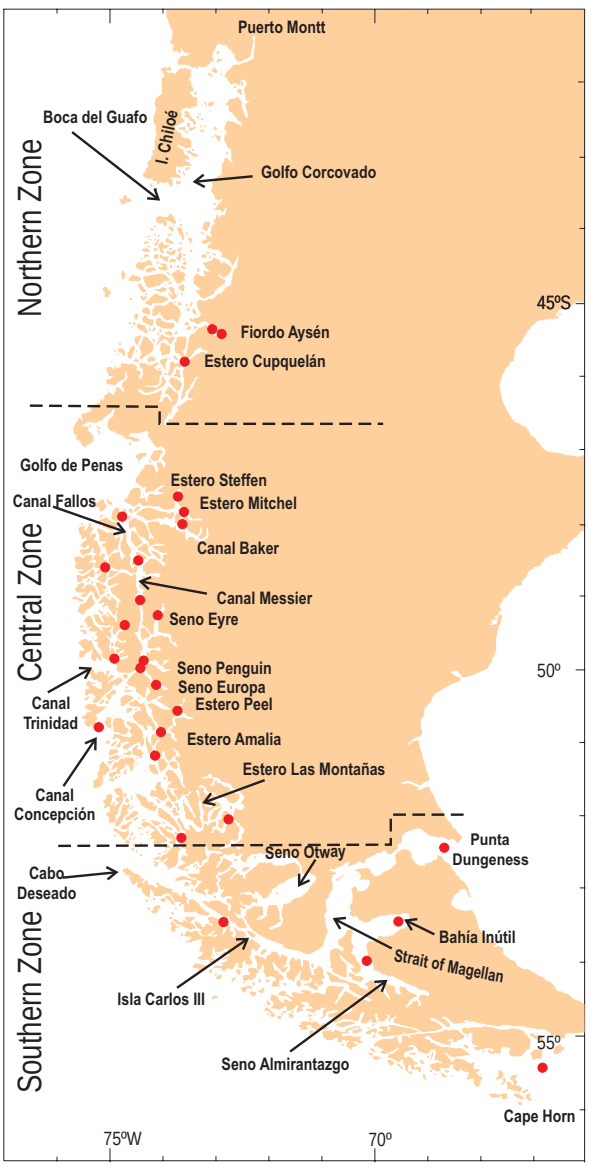

Figure 1: Geographic positions of sampling stations for coastal fish.

These samples, along with reviews of the fish previously collected in the austral region, were combined with background information on each of the specimens caught (Pequeño, 1999, 2000; Pequeño & Lamilla, 1997; Pequeño & Matallanas, 2003) and a body of information including the new ichthyogeographic data for the austral channels and fjords was compiled. The relative abundance of the different taxonomic categories (order, family, species) was also calculated in order to determine which were the most represented and what implications this might have.

A total of 268 specimens were collected in the austral channels and fjords, including one Ciclostomi, one Chondrichthyes, and 11 Osteichthyes families. The order Perciformes was represented by seven families (Pinguipedidae, Harpagiferidae, Bovichtidae, Eleginopidae, Nototheniidae, Labrisomidae, Zoarcidae), constituting 68.2% of the analyzed individuals. The order Perciformes predominated in the central and southern zones, whereas the Osmeriformes predominated in the northern zone. The order Osmeriformes, with two families (Bathylagidae, Galaxiidae), was the second most abundant (29.85%). The remaining orders (Myxiniformes, Batidiodimorpha, Gasterosteiformes, Scorpaeniformes) were represented by one family each (Myxinidae, Pseudorajidae, Syngnathidae, Agonidae, respectively), of which only one specimen was caught per family, so that each one constituted a mere 0.37% of the total catch (Table I).

When analyzed by families, Nototheniidae was the most represented. In this family, *Patagonotothen tessellata* (Richardson, 1844) made up 26.9% (n= 73) of the total catch. *Patagonotothen sima* (Richardson, 1844) followed, with 15.3% and *Patagonotothen cornucola* (Richardson, 1844), which was caught in all three zones, constituted 9.7% of the catch. The last Nototheniidae species, Lepidonotothen *squamifrons macrophthalma* (Norman, 1937), represented only 3.4% of the total. Galaxiidae was the second most abundant family due to the elevated relative abundance (37.4%) of *Galaxias maculatus* (Jenyns, 1842). The family Zoarcidae was the third most abundant, with catches of *Austrolycus deprecisseps* (Regan, 1914) (n= 12) and *Crossostomus chilensis* (Regan, 1914) (n= 1), both from the central zone. The fourth family in abundance (3.7%) was the monotypic Eleginopidae, with *Eleginops maclovinus* (Valenciennes, 1830); these specimens were caught exclusively in the central zone. Two subspecies of the family Harpagiferidae, *Harpagifer bispinis bispinis* (Schneider, 1801) (n= 2) and *H. bispinis palliolatus* (Richardson, 1844) (n= 2), were caught, as were two unidentified individuals of this same genus, making this the fifth most abundant family (2.22 %). The percentage of the remaining families made up less than 1.5 % of the total (Table I).

Table I: Number of fish specimens caught per family in the austral channel and fjord region.

	Zone				
Family	Nothern	Central	Southern	Total	Percentage
Myxinidae			1	1	0.37
Pseudorajidae			1	1	0.37
Bathylagidae		3		3	1.12
Galaxiidae	20	57		77	28.73
Syngnathidae		1	1	2	0.74
Agonidae			1	1	0.37
Pinguipedidae		1		1	0.37
Harpagiferidae		6		6	2.22
Bovichtidae			1	1	0.37
Eleginopidae		10		10	3.70
Nototheniidae	9	130	11	150	56.00
Labrisomidae		1		1	0.37
Zoarcidae		13	1	14	5.18
Total	**29**	**222**	**17**	**268**	**100.00**

Although the majority of the species were known for the interior austral waters, this was the first coastal record of *Bathylagichthys parini* (Kobyliansky, 1990), which was only known previously for the open ocean, at distances of over 200 km from the coast (Pequeño & Matallanas, 2003).

The geographic distribution of *Prolatilus jugularis* (Valenciennes, 1833) was also extended, in this case, southward (Pequeño, 1999), whereas the samples of *Harpagifer bispinis palliolatus* resulted in a northward extension of its distribution range. The single specimen of *Calliclinus geniguttatus* (Valenciennes, 1836) caught confirmed its presence in this zone, although some citations already existed in the literature (Insunza & Pequeño, 1988; Pequeño, 1999). Furthermore, the one *Crossostomus chilensis* (Regan, 1914) specimen sampled constituted a new northern

record of this species, which is infrequent in samples. Only one specimen of the zoarcid *Ilucoetes elongatus* (Smitt, 1898) was caught at a sampling site in the southern zone, slightly expanding its austral distribution limit. Likewise, nine individuals of *Lepidonotothen squamifrons macrophthalma* (Norman, 1937) were also caught in the southern zone.

The 268 specimens caught in the Chilean austral fjords and channels during the CIMAR cruises conform one of the most valuable ichthyologic collections obtained for this extensive geographic area. This collection not only enriches the ichthyologic patrimony of our museums, but also improves our conception of the ichthyofauna in one of the least known places in the world.

Although all the taxa sampled were already known, the fish collected and their catch data nonetheless provide information that expands our knowledge as to the external intraspecific variability of these species. Such information is fundamental for understanding their taxonomy and systematics and is required, along with background information on the catch sites, when analyzing aspects of geographic distribution, an indispensable part of discussions on evolutionary problems and other matters related to environmental topics.

The geographic distribution of the new data, especially from the central and southern zones, indicates that the information for this area is still far from complete. At present, clear geographic schemes as to the ichthyofauna composition of the austral fjords and channels cannot be determined. Likewise, the ability to explain the origins of the possible distribution patterns that were constructed remains a distant goal. Coastal fish (inter- and subtidal) are difficult to catch in austral Chile due to the abrupt nature of a large part of the coastline, whether along islands or the continent. Therefore, the possibility of obtaining samples from these areas is limited by the ability of the diver or the capacity to fish with small-scale, hard-to-handle gear. We still have much to learn about the roles that different species play in their distinct habitats, a problem that should be resolved prior to interfering with this broad and complex ecosystem. Blind intervention, that is, without understanding how the layers of life operate in these areas, could lead to undesirable catastrophes with negative consequences for the future. From an ichthyologic point of view, the sampled sites in the austral zone are scant, considering the several thousand kilometers of coastline in this part of the country, as compared with Chile's open coast.

The collection of *Bathylagichthys parini*, an apparently mesopelagic oceanic species, in the austral channels suggests that this type of species could also be found in analogous habitats. An example of this is the case of *Prolatilus jugularis*; although scientists thought the distribution of this species was well known, new records disproved this belief (Vargas & Pequeño, 2001). Similarly, the austral distribution limits of *Lepidonotothen squamifrons macrophthalma* and *Ilucoetes elongatus* in the central and southern zones were expanded, as were the northern limits of other species such as *Harpagifer bispinis palliolatus* and *Crossostomus chilensis*. This evidence suggests the need for a more thorough study of the zone prior to further statements regarding local ichthyologic geographic distribution patterns.

The high degree of endemism found in this study is worthy of mention. Nearly all the species collected have a geographic distribution restricted to the coast of the southern cone of the Americas and, in some cases, the Islas Malvinas, e.g., two subspecies of *Harpagifer bispinis*, the zoarcids *Austrolycus deprecisseps* and *Crossostomus chilensis*, the notothenids *Patagonotothen cornucola*, *P. sima*, *P. tessellata*, and *Lepidonotothen squamifrons macrophthalma*, the bovichtid *Cottoperca sp.*, the cyclostome *Myxine australis* (Jenyns, 1842), and the ray *Bathyraja albomaculata* (Norman, 1937). Other known species, common at more northerly latitudes (e.g., *Prolatilus jugularis*, *Calliclinus geniguttatus*, *Leptonotus blainvilleanus*, *Agonopsis chiloensis*) also demonstrate endemism in the eastern South Pacific toward the north of Chile. This endemic fauna has been contributing to the biosystemic fabric within the channels and fjords for thousands of years and, although many of its facets remain unknown to date, this fauna undoubtedly constitutes the basis of life in these waters. Its existence is fundamental to the maintenance of other life forms that feed on inter and subtidal organisms.

A prior study (Pequeño *et al.*, 1995) showed that, at present, it is only possible to specify the existence of two groups of coastal fish (inter-and subtidal) in the Chilean austral fjords and channels: one on the north and the other in the south.

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