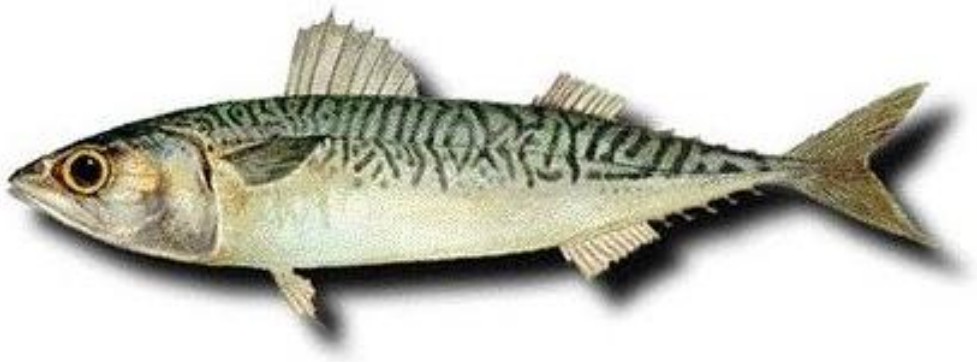
Code: MAS
Scientific name: *Scomber japonicus*



Taxonomy

Phylum	Vertebrata
Class	Actinopterygii
Order	Perciformes
Family	Scombridae
Genus and species	*Scomber japonicus*, Houttuyn, 1782
Scientific synonyms	*Scomber colias, Scomber australasicus* (Note that *Scomber australasicus* Cuvier 1832 is a valid species in its own right, but appears to have an Australasian only distribution. *S. australasicus* has been used erroneously in the past as a synonym for *S. japonicus* in the eastern Pacific).
Common names	Chub mackerel, caballa, cavalinha, estornino, mackerel, blue mackerel
Molecular (DNA or biochemical) bar coding	Available in the Barcode of Life Data System (BOLD), at: http://www.boldsystems.org (Ref.:https://www.boldsystems.org/index.php/Public_SearchTerms?query=%22Scomber%20japonicus%22[tax], see in Public Data to access DNA sequences)

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Species Characteristics

Global distribution and depth range

The distribution of *S. japonicus* is circum-global and cosmopolitan. In the Atlantic Ocean it occurs off the east coast of North America from New Scotia, Canada to Venezuela. On the South American east coast, it occurs from southeast Brazil to south Argentina. On the European coast *S. japonicus* is reported from the United Kingdom to France. *S. japonicus* is reported from almost the whole coast of Africa. It occurs in the Mediterranean and Red Seas. It is apparently absent in the Indian Ocean, from Indonesia and Australia. In the Pacific Ocean *S. japonicus* is fished off Japan and the west coast of South America from Ecuador to Chile (Collette, 2001) (Figure 1). *S. japonicus* appears to be replaced by *Scomber australasicus* in the South West Pacific (found off New Zealand and eastern Australia).

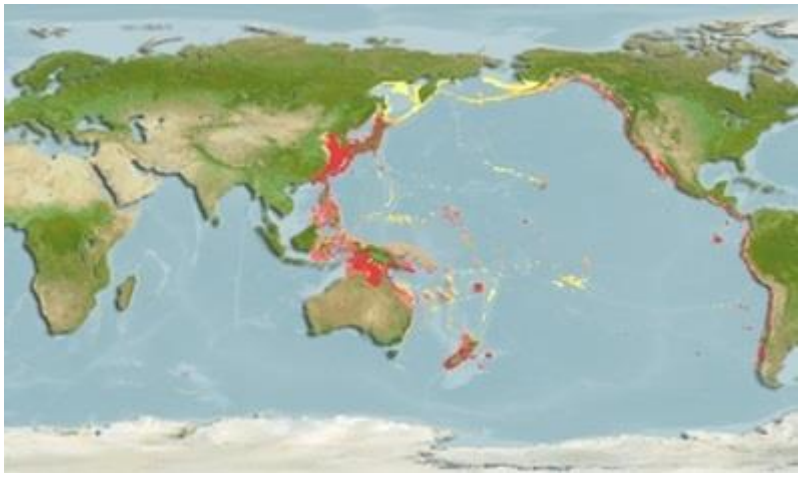

Figure 1. Distribution of chub mackerel *Scomber japonicus* (Houttuyn, 1782). Source: FishBase, 2020

Distribution within South Pacific area

Matsui (1967) describes the distribution of *S. japonicus* in South Pacific to be from Panama to Chile, including around the Galapagos Islands, with austral limits at Guamblin Island, at 45°41'S. The longitudinal distribution includes areas beyond the 200 nm distance from the coast, particularly in the south (off Chile), and mostly within 100 nm of the coast in the north (off Peru and Ecuador). This is shown by the distribution of catches and the extension of observed spawning areas as indicated by the presence of *S. japonicus* eggs and larvae.

Russian investigations on the high seas in the southeastern Pacific (Arkhipov 2004) show *S. japonicus* eggs distributed in a narrow band adjacent to the outer 200 nm limit from the coast between ~13°S and 18°S, and eggs and larvae in a wider area that extends farther offshore between 35°S – 40°S and 80°E – 90°E (Figure 2). Peruvian investigations show eggs and larvae distributed along the whole Peruvian coast extending well beyond the 200 nm limit, but with much more frequent presence and higher concentrations within the 100 nm from the coast, as reported by Santander & Castillo (1972) and shown by more recent analyses of larvae distribution by IMARPE (Figure 3), which matches IMARPE's observed spatial distribution of matured and spawning chub mackerels. Off Chile, *S. japonicus* spawning areas within the 200 nm distance from the coast have also been reported by Rojas & Mujica (1981) and Serra (1983).

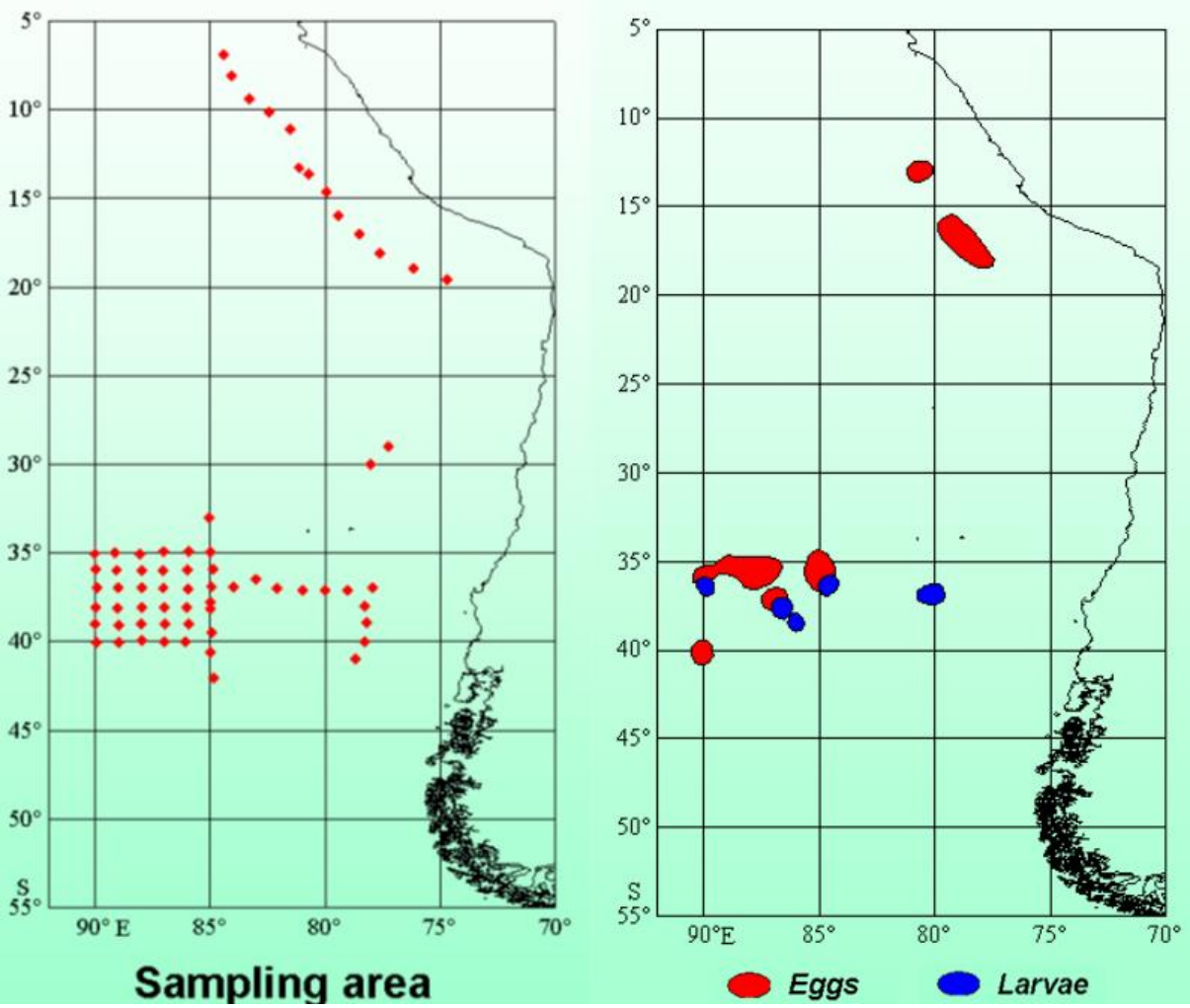

Figure 2: Distribution of chub mackerel *Scomber japonicus* eggs and larvae in the high seas of Chile in the Southeastern Pacific ocean between September 2002-January 2003 (from Arkhipov 2004).

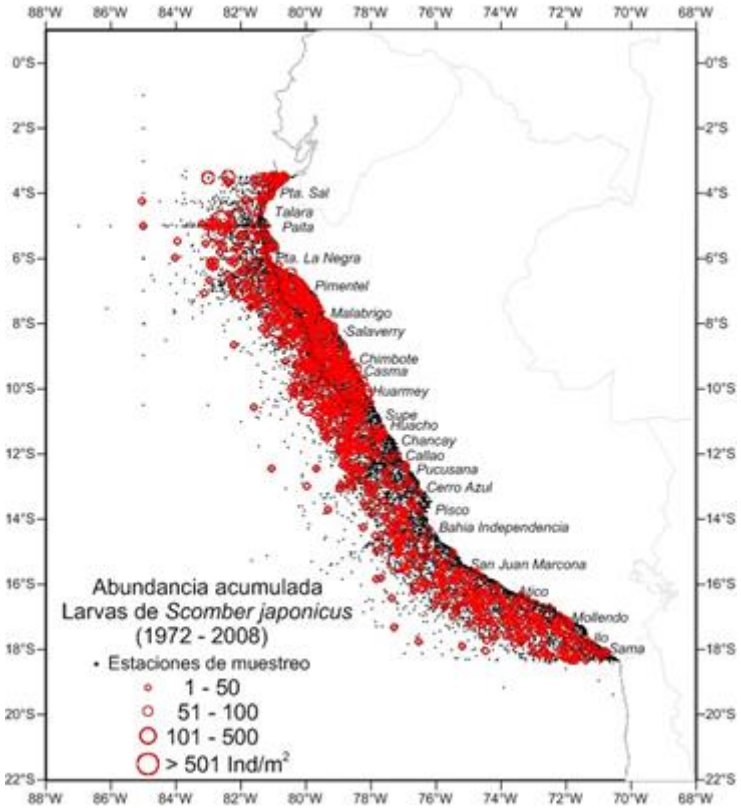

Figure 3.- Sampling stations and accumulated abundance of *Scomber japonicus* larvae off Peru, between 1972 and 2008 (Source: IMARPE, Zooplankton and Ichthyoplankton Laboratory)

General habitat

S. japonicus is a pelagic fish with shoaling behavior. In the Eastern South Pacific waters it forms schools usually with jack mackerel (*Trachurus murphyi*) and sardine (*Sardinops sagax*) at the adult stages, but also with anchovy (*Engraulis ringens*) when smaller than 15 cm. It is uncommon for *S. japonicus* to inhabit waters deeper than 50 m and according to Maridueña & Menz (1986) the species undertakes vertical migration to the surface for feeding. This species inhabits warm and temperate waters of the Atlantic, Indian and Pacific oceans and adjacent seas (Collette & Nauen, 1983).

Biological characteristics

S. japonicus is a heterosexual fish, without evidence of sexual dimorphism (Kramer, 1969; Castro & Santana, 2000). Histological studies demonstrate *S. japonicus* as a partial spawner, with an extended period of reproductive activity (Peña et al., 1986; Dickerson et al. 1992). Off Peru the spawning season is described to be from August to March, mainly in high summer (Miñano & Castillo, 1971; Mendo 1984). Near Ecuador there seems to be a secondary period in September (Serra et al. 1982; Maridueña & Menz, 1986). In Chilean waters the spawning season is identified in November through March in northern and southern areas. This has been confirmed with results from projects monitoring pelagic fisheries in these regions, which report an increase of mature fishes at the end of the year, and high values of gonadosomatic index (GIS) between January and March (Martínez et al., 2006). The length at 50% maturity was estimated by Pardo & Oliva (1992) in the north region as 26 cm, a mean between macro and microscopic criteria.

Growth of the species is characterised as very fast in the first two years, manifested in a high growth rate (k). Fish can reach 50% of the asymptotic length in the first two years Maximum length (L_∞) is approximately 45 cm and longevity between 9 and 10 years. Table 1 shows the growth parameters reported in the literature for this species from the eastern Pacific in both hemispheres. Considerable additional data are available from the northwestern Pacific, but not reported here (e.g. Choi et al. 2000).

Table 1: Growth parameters estimated for *S. japonicus* in the eastern Pacific Ocean.

	Country	L_{oo} (cm)	k	t_0 (years)
Parrish & MacCall, 1978	USA	43.60	0.244	-3.022
Aguayo,1982	Chile	44.60	0.160	-1.550
Mendo,1984	Perú	40.57	0.408	-0.050
Pizarro,1984	Ecuador	39.20	0.230	-1.790
Aguayo & Steffens, 1986	Chile	44.37	0.164	-1.543
Canales et al., 2004	Chile	37.56	0.264	-0.500
Martinez et al., 2006	Chile	41.43	0.184	-1.541
Caramantin et al., 2008	Perú	41.30	0.390	-0.400

Morphological characteristics

S. japonicus present a tapered and elongate body, with a sharp snout. Inter-pelvic process is small and single. No well developed corselet. Swim bladder is present. First haemal spine is posterior to first inter-neural process and 12 to 15 inter-neural bones under first dorsal fin. Anal fin spine conspicuous clearly separated from anal rays but joined to them by a membrane. Back with narrow stripes which zigzag and undulate. Caudal peduncle with 5 finlets on the upper and lower edge. Distance between dorsal fins shorter than or equal to the first dorsal fin base. Lateral line not interrupted and caudal fin forked. Belly is unmarked (Pacific population) or with wavy lines. Dorsal color green and yellow, with thin blue lines (Collette & Nauen, 1983).

Maximum length is about 45-50 cm, while the most common lengths are around 30 cm.

Role of the species in the ecosystem

According to Hernández (1991), it is difficult to determine the trophic level of *S. japonicus* on the food web, mainly due to the diversity of food items found inside their stomachs. In some areas the species seems to eat from phytoplankton to copepods, larvae and small juveniles of other fish species such as anchovy, and is considered to be an opportunistic predator (Konchina 1982; Alegre et al., 2015). In this way, *S. japonicus* can vary their trophic level between the second and fortieth levels, depending on the moment and the type of food available. *S. japonicus* are predated upon by a large range of species, such as tunas, sharks and even dolphins and whales. These features make the species a very important component of the trophic web, as a link between production levels and top predators.

Impacts of fishing

Habitat damage

There are no known habitat damage issues for this is essentially a purse seine and mid-water trawl fishery.

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