

INSTITUTO DEL MAR DEL PERU
IMARPE
PERUVIAN MARINE RESEARCH
INSTITUTE



**PECC XII
TRANSPACIFIC PARTNERSHIP:
Implementing Trade & Investment
Opportunities**

12th General Meeting of
the Pacific Economic Cooperation Council
Santiago, Chile
September 30 to October 2, 1997

**PERUVIAN FISHERIES
“PERU’S CONTRIBUTION TO THE
UTILIZATION OF UNDEREXPLOITED
AND POTENTIAL FISHERY RESOURCES”**

SOUTHERN JACK MACKEREL



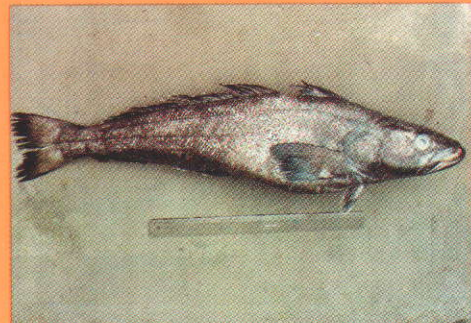
PACIFIC CHUB MACKEREL



DEEP SHRIMP



PATAGONIAN TOOTHFISH





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I. Introduction

This paper contains a summarized description of the current situation of Peru's fisheries, describing the Peruvian Sea, and its main fishery resources, placing special emphasis on underexploited and potential resources, based on the reference terms of our presentation previously coordinated with the organizers of this symposium.

If we take into account the current production levels worldwide and within the Pacific Rim in particular, and the world demand for food products, it is imperative to uncover the possible sources to expand such food supply through diverse specialized activities.

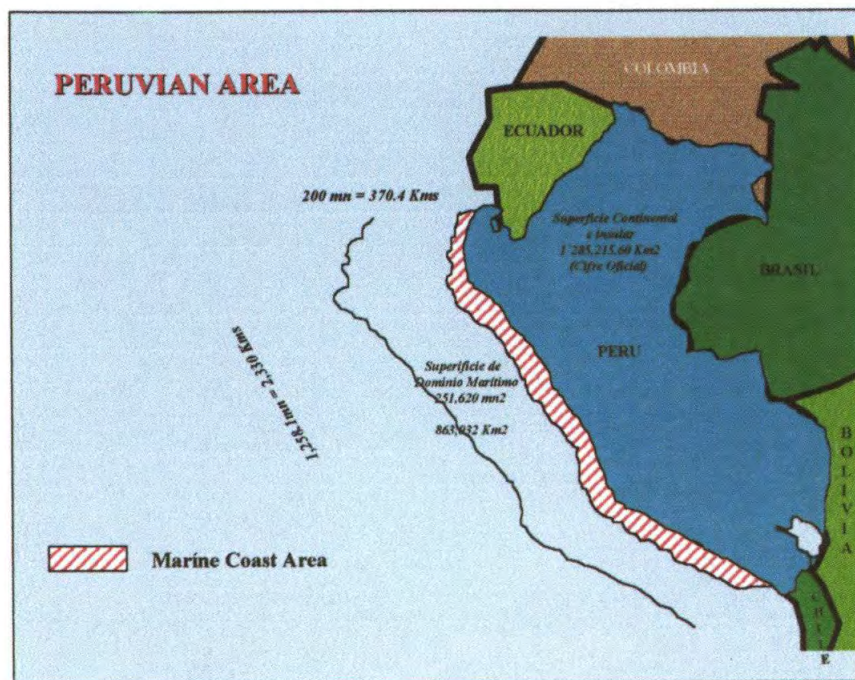
Among these specialized activities we may envision the possibility of moving certain fish stocks which, for many reasons are now underexploited, to full exploitation levels, allowing for an increased production margin. This would also involve the need to assess and quantify the so-called potential resources not as of yet brought to commercial exploitation levels.

To complement this presentation, a description is made of the main fishery resources currently fully exploited which support over 95% of our fisheries and require to maintain a sustainable production in harmony with the conservation of the marine environment to make possible a sustained development of our fisheries.

II. The Peruvian Sea



Peru is situated in the central western coast of South America. Continental Peru is located between parallels $01^{\circ}01'48''$ LS and $18^{\circ}21'03''$ LS, naturally falling inside the Pacific Rim.

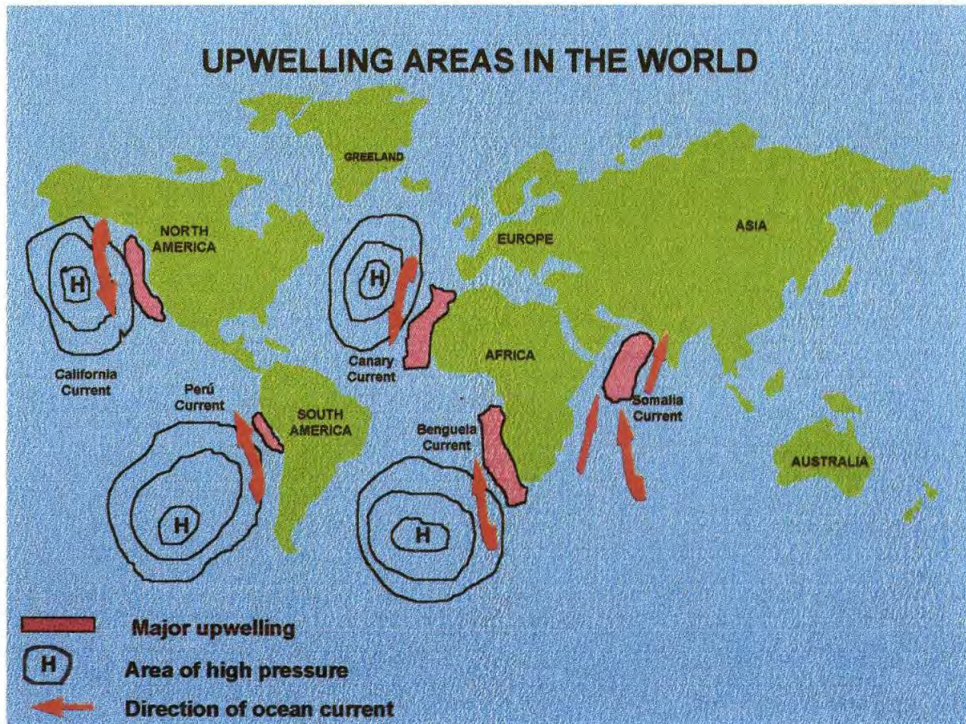


- Peru is bounded on the north by Ecuador and Colombia, on the east by Brasil and Bolivia and on the south by Chile.

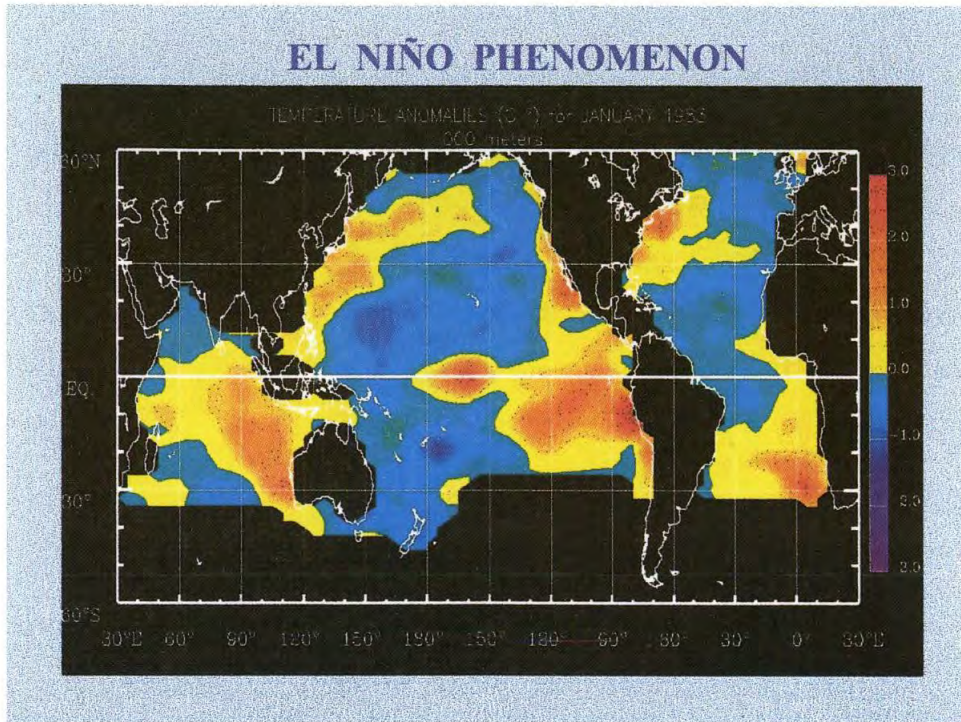
Under its Constitution, Peru has a maritime domain extending on the west 200 milles in the Pacific Ocean with an estimate surface of 863,000km².

As part of its maritime domain Peru has a coastline 3,100km long and a narrow continental shelf of 87,200km².

From a maritime standpoint, Peru forms part of the South-east Pacific.



Peru has high marine production levels associated with the cool Peruvian Current, intensive upwellings and the presence of constant winds, accommodating abundant fishing stocks, as is the case of other similar marine areas in the world like Benguela and the Canary Islands in the Atlantic, Somalia in the Indian Ocean, and California and Peru in the Pacific.



The Peruvian Sea recurrently presents a natural phenomenon called “El Niño” characterized by an anomalous warming of mainly its surface waters causing disturbances in the distribution and abundance of fishery resources sometimes having adverse effects and sometimes positive.

III. MAIN FISHERY RESOURCES

The main commercial species supporting the Peruvian marine fisheries comprise 107 species, which include 73 species of fish, 11 of crustaceans, 16 of mollusks, 2 of echinoderms and 5 of algae.

The marine biodiversity is certainly more rich and includes a variety of biological organisms which complete this biodiversity, such as the major ocean mammals (whales and sperm whales) and the minor ones (sea lions), guano sea birds (pelicans, guanay, boobies), chelonia or sea turtles, among others.

Based on the exploitation and availability levels, fishery resources are classified, in the case of Peru, into three major groups:

Main Fishery Resources

Fully Exploited

Peruvian Anchoveta
Peruvian Pacific Sardine
South Pacific Hake
Jumbo Squid

Underexploited

Trachurus Picturatus Murphyi
Scomber Japonicus Peruanus

Potential

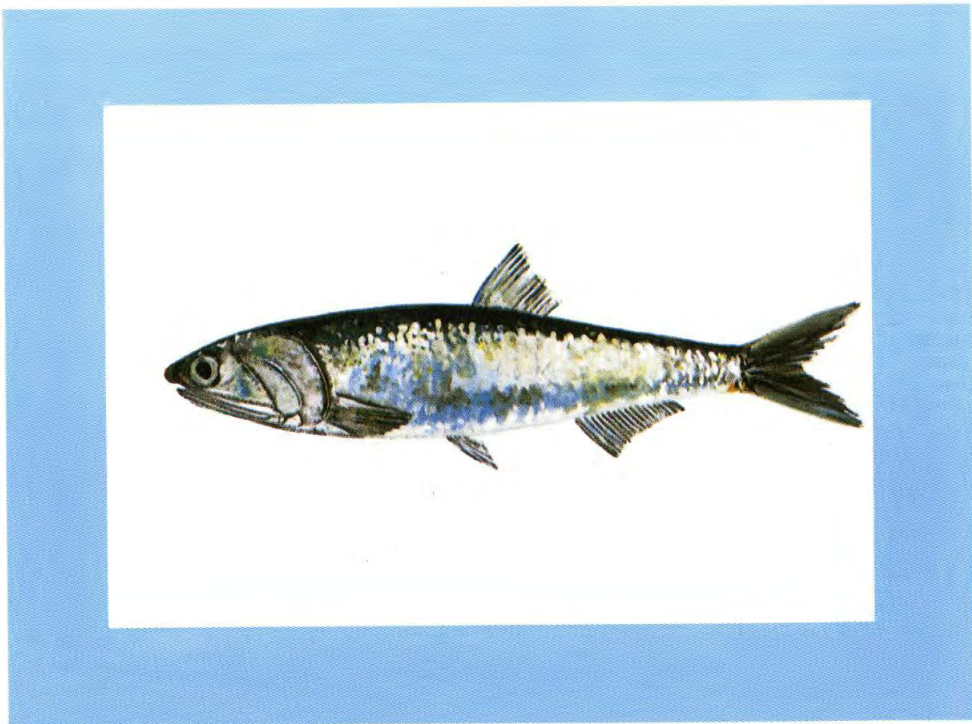
Deep Shrimp
Patagonian Toothfish

1. Fully Exploited

These are resources which, due to their abundance and availability, can withstand catch volumes that will not affect the stock, known as allowable catch quotas, exploited to their fullest extent by man.

These resources, also known as heavily exploited, are, in the case of Peru as to 1996, the following: Peruvian anchoveta, Peruvian pacific sardine, South pacific hake and Jumbo squid.

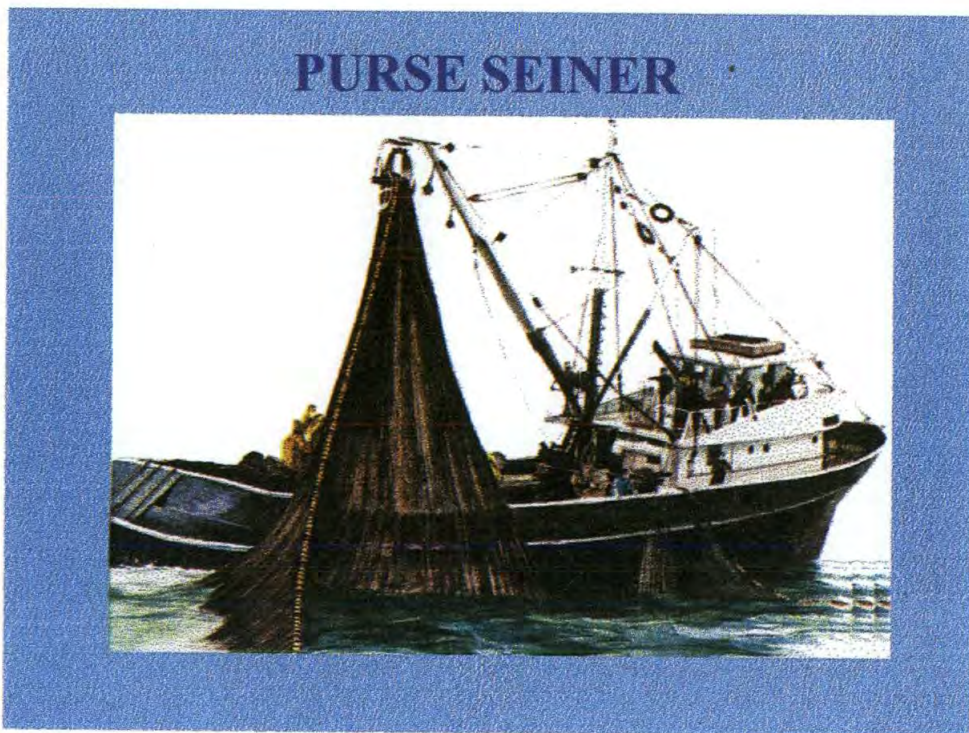
PERUVIAN ANCHOVETA *Engraulis ringens*



1.1 Peruvian anchoveta (*Engraulis ringens*)

It is a small pelagic fish; i.e. lives in surface waters. It measures between 18 and 20cm long and weighs approximately 50g in its adult stage.

It lives along the coastal strip of the cool Peruvian Current forming large and dense schools mainly within 50 nautical miles, providing successful catches and profitable fisheries while rendering them, at the same time, highly fragile. For this reason scientific research needs to be very efficient to procure an adequate management of the resource.

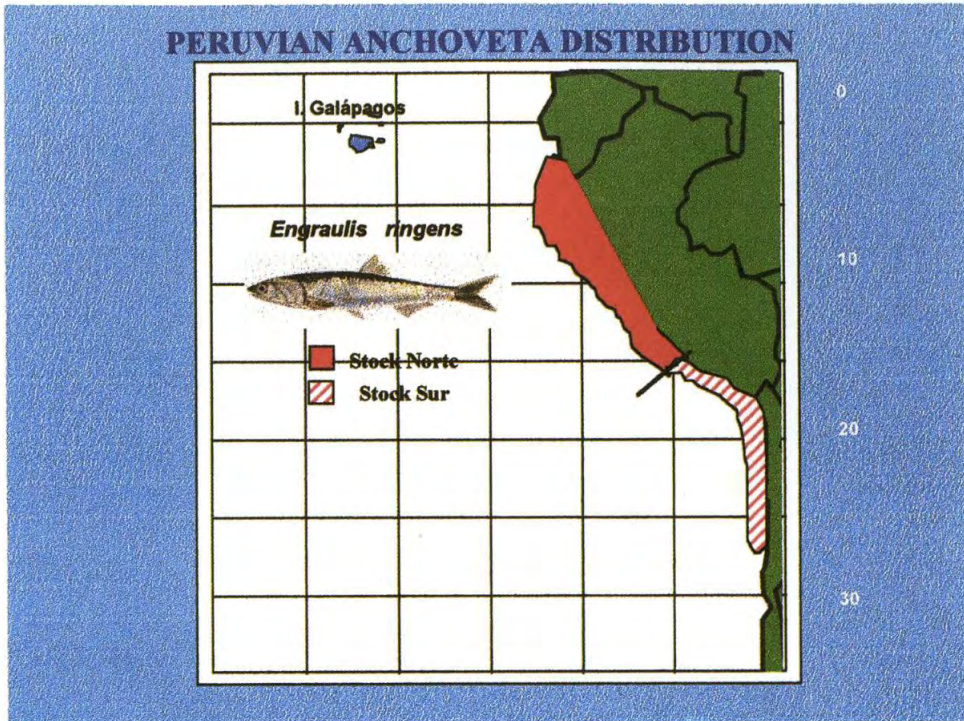


These resource are caught by purse seiners and the fishing gear is the purse seine, a large circular net which traps the fish by surrounding it.

The anchoveta is geographically distributed between 04° LS in the Peruvian Sea and 37°00 LS in the Chilean Sea.

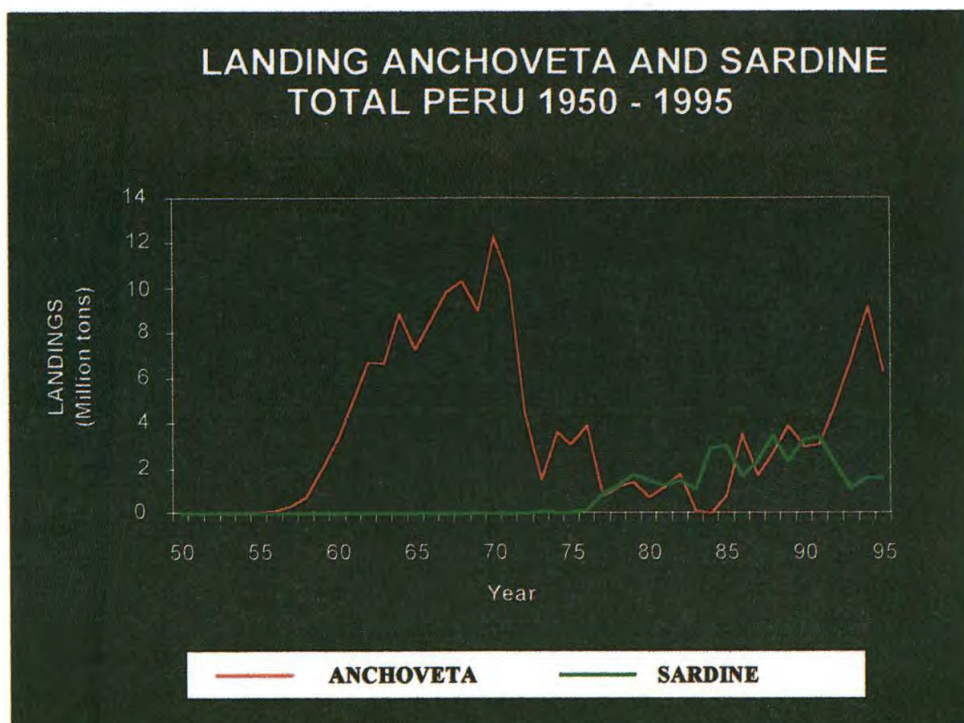
Minor stocks:

A central-northern stock located between 04°00 LS and 16° LS.



A southern stock encountered between 16°00 LS of the Peruvian Sea and the northern region of the Chilean Sea.

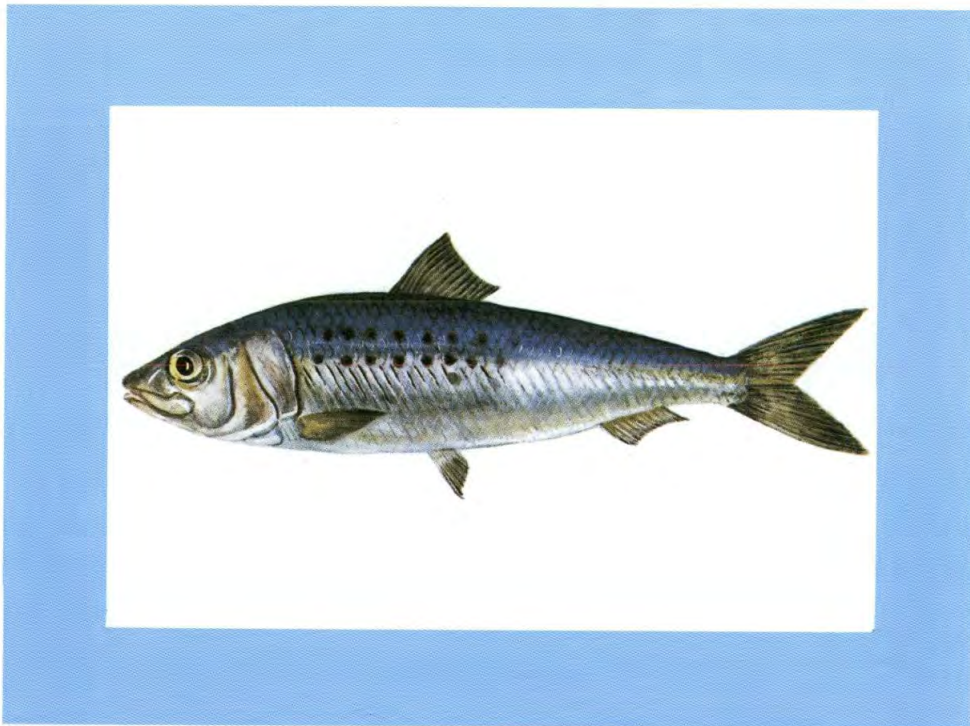
During the highest fish production years, the anchoveta biomass surpassed 15 million tonnes. During the last years it has ranged between 8 and 12 million, allowing for catches of 6 to 9 million tonnes.



The anchoveta landings reveal, even during critical periods, very high yields, regaining its importance from 1990 to date to levels similar to those recorded during peak years.

1.2 Peruvian pacific sardine (*Sardinops sagax sagax*)

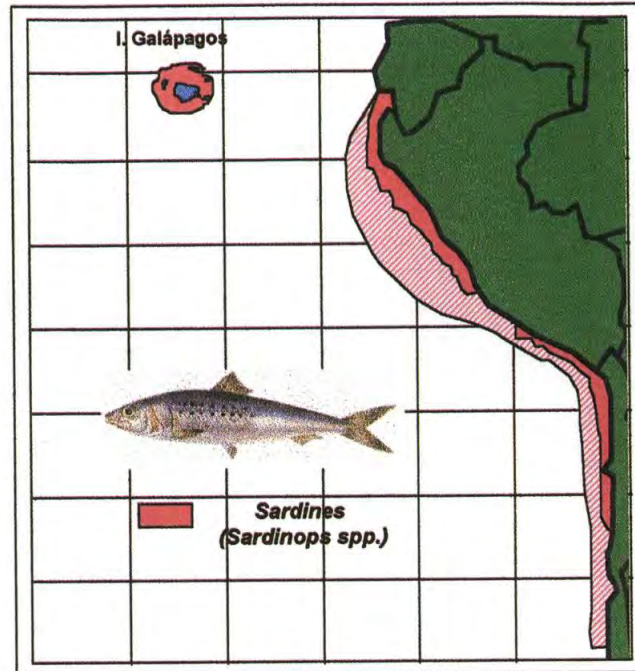
PERUVIAN PACIFIC SARDINE
Sardinops sagax



This is the second among the major pelagic species because of its commercial catch volumes.

This is a longer fish, measuring 28-30cm and weighing 200g at an adult stage.

It also lives in the coastal strip of the Peruvian Sea and it is common to find it during certain seasons more distant from the coast, sometimes even beyond the 200 nautical mile limit.



Distribution: Between 01°39' LN in Ecuador down to 37° LS in Chile.

Minor stocks:

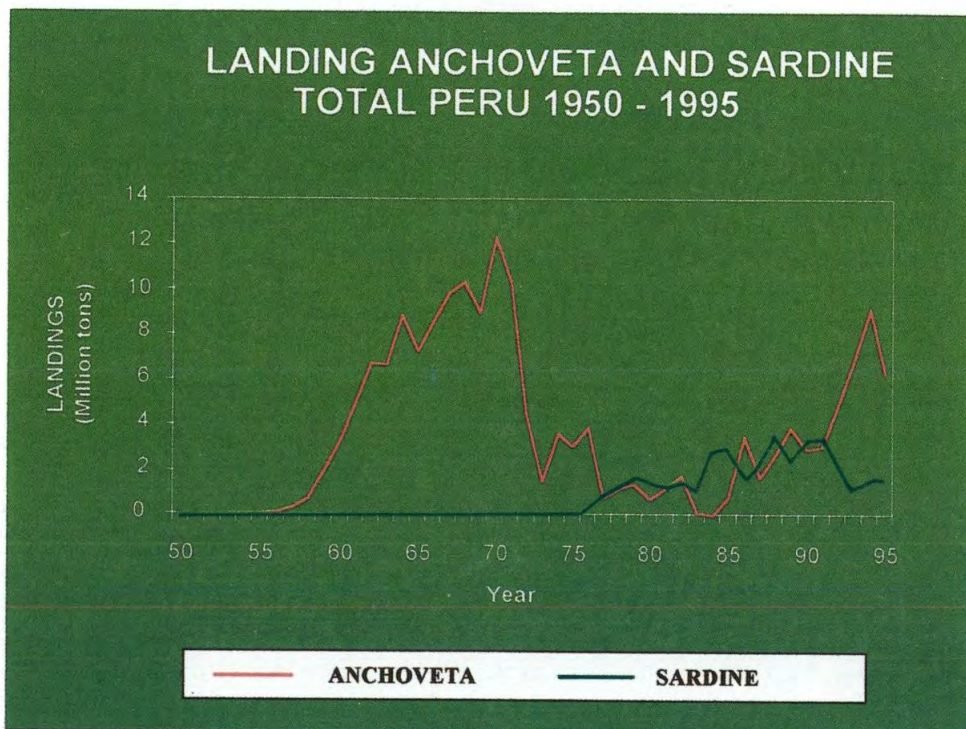
There are two minor stocks in the Peruvian Sea:

From the north frontier with Ecuador down to 16° LS.

In the south, from 16° LS up to the north of Chile.

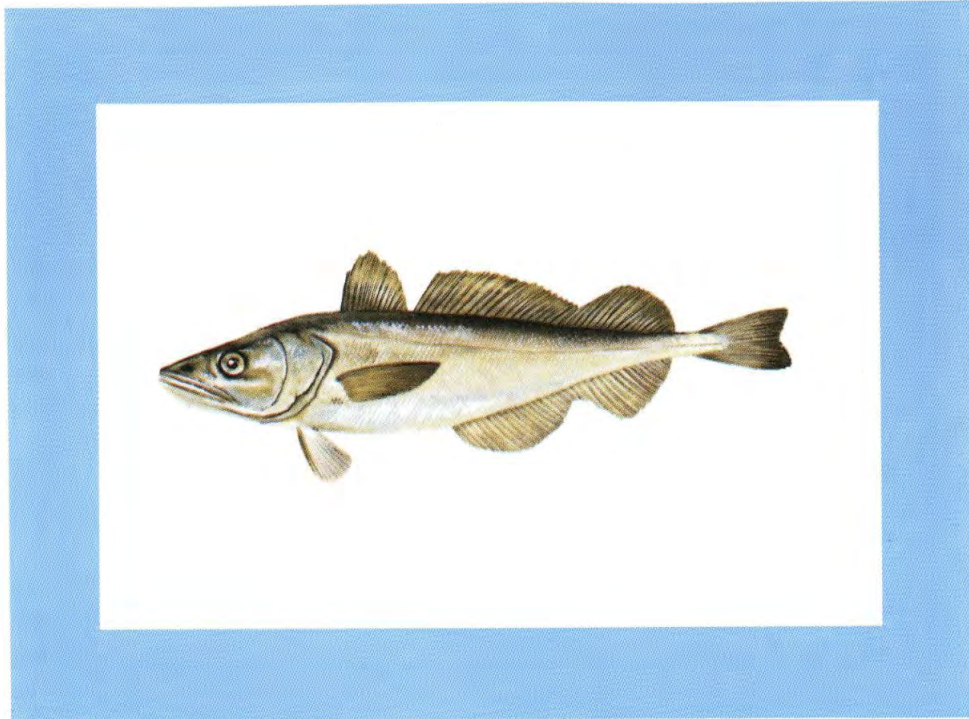
A third minor stock has been identified surrounding the Galapagos Islands in Ecuador.

Biomass: The total biomass estimates reveal an increase since 1978, maintaining its level at 4 million tonnes between 1994 and 1996.



Landings: Its industrial exploitation became more intensive as from 1976 competing with the anchoveta during several years.

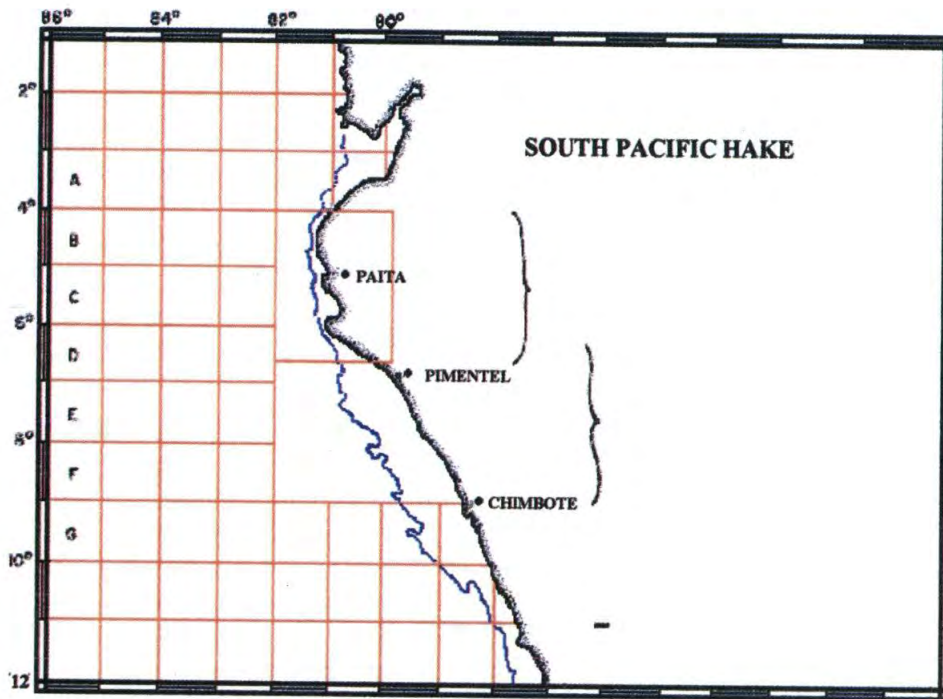
SOUTH PACIFIC HAKE
Merluccius gayi peruanus



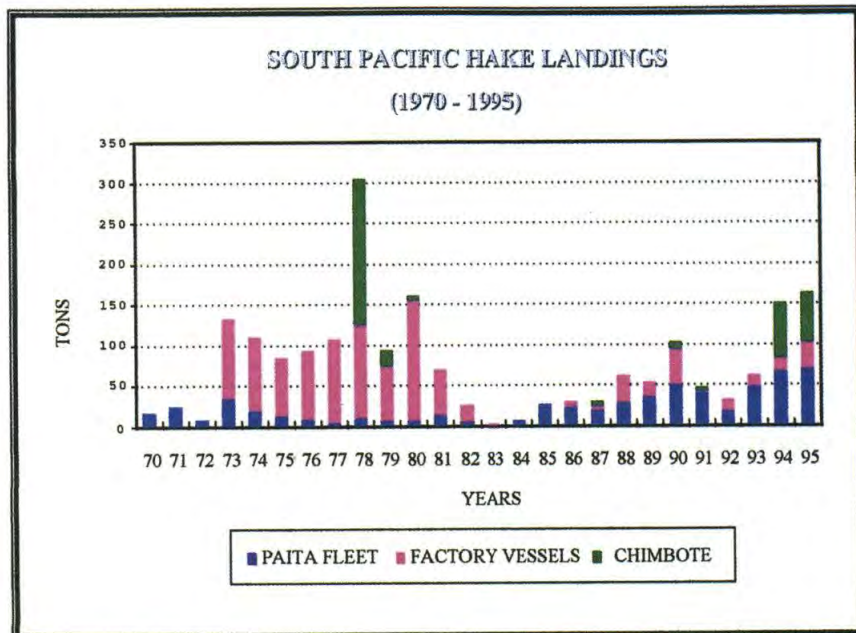
1.3 South Pacific Hake (*Merluccius gayi peruanus*)

This species lives in deep waters and is mostly found in the continental shelf and around the talus rim. This is why it is regarded as a demersal species. It accounts for over 50% of the demersal landings.

In its adult stage, this species can measure 75 to 80cm and weigh 2.5 to 3.0k.



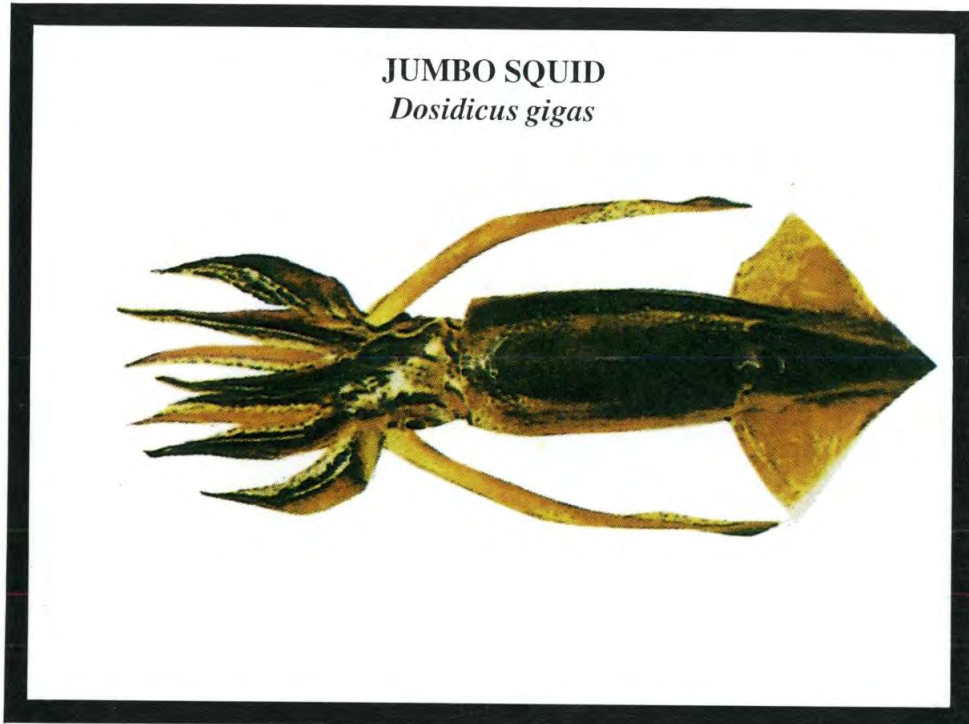
Distribution: It can be found between the northern extreme of the Peruvian jurisdictional waters down to parallel $14^{\circ}00$ LS, still within Peruvian waters. Vertically, it is found down to depths of 600 to 800m. The highest concentration of this species is found north of 9° LS, and during “El Niño”, it straddles to higher latitudes reaching the southern extreme.



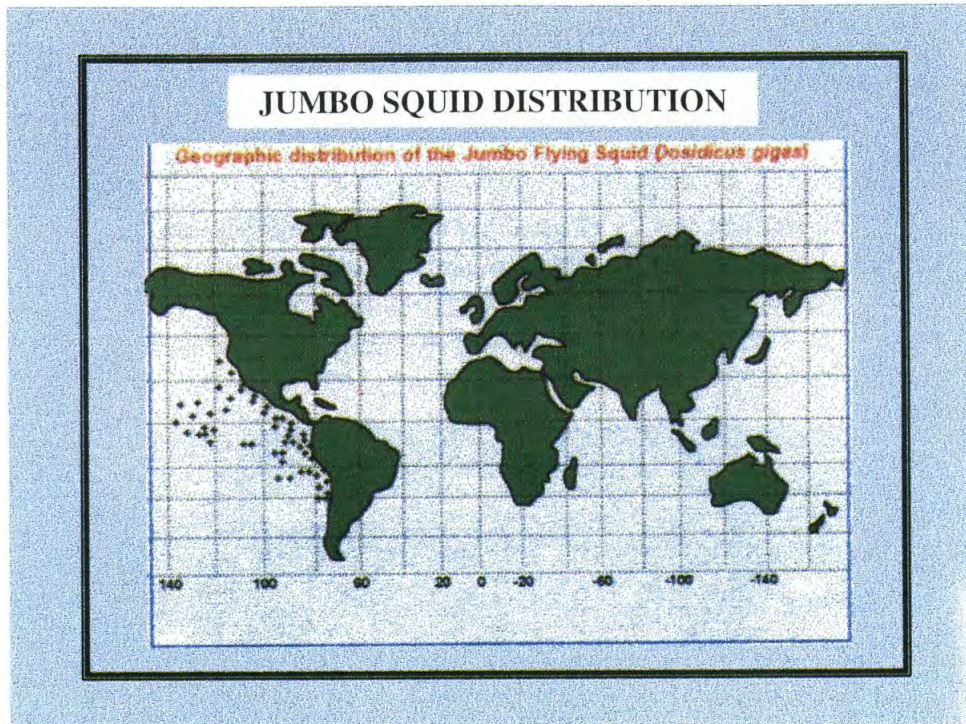
Landings: The industrial fishery, which started during the 60's, registered peak and depressed seasons as a consequence of "El Niño". This affected the distribution of the resource, reducing the catches, favoring however a stock increase during subsequent years, which was also manifested years later by the catches.

In 1995, with a landing of 160,000 tonnes, this species can no longer be considered underexploited, after maintaining such levels for many years, with the exception of 1978, when it moved to surface waters due to a stock growth resulting from "El Niño" in 1972/73. During these years this species was heavily caught.

1.4 Jumbo Squid or Jumbo Flying Squid (*Dosidicus gigas*)



This is a pelagic, oceanic and highly migratory species. It is found inside the jurisdictional waters as well as in the area adjacent to the high seas. When adult, the mantle can measure approximately 150cm and weigh up to 4k.



Distribution. It is widely distributed in the Western Pacific, from the Gulf of California (36°LN) up to 47°LS in the Chilean Sea.

JIGGIN SYSTEM



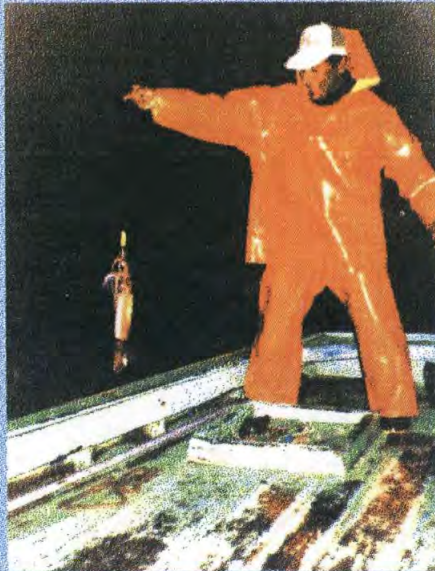
Catch.- It is caught by means of squid trollers and lighting devices to attract the species. This system is known as “Squid Jigging” and is highly selective not allowing for by-catches of other species.

JIGGIN VESSEL

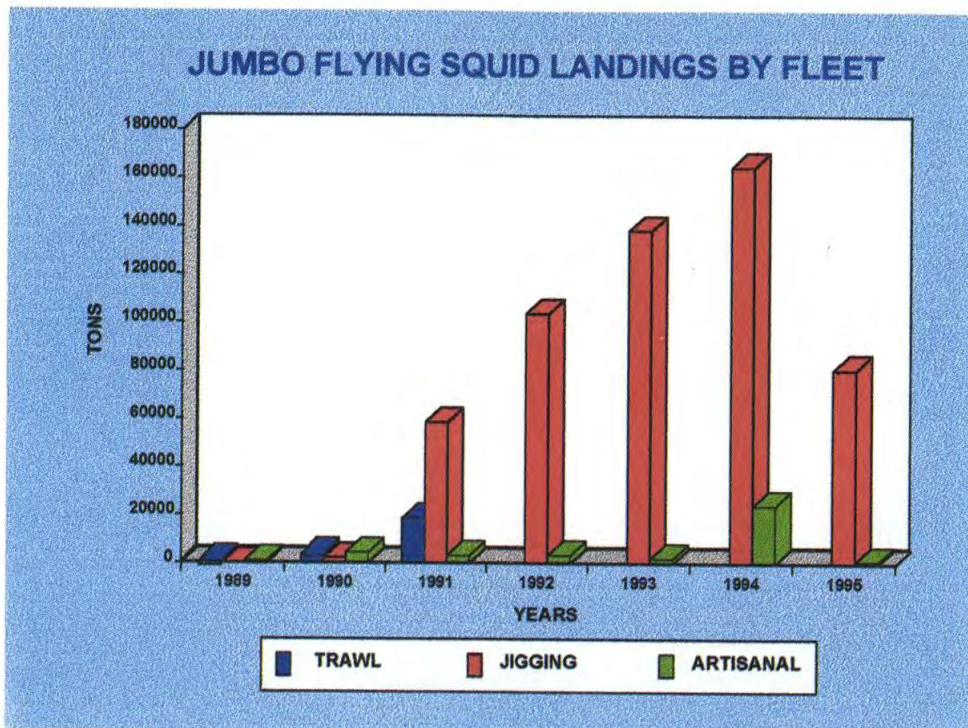


This fishing is conducted using large and specialized vessels.

ARTISANAL FISHERY FLEET



Jumbo squid is also caught by small artisanal vessels.



Landings. Up to 1989, this species was landed in low volumes of 600 tonnes per year.

- The commercial capture of this resource began in 1991 at 81,655 tonnes, increasing in later years to reach a record catch of 193,573 tonnes in 1994, and then drop in 1995 to nearly half of that volume.
- In terms of fleet, national artisanal fishing has accounted for only a small percentage of the total catch, while industrialized fleets have accounted for the major volume. Fifty-three percent (53%) of the industrial fleet has been Korean and forty-seven (47%) Japanese.

2. Underexploited

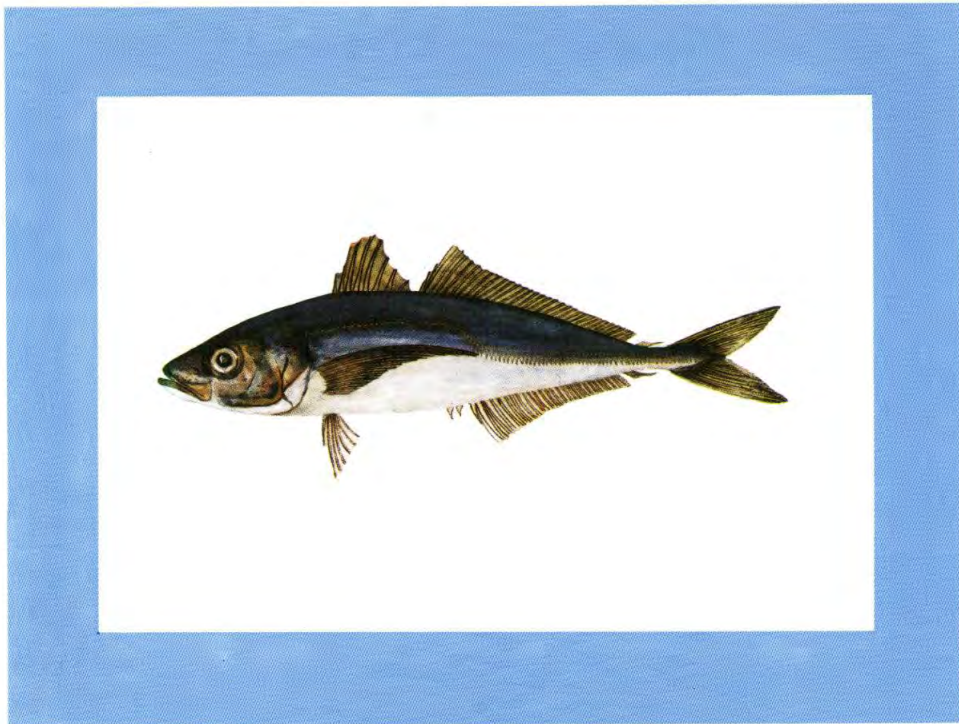
These are resources which are exploited at such levels that may still allow for a surplus production margin.

Due to different technological, economic, market and other reasons, the full exploitation of these resources is still to be achieved.

In Peru, there are two important species which fall under this classification:

2.1 Southern Jack Mackerel (*Trachurus picturatus murphyi*)

SOUTHERN JAC MACKEREL
Trachurus picturatus murphyi



This is the third most important pelagic species after anchoveta and sardine and the most promising one from an economic standpoint because of its abundance.

In its adult stage, this species can measure between 50 to 54cm and weigh 1.2k.

PURSE SEINER FOR JACK MACKEREL



Southern jack mackerel is caught by small purse seiners using purse seine nets similar to those used by the anchoveta fishing vessels but larger in size.

TRAWL FISHING VESSEL



It is also caught by mid-depth trawler vessels.

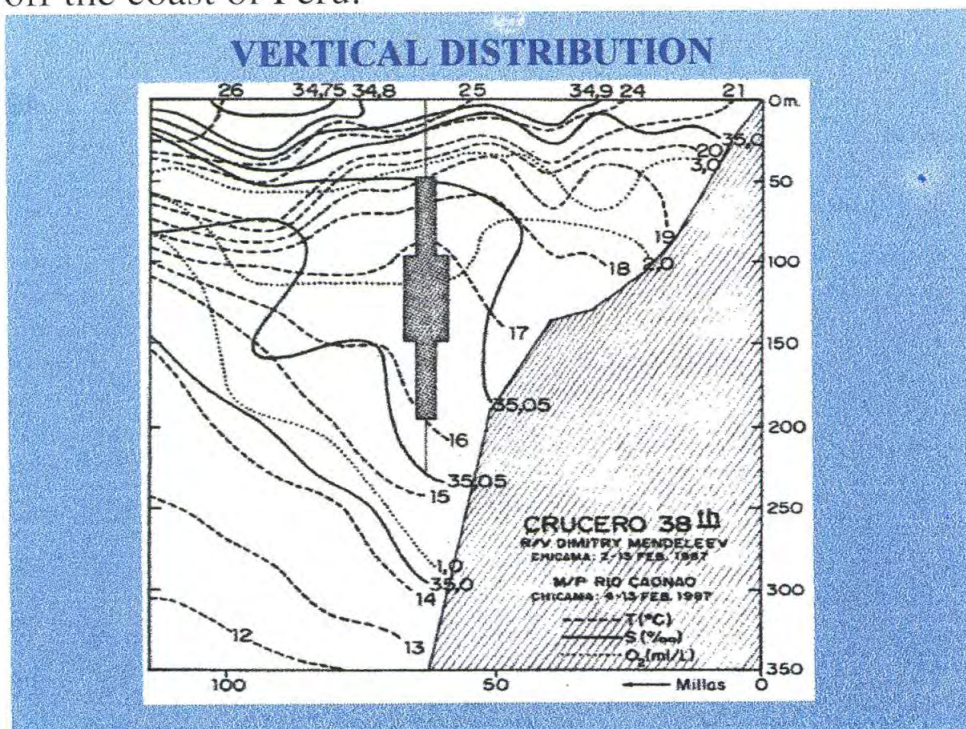
Geographic distribution:

In the southeast Pacific, it is distributed mainly between Ecuador in the north, the Peruvian Sea down to 52° LS in Chile.

Southern jack mackerel is found in the coasts of South America down to the coastal waters of New Zealand and Tasmania (Australia).

In Peru it is distributed all along its coastline and beyond the 160 nautical miles. In 1980, southern jack mackerel larvae were found in areas ranging between 600 and 900 miles off the coast of Chile. The major concentration of this stock are found in the north.

In conclusion, this specie is characterized by its wide distribution, as commercial concentrations have been detected as well (Russian vessels) between 200 and 350 nautical miles off the coast of Peru.



Vertical distribution:

Inside the water column, southern jack mackerel moves significantly from surface waters to a depth of 300m.

The scientific data provided by IMARPE reveal that most fish schools are found during regular years at depths of over 100m, surpassing 200m during abnormal years.

Patterns of behavior:

It appears that southern jack mackerel is attracted by light at night, or by the luminescent species it feeds on. This pattern of behavior is exploited by fishermen.

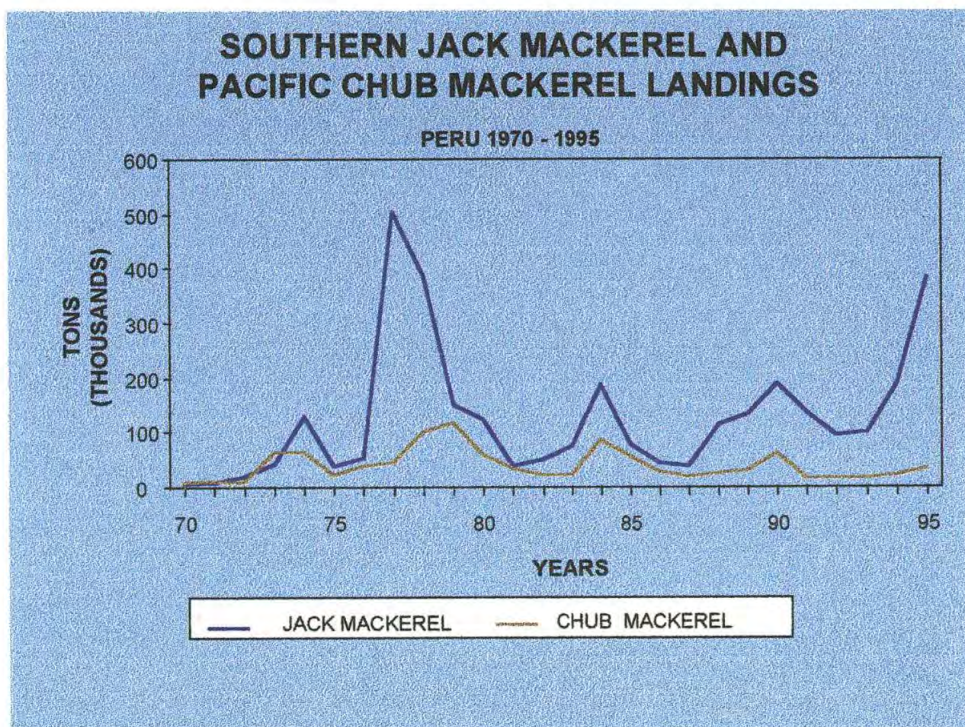
Southern jack mackerel schools are made up of species of similar size, sometimes mixed mainly with Pacific chub mackerel, sardine, and bonito within the same size range.

Biomass:

Research trips made by IMARPE between 1983-1996 register a Southern jack mackerel biomass increase from 180 thousand tonnes up to 8.5 million tonnes, depending on the movement of cool coastal waters (intensive upwelling) and of surface subtropical waters.

The average biomass is estimated at 4.5 million tonnes.

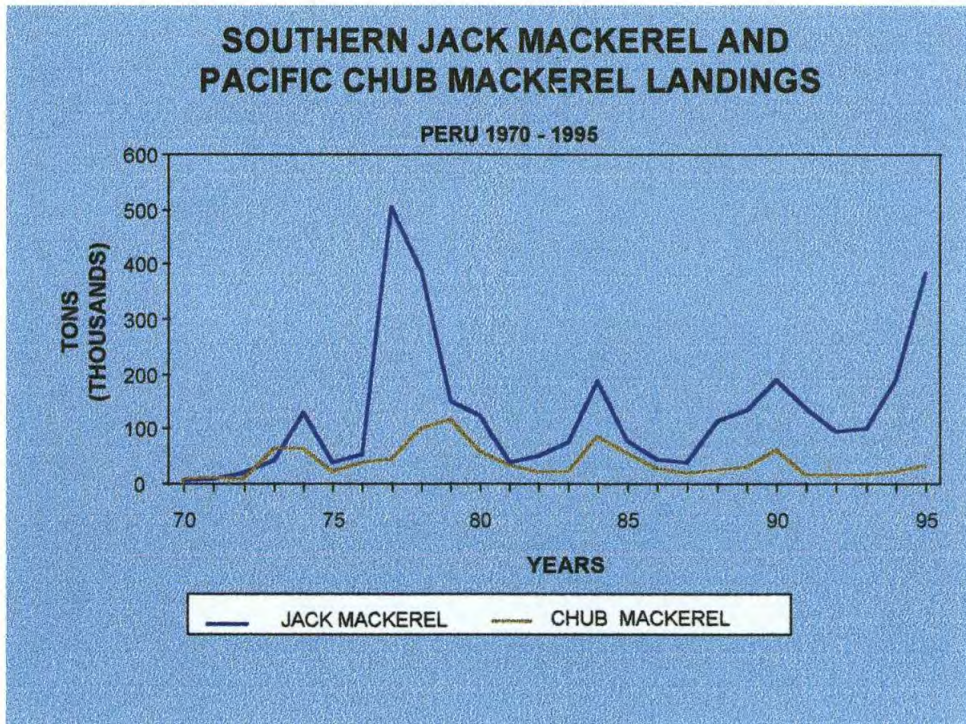
The research trip to take place in February has estimated a southern jack mackerel biomass for 1996 of 3 million tonnes.



Landings:

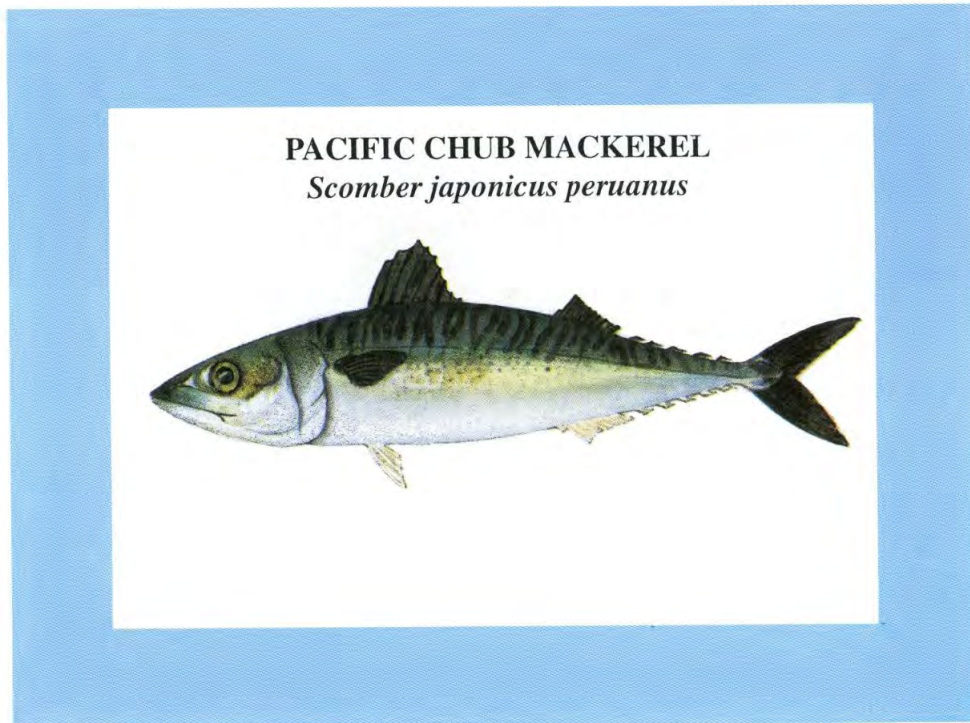
During the last 10 years southern jack mackerel landings have fluctuated from a minimum catch of 38 thousand tonnes in 1987 to a maximum catch of 385 thousand tonnes in 1995.

For the 1983 -1995 period, southern jack mackerel landings recorded an average of 149 thousand tonnes. An increase is observed starting in 1994.



Landings between 1970 and 1995 showed the following pattern of behavior:

2.2 Pacific Chub Mackerel (*Scomber japonicus peruanus*)



This is the fourth most important commercial pelagic species.

It reaches 34 to 36cm in length at the adult stage and weighs 600g.

It is caught mainly by drift nets and purse seines, as in the case of the Southern jack mackerel.

Geographic distribution:

From Mantas to the Galapagos Islands in Ecuador, the Peruvian Sea, and down to the south of Darwin Bay at 45° LS in Chile.

The research carried out by IMARPE confirms that this species is distributed all along the Peruvian coast, beyond 100 miles off the coast, limited by water fronts.

Vertical distribution:

During 1986 - 1987 this resource was detected up to a maximum depth of 240m and the heaviest concentrations were found over 60m deep.

During regular years, Pacific chub mackerel is distributed within the first 100m from the surface, and in abnormal years within 250m from the surface.

Behavior:

IMARPE's scientific sea voyages in the Southern jack mackerel distribution areas reveal that there is a smaller and scattered volume of Pacific chub mackerel.

Pacific chub mackerel has been mainly found at a depth of more than 60m.

Biomass:

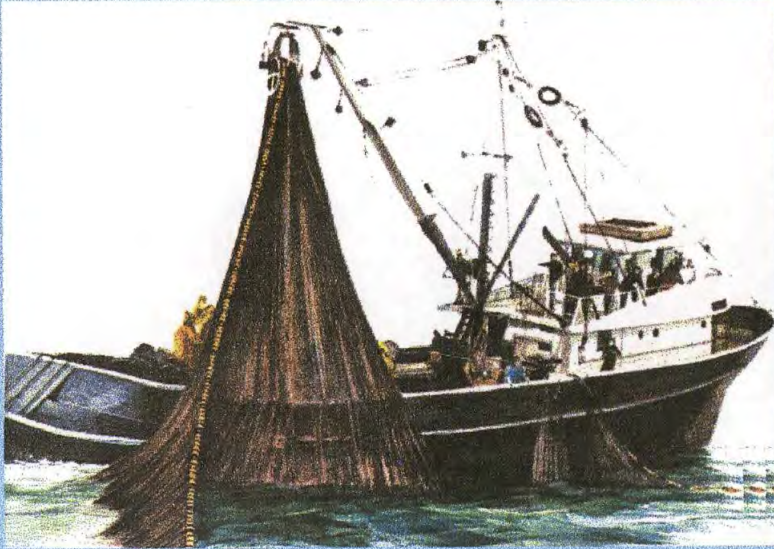
IMARPE's research cruises carried out between 1985 - 1996 revealed an average biomass of 1.4 million tonnes, from a maximum of 2.9 million to a minimum of 368 thousand tonnes.

The highest biomass figures by latitude range between 06° - 11° LS and 12° - 15° LS.

Landings:

There is no fleet exclusively devoted to fish for Pacific chub mackerel. This resource is caught together with southern jack mackerel, anchoveta and sardine.

PURSE SEINER

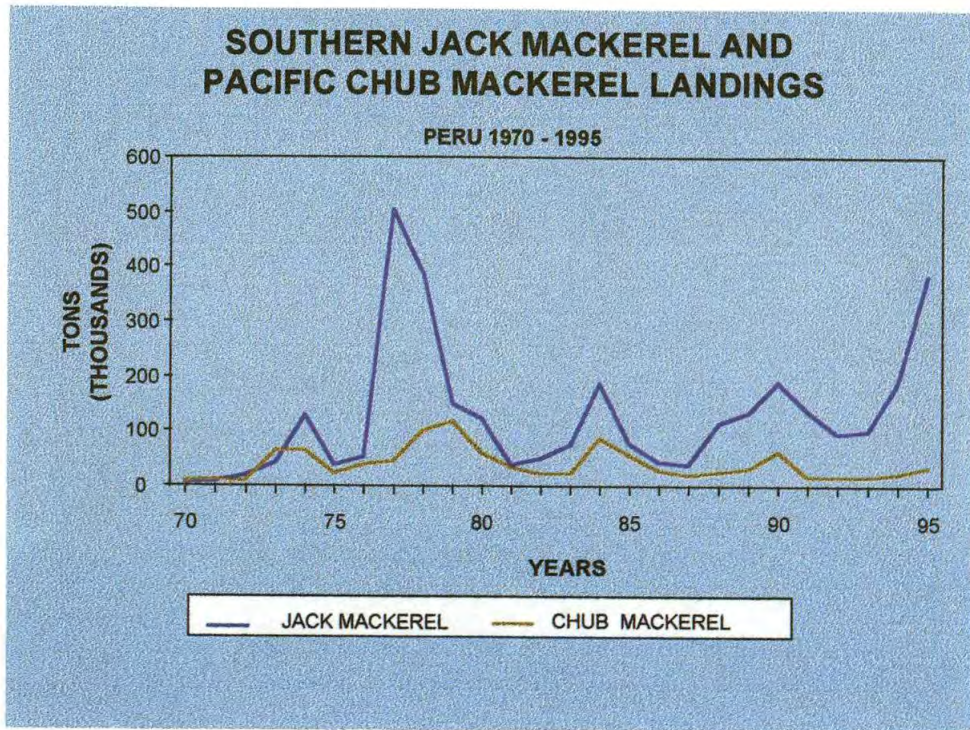


The fishing gear most commonly used for this species is the purse seine, mid-depth trawl and mesh nets.

PURSE SEINER



It is mainly caught by the artisanal fleet, although it is also caught by the industrial coastal and high sea fishing fleets.



During the 1983-1995 period, the Pacific chub mackerel landings reached an average of 32 thousand tonnes per year, and until September 1996, it totalled 23 thousand tonnes.

The northern region (Tumbes-Casma) accounts for 93% of the total landed catch of Pacific chub mackerel.

The minimum catch size was established at 31cm.

Fishery:

This resource started to be exploited in the seventies as a result of a decrease in the anchoveta stocks caused by “El Niño” during 1972/73.

This catch dropped during the eighties as a result of the decrease in the catch effort for this resource.

Presently, very little is known about this resource. It is known that it forms part of the by-catch of the southern jack mackerel accounting for 30% of the catch.

IMARPE has been conducting research studies on this resource, as it believes the catch of this stock can be largely increased.

3. POTENTIAL FISHERY RESOURCES

These resources are not currently fished or unutilized but offer important exploitation perspectives. In most cases, these fisheries are in the exploration stage, as there is scarce information available on the concentration areas, distribution, fishing grounds, biomass and allowable catches.

In Peru, various types of fishery resources with these characteristics are envisioned. Below is a description of two types of resources which are considered important for exploitation purposes in the short term.

3.1 Deep-sea shrimp

DEEP SHRIMP



These are crustaceans comprising different species:

Scientific name	Spanish Name	English Name
<i>Heterocarpus vicarius</i>	camaron nylon	Northern nylon shrimp
<i>Heterocarpus hostilis</i>	camaron nylon	Panama nylon shrimp
<i>Haliporoides diomedae</i>	gamba	Chilean knife shrimp
<i>Nematocarcinus agassizii</i>	camaron paton	Spider shrimp

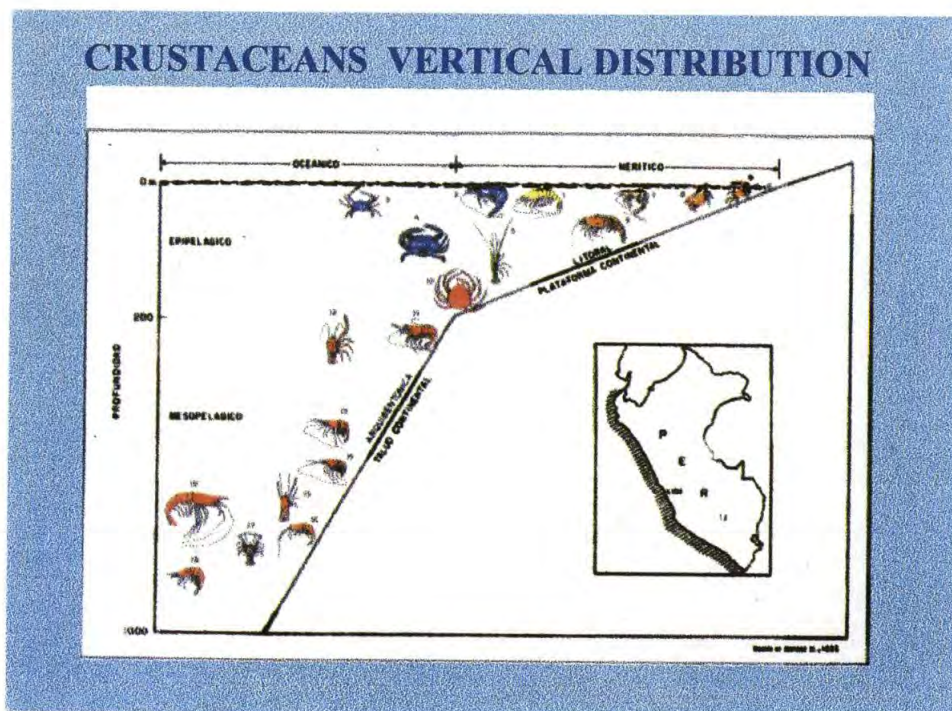
It sizes range between:

Chilean knife shrimp (*H. diomedae*) - total length: 110mm - weight: 30g.

Nylon shrimp (*H. vicarius*)-total length: 80mm - weight 12g.

Vertical Distribution:

These are benthic species associated with the continental talus and, depending on the differesnt kind of species, it can reach a depth of 80-100m to 500 to 800m. The Chilean knife shrimp can even be found at at depths of 1,800m.



Its latitudinal distribution also varies according to the type of species:

Nylon shrimp (*H. vicarius*): From the Gulf of California to the south of Peru

Nylon shrimp (*H. hostilis*): From the Gulf of Panama to Punta Malpelo in Peru

Chilean knife shrimp
(*Haliporoides diomedae*): From Mexico to Huarmey (Peru)

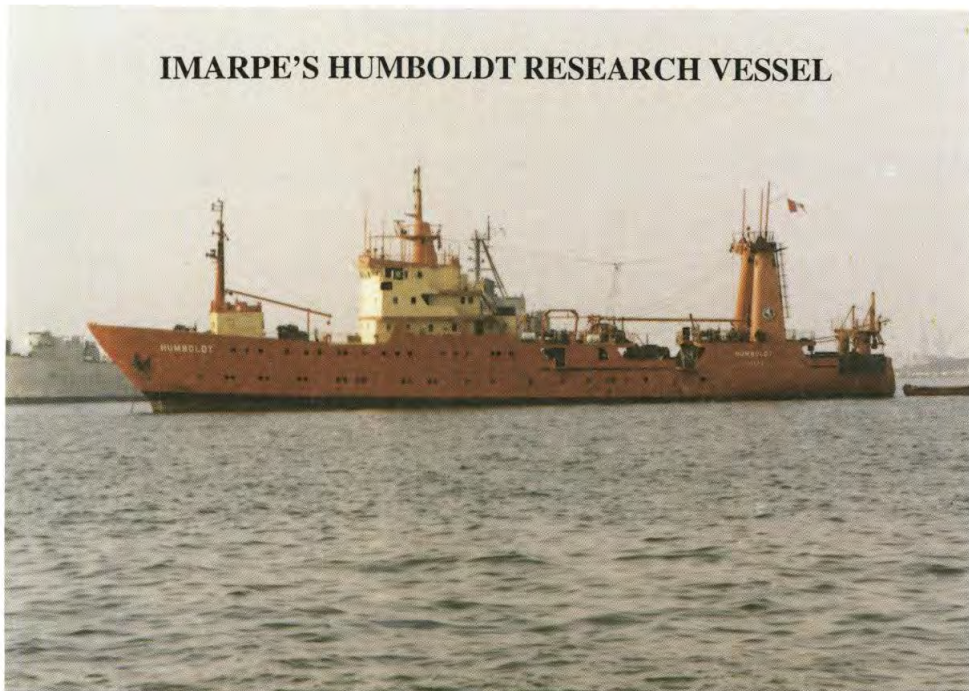
The presence of these species is strongly associated with the type of seabed, being mainly found in muddy and in sand muddy seabeds.

In the case of the Chilean knife shrimp, large schools have been identified around the Mancora bank in the northern waters of Peru.

Estimated Abundance:

In 1990 IMARPE carried out a prospection expedition aboard the NANSEN, a scientific vessel, identifying rates of 228k/hour and 82k/nautical mile.

IMARPE'S HUMBOLDT RESEARCH VESSEL



Further studies are currently carried out aboard the Humboldt, IMARPE's scientific vessel, for a more comprehensive understanding of the stock abundance and distribution.

In July 1996 this vessel undertook a scientific voyage "Location and Identification of Red Deep-Sea Shrimp Banks", capturing 82 different fish species, 52 crustacean species, 20 species of mollusks and 52 of other invertebrates.

It is known that these resources are very sensitive to low oxygen levels in deep waters. This is why concentrations of this resource have been identified at great depths.

Fishing vessels and gear required:

A trawler vessel equipped mainly with a good-quality acoustic sounder is required to capture this resource.

The most appropriate trawl net for Peruvian waters is 30m long, with an internal mesh size of 80mm, an horizontal mouth opening of 13.5m and a vertical mouth opening of 7.5m.

Economic Prospects:

The deep-sea shrimp is much valued for its taste and quality and is in high demand not only in the domestic market but also in Japan and the United States to where it is exported preferably frozen or canned.

The quality of the red deep-sea shrimp is comparable to that of the Spanish shrimp highly valued in Europe.

Other potential resources:

The following is a brief summary of other potential resources:

KING CRAB



a. King crab (*Lithodes panamensis*)

This is a different specie of large-sized crustaceans. Nine different species have been identified in Peru, the largest and most frequent being the *L. panamensis*.

It is distributed all along the coast, particularly in areas to the south of the Mancora Bank, in northern Peru.

In 1986, an exploratory fishing expedition carried out between 06°LS and 09° LS captured from 30k to 1,275k/fishing effort.

WHIPTAILS



b. Whiptail

Macrouridae species. Similar species are fished in Japan, where they are processed for Surimi (fish paste), and highly valued for their resemblance to crab in taste.

MACROALGAE



c. Macroalgae

There are different types of macroalgae (seaweed) of diverse quality and number not as of yet adequately exploited.

PATAGONIAN TOOTFISH

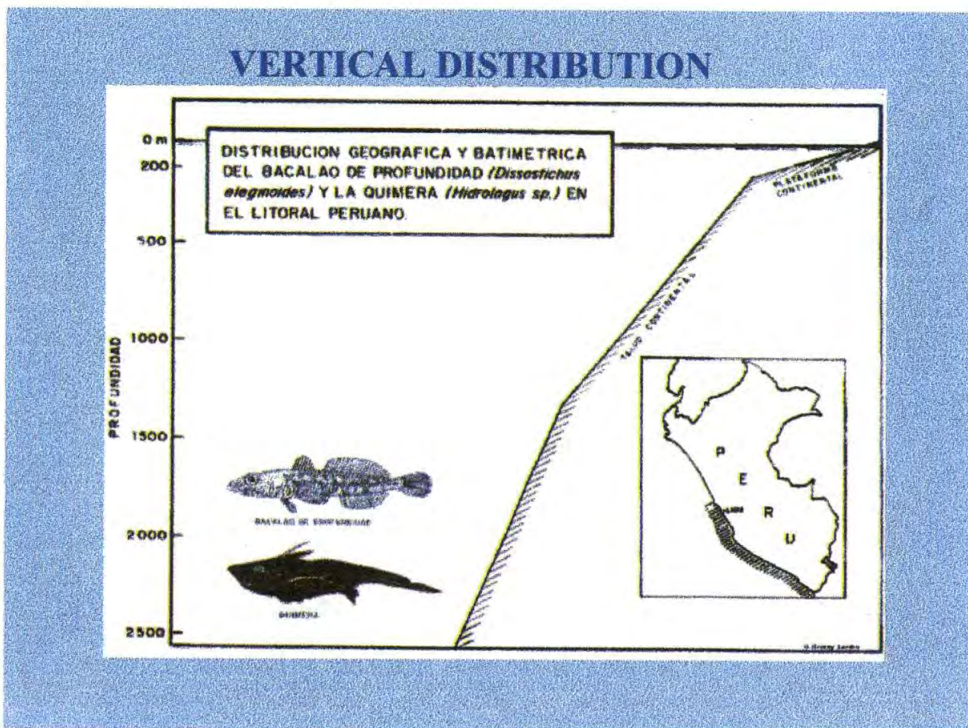


3.2 Patagonian toothfish (*Dissostichus eleginoides*)

This is an abyssal species, ie found at great depths, in very cold waters close to the ocean floor.

It belongs to the *Nototheniidae* family. It is grayish-brown with dark spots, spindle-shaped and elongated.

Specimens of 80 to 164cm weighing between 4 and 15k have been found in Peruvian waters opposite to Pisco (Peru). The maximum size of this species is known to be 215cm (Fisher,1985).



Distribution:

Mainly found in the southern seas around the Sub-Antarctic islands and the Antarctic Peninsula.

Outside this Antarctic convergence, this species has also been found in the north up to the coast of Argentina and Chile.

This species has been recently found on the central coast of Peru, opposite to Huacho (11° LS) in northern Lima, the capital city of Peru.

Vertical distribution:

In Peru it is a benthic specie associated to the talus in deep waters.

In Peru, its occurrence is associated with the intermediate Antarctic waters, generally located at a depth of **over 600 to 1,000m**. At these depths, the water temperature ranges between 4 and 7°C with a salinity ranging between 34.60 to 34.45‰. At these depths, oxygen levels tend to raise significantly. (Zuta, Guillen 1970).

Biomass:

Estimates for this are not yet available.

Fishing Zones: to this date, the areas for this type of fishing have been located in the central part of the Peruvian coast opposite to Pisco (14° LS), opposite to Callao (12° LS) and opposite to Huacho (11° LS).

VESSEL FOR PATAGONIAN TOOT FISH



Vessels and fishing gear:

Presently experimentally caught in Peru by four privately-owned vessels of a total length of 18m and a hold capacity of 24 tonnes. They use a 2-mile bottom longline with a set of 100 hooks.

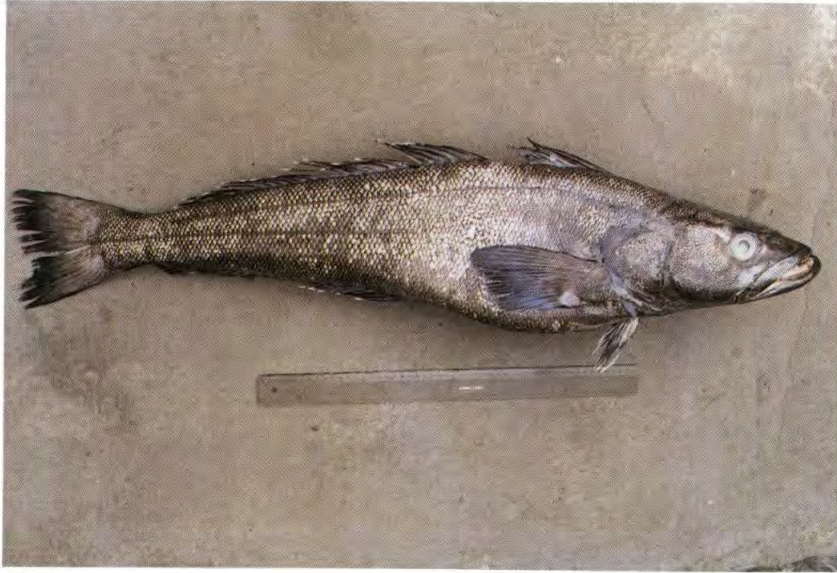
FISHING LABOR



From October 1995 to August 1996 around 271 tonnes of this species were landed.

Once caught, this specie is exported in frozen blocks mainly to Spain, France and Germany.

PATAGONIAN TOOTFISH



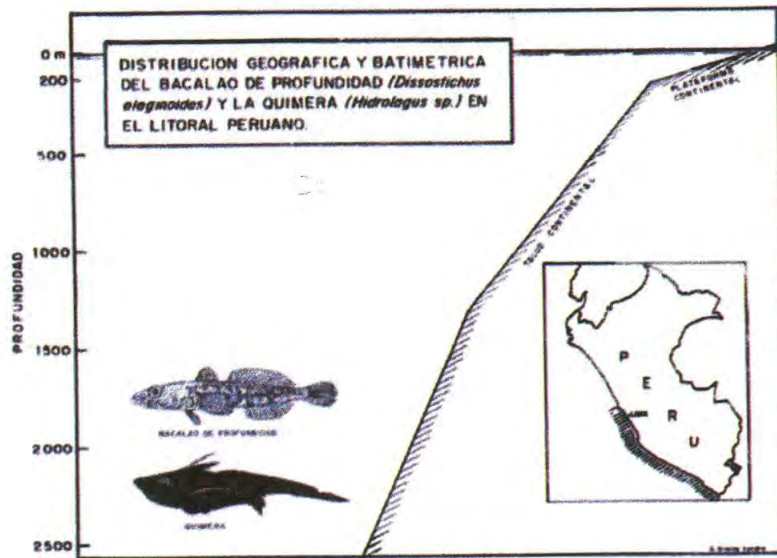
Perspectives:

In terms of quality, it is very similar to the sea bass, of the *Serranidae* family, widely distributed in warm and tropical waters.

The regulations for a prospective commercial harvest of this species are currently being drafted.

Adequate data on this species and on a prospective fisheries are not yet available. Precisely because it may constitute a major potential resource, IMARPE is currently conducting research work on this resource to obtain information pertaining to concentration areas and distribution.

VERTICAL DISTRIBUTION



The first captures of the Patagonian toothfish have revealed as accompanying fauna another important species like “Chimaera”, a *Hidrolagos* species. This species is virtually unknown, but could soon be considered as another potential fish resources in Peru.

IV. Peruvian Marine Fisheries: Current situation

General information:

The Fisheries Sector is among the 13 Economic Sectors of Peru. Since 1970, the Ministry of Fisheries has been charged with the administration because of its social and economic significance to the country. The State operates as a governing and regulating authority, while the private sector promotes production activities, according to the Government’s economic model being implemented since 1990.

The fisheries management and policies are based on the findings of the scientific and technological research conducted by IMARPE. They are also based on the fisheries technology research carried out by the Institute of Fisheries Technology

of Peru -ITP- and on the training and education activities carried out by the Paita Fisheries Training Center (CEP/Paita).

The Peruvian fisheries sector, particularly the marine fisheries based on the diverse marine resources, has been evolving since 1950, placing Peru among the 5 major fishing countries in the world.

Peru's fisheries sector is currently being harmonized to sustainability standards. The relevant regulation programs applicable to the main fisheries are presently being drafted, particularly to regulate such fisheries based on fully exploited and underexploited resources.

The important role of fisheries in the Peruvian economy lies with its contribution to the GNP and to the fact that it is an important source of foreign currency generated by the export sales of fish products, the second most important source in the country, after Mining.

According to the International Fishmeal & Oil Manufacturers Association, Peru ranked first in industrial fishing production in the world in 1994, with 11 542 000 thousand landed tonnes. In the same year, Peru produced 2,3 million tonnes of fishmeal, 181 000 tonnes of frozen fish products and 47 000 tonnes of canned fish products. Fishmeal alone accounted for 51,9% of the total world production.

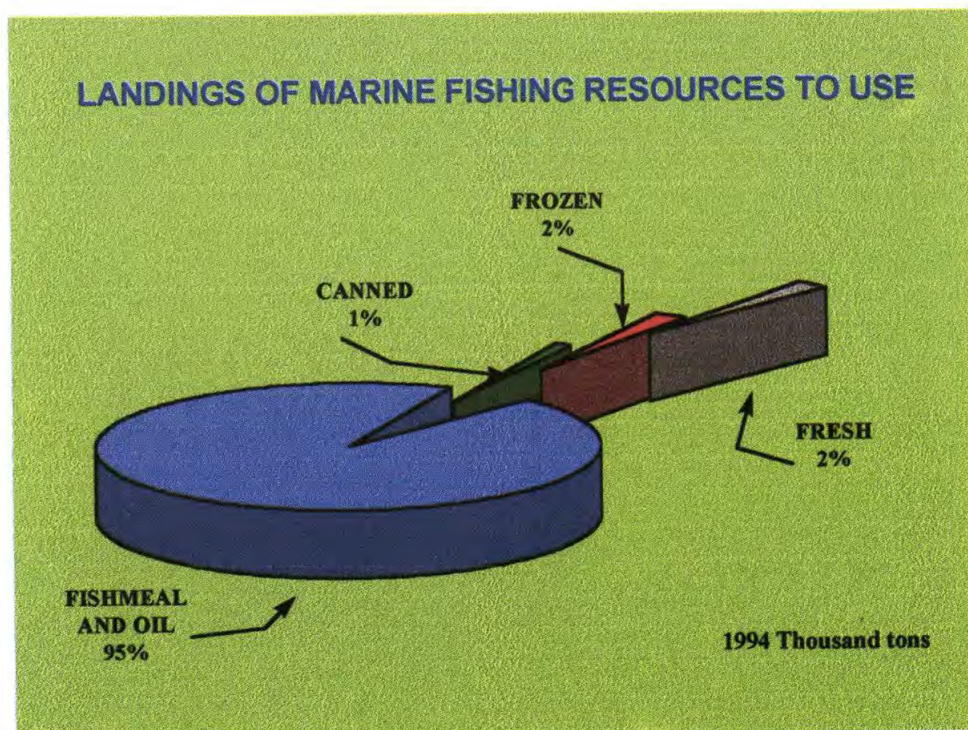
Fishery activities in Peru are carried out abiding by the international regulations on the conservation of the marine environment. In accordance with these regulations, Peru has promulgated the Environmental Code. Decree Law 757 (Framework Law for the Promotion of Private Investment) entrusted the enforcement of the aforesaid Code to each relevant ministry.

The Environmental Impact Studies and the Environmental Adjustment and Management Programs must be complied with by fishing enterprises.

According to the census carried out in August 1996, approximately 1,300 industrial vessels with a hold capacity over 30 tonnes were recorded. In addition, there is information of the existence of approximately 6,500 artisanal vessels.

An estimated 60,000 to 80,000 people derive their livelihood from fishing activities.

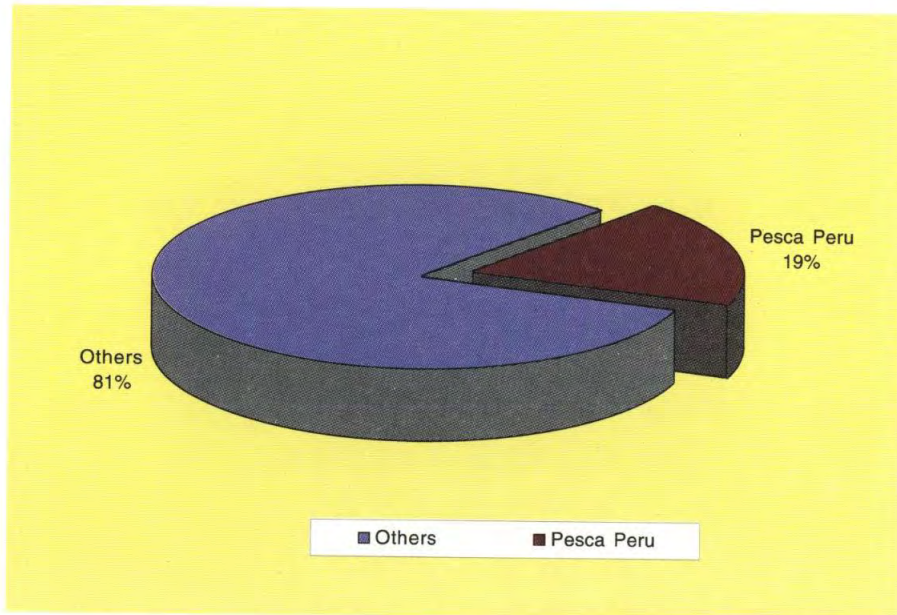
1. Fisheries production:



Utilization and Destination of Fishery Resources

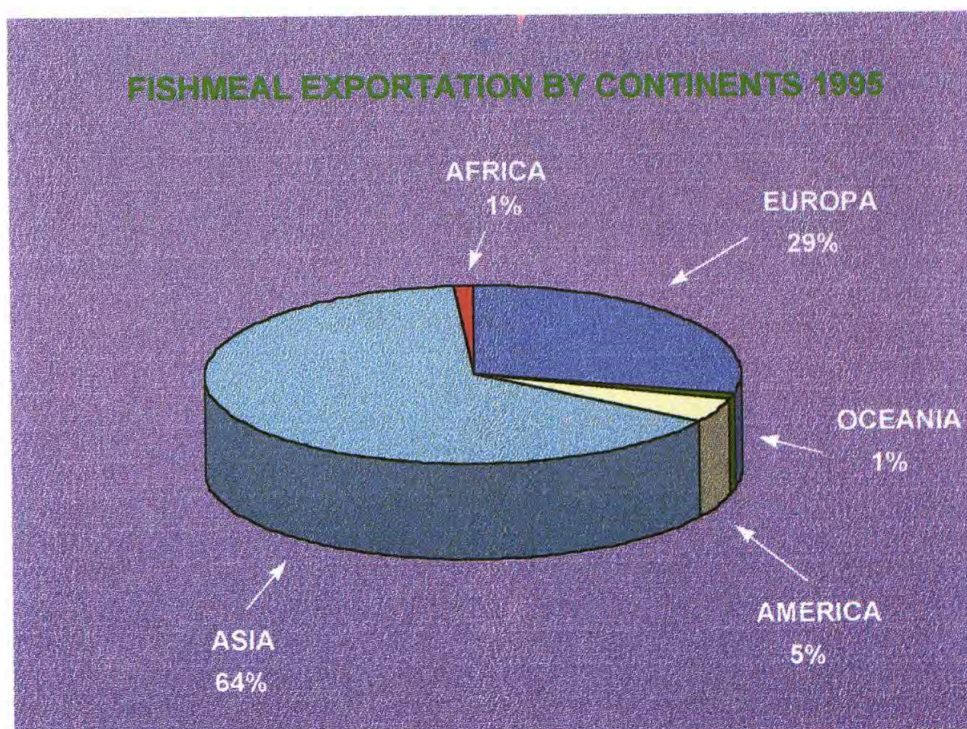
Marine resources are mainly destined for industrial activities. Of the total catch, 95% is allocated to the production of fish meal and fish oil; 2% to the production of frozen fish products; 2% to fresh consumption and 1% to the canning industry.

TOTAL FISHMEAL PRODUCTION 1995



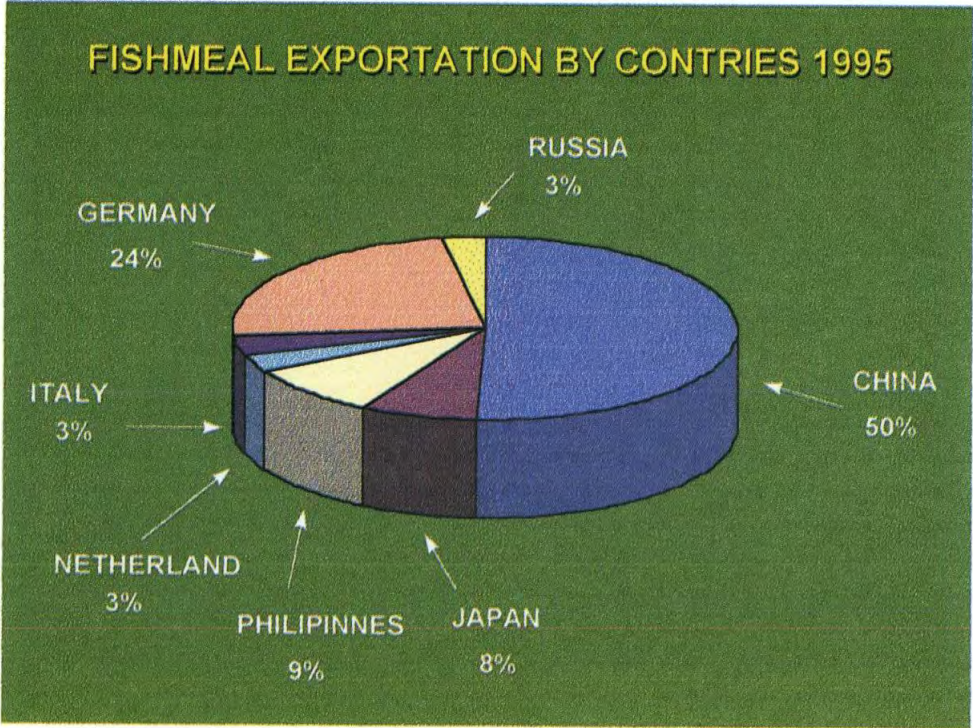
Fish meal and fish oil are produced mainly by private companies (81%).

2. Markets:



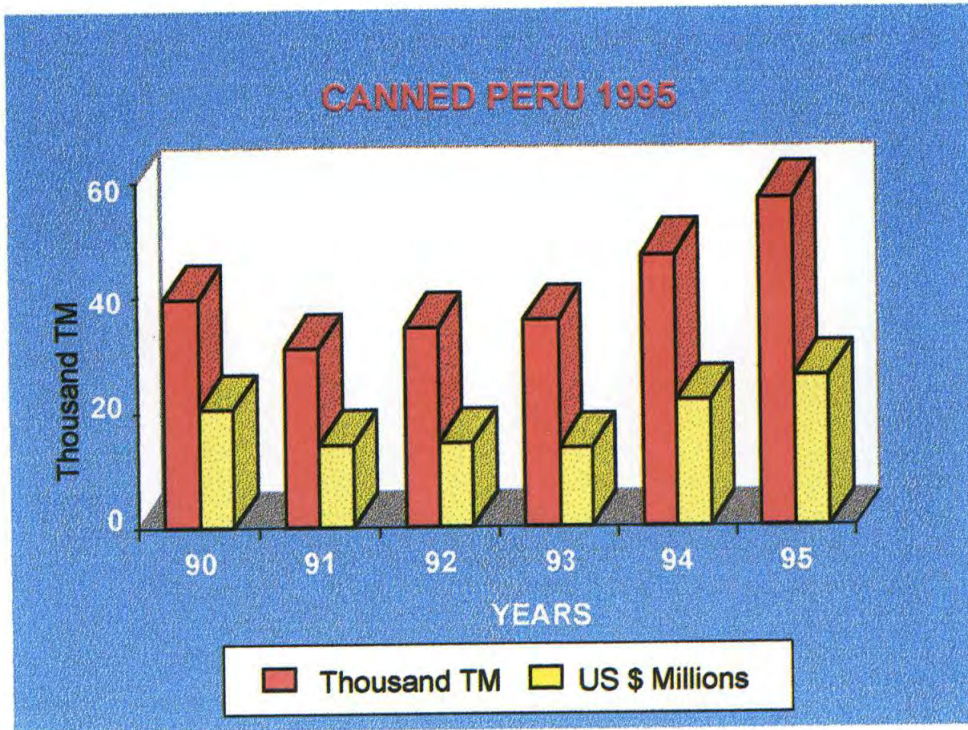
Fish meal, the main fish product manufactured by Peru, is exported to the following markets:

Asia	64%	America	5%
Europe	29%	Africa	1%
		Oceania	1%

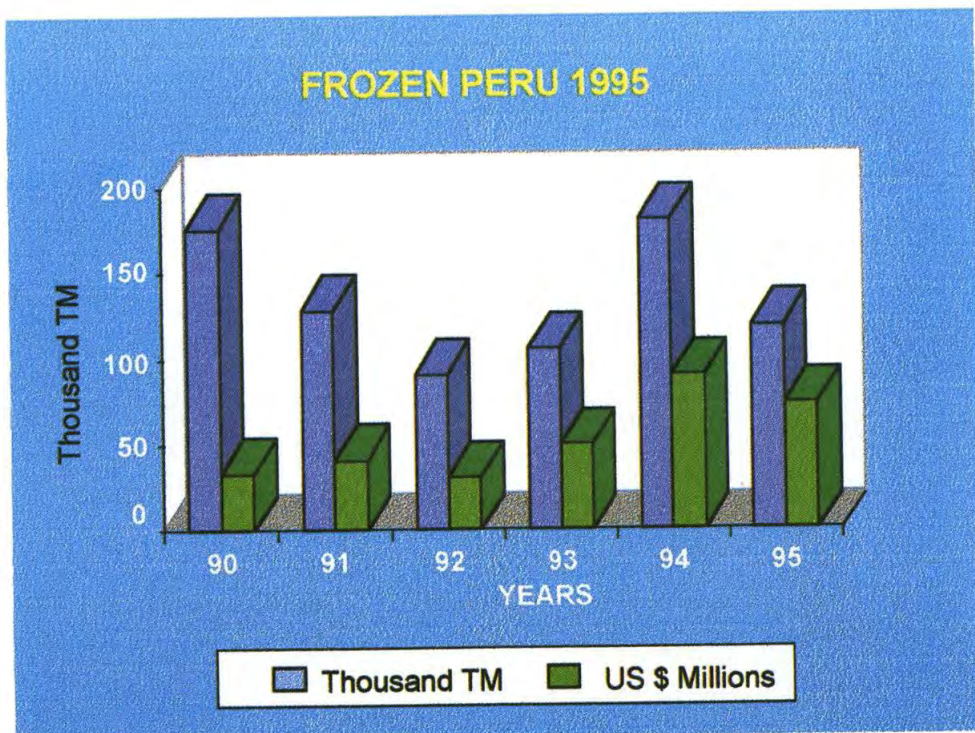


Peru's main fishmeal export markets are:

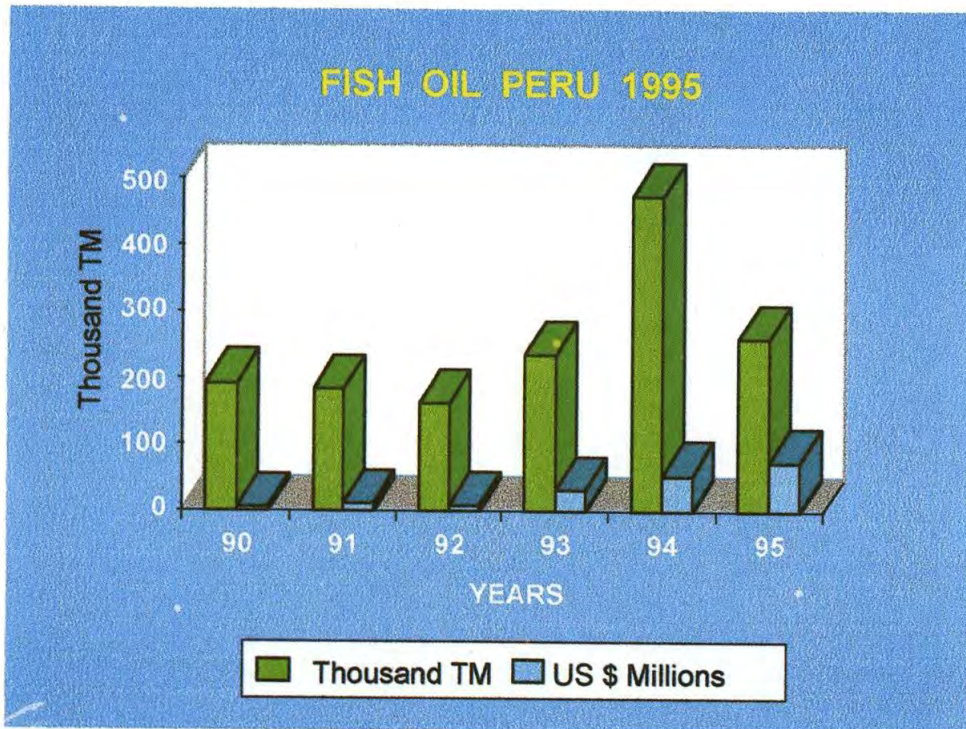
China	50%	Philippines	9%
Germany	24%	Japan	8%



Canned Products.- These products have shown a sustained moderate increase during 1991-1995.



Frozen fish products.- These products showed a similar trend like the canned products, although a decrease compared to 1994 both in volume and value has been registered.



Fish oil.- This product has showed a trend similar to that of fishmeal as the same raw material is used for both products.

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Note: This publication has been produced by IMARPE, Focal Point of the Fisheries Task Force under PERUPEC.

This document has been made possible based on the information contained in various IMARPE publications and internal documents produced throughout its 32 years of institutional life.

The basic information contained in this publication was furnished by IMARPE's General Directorate of Research on Marine Resources, Directorate of Pelagic Resources, of Demersal Resources, and of Potential Resources. The statistical and economic data have provided by IMARPE's Statistics Office.

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