PERU

ANNUAL NATIONAL REPORT TO THE SPRFMO SCIENTIFIC WORKING GROUP

2009

INDEX

1. DESCRIPTION OF THE FISHERY

1.1. Fleet composition

During last years, the operative jack mackerel fishing fleet in Peru showed low variability, reaching its highest value in 2007 with 64 purse seine vessels (Table I).

A number of 52 vessels with a hold capacity between 401 to 900 m3 have operated on average. This fleet has made about 300 to 1000 trips per year and a total of 1022 fishing trips were made in 2006.

Table I. Number of vessels operating on jack mackerel with purse seine, per year and holding capacity strata (2004 - 2008).

Year	Total	CB (m3)	Hold capacity (m3)	N° of Fishing trips	N° of vessels per hold stratum (m^3)				
					30-100	101-200	201-300	301-400	401-900
2004	45	22265	262 583	509			1	4	40
2005	41	21592	168 261	322			4	1	40
2006	52	26825	542 804	1 022		1		2	49
2007	64	32408	445 168	878		1	1	5	57
2008	56	29150	340 616	649			1	6	49

1.2. Catch per year and area

In the last five years, annual jack mackerel catch volume in Peru fluctuated between 49 000 and 280 000 tons, showing a gradual decrease from 2006 to 2008, when 121 000 tons were caught.

During this period, it is remarkable the catch decrease in the northern area and their increase in the central and southern area off Peruvian coast, which are currently the main fishing areas (Table II, Figure 1).

Table II. Jack mackerel catches with purse seine, per area and year (2004 - 2008).

Years	Total Catch (t)	Catch per area (t)		
		North boundary - 09º59' S	10º00' - 15º59`S	16º000 S - South boundary
2004	106270	0	85899	20371
2005	49476	720	16980	31776
2006	280269	65247	191637	23385
2007	188529	5286	132192	51051
2008	120748	64	50085	70599

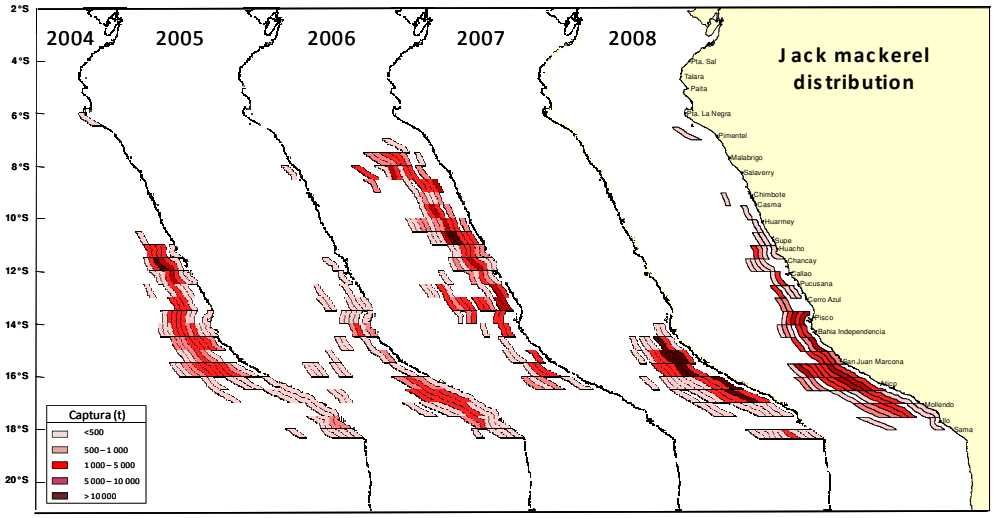


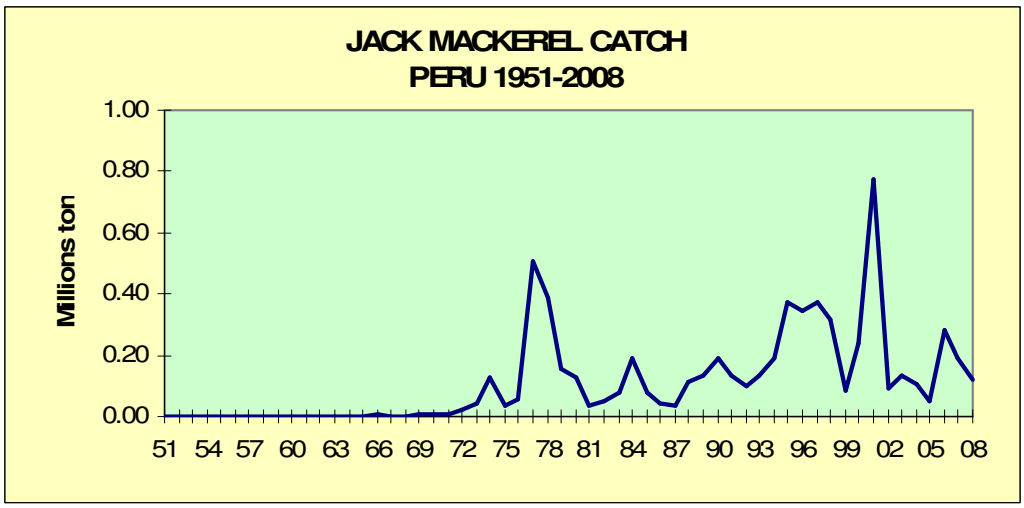
Figure 1: Jack mackerel catch distribution, 2004 – 2008 period

2. CATCH, EFFORT AND CPUE IN THE JACK MACKEREL FISHERY

2.1. Trend in catches

The historical information about jack mackerel catches in Peru indicates that maximum levels were reached in 1977 and 2002, being both influenced by the action of anchovy fleet, which temporarily aimed at jack mackerel fishing. Later on, jack mackerel catches reached between 50,000 and 280,000 tons per year, with peak values in 2006 (Figure 2).

A key point on the development of Jack mackerel and Pacific mackerel fishery was the effect of legal rule D.S. 001-2002 (06-09-2002), which established the exclusive use of these species for direct human consumption, which has restricted catches and allow development of Industrial fleet with Refrigerated Sea Water (RSW) preservation system.



Source: IMARPE

Figure 2: Total catch of jack mackerel with purse seine nets, 1951 – 2008

The species associated with jack mackerel catch, as well as incidental species are presented in Tables III and IV.

Table III. Main species related to catches of Jack mackerel with purse seine nets.

COMMON NAME	SCIENTIFIC NAME
Pacific mackerel	***Scomber japonicus peruanus***
Sardine	***Sardinops sagax***
Scads, mackerel scad	***Decapterus afuerae***
Giant squid	***Dosidicus gigas***
Eastern pacific bonito	***Sarda chiliensis***

Table IV. Incidental species associated to jack mackerel catches made with purse Seine nets.

COMMON NAME	SCIENTIFIC NAME
Sea-catfishes	***Galeichthys peruvianus***
Peruvian Hake	***Merluccius gayi***
Lumptail searobin	***Prionotus stephanophrys***
Pipefish	***Syngnathus acicularis***
Common dolphinfish	***Coryphaena hippurus***
Cabinza grunt	***Isacia conceptionis***
Smooth hammerhead	***Sphyrna zygaena***
Thresher shark	***Alopias vulpinus***
Blue shark	***Prionace glauca***
Squat lobster	***Pleuroncodes monodon***
Peruvian anchovy	***Engraulis ringens***

2.2. Fishing effort trend

The fishing effort in jack mackerel fishery, measured as fishing trips and fishing hours, showed an increase in the number of trips from 2006 onwards and reached 1022 trips with a gradual decrease in the last years.

Fishing trip duration did not show much variability and reached an average of 95 hours per trip. In 2008, trips duration was 60 hours, on average (Figure 3).

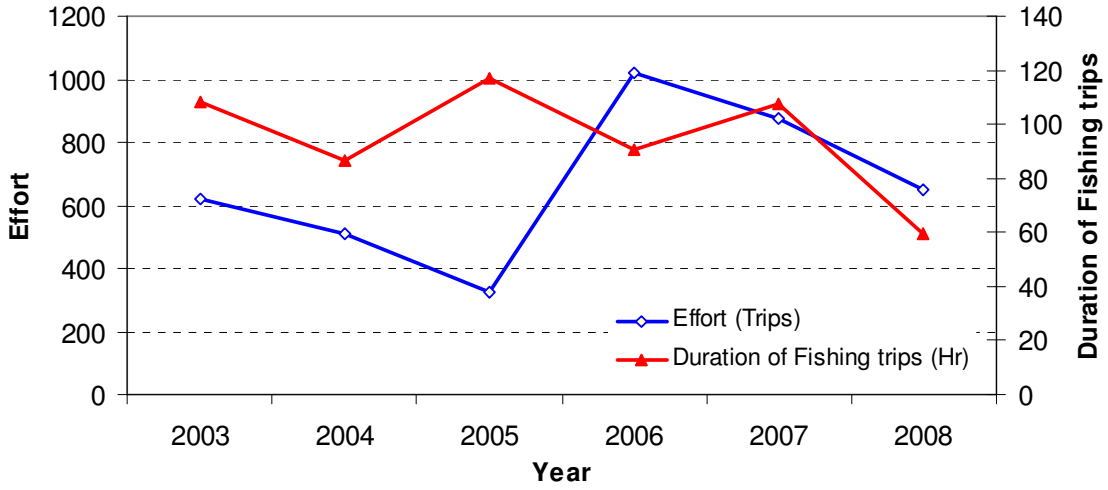


Figure 3: Number of fishing trips and duration of fishing trips with purse seine nets, 2001 – 2008 periods.

2.3. CPUE trends

In purse seine jack mackerel fishery in Peru two CPUE indicators are present. Both indicators: catches/ fishing trips and catches/trip hour showed the same trend, with highest values in 2008. However, a strong decrease has occurred during the last few years (Figure 4).

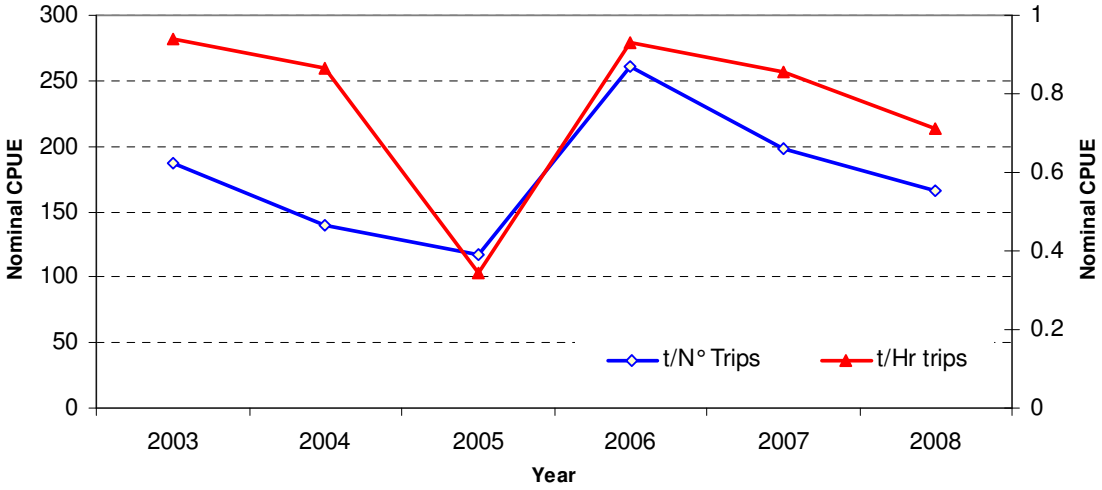


Figure 4: Nominal CPUE; tons of jack mackerel by fishing trips and tons of jack mackerel by duration of fishing trips, 2001 – 2008.

3. RESEARCH ACTIVITIES AND DATA COLLECTION

The Monitoring of pelagic fisheries and research surveys conducted mainly for anchovy, allowed to gather the fishing effort and biological data of jack mackerel and pacific mackerel. Nevertheless, we are aware of the necessity of getting data from 100 nautical miles offshore, in order to have more elements for fisheries management.

The study area, cover all the Peruvian coast, which is dominated by the Humboldt eastern boundary current system. The main pelagic species are anchovy (*Engraulis ringens*), sardine (*Sardinops sagax*), jack mackerel (*Trachurus murphyi*) and pacific mackerel (*Scomber japonicus*). Stock assessment of the main pelagic resources were made with the hydroacoustic method, using a SIMRAD echosounder - echointegrator EK 500 and EK 400 operating at 120 and 38 Khz to a depth of 250 m (IMARPE, 1997). Currently a combination of direct and indirect methods is used.

IMARPE conducts a special research on Jack and Pacific mackerel, with focus on biology, habitat and fisheries, based on the Program "Bio-oceanographic research of Jack mackerel and Pacific mackerel resources", approved by Ministerial Resolution N° 489-2008-PRODUCE on May 20, 2008, with financial support by Vice-Ministry of Peruvian Fishery, with the purpose of getting integral knowledge of the biological and fisheries features of this resource.
All the research about jack mackerel includes the following projects:

Pelagic Resources Monitoring Program:
The main goal of this program is the collection of daily information on composition and size of catches that is later integrated in a large database which is the source for population's dynamics models construction. The pelagic resources monitoring program, integrate data from different sources such as: land sampling, vessels sampling and Satellite Information Systems. Results are obtained in real time and they give information about fishing zones, distribution, size, sexual maturity and SST.

Fishing Logbooks Program:
This program Is an onboard observers program aiming to monitor the purse seine fleet. It is an important tool which supports the pelagic fish stock assessment and management in Peru. The program has evolved since its beginning and is now being up dated to the framework of the Ecosystem Management. Currently, the monitoring issues are: effective effort, discards, biologic data collection, sightseeing of birds, mammals and turtles, collecting of water samples, taking pictures of acoustic records, among others. Once the information is obtained, it is immediately transmitted through mobile telephone systems and received by IMARSIS database in order to be analyzed in "real time".

Hydroacoustic direct assessments and application: This activity is developed to determine spatial distribution, relative or absolute abundance index to recommend management measures (Figure 5).

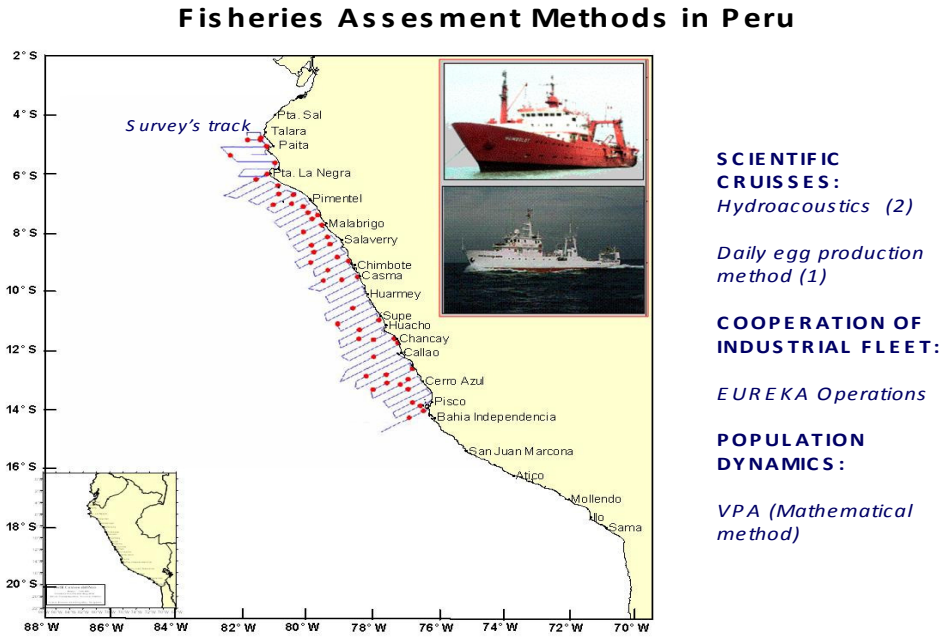


Figure 5. Fisheries Assessment methods in Peru

Satellite Monitoring of fishing fleet: This system is used to monitor fishing vessels fleet activities in "real time".

The use of this kind of data allows the access to diary information on the main fishing areas where the industrial fishing fleet operates. Once this information is complemented with biological data obtained on board, it allows to evaluate the magnitude of the fishery in a daily basis and the occurrence of fishing and nursery grounds.

4. BIOLOGICAL INFORMATION

4.1. Biological sampling

The biological information is obtained through random two-stage stratified sampling, where 10 individuals from each size range are considered. With this sampling, information about length, weight, sexual maturity, gonad and weight length are obtained. Ovaries, otoliths and stomach samples are taken to perform ovarian tissues, age, growth and feeding diet analyses, respectively. Sampling is done twice a month at all IMARPE coastal laboratories.

4.2. Length and age composition of catches

The jack mackerel annual size structure during 2004 - 2008 had a polimodal structure. There is a remarkable presence of a high recruitment in 2005 and a very high percentage of adult individuals in 2007 and 2008, which had a modal size between 33 and 35 cm of total length (Figure 6).

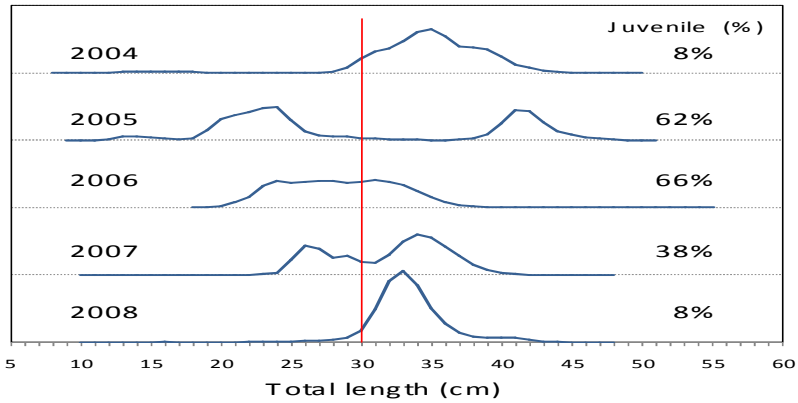


Figure 6. Annual Size structure of jack mackerel catches in percentages during 2004 – 2008

A general view of the jack mackerel size structure in the Southeast Pacific during 2008, shows the simultaneous presence of a remarkably homogeneous size group in central and southern area off Peru and North of Chile (Figure 7).

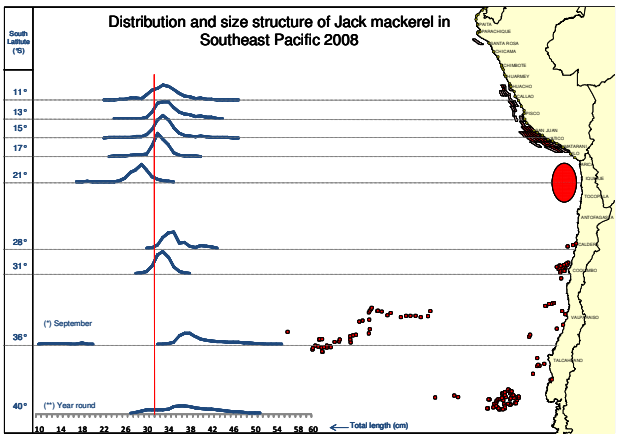


Figure 7. Distribution and size structure of jack Mackerel in Southeast Pacific during 2008.

4.3. Biomass estimates and inter-decadal changes

Jack mackerel biomass estimates for the period 1983- 2004, obtained by acoustic method in the Peruvian coast, clearly show two phases: a high biomass phase from 1983 to 1996 (average biomass= 4´ 800,000 tons) and a low biomass phase from 1997 (average biomass = 450, 000 tons), to present (Figure 8).

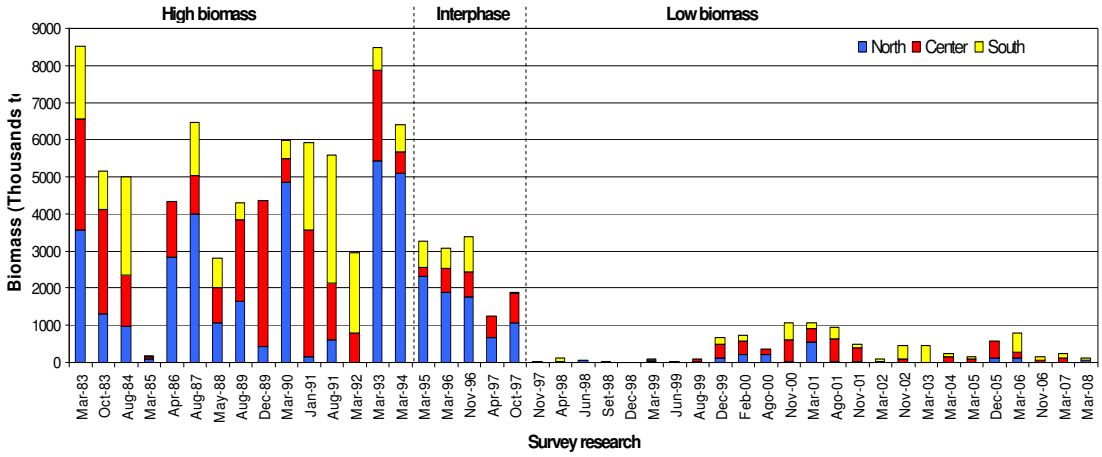


Figure 8. Jack Mackerel Biomass, according to Acoustic Assessment Survey (1983-2007)

In the period 1998 – 2008 the decrease of jack mackerel biomass could be linked to an increase in giant squid abundance, mainly in the north part of Perú (Figure 9). The areas occupied by jack mackerel before the mid 90's are now occupied by giant squid *Dosidicus gigas.*

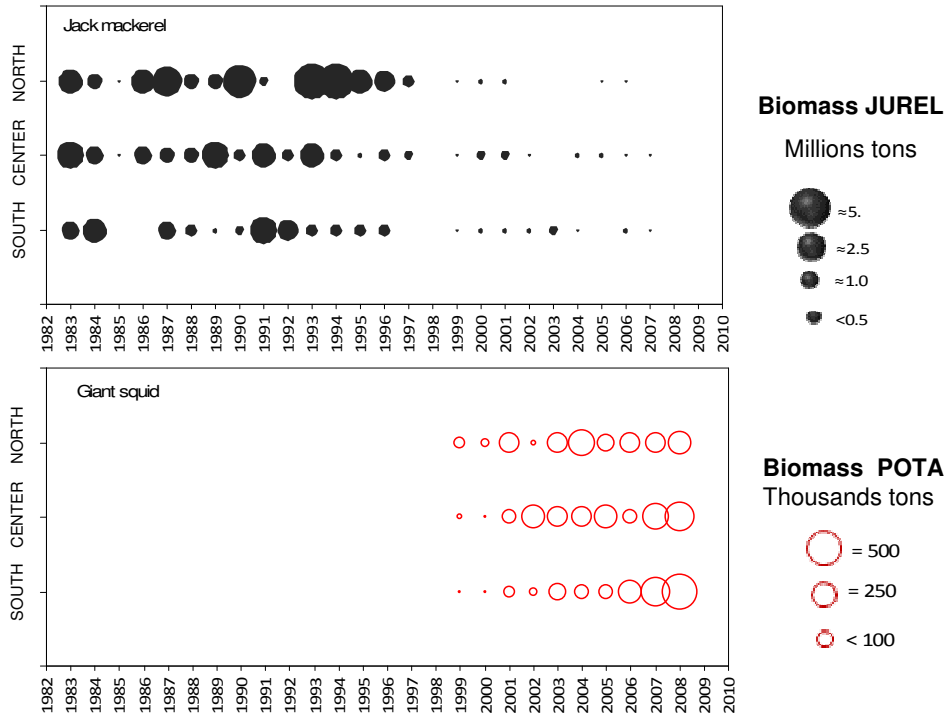


Figure 9. Distribution of Jack Mackerel biomass and Giant squid biomass in Peru during 1982-2009.

There is also reference that the depth of the oxygen minimum zone is shallower since the 90's, so it is understood that climate has played an important role in the decreasing availability of jack mackerel off Peru.

4.4. Biomass estimates by age-structured stock assessment models

A series of stock assessment models was implemented in order to estimate the available biomass of jack mackerel off Peru during the last ten years. Stock abundance and biomass, fishing mortality and exploitation rate were estimated by two approaches: Statistical Catch at Age Analysis (CAGEAN) and ADAPT. Parameters to models (growth, age-length key, sexual maturity, weight and age) were estimated from fishery monitoring and surveys data. The CAGEAN was first tuned with commercial catch, acoustic biomass and catch per unit effort, later only with commercial catch and acoustic biomass. ADAPT was tuned only with acoustic biomass.

Available biomass off Peru estimated by the 3 models showed similar trends but slightly differences. Since 1999 to 2008, the highest biomass (between 1 and 2 million t) was observed in 2001, after that biomass has kept almost constant (about 0.3 million t). As well as biomass, fishing mortality estimated by all the models showed similar trends. The highest value was observed in 2001, the lowest from 2002-2005, while medium values were observed from 2006- 2008.

5. PORT OBSERVER AND SAMPLING PROGRAM

The sampling aims to obtain the maximum number of samples to cover the largest possible geographical area, where the fishing fleet is distributed, assuming its position is related to the highest resource concentration. This improves the probability to obtain representative samples obtained from the population in study (Figure 10).

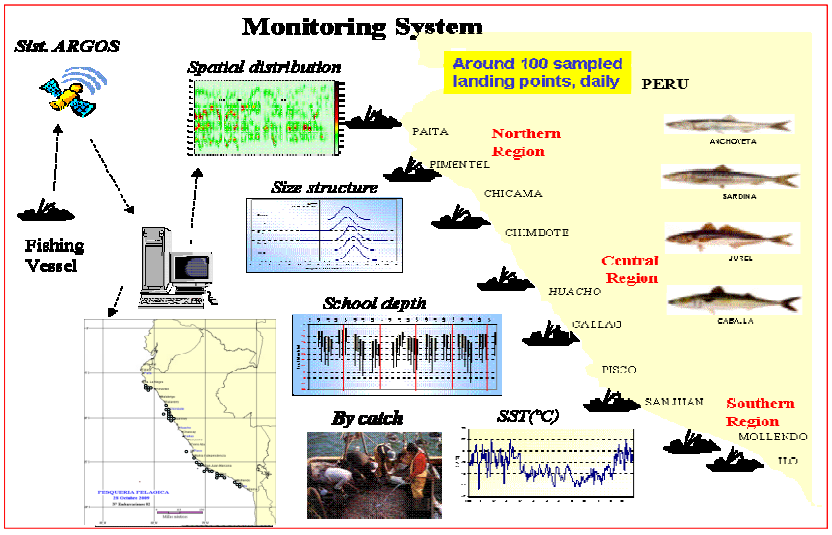


Figure 10. Port observer and monitoring system in Peru

IMARPE head office is located in Callao. However, there are 9 laboratories in the Peruvian coastal region Tumbes, Paita, Santa Rosa, Huanchaco, Chimbote, Huacho, Pisco, Ilo and Puno and temporal stations in Chicama and Matarani.

6. IMPLEMENTATION OF MANAGEMENT MEASURES

6.1. Biological measures

Among the main regulative measures, the following are remarked:

- Mesh size: 38 mm or 1½ inch.
- Minimum catch size: 31 cm.
- Juveniles limit in catch: 30% of total weight.
- Jack and Horse Mackerel Fishery Law N° 011-2007-PRODUCE (12th April 2007), that promotes a rational exploitation of this fishery resources.

6.2. Effort control

The legal rule D.S. 001-2002, since 2002 established exclusive use of these species for direct human consumption, which has restricted catches and allowed the development of industrial fleet with Refrigerated Sea water systems.

In the late '90s started satellite monitoring of vessels, and from 2003, the Government of Peru ordered the implementation of satellite-based vessels monitoring systems in both: large scale and wooden industrial fishing vessels (D.S. N° 031-2003-PRODUCE).

The aim was to promote the development of the national fishing activity in high seas, mainly in the South East Pacific Ocean area. On July 2009, a legal rule named D.S. 022-2009-PRODUCE established the regulatory provisions for the exploitation of straddling species, such as jack mackerel and horse mackerel, by national large scale fishing vessels in high seas.