



11th Meeting of the Science Working Group  
Lima, Peru, 15-19 October 2012



## PERU

# CHARACTERISTICS OF THE PERUVIAN STOCK OF JACK MACKEREL (NORTHERN STOCK) IN THE SOUTHEAST PACIFIC AND NOTES ON THE SCIENTIFIC BASIS FOR ITS DIFFERENTIATION

# CONTENT

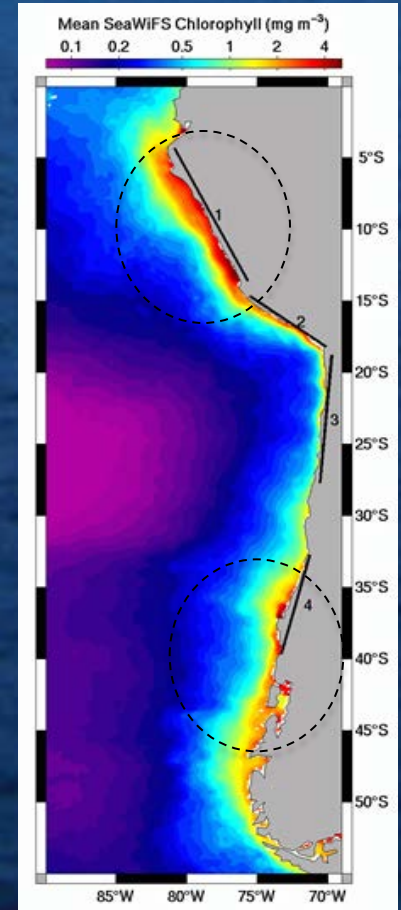
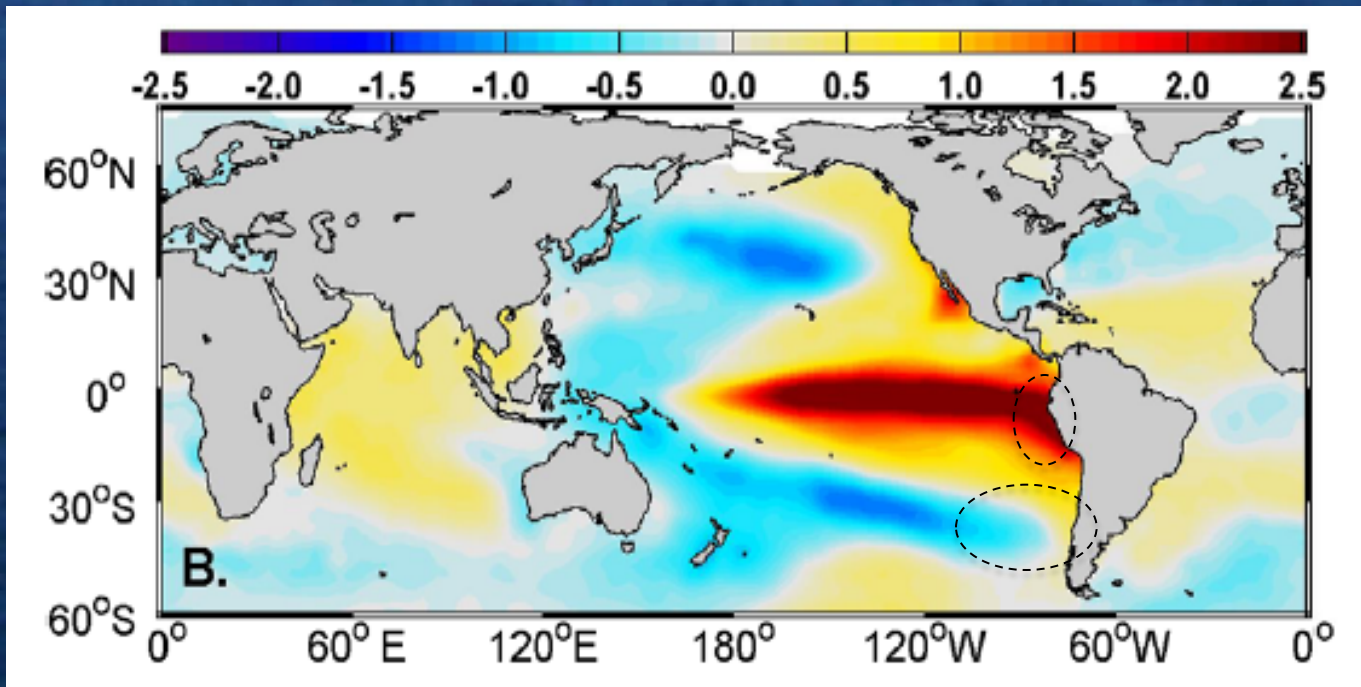
- **Introduction**
- **Characteristics of the Peruvian stock**
  - Habitat
  - Life cycle parameters
  - Growth & Natural Mortality
  - Size at First Maturity
  - Spawning Cycle
  - Spatial distribution
  - Trophic relationships
  - Parasitism
- **Conclusions**

# INTRODUCTION

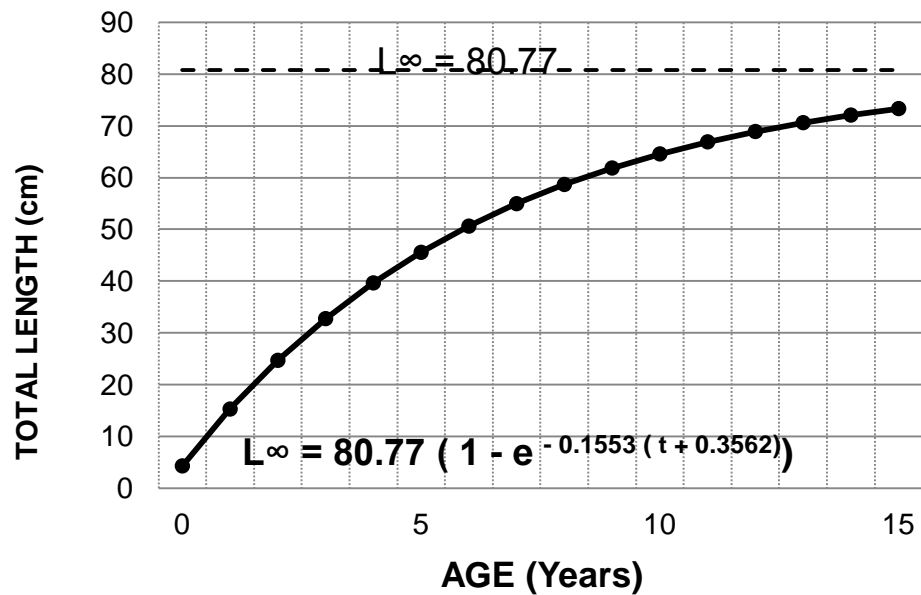
- From fisheries management perspective, it is required that the group of fish subject to a fishery:
  - must be able to reproduce amongst themselves; -
  - must have similar life history characteristics;
- To identify stock units, the first fundamental step is to understand the life cycle characteristics of an exploited resource, before attempting more specific stock identification studies.

# HABITAT

There are marked differences both in Variability and Productivity, between the habitats of jack mackerel Off Peru and off Chile.



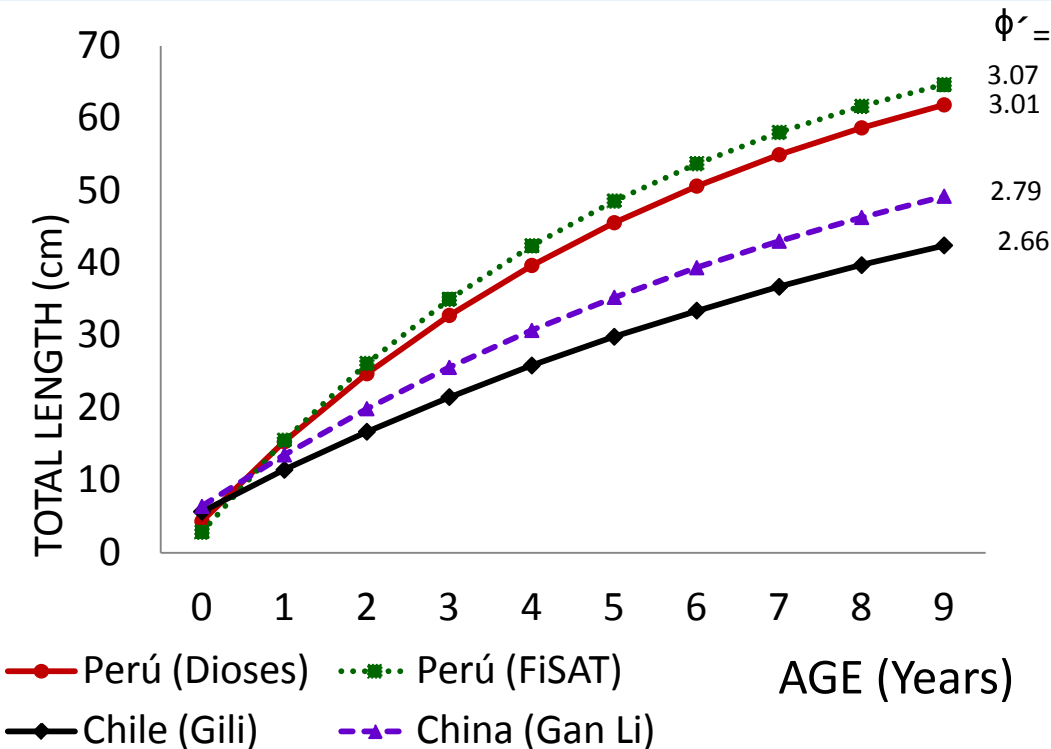
The jack mackerel off Peru lives in a more uncertain environment.  
In such circumstances jack mackerel must be a “more r strategist” species



A faster growth of jack mackerel off Peru.

A HIGHER Natural Mortality (M)

Method	M (year)
M (Pauly)	0.33
M (Jensen)	0.23
M (Froese)	0.36
M (Hoenig)	0.31
<b>M average</b>	<b>0.31</b>

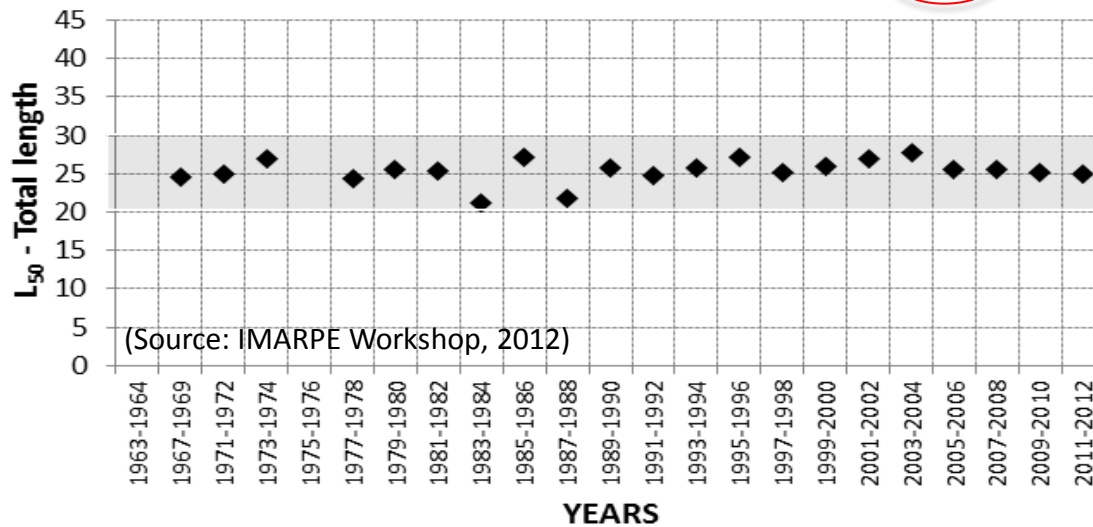


Note:

Horse mackerel (*Trachurus trachurus*) from Mauritanian coasts are differentiated mainly by its higher growth rate, from other European stocks. (Abaunza, et al, 2008)

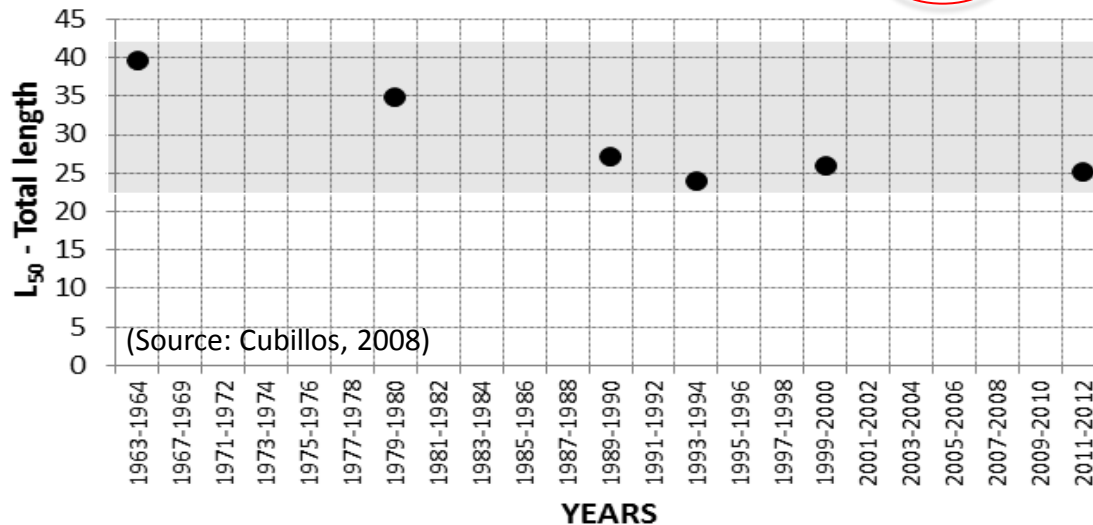
# SIZE AT FIRST MATURITY

## Mean Size at First Maturity of Jack mackerel - Peru



There is no trend along time in size at first maturity of jack mackerel, off Peru.

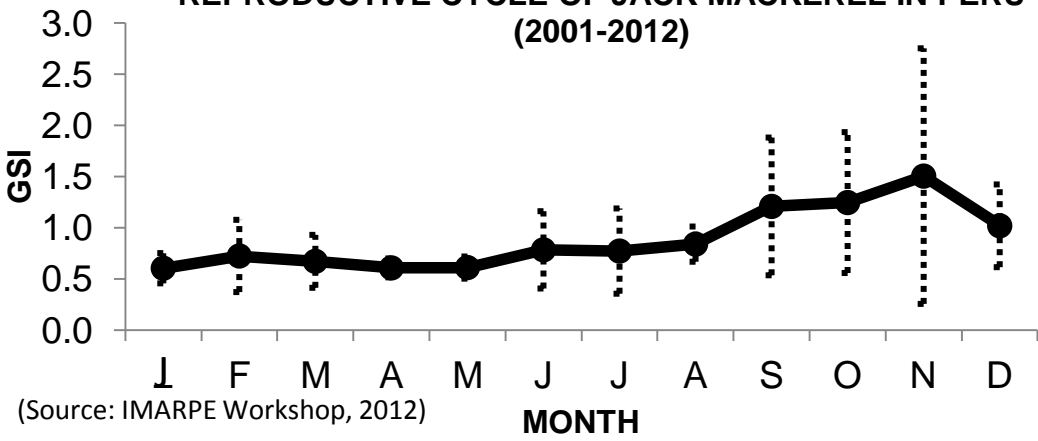
## Mean Size at First Maturity of Jack mackerel - Chile



It has an earlier sexual maturity

Note:  
*In Peru, all the analysis was based only in females.*

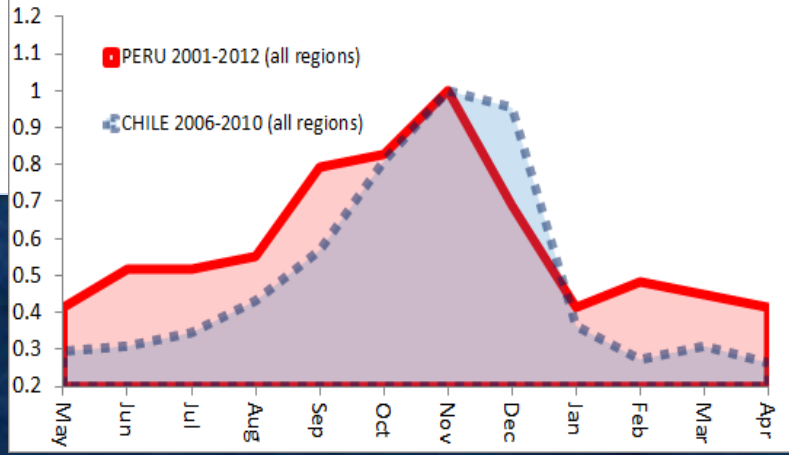
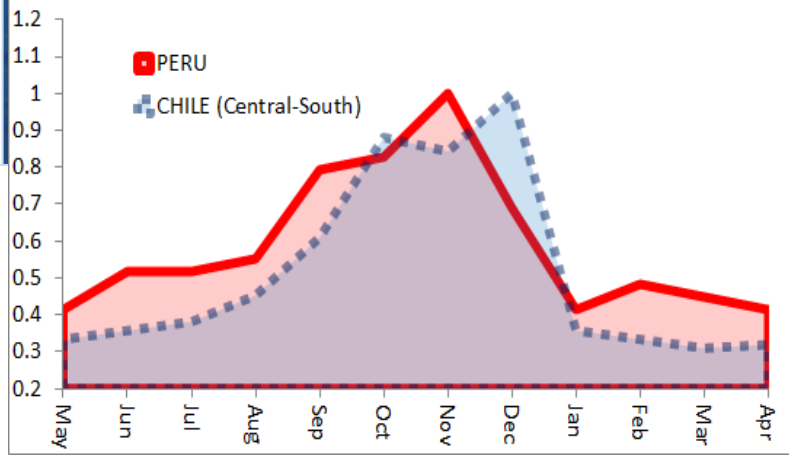
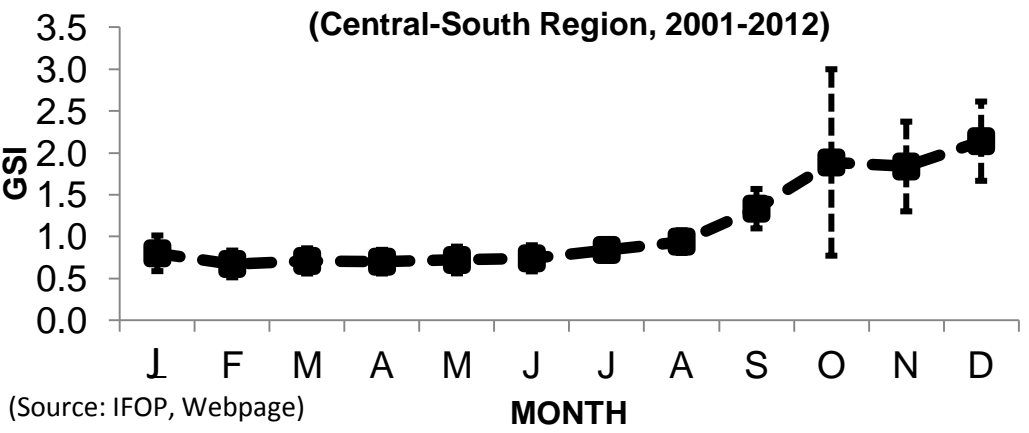
### REPRODUCTIVE CYCLE OF JACK MACKEREL IN PERU (2001-2012)



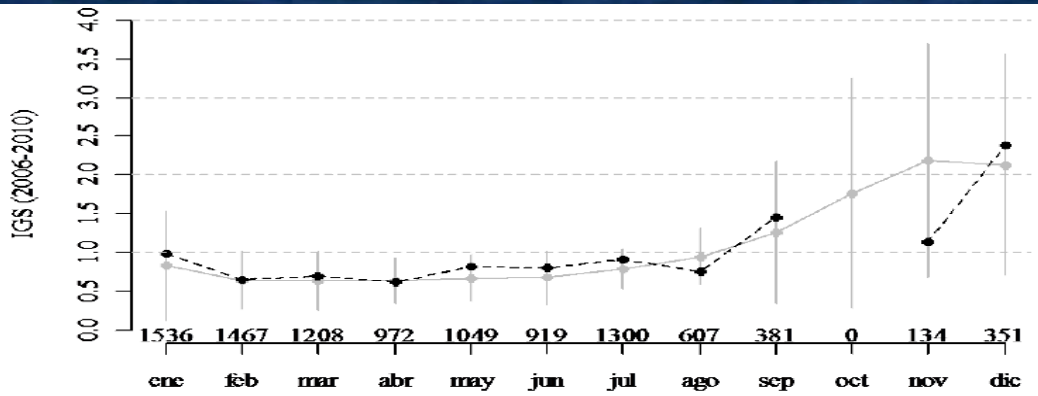
### SEASONALITY:

Same regional signal, some differences in amplitude: a wider seasonality off Peru

### REPRODUCTIVE CYCLE OF JACK MACKEREL IN CHILE (Central-South Region, 2001-2012)

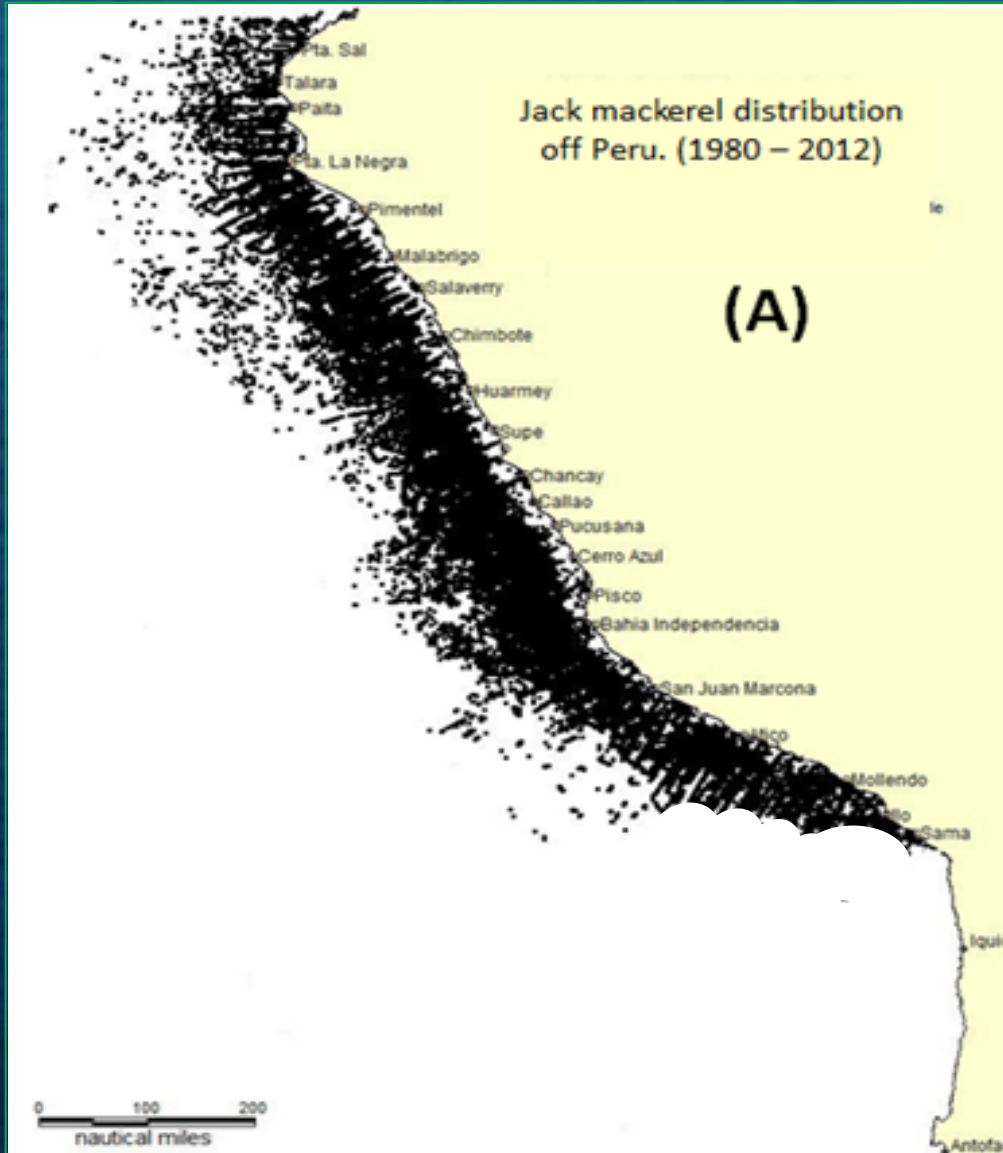


STANDARDIZED VALUES (Max. GSI = 1)



(Source: Leal, Díaz & Saavedra, 2012 –SWF-11-07)

# A WIDE SPATIAL DISTRIBUTION OFF PERU 32 YEARS OF DATA (1980-2012)



Distribution of jack mackerel is wide and occupies all the Peruvian sea and the adjacent high sea.

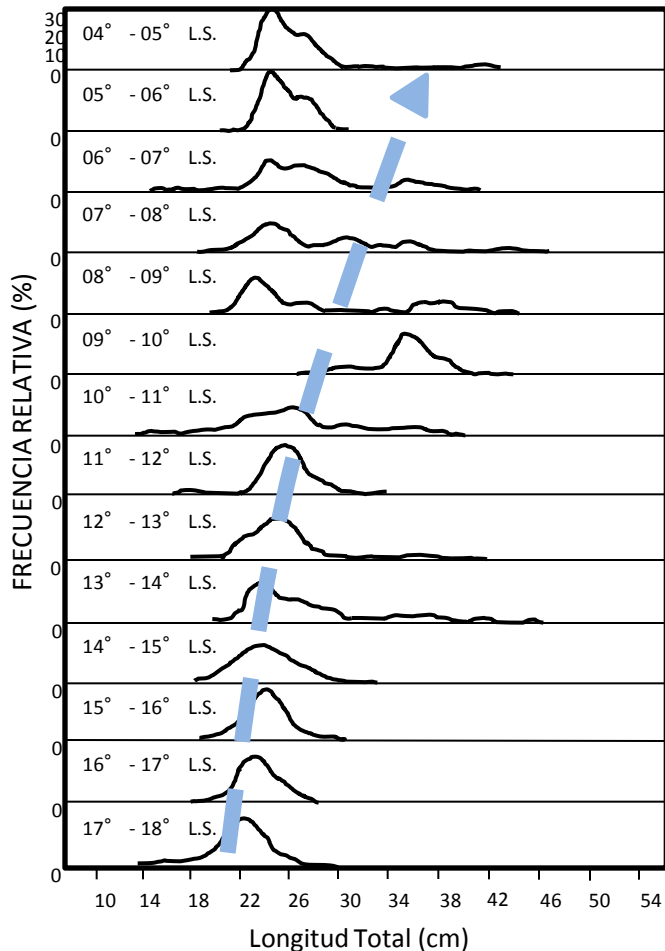


# A DIFFERENT ONTOGENETIC MIGRATION: South–North Pattern

Aug – Sep 1987

Jan – May 1990

Jan- May 2011



ESTRUCTURA POR TALLA DE JUREL, SEGÚN GRADOS DE LATITUD, DURANTE EL CRUCERO, BIC HUMBOLDT Y SNP-I 8708-09

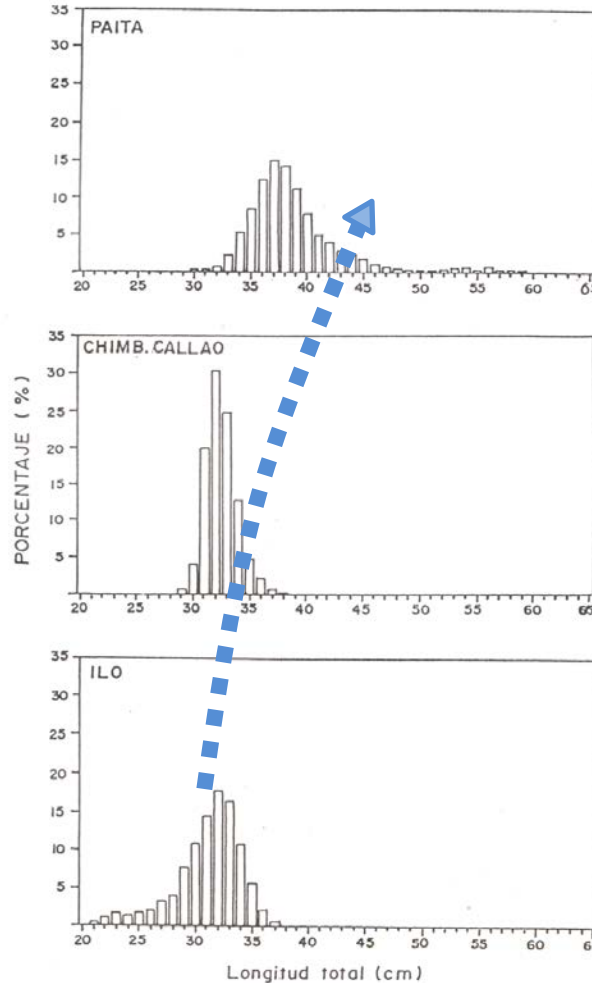
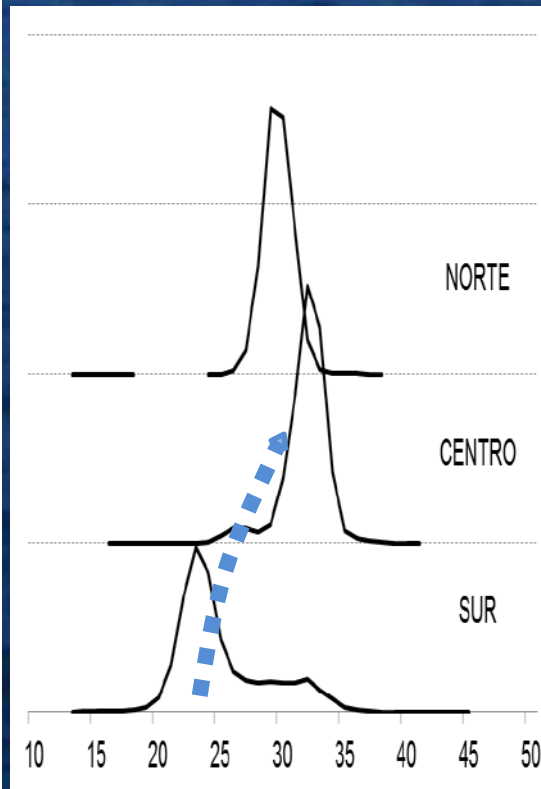


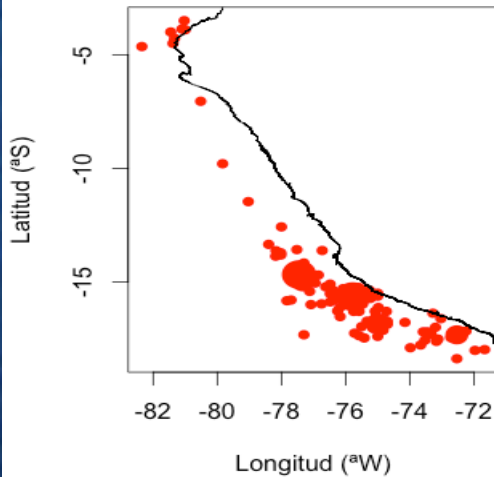
Fig.20 Estructura por tallas de Jurel, periodo: Enero-Mayo 1990.



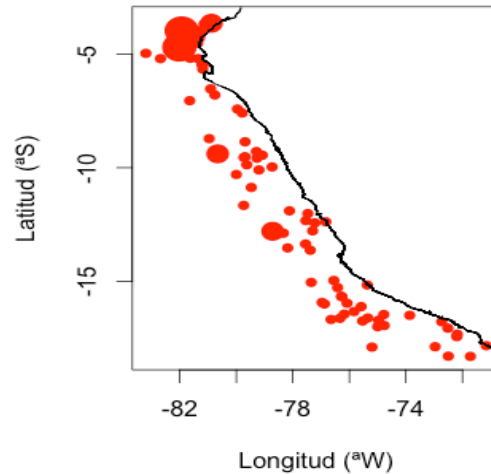
# A MAIN SPAWNING CENTER

## Distribution of Jack mackerel larvae

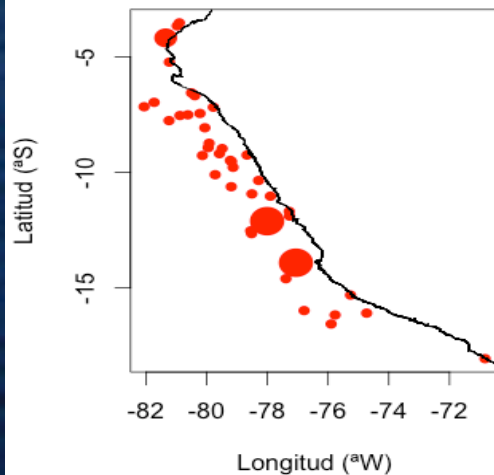
1970 - 1979



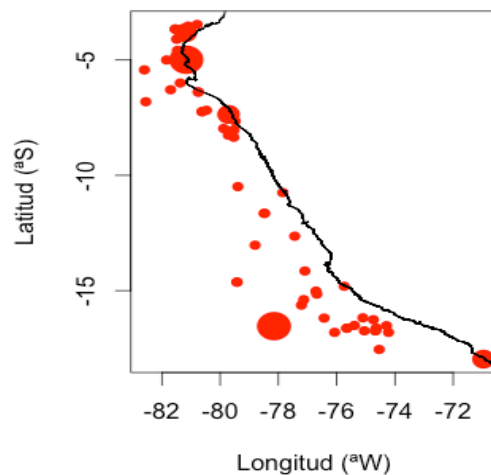
1980 - 1989



1990 - 1999



2000 - 2010

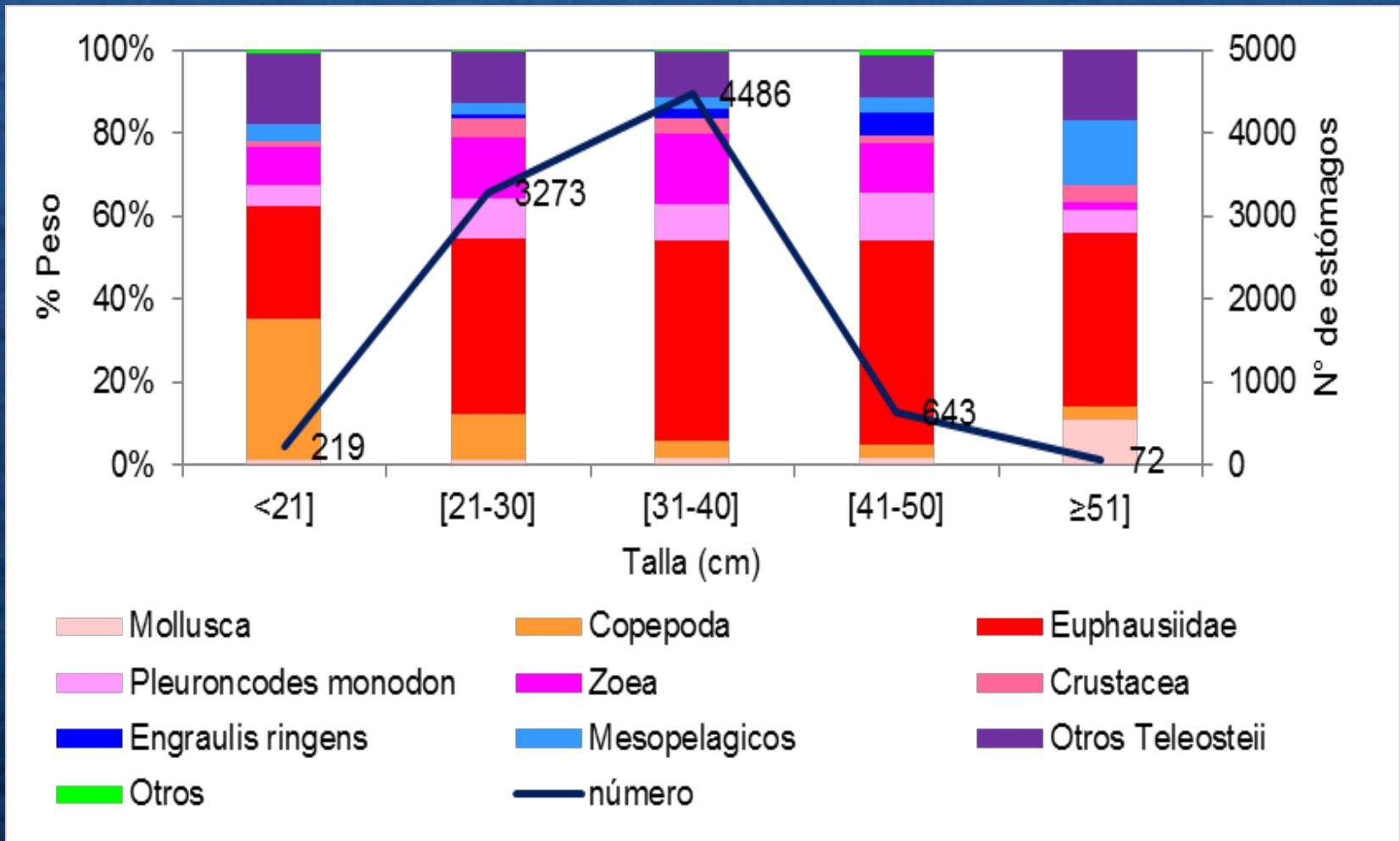


**Range = 03 – 1131  
larvae/m<sup>2</sup>**

**Median = 21  
larvae/m<sup>2</sup>**

**The Peruvian Coast is a main spawning center:**  
Range and median values are in the same order of magnitude than those found off Chile.

# AVERAGE TROPHIC SPECTRUM: 1977 - 2011



Euphausids are the more abundant group of the zooplankton community in the Peruvian sea. There is no need for large jack mackerel to migrate to southern latitudes, to find euphausids, due to “lack of food” as was proposed by Elizarov et al, (1993).

# Summary of characteristics of Peruvian stock of jack mackerel:

- the habitat, with high productivity related to the high environmental variability,
- a “more r” adaptive response to this habitat (in respect to other stocks of the region),
- faster individual growth,
- a south-north ontogenetic migration pattern with all phases of the life cycle being present off Peru,
- higher plasticity of the reproductive behavior as adaptation to a different and more variable climatic regime,
- long term stability of size (and age) at first maturity,
- a permanent main spawning center off Peru

**THE END**