Chilean Jack Mackerel Workshop

South Pacific Regional Fisheries Management Organization

Distribution changes and interactions of Jack Mackerel off Peru as observed using acoustics (1983-2008)

providing ecological insights from sound

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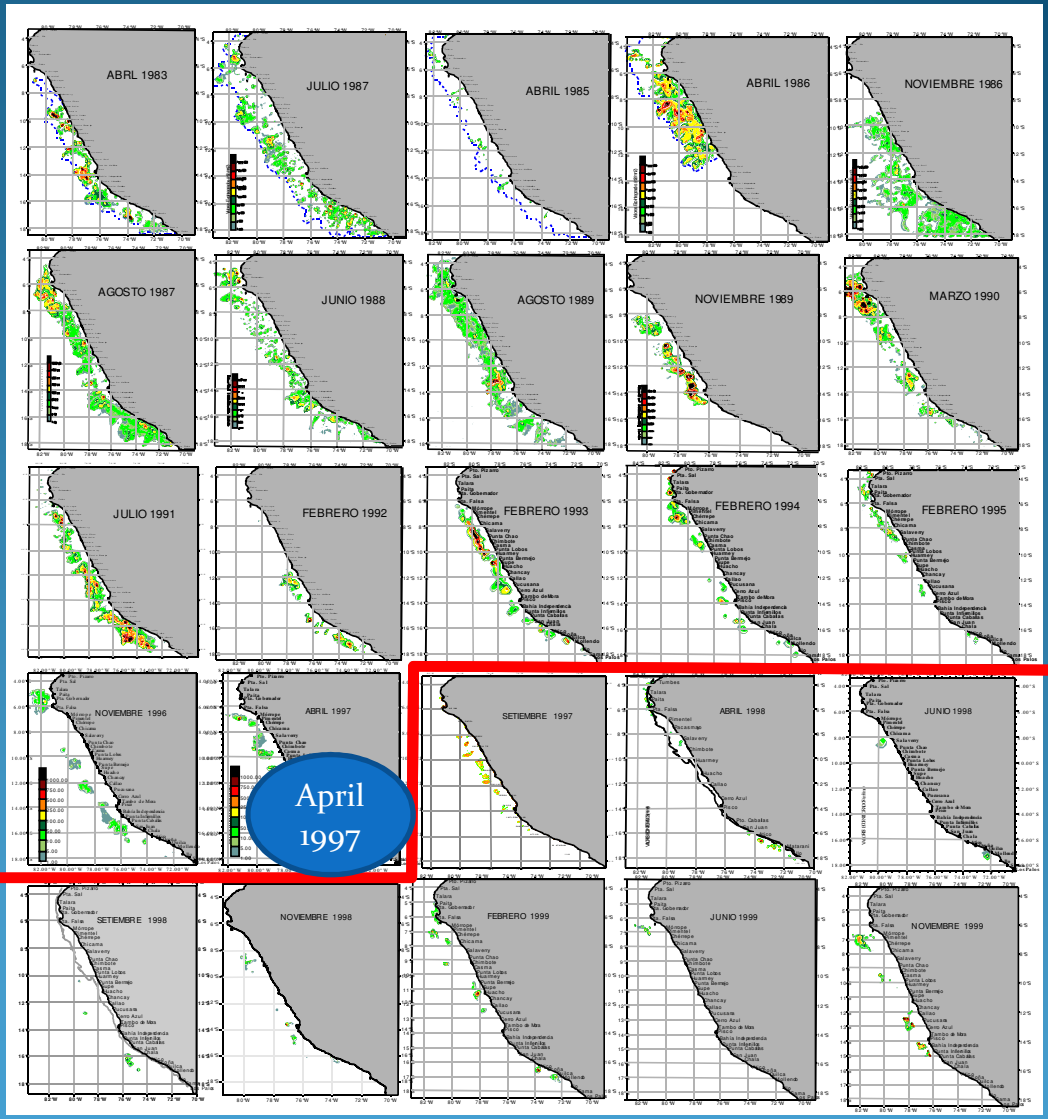
Introduction

- A new (peruvian) fishing fleet had replaced the operation of foreign vessels by mid the 1990's.

- Ecosystem off Peru has become colder since last strong El Nino (1997-98).

- A Regime shift affected distribution and abundance patterns of Jack Mackerel (JM) and others as well.

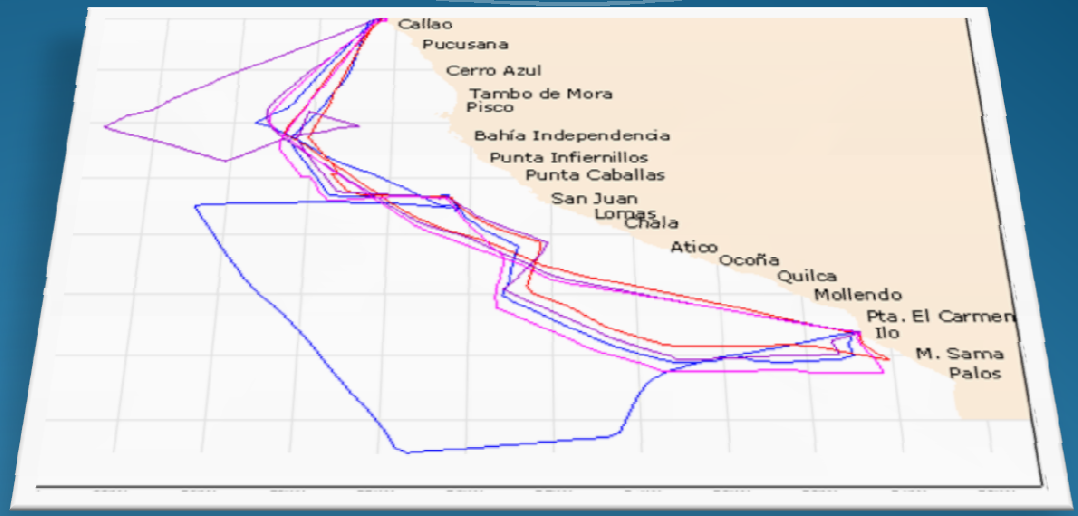
- We're studying the changes in habitat range of on JM.



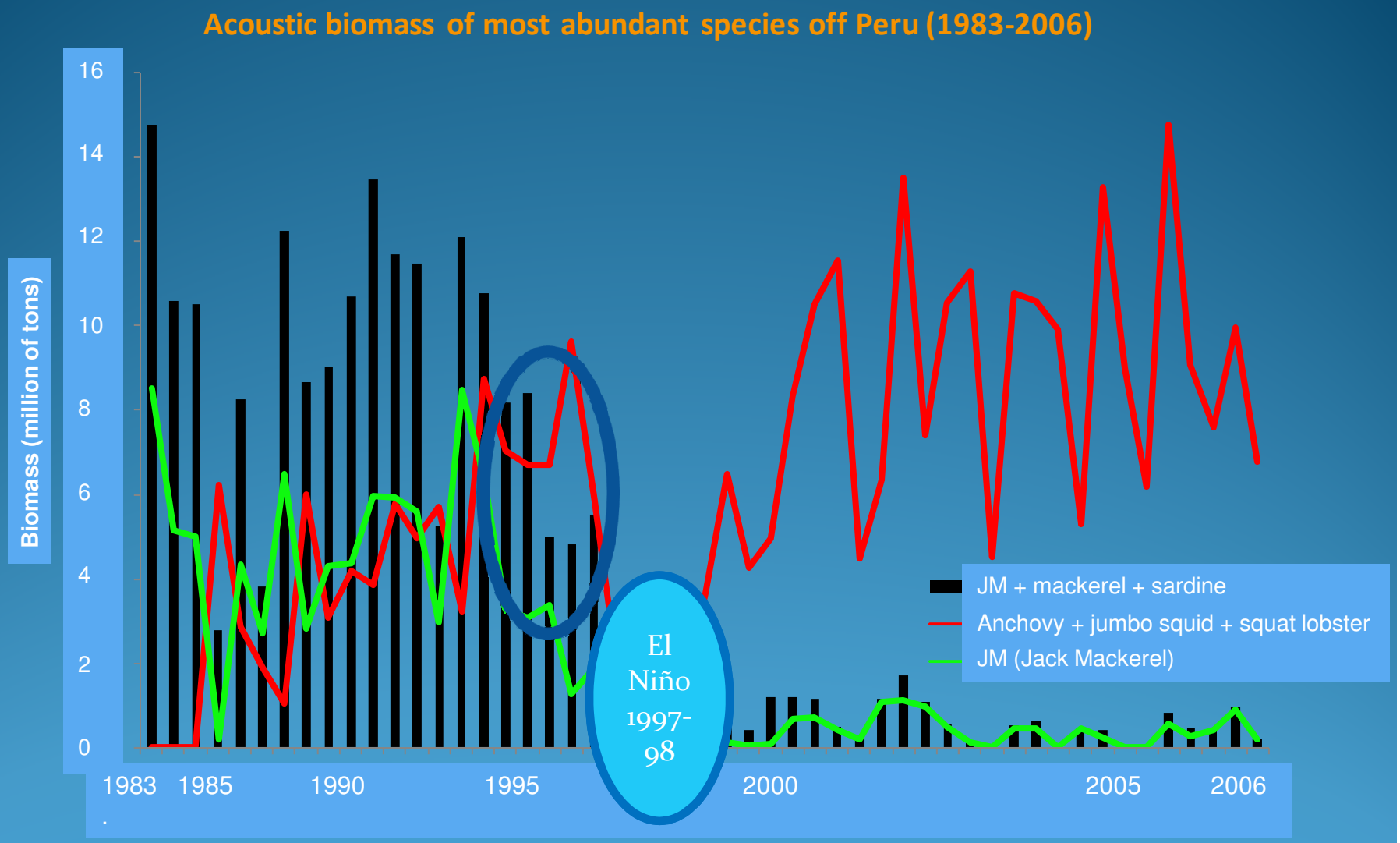
Gutiérrez et al, in prep.

Methods, surveys

- 45 Scientific Acoustic Surveys.
- Fishery-Acoustic Surveys
- CTD probes
- Digital echo sounders
- Acoustic software
- Fishery statistics
- Trophic ecology techniques
- GAM approach to analyze non linear relationships



Long-term changes in biomass composition



Gutiérrez et al, in prep.

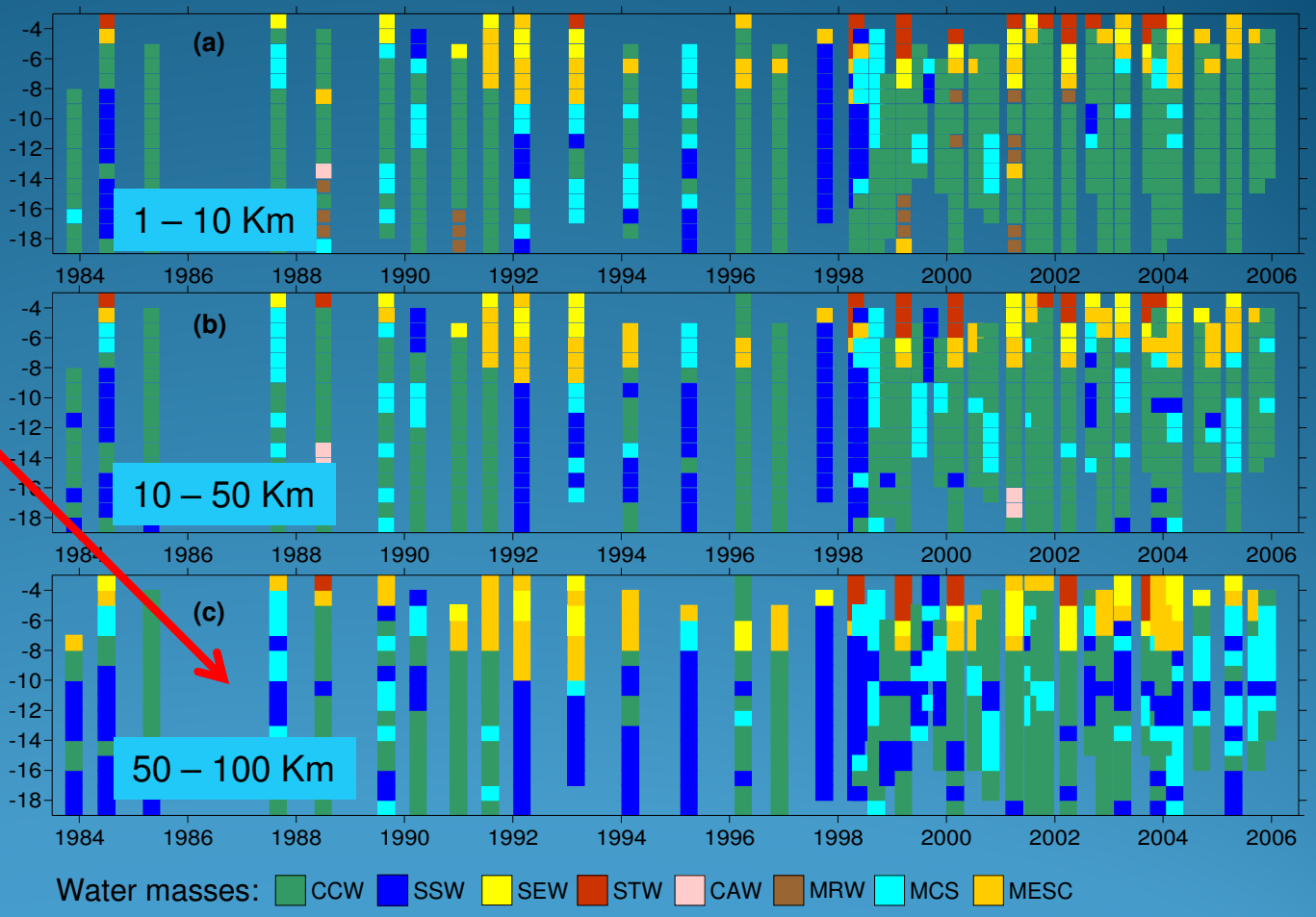
Water masses changes (1983-2006)

•Slight changes in surface water masses composition.

• Only the band from 50 to 100 km off shore shows an increase of area covered by coastal and mixed waters.

• 1990 decade is biased by summer surveys.

•Then, no obvius change on salinity.

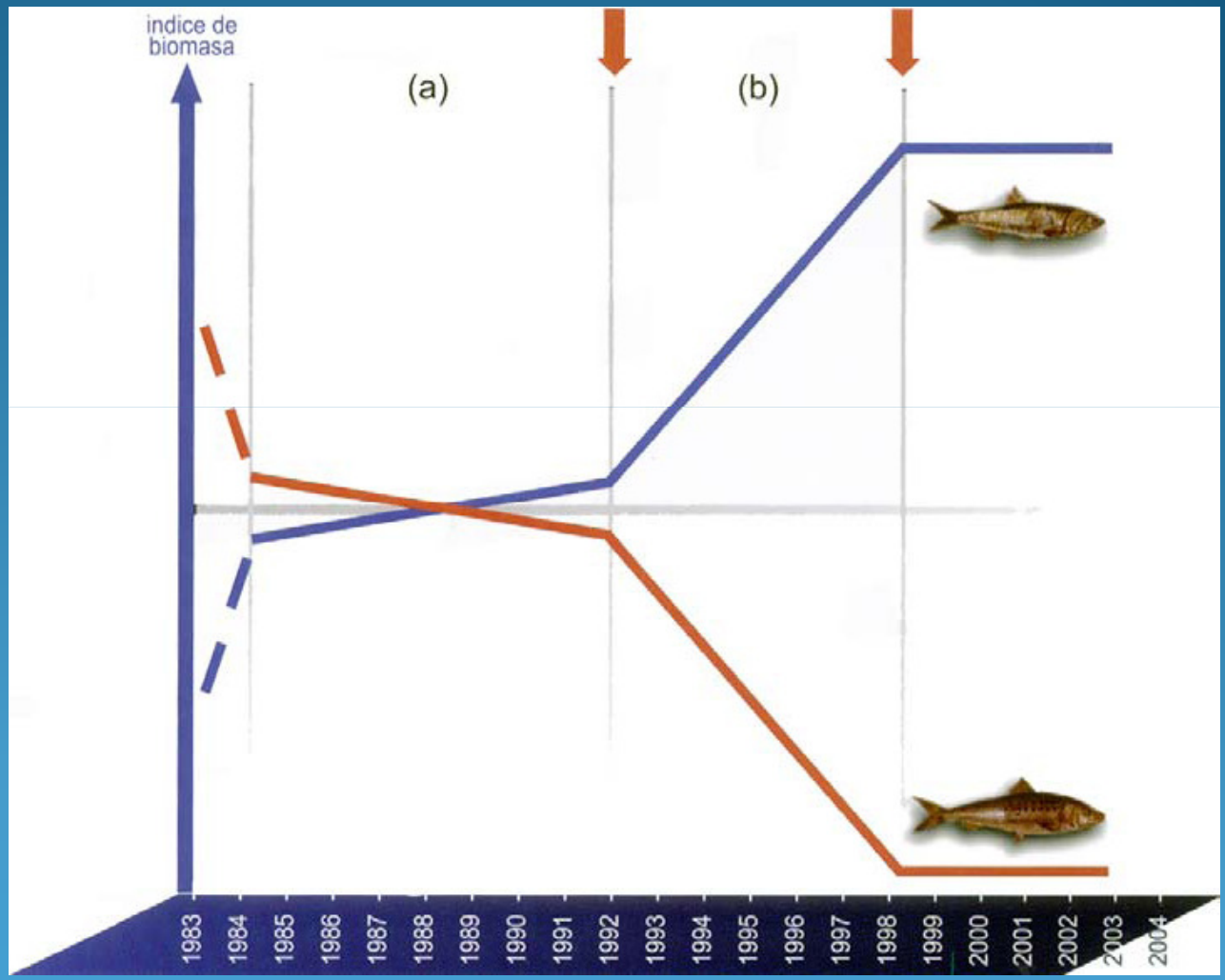


Water masses composition along peruvian coast as observed during acoustic surveys between 1983 to 2006. Top panel shows the distance from 1 to 10 km off shore; middel panel is the range from 10 to 50 km, and bottom panel is the distance from 50 to 100 km from the coast.

Swartzman et al, 2008.

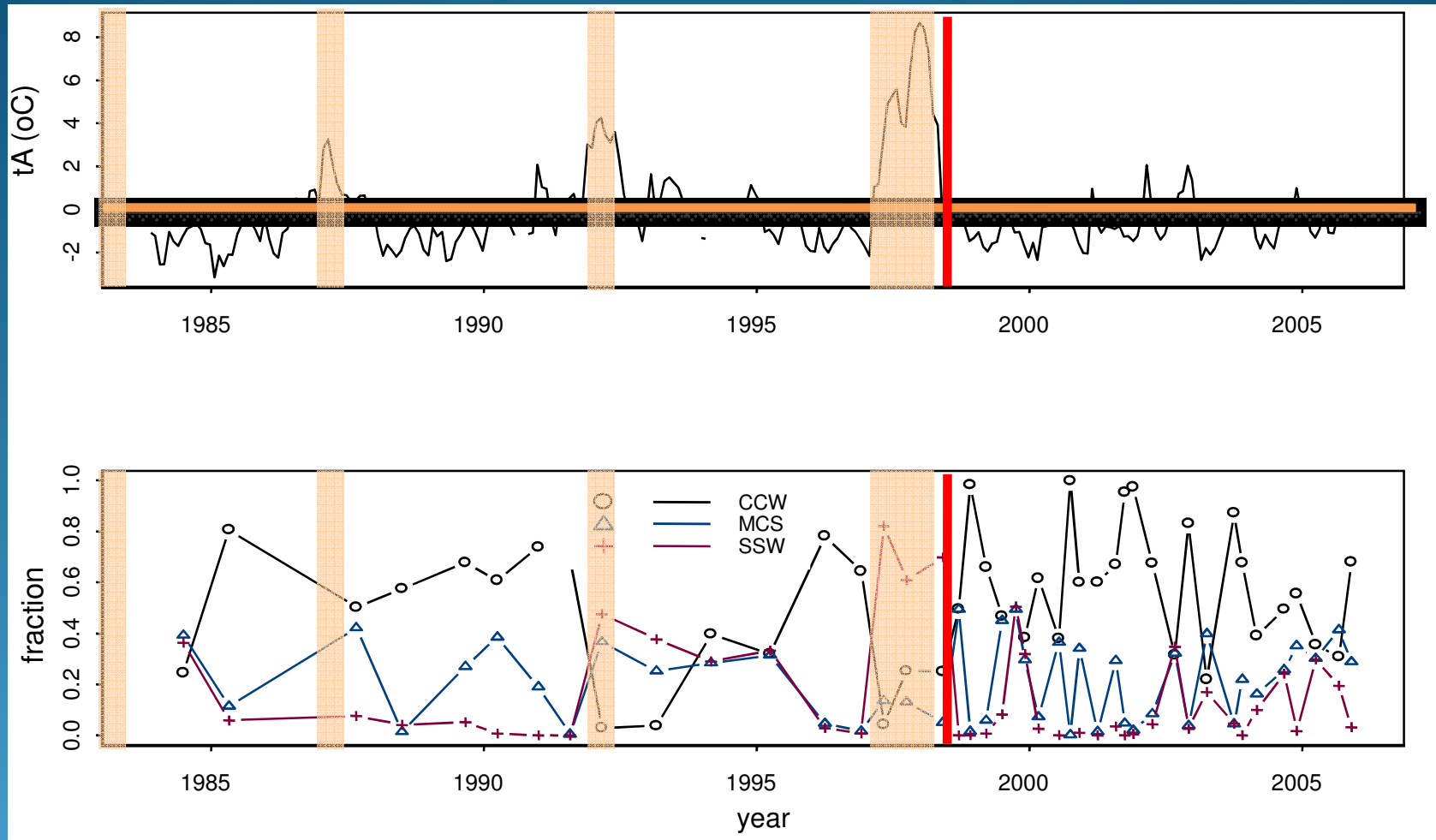
Regime shifts and changes in habitat range

- Biological triggers of regime shift are still hided.
- Changes not only influenced on anchovy and sardine.
- Furhermore there have been changes in planktonic communities (Ayon et al in prep. etc etc)



Gutiérrez et al, 2007

Regime shifts and changes in habitat range



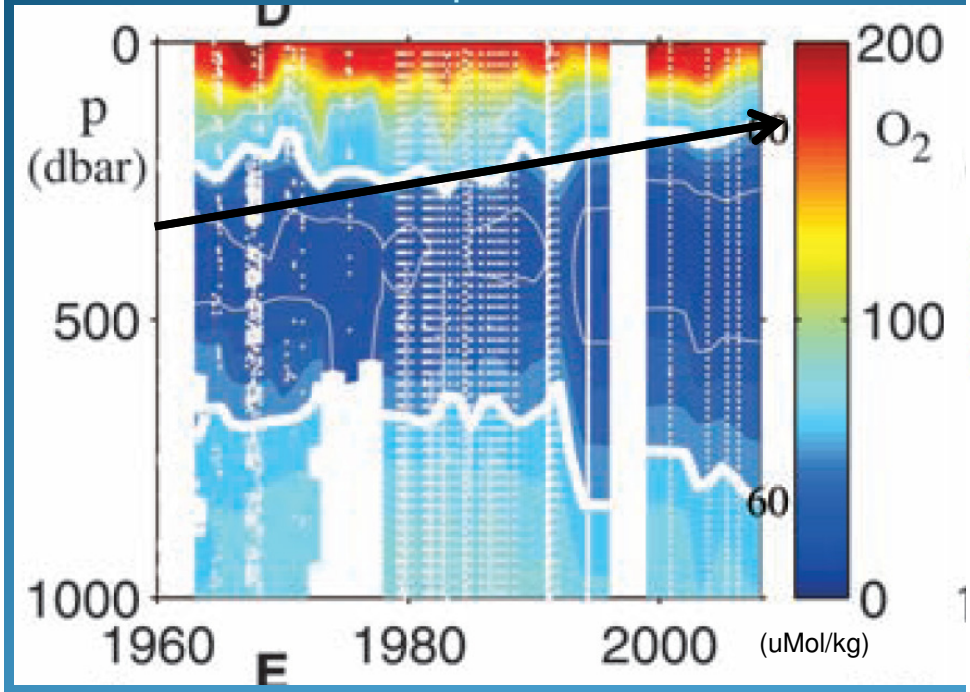
Temperature anomaly (tA) for surface temperature off the Peruvian coast near Chicama (8ºS), Peru (b). Percentage of the survey area covered by CCW, SSW, and MCS from 1983 -2005. El Niño periods are shown by salmon coloured bands with intensity proportional to opacity.

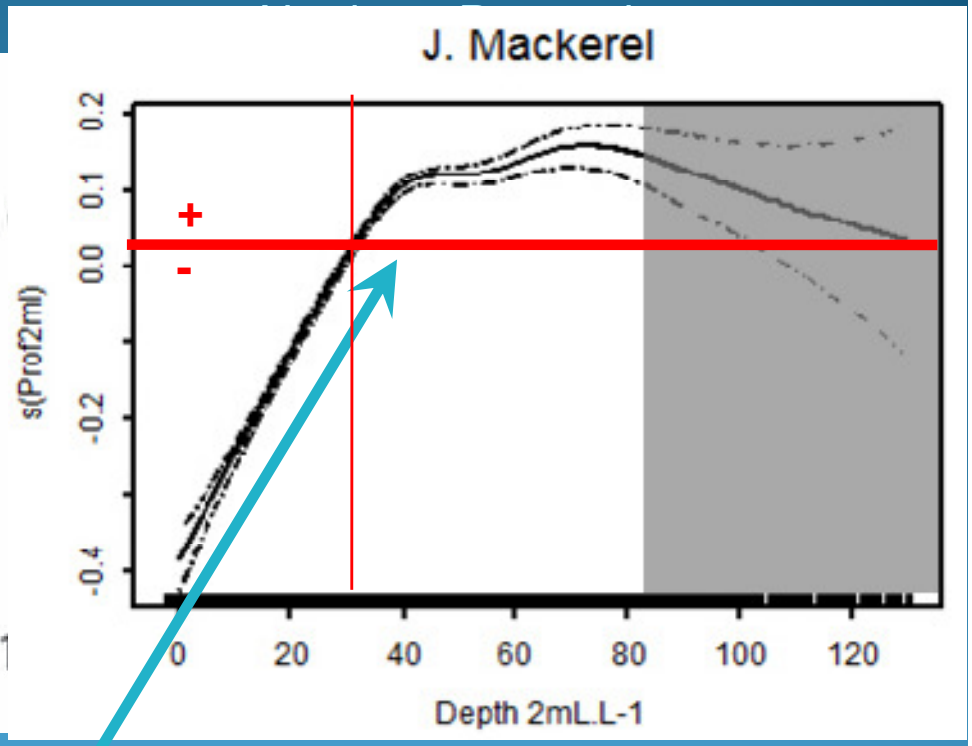
Swartzman et al, 2008.

Change: Global expansion of Oxygen Minimun Zones (OMZ)

(reduction of habitat range for certain species in the main ecosystems)

Eastern equatorial Pacific





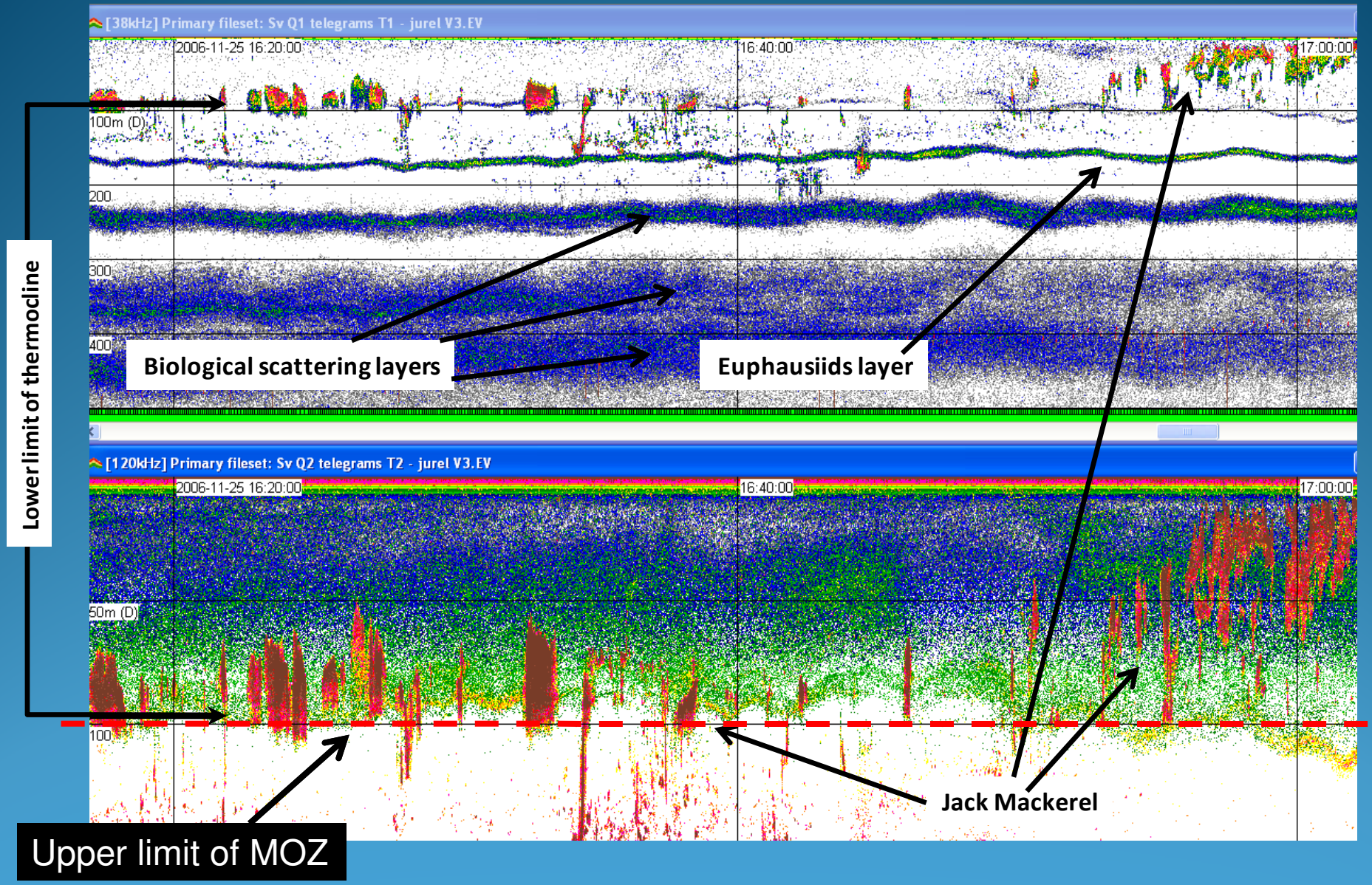
Stramma et al, 2008

Higher abundances only when oxycline is deep

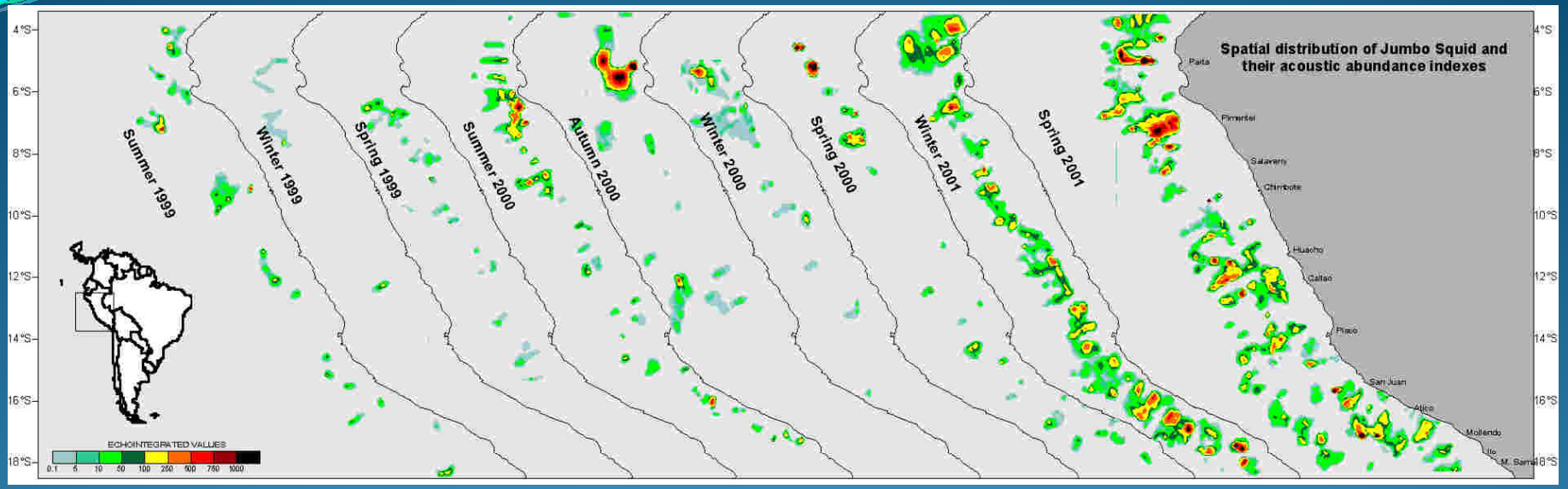
Impact on sardine abundance (and other species as well)

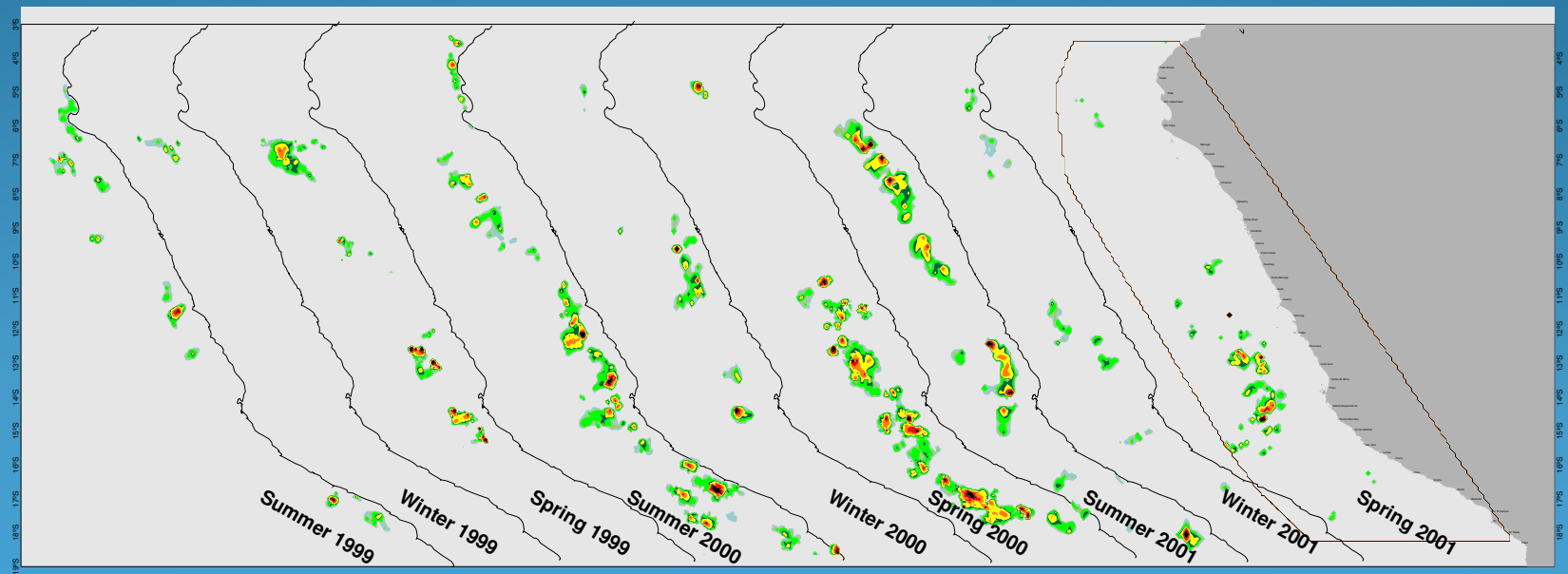
Bertrand et al, 2008.

Euphausiids as a proxy of Jack Mackerel abundance



Giant Squid versus Jack Mackerel





Gutièrrez, 2002.

Discussion, Proposal

• The change in distribution and abundance of JM and others which was observed since mid the 1990's off Peru might be a variation of their habitat range.

• Changes in surface would not explain the variations. We strongly support of the oxygen as a driver of the process.

• It is needed to stress the effort for loading more data about biotic and abiotic factors in an ecosystem approach adapted to the JM fishery.

• Acoustic can contribute with practical solutions to the need of data (e.g. OMZ depth, JM density, zooplankton distribution etc).

• We propose to adopt/adapt the CRR 287 (ADFV) as a common protocol (where pertinent) for the operation of the fishing fleets in the Southeast region.