International Consultations on the Establishment of the
South Pacific Regional Fisheries Management Organisation

Eighth International Meeting

REPORT OF THE SCIENCE WORKING GROUP
Auckland, New Zealand
2 – 6 November 2009

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1. Welcome & Introductions

The 8th meeting of the SPRFMO Scientific Working Group was opened by the Chair, Andrew Penney of New Zealand.

2. Adoption of Agenda

The draft agenda (Annex SWG-01) was amended and adopted.

3. Administrative Arrangements

The Executive Secretary noted the meeting schedule had been distributed and outlined other administrative arrangements. Annex SWG-02 lists the attendees.

3.1 Meeting documents

The Chair reviewed the meeting documents for the Working Group, Sub-Groups and the Information papers. It was noted that two further National Reports and possibly other papers would be provided during the meeting. The meeting documents are listed in Annex SWG-03.

4. Nomination of Rapporteurs

The Chair agreed to rapporteur the meeting, with assistance from the interim Secretariat.

5. Discussion of National Reports

Following adoption at the 7th SPRFMO meeting of guidelines for annual National Reports to the SWG, national reports were tabled at this meeting by Australia, Belize, Chile, China, Chinese-Taipei, the European Community, Korea, New Zealand, Peru and Vanuatu. Participants made brief presentations of their national reports and provided answers and explanations in response to questions.

The meeting noted the importance of information on management actions taken which might influence trends in key fishery indicators such as catch and effort and requested that participants provide such information in future reports.

6. Inter-Sessional Work

6.1 Report from the Interim Secretariat on status of catch & effort data submission

The Data Manager of the Interim Secretariat presented the report SP-08-SWG-09 Rev 1, noting differences between this and the version presented at the 7th International meeting. She said that in addition to the data presented in the Report, jack mackerel catch data by month would be available to members of the Jack Mackerel Sub-Group for purposes of stock assessment. In response to a question about the number of vessels fishing, she replied that information could be found in the report on Interim management Measures, SP-08-WP-04.

6.2 Update by the Interim Secretariat on status of the SPRFMO GIS database

The Executive Secretary presented paper SP-08-SWG-04 Rev 1 which outlined the costs of purchasing ArcGIS software. The entry system ArcView, which would also allow the Interim Secretariat to display static maps in documents, would cost $12,000 for the software and an estimated cost of $4,800 for training. The maintenance costs for subsequent years would be $3,300. Adding the ArcGIS Server package, which would allow participants to analyse the geospatial database that were held on the website would cost an additional $10,000 for software with subsequent years' maintenance of $2,500.

After discussing the alternatives, the Science Working Group recommended that the Plenary agree:

(1) To add $16,800 to the draft budget in paper SOP-08-WP-03 for this financial year for the purchase ArcView software and training, and
(2) To note that ArcGIS Server should be purchased at some later time.

7. Report-Back from the Meeting of the Jack Mackerel Sub-Group

7.1 Report and Summary of the Jack Mackerel Sub-Group

The Jack Mackerel Sub-Group met prior to the SWG meeting and the full report of that meeting is appended as Annex SWG-04. Main issues dealt with by the JMSG Sub-Group at this meeting were:

- In the absence of agreed stock assessments, and as agreed at the 7th SWG meeting, a comprehensive review of fishery and other indicators was used as the basis for providing advice on the status of jack mackerel in 2009. A number of indicator papers were reviewed and a summary of key indicators was produced (see Annex SWG-JM-01 to the JMSG report).
- This summary of indicators was used as the basis for developing a *Jack Mackerel Stock Status Summary* by the JMSG.
- The JMSG reviewed inter-sessional progress with components of the proposed Jack Mackerel Stock Structure Research Programme and made recommendations on future work to implement cooperative research under this research programme.

7.2 SWG Advice on Jack Mackerel Stock Status

The JMSG produced the following Jack Mackerel Stock Status Summary:

- The main jack mackerel (*Trachurus murphyi*) fishery of interest to SPRFMO at present is the fishery occurring off the south-central coast of Chile, extending from within the Chilean EEZ and out onto the high seas. Jack mackerel catches within the Chilean EEZ and on the adjacent high seas contributed 88% of the total jack mackerel catch reported to SPRFMO in 2007 - 2008.
- The remaining 12% of jack mackerel catch reported to SPRFMO has been taken primarily within the Peruvian EEZ.
- Most participants considered that jack mackerel catches off the Chilean coast over this period show a continuous distribution from the Chilean coast out to the westwards extent of the current high-seas fishery, out to about 120°W. Regular seasonal movement in catch positions and reports of fishing fleets following jack mackerel concentrations as they move westwards and northwards as the fishing season progresses indicate that jack mackerel should be managed as one single management unit for the immediate future. This recommendation is not intended to prejudice any of the stock structure hypotheses adopted by the Jack Mackerel Stock Structure Workshop.
- Jack mackerel abundance and productivity is strongly driven by annual recruitment and somatic growth, with clear evidence that rapid increases in abundance and high catches from 1984 - 1990 resulted from two exceptionally strong year classes in 1983 and 1984. This was followed by a period of low to moderate recruitment from 1988 - 1996, with estimated biomass declining over 1990 - 1996. A modest increase in recruitment over 1997 - 2000 resulted in a slight increase in biomass over 2000 - 2002.
- These strong inter-annual changes in recruitment and abundance appear to be related to changes in oceanographic conditions in the region, particularly shifts in water temperature and primary productivity, and are linked to large-scale oceanographic changes resulting from El Niño and La Niña events and inter-decadal variation in the region. The dynamic nature of oceanography of the region indicates that jack mackerel populations must be expected to show strong natural fluctuations in both abundance and distribution.
- Recruitment levels (numbers at age 2) have remained below 25% of the peak recruitment in 1985-1986, and appears to have shown a further decline since 2001, with very low recruitment in 2003 and 2007. Low recent recruitment has resulted in a steady decline in the proportion of small fish in the catch, and an increase in modal size of fish caught. Over 2007 - 2009, modal size in catches in the south-central region has increased, which is consistent with a modal progression of an ageing population with very low recruitment.
- Over the period 2000 - 2005 there was a slow increase in total catches from about 1.5 million t to 2 million t, remaining at that level to 2006. Despite increasing participation and fishing effort in the fishery since then, catches declined from 2007 down to 1.47 million t in 2008. Initial catch estimates for some fleets suggest that this decline in catches has continued in 2009.

- In contrast, a large proportion of juveniles (age 2) occurred in catches in the Northern Chilean zone in 2008 relative to previous years, possibly indicating a substantially stronger recruitment in that area in that year.
- Acoustic surveys and egg surveys over part of this area out to 85°W indicate a steady decline in estimated total and spawning biomass since 1998, generally showing a period of higher abundance over 1998 - 2001, a substantial decline between 2001 and 2003, followed by a period of significantly lower abundance from 2003 - 2008. Acoustic surveys off Peru show a similar decline in biomass estimates since 1997.
- An updated Chilean assessment concludes that total and spawning biomass have been declining since 1990, and appear to have reached their lowest levels since the late 1970s in 1998. Thereafter there was a small increase in estimated total biomass to 2002, followed by a corresponding decline back to the 1998 level. Assessments indicate that these declines were related to the combination of poor recruitment and high fishing mortality, with landings exceeding surplus production over the periods 1990 - 1997 and 2002 onwards.
- Model estimates of spawning-biomass ratios[1] (SBR) in the Chilean assessment have been below 40% since about 1995, following a steep decline in SBR from 1989 to 1998. After a period of increase from 1998 to about 2004, SBR appears to have been declining again since then, in response to poor recent recruitment.

- **In overview, these indicators indicate that fishing mortality (F) is likely to have exceeded sustainable levels since at least 2002, and continues to do so. Current biomass levels are substantially below levels at the peak of the fishery in the 1990s and, as a result of recent poor recruitment, are highly likely to be still declining.**
- **Low recruitment, low and declining spawning and total biomass, low and declining SBR and landings in excess of surplus production all indicate that further declines in stock status are likely unless fishing mortality is reduced, particularly if recruitment remains poor.**
- **To stop further declines and re-build this jack mackerel stock, urgent and adequate measures will be required to limit fishing mortality to sustainable levels. Indicators suggest that this will require a decrease in fishing mortality. Given current declines in estimated biomass, a decrease in fishing mortality will require a reduction in total removals.**

Some participants expressed concern that current exploitation rates on recruiting fish represent a risk to recovery of spawning biomass. However, the majority of the group noted that estimates of current exploitation rates of juvenile jack mackerel are low and do not present a serious risk to recovery of spawning biomass.

[1] SBR in this assessment was estimated as the current spawning biomass relative to the spawning biomass that would have existed in the absence of fishing.

8. Report Back from the Meeting of the Deepwater Sub-Group

The Deepwater Sub-Group met prior to the SWG meeting and the full report of that meeting is appended as Annex SWG-05.

The Deepwater Sub-Group (DWSG) had two main items of discussion. The revised Benthic Fishery Impact Assessment Standard was reviewed section by section. There was significant discussion of certain elements such as new/exploratory fisheries. The task team (Australia, Chile, New Zealand and US) was asked to revise the Standard based on the discussions for consideration at the next meeting of the DWSG. The DWSG also conducted a preliminary review of the bottom fishery impact assessment submitted by the EU for the Spanish demersal gillnet fishery. The DWSG had significant concerns with the assessment from Spain, in particular the lack of scientific analysis on the impacts of this fishery on vulnerable marine ecosystems and deepwater low productivity species. The conclusions that the new fishing activity will have a low impact and is of low risk are completely unjustified. Available information for other fisheries and research suggest that the fishing activity is likely to be a high risk for VMEs and deepwater low productivity species, particularly deepwater sharks.

9. Species and Habitat Profiles

9.1 Review of new species or habitat profiles

No new species or habitat profiles were considered at this meeting

9.2 Revisions to existing profiles

Amendments have been proposed at previous meetings for a number of the deepwater species profiles. However, no inter-sessional progress has been made with incorporating these proposed amendments into revised profiles, and no revised profiles were considered at this meeting.

10. Future Scientific Work Programme

<u>Jack Mackerel Sub-Group</u>

- Finalisation of the simulated jack mackerel data sets by the Assessment Simulation Task Team (ASTT) and conducting of assessment trials using these simulated data.
- Inter-sessional meeting of the ASTT during the first half of 2010 to review results of assessment trials and select assessment methodologies and approaches to conduct assessment using real data.
- Nominations to the Stock Structure Research Programme Steering Committee and work by this team to progress the components of the Stock Structure Research Programme.

- Preparation and exchange of otolith reference collections and standardisation of ageing methodologies
- Development of recommended guidelines and protocols for collection of acoustic data using industry vessels, to be coordinated by Dr Gerlotto.

Deepwater Sub-Group

- Review and comment on the preliminary risk assessment for EC gillnet fisheries in the SPRFMO Area by end December 2009.
- Additional amendments to the draft SPRFMO Bottom Fishery Impact Assessment Standard and preparation of a further amended draft standard for consideration at the next meeting.

Scientific Working Group

- Progress on deepwater species profiles.

11. SWG and Sub-Group Chairmanship

The SWG confirmed that Dr Rodolfo Serra should serve as the Chair of the Deepwater Sub-Group for the next two-year period. Participants were asked to consider nominations for the Chair of the Jack Mackerel Sub-Group.

12. Other Matters

No other matters were discussed.

13. Adoption of SWG Report

The SWG Plenary Report was adopted after inclusion of edits proposed by participants.

14. Meeting Closure

The meeting was closed at 18h45.

Annex SWG-01

AGENDAS FOR THE SCIENCE WORKING GROUP and SUB-GROUPS

Eighth International Meeting: Science Working Group

SCIENCE WORKING GROUP: PLENARY

AGENDA

1. **Welcome & Introductions**
2. **Adoption of Agenda**
3. **Administrative Arrangements**
   - 3.1. Meeting documents
4. **Nomination of Rapporteurs**
5. **Discussion of National Reports**
6. **Inter-Sessional Work**
   - 6.1. Report from the Interim Secretariat on status of catch & effort data submission.
   - 6.2. Update by the Interim Secretariat on status of the GIS database.
7. **Report-Back from the Meeting of the Jack Mackerel Sub-Group**
   - 7.1. Consideration of the report and summary of the Jack Mackerel Sub-Group meeting.
   - 7.2. SWG Advice on Jack Mackerel Stock Status
8. **Report Back from the Meeting of the Deepwater Sub-Group**
9. **Species and Habitat Profiles**
   - 9.1. Revisions to existing species or habitat profiles.
   - 9.2. Review of new species or habitat profiles.
10. **Future Scientific Work Programme**
11. **SWG Chairmanship**
12. **Other Matters**
13. **Adoption of SWG Report**
14. **Meeting Closure**

SCIENCE WORKING GROUP: JACK MACKEREL SUB-GROUP

AGENDA

1. **Opening of the Meeting**
2. **Adoption of Agenda**
3. **Administrative Arrangements**
   - 3.1. Meeting arrangements.
   - 3.2. Meeting documents.
4. **Nomination of Rapporteurs**
5. **Chairmanship of the Jack Mackerel Sub-Group**
6. **Review of Jack Mackerel Fishery and Stock Status Indicators**
7. **Advice to the Science Working Group on the Status of Jack Mackerel in 2009**
8. **Inter-Sessional Evaluation of Jack Mackerel Assessment Modelling Approaches**
9. **Jack Mackerel Stock Structure Research Programme**
   - 9.1 Report back from the Stock Simulation Task Team.
   - 9.2 Use of hydro acoustic techniques for pelagic research.
10. **Revisions to the Jack Mackerel Species Profile**
11. **Future Jack Mackerel Sub-Group Work Programme**
    - 11.1. Identification of short & medium term research and assessment requirements.
12. **Other Matters**
13. **Adoption of Jack-Mackerel Sub-Group Report and Summary**

SCIENCE WORKING GROUP: DEEPWATER SUB-GROUP

AGENDA

1. **Opening of the Meeting**
2. **Adoption of Agenda**
3. **Administrative Arrangements**
   - 3.1. Meeting arrangements.
   - 3.2. Meeting documents.
4. **Nomination of Rapporteurs**
5. **Chairmanship of the Deepwater Sub-Group**
6. **SPRFMO Benthic Assessment Standard**
7. **Review of Bottom Fishery Impact Assessments**
8. **Deepwater Species Assessment and Management**
9. **Other Matters**
10. **Adoption of Deepwater Sub-Group Report and Summary**

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Annex SWG-03

DOCUMENT LIST

Scientific Working Group

SP-08-SWG-01:	SWG8 and Sub-Groups Draft Agendas.
SP-08-SWG-02:	SWG8 and Sub-Groups Draft Document List Rev 5.
SP-08-SWG-03:	SWG8 Proposed Schedule of Meetings.
SP-08-SWG-04 rev 1:	Costs of ArcGIS software.
SP-08-SWG-05:	National report of the European Community to the SPRFMO Science Working Group on the fisheries in the Pacific in 2008.
SP-08-SWG-06:	National Report of Chile to the SPRFMO Science Working Group.
SP-08-SWG-07	Belize's annual report to the interim secretariat of SPRFMO
SP-08-SWG-08:	New Zealand National Report on Fishing and Research Activities in the SPRFMO Area during 2008.
SP-08-SWG-09	Update of Data Submitted to the Interim Secretariat as at 29 October 2009 (Rev 1)
SP-08-SWG-10	National Report of Korea to the SPRFMO Science Working Group (Rev 1)
SP-08-SWG-11	National Report of Peru to the SPRFMO Science Working Group
SP-08-SWG-12	Australian National Report to the South Pacific Regional Fisheries Management Organisation(SPRFMO) Science Working Group, 2009
SP-08-SWG-13	National report of China to the SPRFMO Science Working Group (Rev 1)
SP-08-SWG-14 Group	National Report of Chinese Taipei to the SPRFMO Scientific Working
SP-08-SWG-15	Vanuatu 2008 Annual National Report to the SPRFMO Science Working Group

Jack Mackerel Sub-Group

SP-08-SWG-JM-01	The fishery for jack mackerel in the Eastern Central Pacific by European trawlers in 2008 and 2009.
SP-08-SWG-JM-02	Reproductive parameters and spawning biomass of Chilean Jack Mackerel (Trachurus murphyi), in 1999-2008, determined by the Daily Egg Production Method.
SP-08-SWG-JM-03	Acoustic biomass of Jack Mackerel (Trachurus murphyi, Nichols, 1920) structured by size and age in the central coast off Chile.
SP-08-SWG-JM-04	Main biological indicators of Jack Mackerel (Trachurus murphyi).
SP-08-SWG-JM-05	Fishing indicators of Jack Mackerel in Chile, 1975-2008.
SP-08-SWG-JM-06	Environmental variability of the Chilean Jack Mackerel habitat in the southeastern Pacific Ocean.
SP-08-SWG-JM-07	Composite distribution of jack mackerel catches and surveyed acoustic biomass off the Chilean coast from 24°S to 52° S (Rev 1)
SP-08-SWG-JM-08	Updated Status of the Chilean Jack Mackerel Stock (to be tabled at the JMSG meeting).
SP-08-SWG-JM-09	Diagnosis of the Chilean Jack Mackerel (to be tabled at the JMSG meeting).
SP-08-SWG-JM-10	Interpretation of biological –fishing indicators of jack mackerel exploited off central southern Chile (to be tabled at the JMSG meeting)
SP-08-SWG-JM-11	Protocol for acoustic data collection and analysis
SP-08-SWG-JM-12	Revised Chilean jack mackerel (*Trachurus murphyi*) species profile
SP-08-SWG-JM-13	Methodological proposal for direct stock assessment of marine resources in the SPRFMO area

Deepwater Sub-Group

SP-08-SWG-DW-01	Revised Draft SPRFMO Bottom Fishery Impact Assessment Standard
SP-08-SWG-DW-02	EC preliminary assessment of the risk of causing serious damage to the vulnerable marine ecosystems and protocol of action
SP-08-SWG-DW-03	Classification guide for potentially vulnerable invertebrate taxa in the SPRFMO Area
SP-08-SWG-DW-04	Chilean proposal: Requirements for the development of new fisheries
SP-08-SWG-DW-05	Chilean remarks on the "SPRFMO Bottom Fishery Impact Assessment Standard" (BFIAS) draft October 2009

Information Papers

SP-08-SWG-INF-01	Background information on approaches to assessment, monitoring and management of developing or exploratory deepwater fisheries in other high-seas regions.
SP-08-SWG-INF-02	Differences Between Mackerel (Trachurus species) Data Submitted to SPRFMO versus the FAO.
SP-08-SWG-INF-03	CCAMLR 2009 - Report on workshop on vulnerable marine ecosystems.
SP-08-SWG-INF-04	Overview of the Process Adopted by the Commission for the Conservation of Southern Bluefin Tuna for Provision of Management Advice Based on an Annual Review of Fishery Indicators.
SP-08-SWG-INF-05	Extract from the CCSBT12 SC10 Presentation – Fishery Indicators.
SP-08-SWG-INF-06	Kolody et al 2005 – CCSBT Fishery Indicators for the CCSBT Stock2004-05.
SP-08-SWG-INF-07	Proposed Process for the 2009 Review of Jack Mackerel Fishery Indicators by the SPRFMO Science Working Group - Jack Mackerel Sub-Group.
SP-08-SWG-INF-08	TRAFFIC letter to SPRFMO SWG.
SP-08-SWG-INF-09	DSCC comment on SPRFMO standard.

Eighth International Meeting on the Establishment of Proposed South Pacific Regional Fisheries Management Organization

Report of the Jack Mackerel Subgroup

Auckland, New Zealand

02 – 06 November 2009

1. Opening of the Meeting

The meeting of the Jack Mackerel Sub-group (JMSG) of the Science Working Group (SWG) was opened by the chair of the SWG, Mr Andrew Penney (New Zealand) who welcomed all participants.

2. Adoption of Agenda

The Agenda was adopted after inclusion of an additional sub-item on acoustic methods under agenda 9 and is included in Annex SWG-01.

3. Administrative Arrangements

3.1 Meeting Arrangements

A list of participants is attached in Annex SWG-02.

3.2 Meeting documents

A list of documents from the meeting is provided as SPRFMO-VIII-SWG-02.

4. Nomination of Rapporteurs

Dr. Pamela Mace (New Zealand), Dr. Ad Corten (EU) and Dr. Aquiles Sepúlveda (Chile) offered to act as rapporteurs for the meeting.

5. Chairmanship of the Jack Mackerel Sub-Group

No inter-sessional nominations were received for a Chair of the Jack Mackerel Sub-Group. The Sub-Group agreed that this meeting be Chaired by the Chair of the SWG.

6. Review of Jack Mackerel Fishery and Stock Status Indicators

At the 7th meeting in Lima, the Jack Mackerel Sub-Group agreed that, in the absence of agreed jack mackerel stock assessments upon which to base advice, advice to be provided in 2009 on the status of the jack mackerel stock/s to the SWG and Negotiations should be based on a review of trends in indicators derived from the fishery for jack mackerel and from fishery-independent surveys.

Ten papers (SP-08-SWG-JM-01 to 10) and numerous national reports containing indicators were tabled by participants. In addition the Secretariat prepared an updated report on status of data provision (SP-08-SWG-09 Rev1) and on differences between jack mackerel catches reported to SPRFMO and to the FAO (SP-08-SWG-INF-02). Presentations were made of all national reports and papers and preparation of an initial draft list of potential indicators, followed by then critical review

of this draft list to provide a final list of indicators with associated comments on what information each indicator provided on status of jack mackerel.

Summary of Paper Presentations

SP-08-SWG-JM-01 **The fishery for jack mackerel in the Eastern Central Pacific by European trawlers in 2008 and 2009**

This report summarises fishing activity by the Pelagic Freezer-trawler Association (PFA) from 2005 onwards, with a focus on 2007-09. The key points are that: the PFA fleet has expanded from one vessel in 2004 and 2005 to 6 vessels in 2007-09; and over the period 2007-09, peak catches have occurred progressively earlier, fishing has ended progressively earlier, catch per day has progressively declined, and the minimums and modes of the length frequency distributions have become progressively larger. The length-frequency distributions were very stable from one month to another indicating that the fleet was following the same population of fish.

Past data indicate that small fish are widely distributed throughout the area of distribution of the stock, with no known nursery ground(s). However, the PFA data indicate that in the most recent 2-3 years, there appears to have been little or no recruitment to the fishery.

In 2007 and 2009, the PFA fleet moved west of 100^{o}W towards the end of the season. In 2008, the movement of the fleet was in a northern rather than a western direction. The fishery tends to end at the time the fish leave the fishing area and move towards the spawning grounds. Peak spawning is in November-December. The increase in average fish size has resulted in a change in fishing behaviour. Large fish tend to be difficult to catch during the day with mid-water trawls. Therefore, fishing activity has tended to be more concentrated at night.

It was noted that the Vanuatu, Chinese and Korean fleets have fished in the same areas and recorded the same population trends over the past three years. It was also noted that there are two other EU vessels active in the jack mackerel fishery that were not included in the report.

SP-08-SWG-JM-02 **Reproductive parameters and spawning biomass of Chilean jack mackerel (*Trachurus murphyi*) in 1999-2008, determined by the daily egg production method.**

Nine surveys have been conducted over the period 1999 to 2008. The study area varied from year-to-year depending on the location of the 16^{o}C isocline. There was high variability in reproductive variables such as the daily egg production and the spawning fraction between years. Results indicate that spawning biomass decreased from 1999 to 2003 and has thereafter been variable at relatively low levels, with an overall moderate declining trend.

It was noted that the egg surveys have not covered the entire spawning area, with indications of a variable amount of spawning biomass to the west of the study area in several years. The 2007 season was a particularly anomalous year. In that year, there was a strong La Nina event (the strongest since 1935). The 16^{o}C isocline moved north, as did the study area, but few eggs were found. In 2008, egg production appeared to have returned to previous levels.

SP-08-SWG-JM-03 **Acoustic biomass of jack mackerel (*Trachurus murphyi* Nichols, 1920) structured by size and age in the central coast off Chile.**

Twelve surveys have been conducted between 1997 and 2008. The number of aggregations per nautical mile has decreased from 8 in 1997 to 2 in 2002 and subsequently. Acoustic estimates of biomass within the Chilean 200 nm zone have decreased substantially from 2001 to 2002 and from 2007 to 2008. Outside the zone, acoustic estimates of biomass have varied without trend from 2003 to 2007 but with a pronounced drop from 2007 to 2008. The substantial decrease between 2007 and 2008 in both zones may be partially explained by an apparent shift of fish westwards out of the survey area, as indicated by the distribution of commercial catches in June of 2007 and 2008, at the time of the surveys.

There was general agreement that the acoustic surveys provided a better (less biased) estimate of trends in biomass than do the egg surveys. In both the egg and acoustic surveys, mean length has increased as biomass has declined.

SP-08-SWG-JM-04 **Main biological indicators of jack mackerel (*Trachurus murphyi)***

This paper presented information on size and age compositions, and condition factor from catch samples collected between 1975 and 2008. Results indicated that changes in the size and age compositions were related to trends in recruitment, with low average size and age following high recruitment and increasing average size and age in recent years resulting from recent low recruitment. There has also been an apparent increase in condition factor in recent years. WG members agreed that the increase in condition factor could be due to changes in oceanographic conditions rather than density-dependent effects.

There was also a marked difference in size of fish in the northern and southern Chilean fisheries, with smaller fish in the north (<28cm) and larger fish in the south.

SP-08-SWG-JM-05 **Fishing indicators of jack mackerel in Chile, 1995-2008.**

This paper summarises information from the commercial Chilean fleet regarding catches, fleet composition, effort and catch per unit effort. The fleet grew steadily until 1997, and then declined in response to the imposition of a maximum per owner catch limit, to more or less stable levels in recent years. Subsequently, larger vessels with higher fishing capacity have replaced smaller vessels resulting in an overall increase in average hold capacity; nevertheless, the total hold capacity has declined since 1997 to recent levels that are about half of peak levels. In the last seven years, the central-southern industrial fleet has expanded gradually, both spatially and temporally due to changes in the distribution and abundance of the resource. There was a decrease in the number of trips and an increase in the duration of trips.

Nominal CPUE has increased more or less continuously since 1981. However, WG participants considered that purse seine CPUE is not likely to be an indicator of trends in stock abundance.

SP-08-SWG-JM-06 **Variability of the Chilean jack mackerel fishing habitat in the southeastern Pacific Ocean**

Annual trends in sea surface temperature and chlorophyll demonstrate that oceanographic conditions in the area of distribution of jack mackerel are highly dynamic. They are also dynamic within seasons. It is likely that this seasonal and annual variability appreciably affects the abundance and distribution of jack mackerel.

However, participants agreed that there is insufficient information on fish behaviour to use this information for predictive purposes.

SP-08-SWG-JM-07 rev **Composite distribution of jack mackerel catches and surveyed acoustic biomass off the Chilean coast from 24°S to 52°S.**

A composite overlay map of recent jack mackerel catches and surveyed acoustic biomass off the Chilean coast shows an unbroken, contiguous distribution of jack mackerel from the Chilean coast, across the EEZ and out to at least 85°W, the seaward limit of the acoustic surveys. Chinese and EC catch data indicate that this contiguous distribution of catches (over the time periods of the data shown) then tails off westwards out to about 112°W.

SP-08-SWG-JM-08 **Updated status of the Chilean jack mackerel stock**

The Chilean assessment model assumes a single stock of jack mackerel inside and outside the EEZ off Chile. It considers two zones or fisheries: a northern fishery from the Peruvian border to 24°S, inside the EEZ; and the south-central fishery from 24°S to the south, inside and outside the EEZ to a western limit of FAO statistical area 87 (120°W).

The assessment model spans 34 years, from 1975 to 2008. Data inputs included landings, standardised CPUE, catch-at-age, weight-at-age, a fixed maturity schedule estimated outside the model, relative estimates of biomass obtained from acoustic surveys, age composition of the acoustic estimates of biomass, and relative estimates of spawning biomass obtained from egg surveys using the daily egg production method.

A total of 26 scenarios were explored based on various combinations of natural mortality, selectivity, catchability, and applications of alternative age-structures to the northern and southern zones. Two alternative hypotheses regarding the distribution of the population were evaluated: a contraction of the population, and a change in population distribution. For the contraction hypothesis, catchability was modelled using a hyper-depletion parameter applied to the within-EEZ acoustic biomass estimates.

All 26 scenarios showed similar trends in spawning biomass (SSB), recruitment (R) and spawning biomass ratio (SBR) (except that two scenarios exhibited higher SSB in the first decade of the assessment). A scenario based on the distribution change hypothesis was identified as the base case model.

The updated Chilean stock assessment indicates that the jack mackerel biomass increased from 1975 to 1985 due to a steady increase in the size of the 1973 to 1982 year classes, followed by two successive exceptional year classes in 1983 and 1984 (each estimated to be almost 60 billion

individuals at age 2). Estimated year class strengths have subsequently been much smaller (an average of less than 15 billion age 2 individuals over the period 1986 to 2006). Estimated spawning biomass has subsequently declined substantially to relatively low levels (about 15% of the peak in 1989-90).

Simultaneously with the increase in biomass, landings grew rapidly from less than 100,000 t in 1975 to a maximum of 4.2 million t in 1995. Thereafter, landings have declined to less than half of the peak, although they have exhibited a moderate increasing trend since about 1998.

Fishing mortality (F) was estimated to have escalated from about 1986 to the mid-1990s: for fish of 4 years and older, it exceeded 0.4 in 1997, dropping to approximately 0.2 by 1998 and remaining at about that level for the remainder of the assessment period. More importantly, landings have exceeded the estimated surplus production of the stock over two periods: 1990-1997, and 2002 to the present. The estimated SBR (currently about 25%) is well below the commonly-used reference level of 40% and has been since about 1993.

SP-08-SWG-JM-09 **Diagnosis of the Chilean jack mackerel**

This paper synthesised relevant variables from the Chilean catches and surveys that are potentially useful as indicators of stock or fishery status.

Although this paper was not formally presented, several figures were extracted from it for use in the appendix to the Review of Jack Mackerel Fishery and Stock Status Indicators.

SP-08-SWG-JM-10 **Interpretation of biological-fishing indicators of jack mackerel exploited of central-southern Chile.**

A simulation model was constructed to examine trends in various indicators of stock or fishery status under two recruitment scenarios and a range of fishing mortalities. Observed trends in variables are consistent with the poor recruitment scenario.

Selection of indicators for inclusion in the Review of Jack Mackerel Fishery and Stock Status Indicators

A number of indicators of jack mackerel stock status were selected from the ten papers reviewed under this agenda item. Supplemental information from National Reports was also included, where appropriate. Indicators from Working Group papers and national reports that are believed to reflect stock status have been extracted into the attached Annex SWG-JM-01, which also contains comments showing the key conclusions drawn by the group regarding what each set of indicators says about jack mackerel status. Some potential indicators were not included because they are not believed to be representative of jack mackerel status for various reasons. These include all purse seine indices of abundance and the Chinese nominal CPUE, which was rejected due to the trend of increasing vessel size.

There is a moderate level of uncertainty about the extent to which trends in catches, effort, catch per unit effort, size and age distributions, egg and acoustic survey biomass estimates, and stock assessment results represented trends in the underlying population of jack mackerel. Historically

(1982 -1991) the fishery extended as far west as at least 170°W, but subsequently contracted considerably in both distribution and abundance. A substantial fishery that recorded peak landings of 5 million metric tonnes in 1995 has declined to about 1.4 million metric tonnes in 1999 and fluctuated between 1.5 million and 2 million tons until 2008

Two very strong year classes were spawned in 1983 and 1984, resulting in recruitment levels of the order of 60 billion 2 year old individuals entering the fisheries in 1985 and 1986 respectively. All 22 subsequent year classes have been of the order of only 25% of these levels. This is indicative of episodic recruitment events (that are not fully understood), presumably occurring in the rare instances when all relevant oceanographic and population conditions happen to sum to optimal conditions for jack mackerel spawning success. Historical ex-Soviet Union catch records suggest that there may have been even more substantial recruitment events that occurred in the late 1970s, resulting in a range extension of the jack mackerel stock as far to the west as the NZ EEZ.

Acoustic survey data from Chile and Peru were included in the summary of indicators. However, WG participants noted that more information on the design of the surveys, timing of surveys and the survey area covered should be provided in the future in order to assist the Scientific Working Group in determining their utility as indicators.

7. Advice to the Scientific Working Group on the Status of Jack Mackerel

The Sub-Group recognised the importance of indicating to which areas or stocks their advice applied when providing advice on jack mackerel stock status. No specific discussions were held on stock structure hypotheses during the meeting and the group recommended that the advice to be provided in 2009 should be considered to apply to all jack mackerel fisheries in the SPRFMO area. While uncertainties and differences of opinion exist regarding likely distribution and boundaries of jack mackerel stocks in the Area, it was recommended that all fisheries should be considered to constitute a single management unit for the immediate future, and noted that this was an appropriate precautionary approach in the face of uncertainty regarding stock structure.

The agreed list and overview of jack mackerel indicators in Annex SWG-JM-01 was then discussed and served as the basis for developing the jack mackerel stock status summary below.

Jack Mackerel Stock Status Summary

- The main jack mackerel (*Trachurus murphyi*) fishery of interest to SPRFMO at present is the fishery occurring off the south-central coast of Chile, extending from within the Chilean EEZ and out onto the high seas. Jack mackerel catches in this area contributed 88% of the total reported jack mackerel catch in the SPRFMO area in 2007 - 2008.
- The remaining 12% of catch has been taken within the EEZs of Peru and Ecuador.
- Most participants considered that jack mackerel catches off the Chilean coast over this period show a continuous distribution from the Chilean coast out to the westwards extent of the current high-seas fishery, out to about 120°W. Regular seasonal movement in catch positions and reports of fishing fleets following jack mackerel concentrations as they move westwards and northwards as the fishing season progresses indicate that jack mackerel should be managed as one single management unit for the immediate future.

- However, Russian scientists considered that there is not adequate information to support any specific stock structure hypothesis regarding extent of the straddling Chilean jack mackerel stock.
- Jack mackerel abundance and productivity is strongly driven by annual recruitment and somatic growth, with clear evidence that rapid increases in abundance and high catches from 1984 - 1990 resulted from two exceptionally strong year classes in 1983 and 1984. This was followed by a period of low to moderate recruitment from 1988 - 1996, with estimated biomass declining over 1990 - 1996. A modest increase in recruitment over 1997 - 2000 resulted in a slight increase in biomass over 2000 - 2002.
- These strong inter-annual changes in recruitment and abundance appear to be related to changes in oceanographic conditions in the region, particularly shifts in water temperature and primary productivity, and are linked to large-scale oceanographic changes resulting from El Niño and La Niña events and inter-decadal variation in the region. The dynamic nature of oceanography of the region indicates that jack mackerel populations must be expected to show strong natural fluctuations in both abundance and distribution.
- Recruitment levels (numbers at age 2) have remained below 25% of the peak recruitment in 1985-1986, and appears to have shown a further decline since 2001, with very low recruitment in 2003 and 2007. Low recent recruitment has resulted in a steady decline in the proportion of small fish in the catch, and an increase in modal size of fish caught. Over 2007 - 2009, modal size in catches in the south-central region has increased , which is consistent with a modal progression of an ageing population with very low recruitment.
- Over the period 2000 - 2005 there was a slow increase in total catches from about 1.5 million t to 2 million t, remaining at that level to 2006. Despite increasing participation and fishing effort in the fishery since then, catches declined from 2007 down to 1.47 million t in 2008. Initial catch estimates for some fleets suggest that this decline in catches has continued in 2009.
- Acoustic surveys, and estimates of spawner biomass derived from egg surveys, over part of this area out to 85°W indicate a steady decline in these indices of abundance since 1998, generally showing a period of higher abundance over 1998 - 2001, a substantial decline between 2001 and 2003, followed by a period of significantly lower abundance from 2003 - 2008. Acoustic surveys off Peru show a similar decline in biomass estimates since 1997.
- An updated Chilean assessment concludes that total and spawner biomass have been declining since 1990, and appear to have reached their lowest levels since the late 1970s in 1998. Thereafter there was a small increase in estimated total biomass to 2002, followed by a corresponding decline back to the 1998 level. Assessments indicate that these declines were related to the combination of poor recruitment and high fishing mortality, with landings exceeding surplus production over the periods 1990 - 1997 and 2002 onwards.
- Model estimates of spawner-biomass ratios[2] (SBR) in the Chilean assessment have been below 40% since about 1995, following a steep decline in SBR from 1989 to 1998. After a period of increase from 1998 to about 2004, SBR appears to have been declining again since then, in response to poor recent recruitment.
- **In overview, these indicators indicate that fishing mortality (F) is likely to have exceeded sustainable levels since at least 2002, and continues to do so. Current biomass levels are substantially below levels at the peak of the fishery in the 1990s and, as a result of recent poor recruitment, is highly likely to be still declining.**

[2] SBR in this assessment was estimated as the current spawning biomass relative to the spawning biomass that would have existed in the absence of fishing.

- **Low recruitment, low and declining spawning and total biomass, low and declining SBR and landings in excess of surplus production all indicate that further declines in stock status are likely unless fishing mortality is reduced, particularly if recruitment remains poor.**
- **To stop further declines and re-build this jack mackerel stock, urgent and adequate measures will be required to limit fishing mortality to sustainable levels. Indicators suggest that this will require a decrease in fishing mortality. Given current declines in estimated biomass, a decrease in fishing mortality will require a reduction in total removals.**

8. Inter-Sessional Evaluation of Jack Mackerel Assessment Modelling Approaches

Some progress had been made by the Jack Mackerel Assessment Task Team (ASTT) during the intersessional period, but the team did not achieve the original goal of producing results of the simulation exercise already at the present meeting. For a number of reasons, there had been a slow response to the first data set circulated by Jim Ianelli, and this had delayed the production of a final set of simulated data. This final set was circulated to some (but not all) participants of the ASTT not until the 22nd of October.

At the moment, feedback on the simulated data set has been provided by Chile, Peru, and the EU. During the current meeting, the new data set was discussed in detail, and questions were put forward by e-mail to Dr Jim Ianelli. The Peruvian team unfortunately had not yet received the new data set, so they would need some more time to respond to the data.

It was noted that in addition to the simulated data set, participants will have to set external parameters to their models, such as natural mortality and selectivity pattern. These parameters will have to be standardized between participants, in order make the results of their models as comparable as possible.

The current data set refers to one single stock, exploited by three different fleets. A further refinement of the data set, assuming multiple stocks that are exploited by multiple fleets, would make the demands on the simulated data set much larger. A consequence of the restriction of the simulation exercise to a single stock is that the results of the exercise cannot be used to evaluate which of the models is best in handling a multiple stock situation. This limitation, however, is not seen as a major obstacle to the simulation exercise.

The ASTT intends to start running the respective models on the simulated data set as soon as the remaining questions have been clarified and external parameters have been agreed upon. This should be done before the 30th of November. The next step is that all participants use their models to estimate the parameters of the underlying model population. The results of this work should be available early 2010. The team proposes to arrange a meeting of the ASTT at that time, to discuss the results of the various models with Jim Ianelli. At this meeting it should be decided which of the models should be included in the standard methodology of the Jack Mackerel Subgroup. Subsequently, the team could start working on the actual assessment of the jack mackerel stock, using real data that hopefully will become available in 2010. The team could then produce the first results of their assessment at the next meeting of the Jack Mackerel Subgroup.

9. Jack Mackerel Stock Structure Research Programme

9.1 Report back on Inter-Sessional Progress with the Jack Mackerel Research Programme

Participants reported back on any inter-sessional progress made with cooperative jack mackerel research as envisaged under the research programme:

- Russia reported that that jack mackerel genetic samples had been collected in the South Pacific and that analysis of these samples would commence in 2010.
- Chile has prepared an otolith reference set for potential exchange and use in standardising otolith interpretation and ageing methodologies. Other participants were requested to consider preparing and exchanging similar otolith reference collections.
- New Zealand reported that they have collected and provided genetic samples to Chile and Russia from the New Zealand zone for use in genetics studies.

Participants expressed concern that only Chile has so far nominated a representative to the proposed Research Programme Task Team, and that no progress has been made on developing cooperative research programmes under that research programme proposal. The Secretariat was asked to again write to participants requesting nominations to the Task Team, and participants were urged to make progress on implementing cooperative research projects under the research programme.

9.2 Application of Hydro-Acoustic Methods to Pelagic Research

Initial discussions were held at the 7th SWG meeting in Lima regarding the use of industry vessels to collect acoustic data for jack mackerel fisheries, and the SWG recognised the value of such an approach. Dr Francois Gerlotto gave a presentation providing further information on the potential uses and benefits of industry vessels to collect acoustic data (SP-08-SWG-JM-13). Such data could be used to generate a wide range of useful indicators related to both stock status and to environmental effects of aspects such as distribution.

An important aspect of making such data useful for scientific analyses is to ensure that they are collected in a standardised way and made available in a form that can be integrated into scientific analyses. At the previous meeting it was noted that the ICES working group on acoustics has conducted substantial work on standardising of acoustic data collection. At this meeting Peru tabled a draft guideline for collection of acoustic data using industry vessels (SP-08-SWG-JM-11) and requested that other participants review and propose improvements to this guideline inter-sessionally.

Recommendations resulting from this presentation and discussion were:

- Participants should consider initiating acoustic data collection projects in cooperation between industry and research institutes.
- Acoustic data collection and analysis methods to be used should be standardised as far as possible. The work done by ICES and the initial guideline presented at this meeting were relevant to developing standardised protocols. Particular attention will need to be paid to target strength estimation and target identification.

10. Revisions to the Jack Mackerel Species Profile

A revised jack mackerel species profile was developed inter-sessionally by Dr. Glubokov (SP-08-SWG-JM-12) and provided to the meeting. Discussion of this updated profile was deferred to the next meeting of the Jack Mackerel Sub-Group.

11. Future Jack Mackerel Sub-Group Work Programme

Future short and medium term priorities for inter-sessional jack mackerel work are:

- Finalisation of simulated data and inter-sessional conducting of assessment trials using these simulated data.
- Inter-sessional meeting of the ASTT to review results of simulations and select assessment methodologies to use for conducting assessments using real data.
- Develop and exchange otolith reference collections, to standardise otolith interpretation and ageing protocols and to determine age and growth information for use in stock assessments.
- Establishment of the Stock Structure Research Programme Steering Committee and progress with implementing cooperative research projects under that research programme. In the medium term, progress needs to be made on developing specific project proposals, budgets and work plans for specific stock structure research projects under the programme. It was recognised that it would be useful for the Task Team to conduct an initial synthesis and prepare a report on all available information on Jack Mackerel stock structure.
- Progress should be made on developing guidelines and protocols for collection of acoustic data using industry vessels and initiating such acoustic data collection. Dr Francois Gerlotto offered to coordinate communication with participants on this initiative.

12. Other Matters

No other matters were discussed.

13. Adoption of Jack-Mackerel Sub-Group Report and Summary

The jack mackerel sub-group report and summary of key conclusions were adopted after agreed amendments were made.

List of Jack Mackerel Indicators Selected by the Jack Mackerel Sub-Group as the Basis for Providing Stock Status Advice in 2009

1. Introduction

This appendix presents indicators considered useful to providing advice on the stock status of jack mackerel in 2009. Most of the indicators shown have been selected to be representative of the current jack mackerel fisheries.

2. Catch Trends

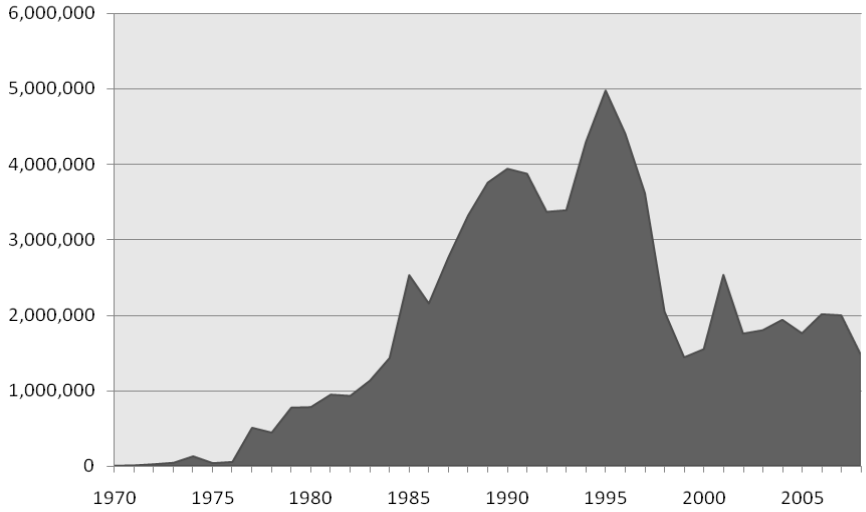


Figure 1. Total annual jack mackerel catch from 1970 - 2008. (Prepared by Secretariat)

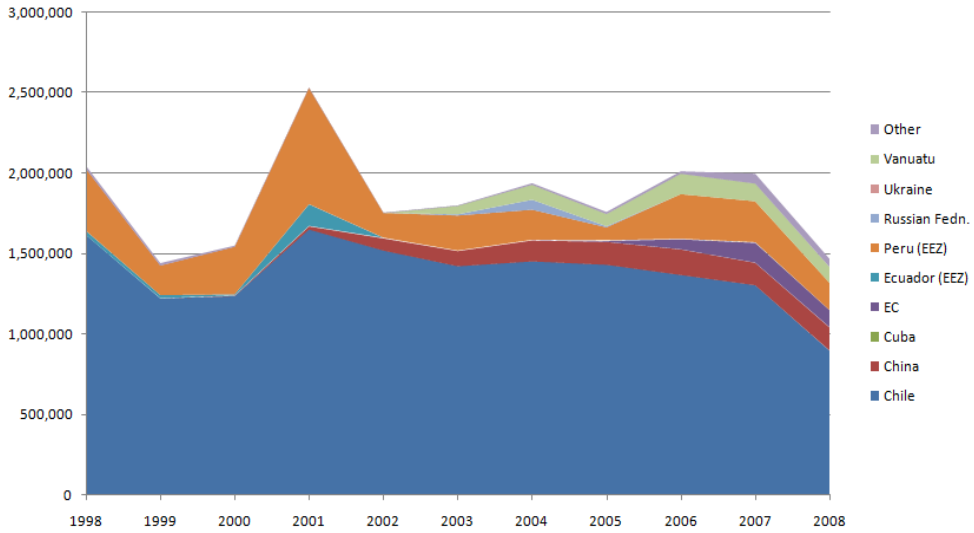


Figure 2. Total annual jack mackerel catch by flag from 1998 - 2008. (Prepared by Secretariat)

- Recorded catch increased rapidly from the mid-1970s to a peak of 5 million tonnes in the mid-1990s, but thereafter declined to 2 million tonnes or less in recent years.
- Chile and, to a much lesser extent, Peru have dominated the landings throughout the recorded period, but an increasing number of flag states have entered the fishery in recent years.
- Following a period of fairly constant or slowly increasing catch from 2002 - 2006, catches declined from 2007-2008. Initial catch estimates for some fleets indicate that catches have continued to decline in 2009.

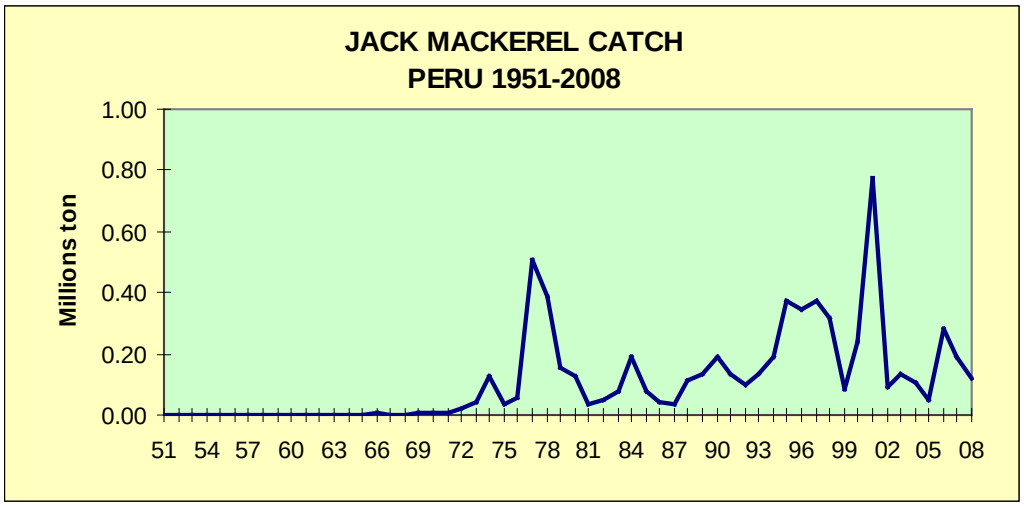


Figure 3. Total Peruvian catch of jack mackerel with purse seine nets, 1951 – 2008 (from Peru National Report 2009)

- The Peruvian catch has fluctuated widely without trend over the history of this fishery.

Table 1. Trends in annual jack mackerel catch by the EU Pelagic Freezer Association vessels since 2005. (Note that these vessels do not represent the entire EU fleet) (From SP-08-SWG-JM-01)

Flag	**Jack Mackerel Catch (t)**			
Year	**Netherlands**	**Germany**	**Lithuania**	**Total**
2006	5,973	0	0	5,973
2006	33,766	0	0	33,766
2007	41,747	43,610	38,166	123,523
2008	37,113	48,505	22,556	108,174

- Fishing vessels from the EU have increased their participation and catch in the fishery off south-central Chile in recent years.

3. Effort Trends

Table 2. Number of vessels reported as being actively fishing jack mackerel by each participant over the period 2003 - 2008.

PARTICIPANT	2003	2004	2005	2006	2007	2008
Belize					1	1
Chile		142	143	135	131	126
China		12	13	12	11	11
Cook Islands					3	
European Community			1	2	8	7
Faroe Islands					3	1
Korea		3	2	3	3	3
Peru (EEZ)		45	45	52	64	56
Russian Federation					0	1
Vanuatu	4	4	4	6	4	4
Total No. Vessels	4	206	208	210	228	210

- The number of vessels participating in the jack mackerel fisheries increased from 206 - 228 vessels from 2004 - 2007, decreasing to 210 vessels in 2008. Over this period, main changes have been a reduction in Chilean vessels and increases in EC and Peruvian vessels.

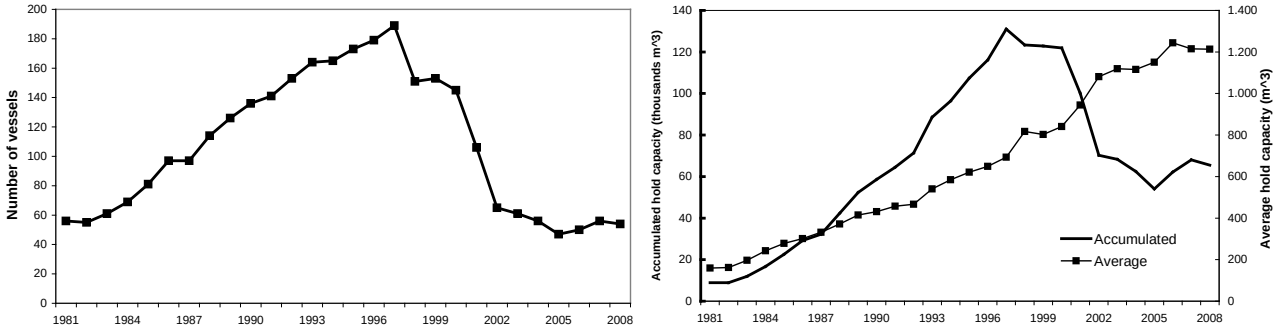


Figure 4. Evolution of the industrial pelagic purse-seine fleet in the central-southern zone of Chile; number of vessels, average and accumulated hold capacity 1981-2008. (From SP-08-SWG-JM-05)

- The total number of vessels and the total hold capacity of the Chilean fleet increased to a peak in the late 1990s and thereafter decreased rapidly to more or less stable levels in recent years.
- The implementation of the Maximum per owner Catch Limit contributed to the decrease in the fleet size, which reached its lowest number in 2005 with around 50 operating vessels and 54 thousand m^3 of total hold capacity.
- Larger vessels with higher fishing capacity replaced smaller vessels, facilitating operating in adverse conditions, fishing over a wider area in high seas and conducting longer fishing trips.

Table 3. Trends in annual fishing effort by EU Pelagic Freezer Association vessels since 2005. (From SP-08-SWG-JM-01)

year	Number of vessels	Number of fishing days
2005	1	44
2006	1	109
2007	6	401
2008	6	423
2009	6	436

(Fishing days here means any day on which fish were caught, and excludes searching days.)

- Effort by the EU PFA vessels has increased steadily since 2005.

4. Spatial and Temporal Distribution of the Fishery

Historical Catch and Effort Distribution in the High Seas

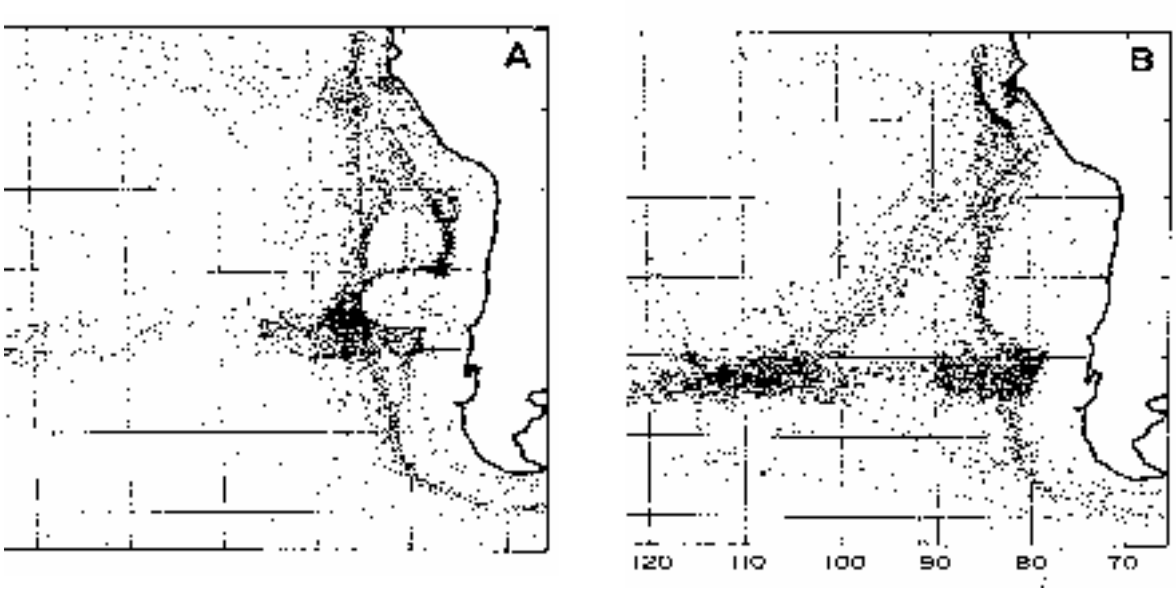


Figure 5. Locations of ex-USSR fleet 1978-92. A. July-?. B. April-June. From Parrish ?

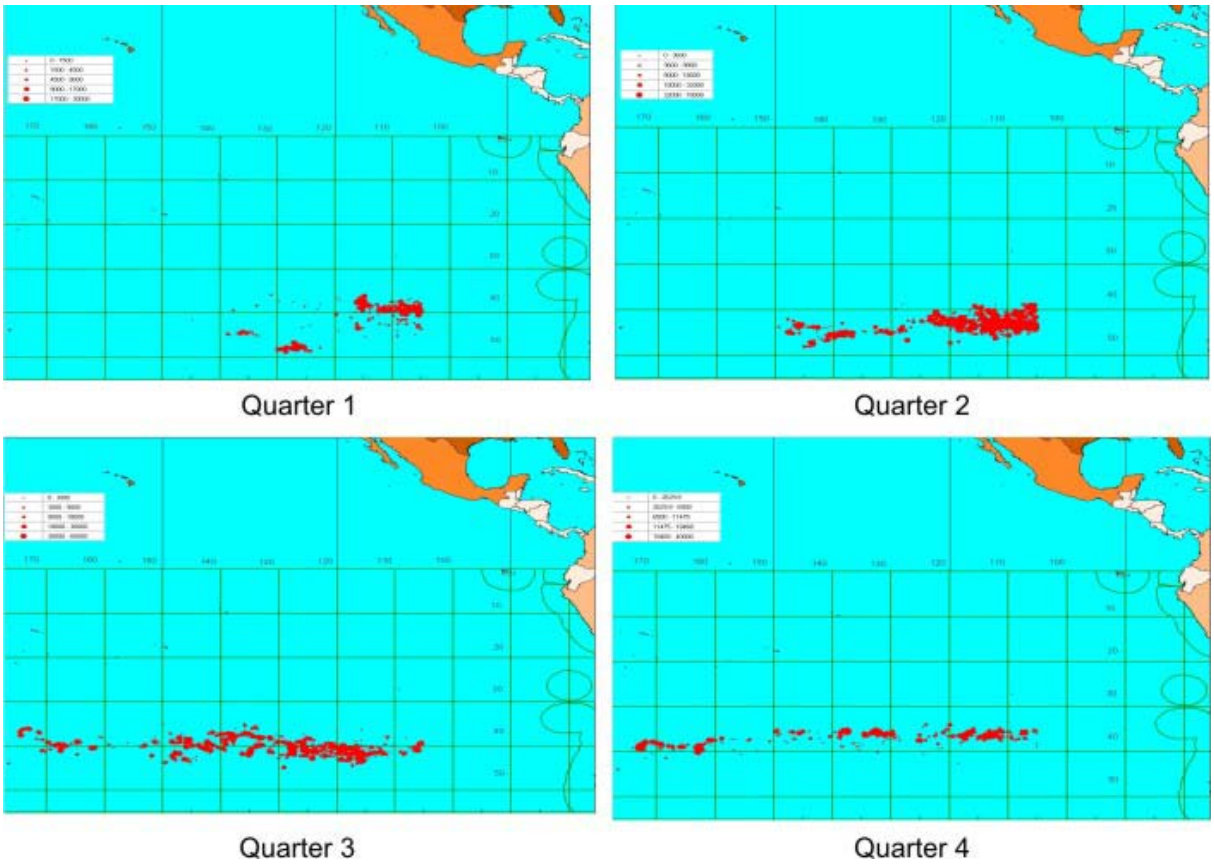


Figure 6. Jack mackerel distribution in the catches of the Russian research and searching vessels westward of 105°W 1982-1991 (334 trawls, catch in kg).

- Historical (1978-92) distributions of vessel locations and catches from the former USSR jack mackerel fleet indicate that the distribution of jack mackerel extended to 170°W over that period.

Chile

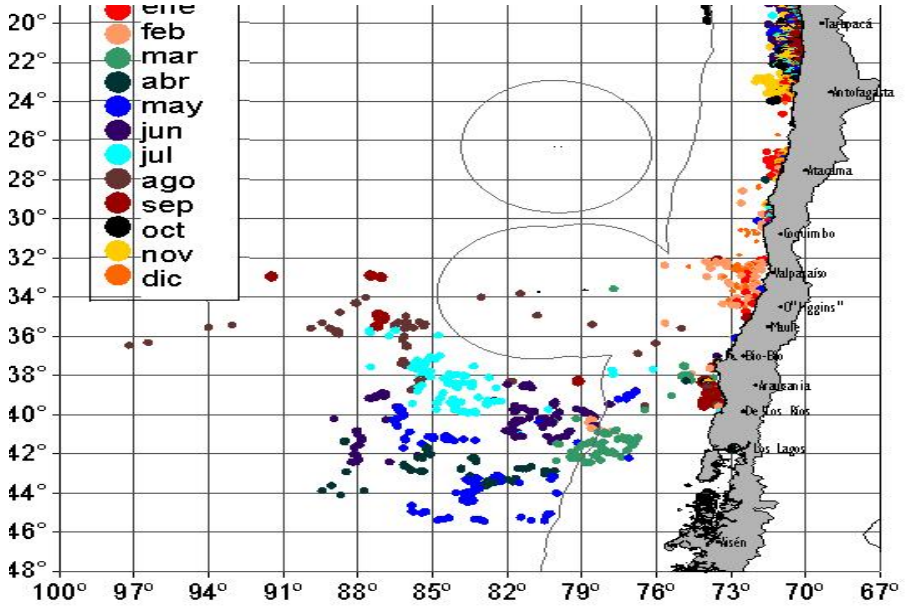


Figure 7. Spatial distribution of the jack mackerel catches made by the national fleets, within and outside the EEZ, during 2008. (From SP-08-SWG-JM-09)

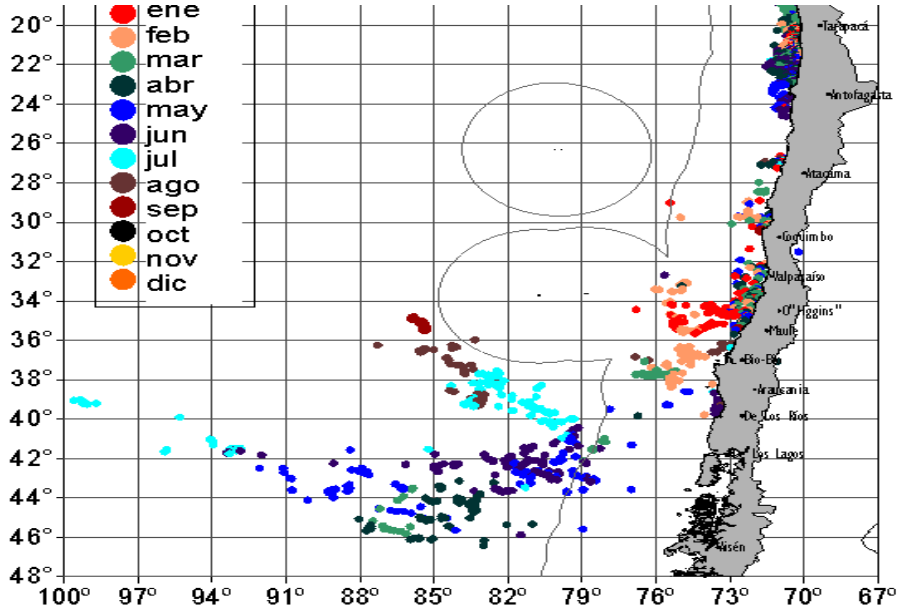
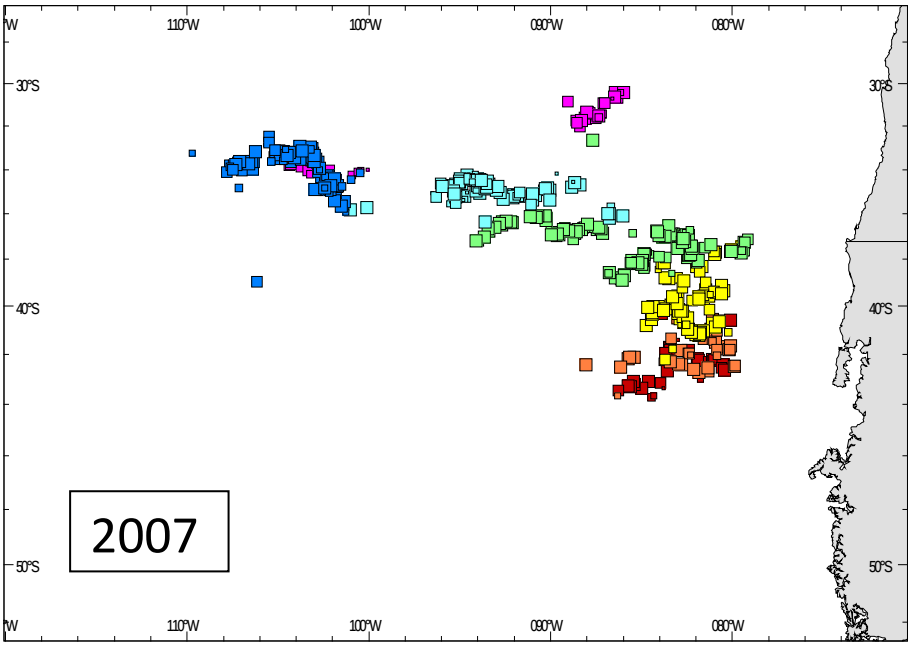


Figure 8. Spatial distribution of the jack mackerel catches made by the national fleets, within and outside the EEZ, during the first semester of 2009. (From SP-08-SWG-JM-09)

- The Chilean fishery shows strong seasonal changes in distribution.
- In 2008 and 2009 there has been a substantial expansion of Chilean fishing out onto the high seas, extending as far as 100°W in 2009.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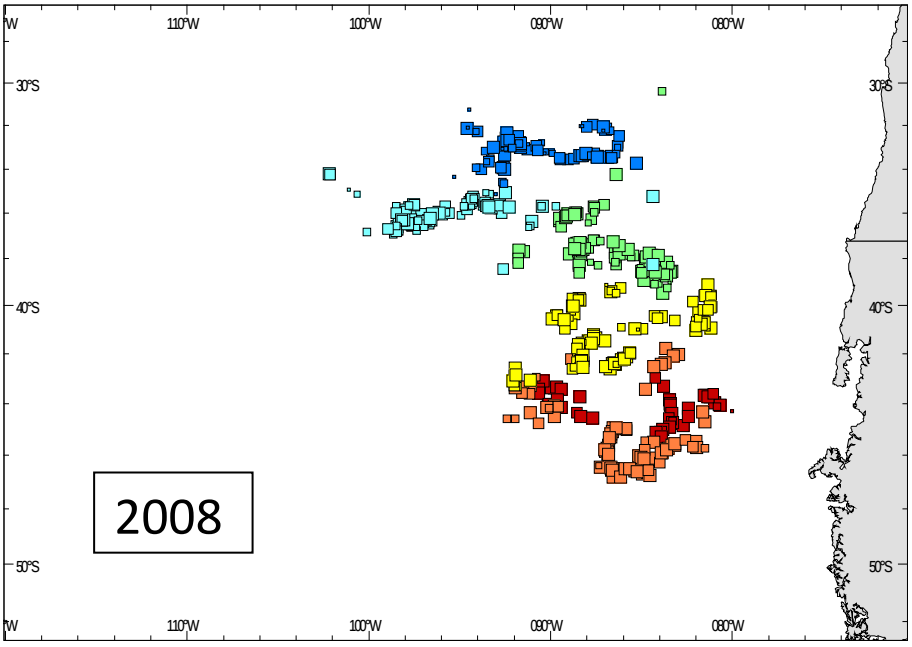
2007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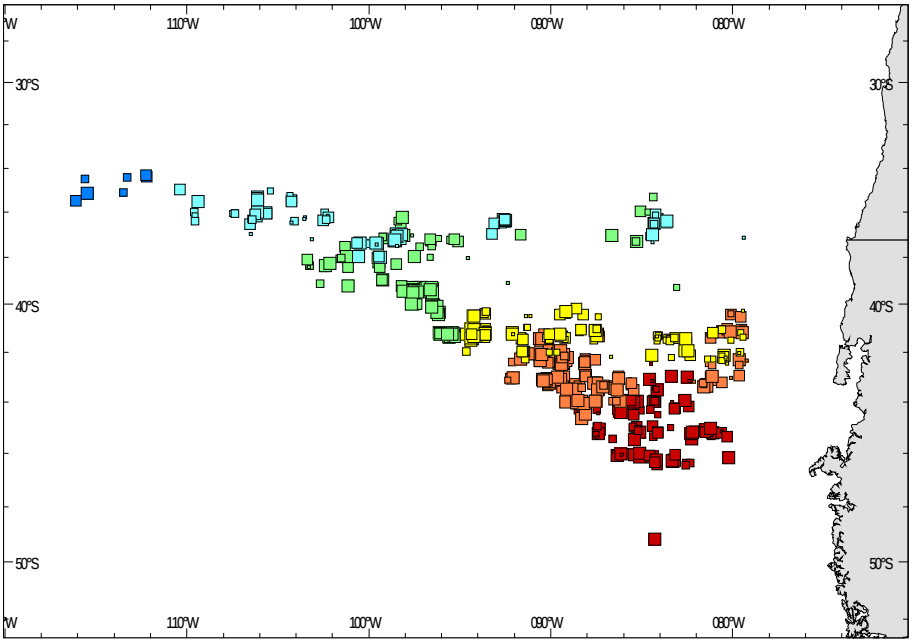

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Figure 9. Catch distribution by month of the EU PFA fleet from 2007 to 2009 (Red = April, orange = May, yellow = June, green = July, light blue = August, dark blue = September, purple = October. Size of squares is proportional to catches). (From SP-08-SWG-JM-01)

- For the EU PFA fleet, the fishery generally starts in April between 40° - 45° South just outside the Chilean EEZ. In subsequent months the fleet moves away from the continent in a northwesterly direction. The fishery ends in September/October, normally at the westernmost edge of the fishing area.
- However, there are marked differences between the individual years. In 2008, the movement of the fleet was in a northerly rather than in a westerly direction. In contrast, 2009 was comparable again to 2007, in that the fleet moved further to the west during the season, showing a more or less continuous distribution of effort and catches from 80°W to 115°W.

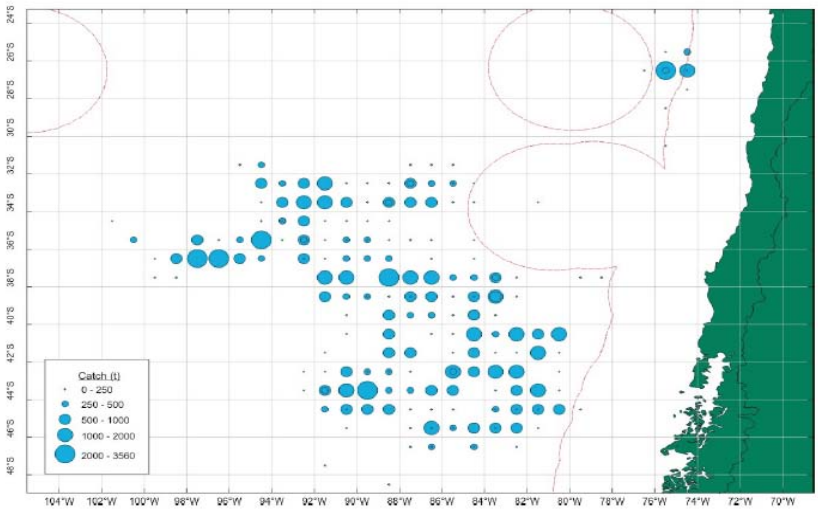

Figure 10. Locations and magnitude of jack mackerel catches by Vanuatu vessels in 2008.

- Distribution of catches by the Vanuatu fleet in 2008 was similar to the catch distributions of the EU PFA vessels.

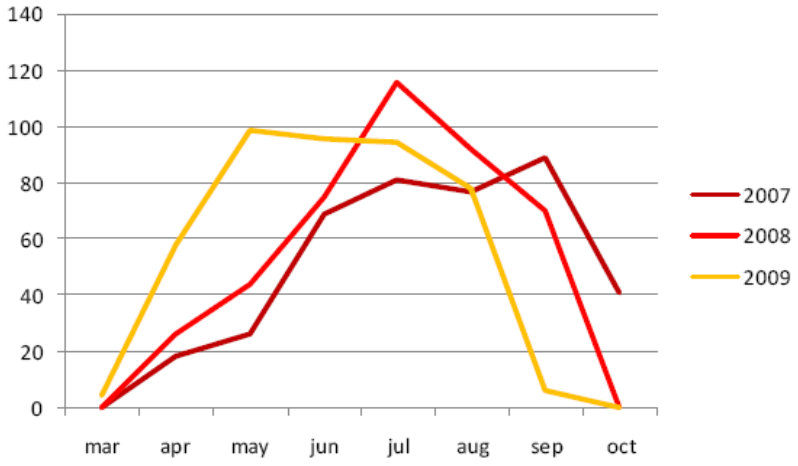

Figure 11. Total number of fishing days by EU Pelagic Freezer Association vessels per month: 2007, 2008 and 2009 - 2008. (From SP-08-SWG-JM-01)

- For the EU PFA fleet, the peak number of fishing days has been progressively earlier in the season, and the season has ended progressively earlier, each year from 2007-2009. The Chinese fleet showed a similar progressively earlier end to the fishing season in 2007 and 2008, and the Vanuatu fleet showed an earlier end to the fishing season in 2009 (China and Vanuatu National Reports 2009).

Chile

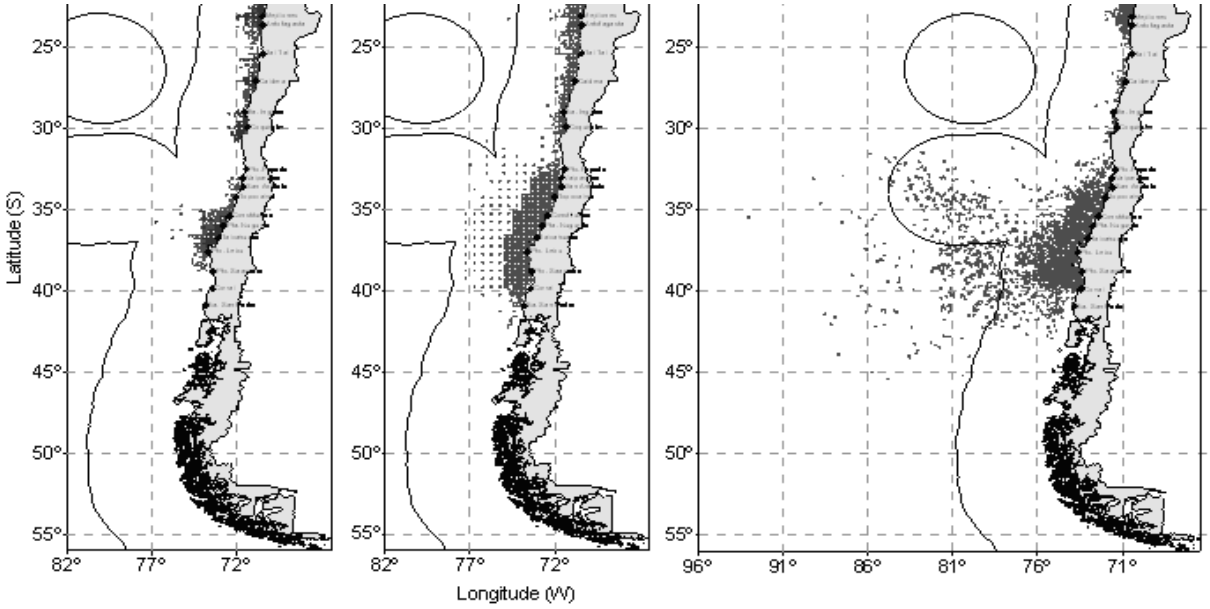

Figure 12. Spatial-temporal distribution of the jack mackerel catches by the industrial purse-seine fleet, according to 1980-2008. (Adapted from SP-08-SWG-JM-05)

- The Chilean fishery has shown an expansion of fishing activity westwards in the south-central area. Over 1980 - 1989, fishing was conducted entirely within the EEZ. Over 1990 - 1999, fishing gradually extended westwards. From 2000 onwards, fishing started to extend out onto the high seas.
- During 2008, a significant part of the catches from the south-central zone was caught outside the EEZ (79%).
- In the northern-zone fishery, the jack mackerel fishery has remained primarily coastal. Jack mackerel catches are mainly concentrated (> 85%) in the first 50 nm, and the remainder between the 50 and 100 nm, with minor catches in the high seas.

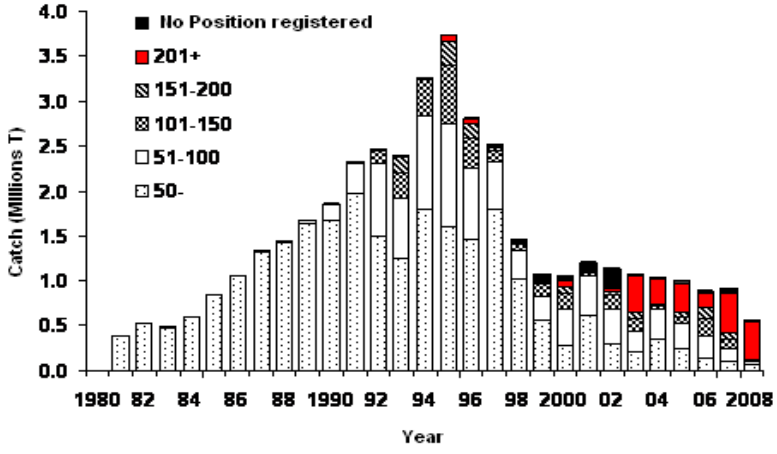

Figure 13. Industrial jack mackerel catches (t) from central-southern Chile, according to distance from the coast (nm), 1980-2008. (From SP-08-SWG-JM-05)

- The westwards shift of the Chilean fleet has resulted in an increasing proportion of their jack mackerel catch being taken on the high seas since 2003.

Peru

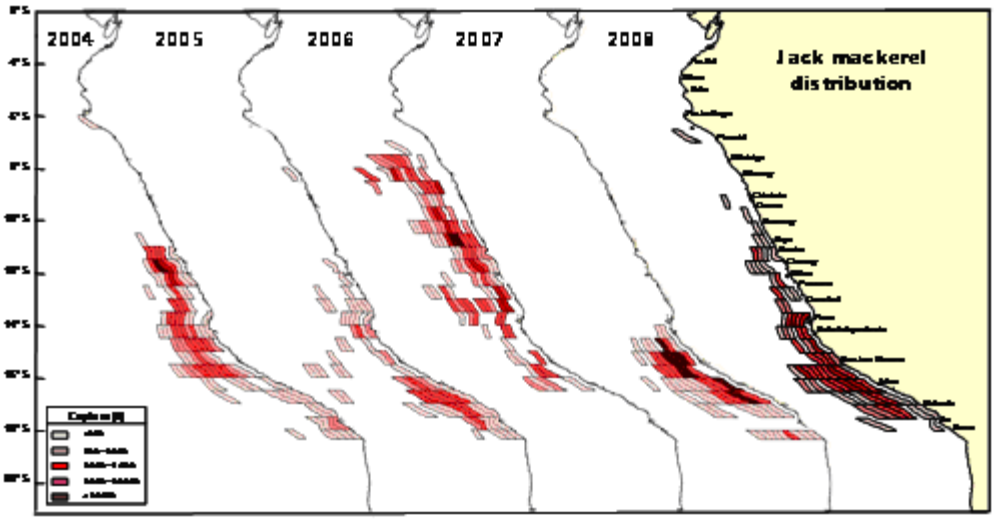

Figure 14. Jack mackerel catch distribution, 2004 – 2008 period (from Peru National Report 2009)

- The distribution of Peruvian catch and effort shows a recent contraction to the south.
- The northern areas occupied by jack mackerel before the mid 1990's are now occupied by giant squid *Dosidicus gigas.*

5. Trends in CPUE

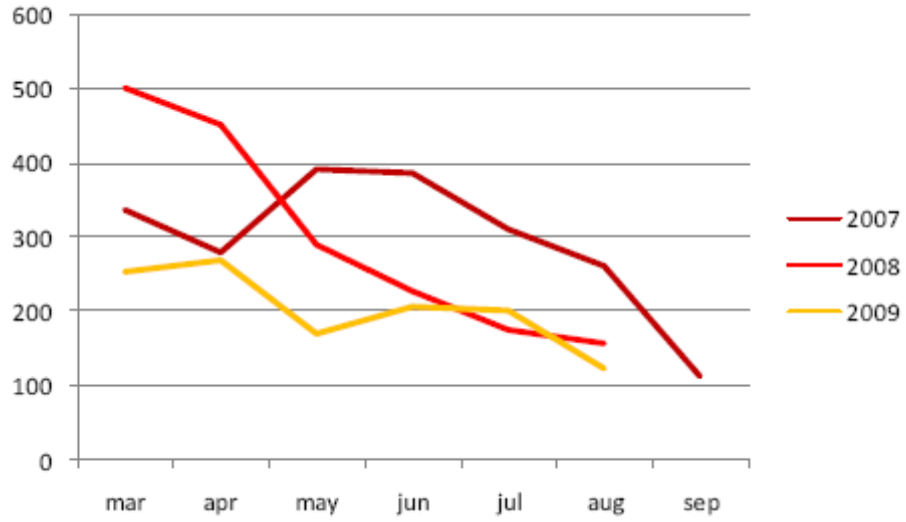

Figure 15. Monthly catch per day (tons) of jack mackerel by the EU fleet in 2007 – 2009. (Data for 2009 are preliminary) (From SP-08-SWG-JM-01)

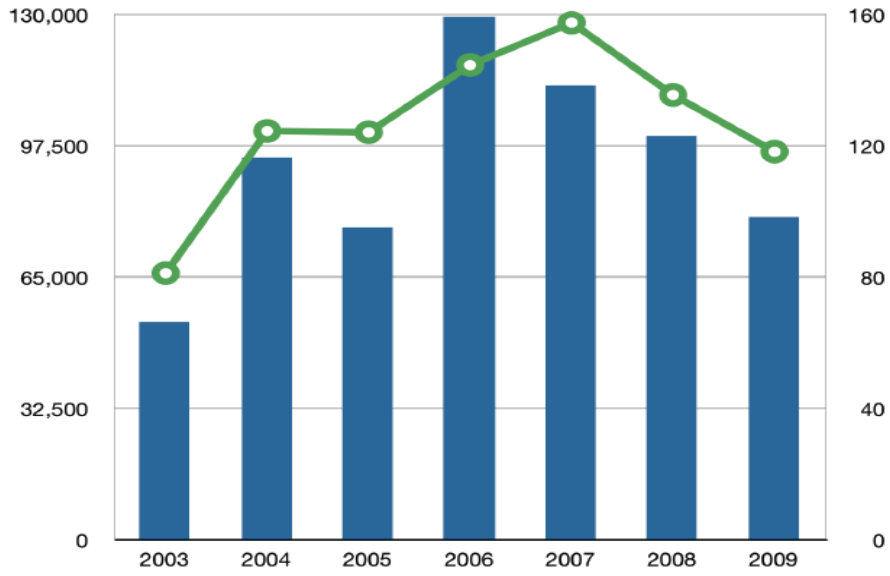

Figure 16. Trends in total jack mackerel catches (t) and catch rates (t/day) by the Vanuatu fleet from 2002 to 2009. (From Vanuatu National Report 2009)

- CPUE of the EU PFA and Vanuatu fleets have shown a decline since 2007.

Table 4. Catch, effort and CPUE for the Korean jack mackerel fishery in the SPRFMO area from 2004 - 2008. (From Korean National Report 2009)

Years	No. of Fishing Days	Catches (t)	CPUE (t/hr)
2004	205	7,438	3.88
2005	170	9,126	5.69
2006	232	10,474	5.01
2007	237	10,940	5.18
2008	249	12,600	5.98

- Nominal Korean CPUE (t/hr) shows a substantially different trend from other indices for the fishery off the south-central Chilean coast, being stable over the period 2005 - 2008. It should be noted that catches by this fleet are rather small.

6. Egg Production Survey Indices

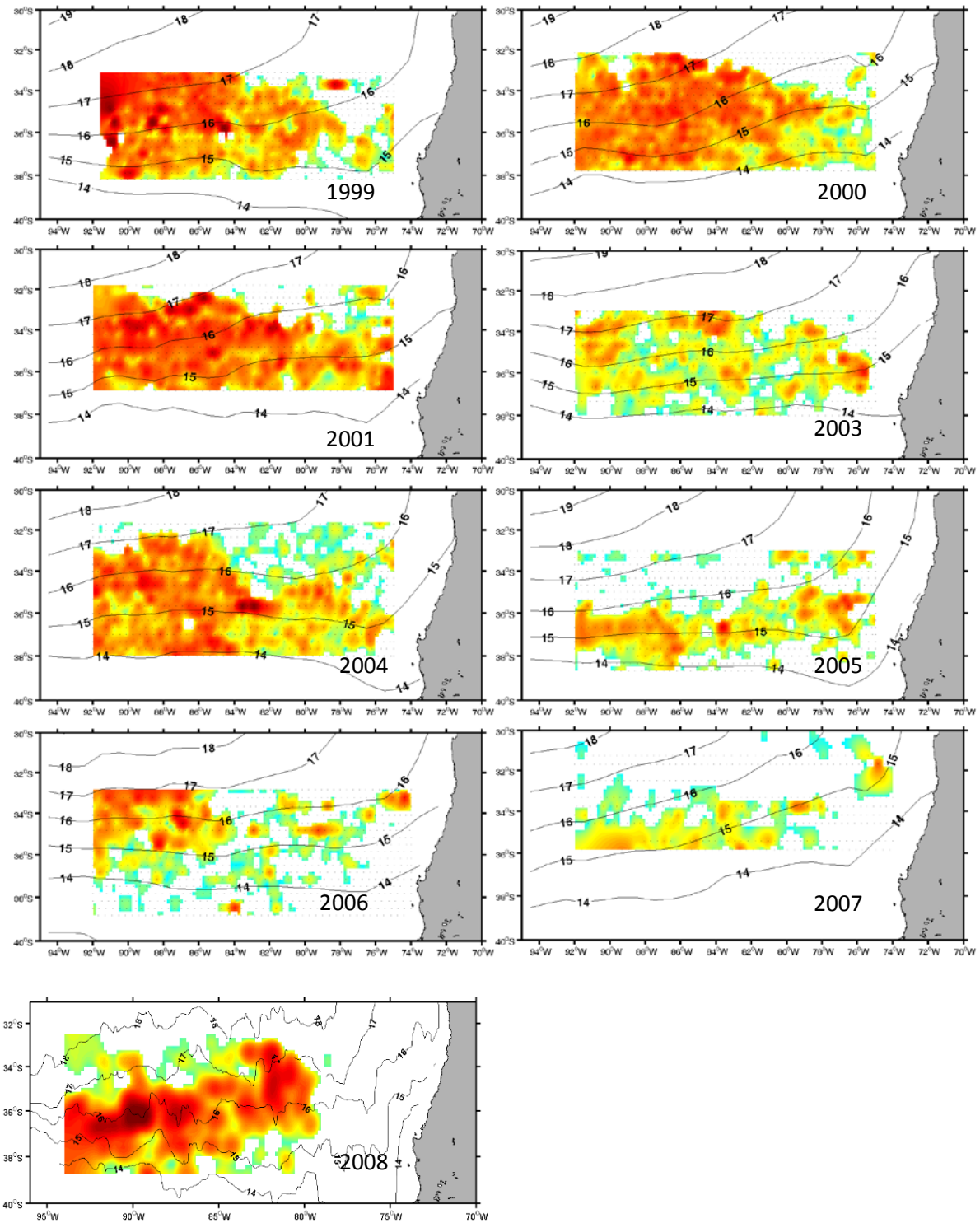

Figure 17. Spatial distribution of jack mackerel eggs in relation to sea surface temperature isotherms found in daily egg production surveys conducted off southern-central Chile in November 1999-2008 (additional information to SP-08-SWG-JM-02).

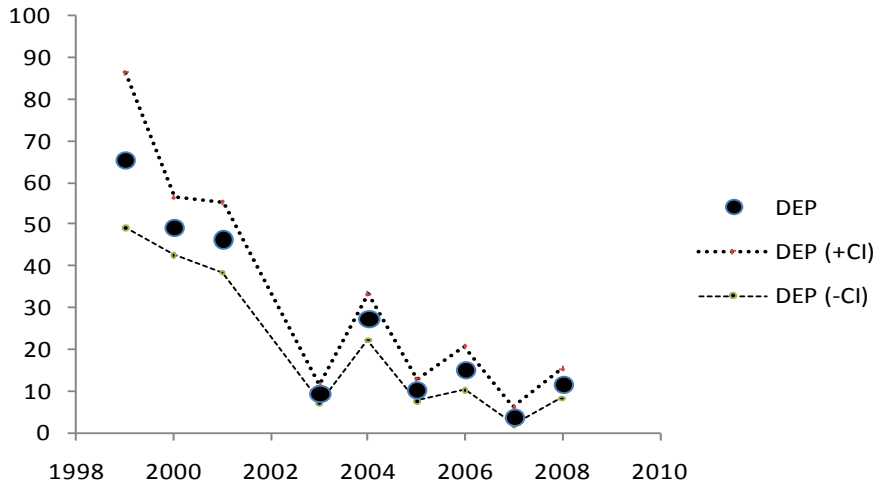

Figure 18. Survey estimates of jack mackerel daily egg production (DEP, (eggs.m-^{2}.d^{-1}) with confidence intervals from daily egg production surveys conducted off southern-central Chile in November 1999-2008 (additional information to SP-08-SWG-JM-02).

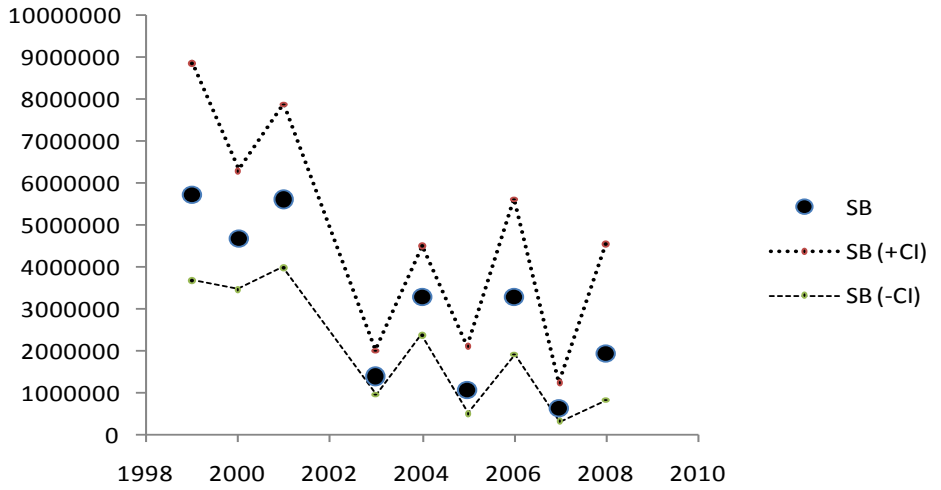

Figure 19. Survey estimates of jack mackerel spawner biomass (SB, tons) with confidence intervals from daily egg production surveys conducted off southern-central Chile in November 1999-2008 (additional information to SP-08-SWG-JM-02).

The key features of the Chilean egg surveys are:

- The density and distribution of eggs in daily egg production surveys conducted off southern-central Chile show a substantial decline over the period from 2001 - 2005.
- There appear to have been two periods of different egg production and estimated spawner biomass - a period of higher DEP and SB from 1999 - 2001 and a period of lower DEP and SB from 2003 - 2008.
- Egg distribution shows a westward shift in 2008, with no eggs encountered in the area 75° - 80° W.

6. Acoustic Survey Indices

Chilean Acoustic Estimates of Biomass

Table 5. Number of aggregations (%) per nautical mile in Chilean acoustic surveys: 1997 - 2002 (within the Chilean EEZ) and 2003 - 2008 (surveys extended to beyond the Chilean EEZ in the southern area). (From SP-08-SWG-JM-03)

Years	Number of aggregations per nautical mile (%)							
	1	2	3	4	5	6	7	8
1997	52.3	25.5	11.6	5.5	2.6	2.0	0.3	0.2
1998	63.2	22.1	9.6	2.2	2.2	0.7		
1999	69.5	20.9	6.4	2.5	0.7			
2000	70.9	17.4	10.0	1.3	0.4			
2001	71.4	25.9	2.7					
2002	93.1	6.9						
2003	87.6	12.4						
2004	85.0	15.0						
2005	92.3	7.7						
2006	91.8	8.2						
2007	95.2	4.8						
2008	94.5	5.5						

- The number of aggregations per nautical mile has decreased steadily from 8 in 1997 to 2 in 2002, with increased proportion of single aggregations in 2008.

Table 6. Acoustic indices of jack mackerel biomass and coefficient of variation (CV) inside and outside the Chilean EEZ and total area in which jack mackerel biomass was found (1997-2008). The western limit in 2006 was 500 nm and 480 nm in 2008. (From SP-08-SWG-JM-03)

Years	5-200 nm		200-400+ nm		Total		Biomass
	Biomass (tons)	CV	Biomass (tons)	CV	Biomass (tons)	CV	Area (mn^2)
1997	3,753,516	0.044			3,753,516	0.044	58,000
1998	3,255,838	0,039			3,255,838	0.039	47,540
1999	4,354,999	0.031			4,354,999	0.031	61,317
2000	5,889,227	0.049			5,889,227	0.049	65,196
2001	6,146,418	0.034			6,146,418	0.034	52,636
2002	2,027,384	0.040			2,027,384	0.040	53,496
2003	914,653	0.090	1,831,599	0.067	2,746,252	0.051	53,129
2004	529,790	0.068	3,495,064	0.057	4,024,854	0.051	66,636
2005	583,259	0.106	3,503,062	0.035	4,086,322	0.034	57,226
2006	612,457	0.125	2,827,428	0.075	3,439,885	0.060	52,886
2007	87,753	0.121	3,155,924	0.057	3,243,676	0.055	35,748
2008	1,457	0.100	487,507	0.130	488,965	0.120	8,621

(Biomass Area = the area occupied by biomass within the surveyed area. Note : The surveyed area changed between 2002 and 2003, being extended further south and westwards outside the EEZ. From 2003 onwards the surveyed area has remained constant.)

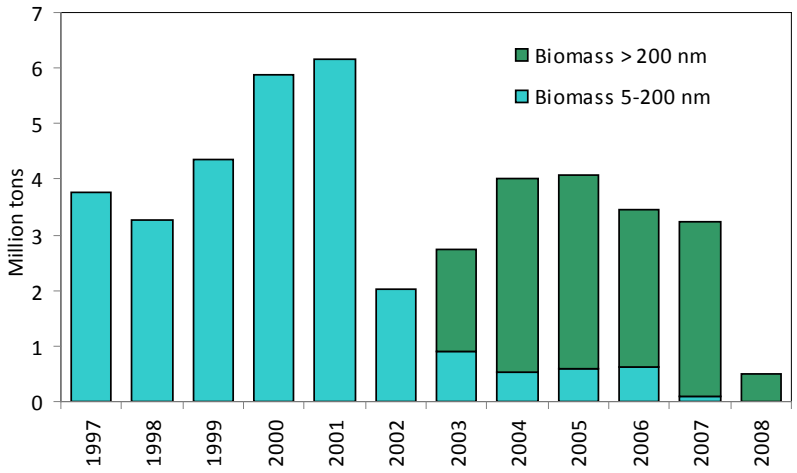

Figure 20. Acoustic indices of jack mackerel biomass inside and outside the Chilean EEZ from 1997 - 2008. The western limit in 2006 was 500 nm and 480 nm in 2008. (From SP-08-SWG-JM-03)

- Acoustic estimates of biomass within the Chilean 200 nm zone decreased substantially from 2001 to 2004, and from 2006 to 2008. Outside of the Chilean EEZ, estimated biomass within the surveyed area fluctuated without trend from 2003 - 2007, but declined substantially between 2007 and 2008.

- The substantial decrease noted between 2007 and 2008 both inside and outside the Chilean EEZ may be partially explained by an apparent shift of jack mackerel westwards out of the survey area, as indicated by the westward shift in fishing positions between these years.

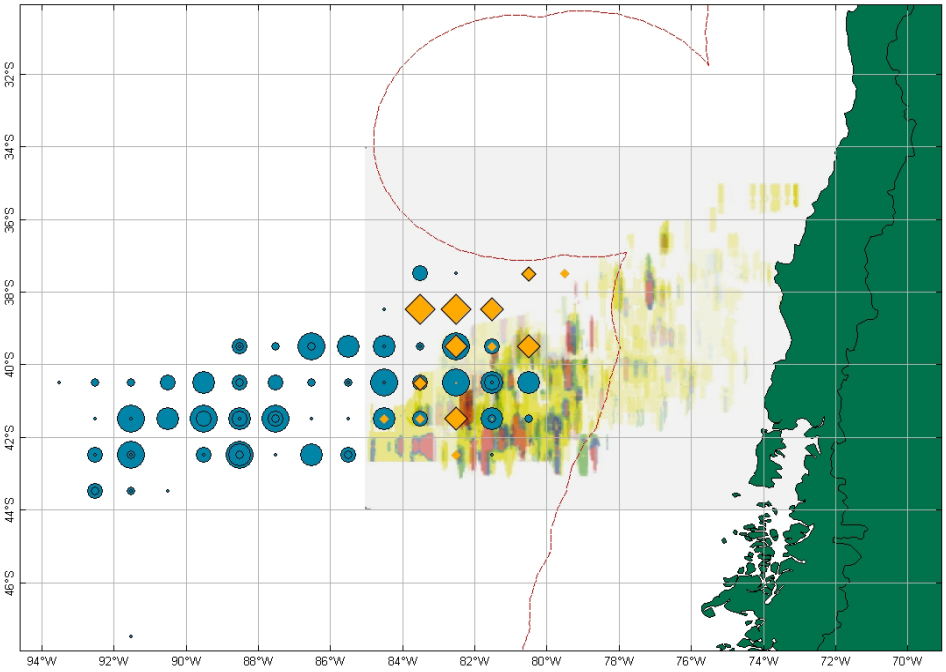

Figure 21. Geographic distribution of jack mackerel catches by 1x1° block of central southern Chile in June 2007 (orange diamonds) and June 2008 (blue circles) compared to overlaid estimates of acoustic biomass from acoustic surveys in 2003, 2004, 2006 and 2007. (Prepared by Secretariat).

Peruvian Acoustic Estimates of Biomass

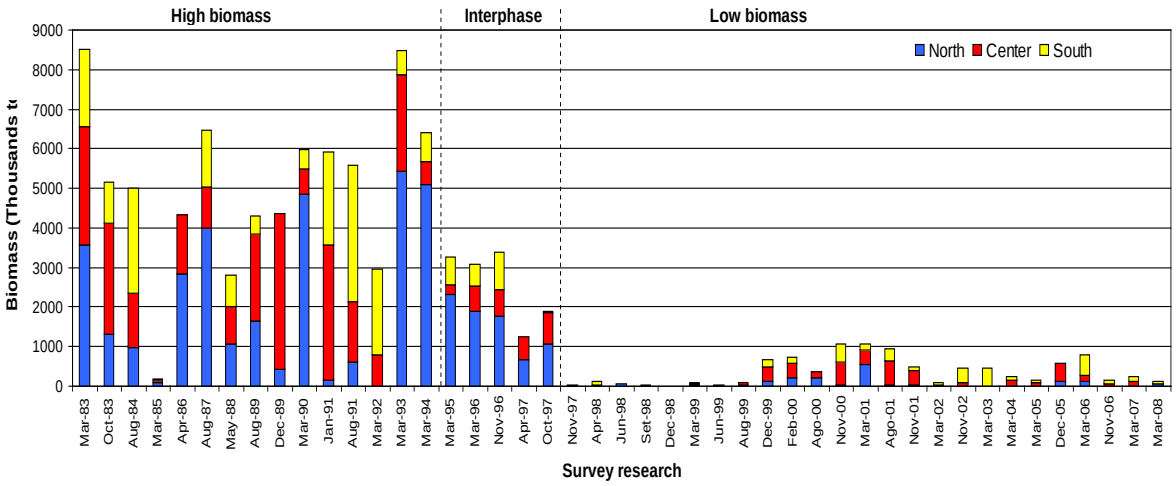

Figure 22. Jack mackerel biomass from acoustic surveys conducted from 1983 - 2007 (from Peru National Report 2009).

- Jack mackerel biomass estimates for the period 1983- 2008, obtained from acoustic surveys off 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 the present.
- In the period 1998 – 2008 the decrease in jack mackerel biomass coincides with a rapid increase in giant squid abundance, mainly in the northern part of Peru. This also coincides numerous other changes in the region, indicating that jack mackerel abundance was affected by factors other than the fishery

7. Size/age structure of catches/surveys

EU Size Data

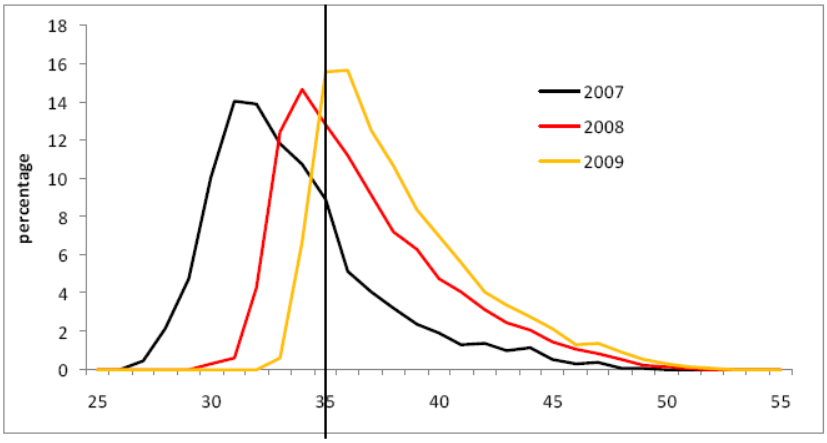

Figure 23. Annual length distribution of jack mackerel catch by the EU fleet compared for three consecutive years: 2007, 2008 and 2009. (From SP-08-SWG-JM-01)

- Modal size of jack mackerel caught by the EU PFA fleet has shown a steady increase from 31cm - 36 cm over 2007 - 2009, associated with the disappearance of smaller fish from the catch, with minimum size increasing from 26cm - 32 cm over the period, indicating little or no recruitment over the past two years.
- The mode of 31 cm in 2007 corresponds to a 4-5 year old jack mackerel, depending on the growth function used. Modes in 2008 and 2009 each correspond approximately to one additional year of increment in age. A jack mackerel with a mean length of 36 cm is approximately 6-7 years old.

Chilean Size and Age Data

Table 7. Trends in annual length structure of Chilean jack mackerel in sampled during annual egg-production surveys in oceanic waters: 1999-2008. (From SP-08-SWG-JM-02)

Year	Range	Principal Mode (cm)	% Below Minimum Length
1999	21-56	25	56.8
2000	21-54	26	27.0
2001	20-57	26	32.8
2003	18-60	28	15.7
2004	20-65	29	11.4
2005	23-52	31	0.2
2006	26-61	35	0.0
2007	29-55	(*)	0.0
2008	28-47	37	0.0

(*) Undetermined, only 116 adults of jack mackerel were sampled.

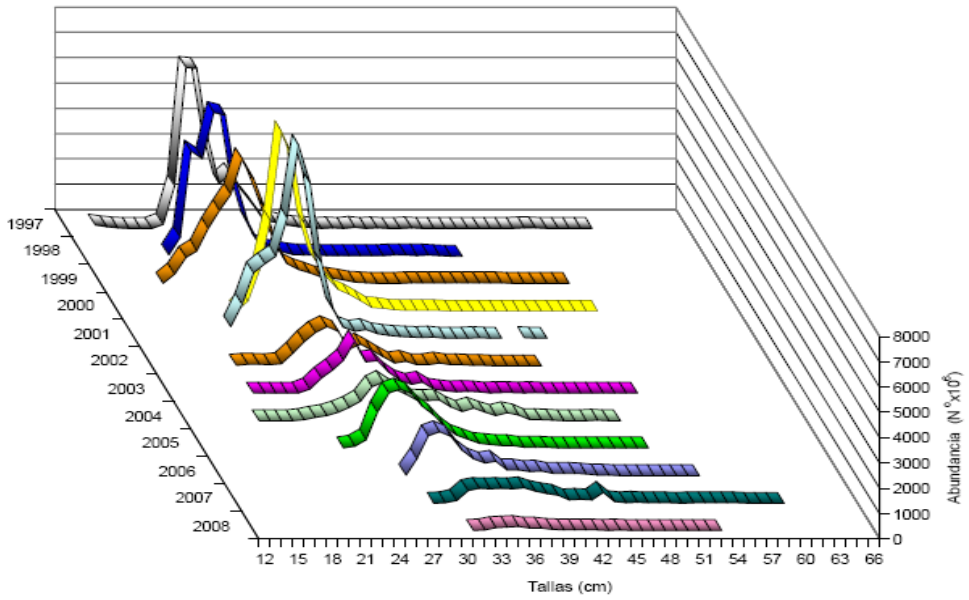

Figure 24. Acoustic estimates of jack mackerel abundance (fish numbers) in the Chilean acoustic survey area structured by size in the period 1997-2008 between 5- 400 + nm offshore (From SP-08-SWG-JM-03).

- Size frequency of Chilean jack mackerel sampled during the spawning period shows a similar increase in the main modal length, an increase in minimum length in the samples and a decrease in the percentage of fish below the minimum size limit of 26cm. Acoustic survey size composition also shows the same trends.

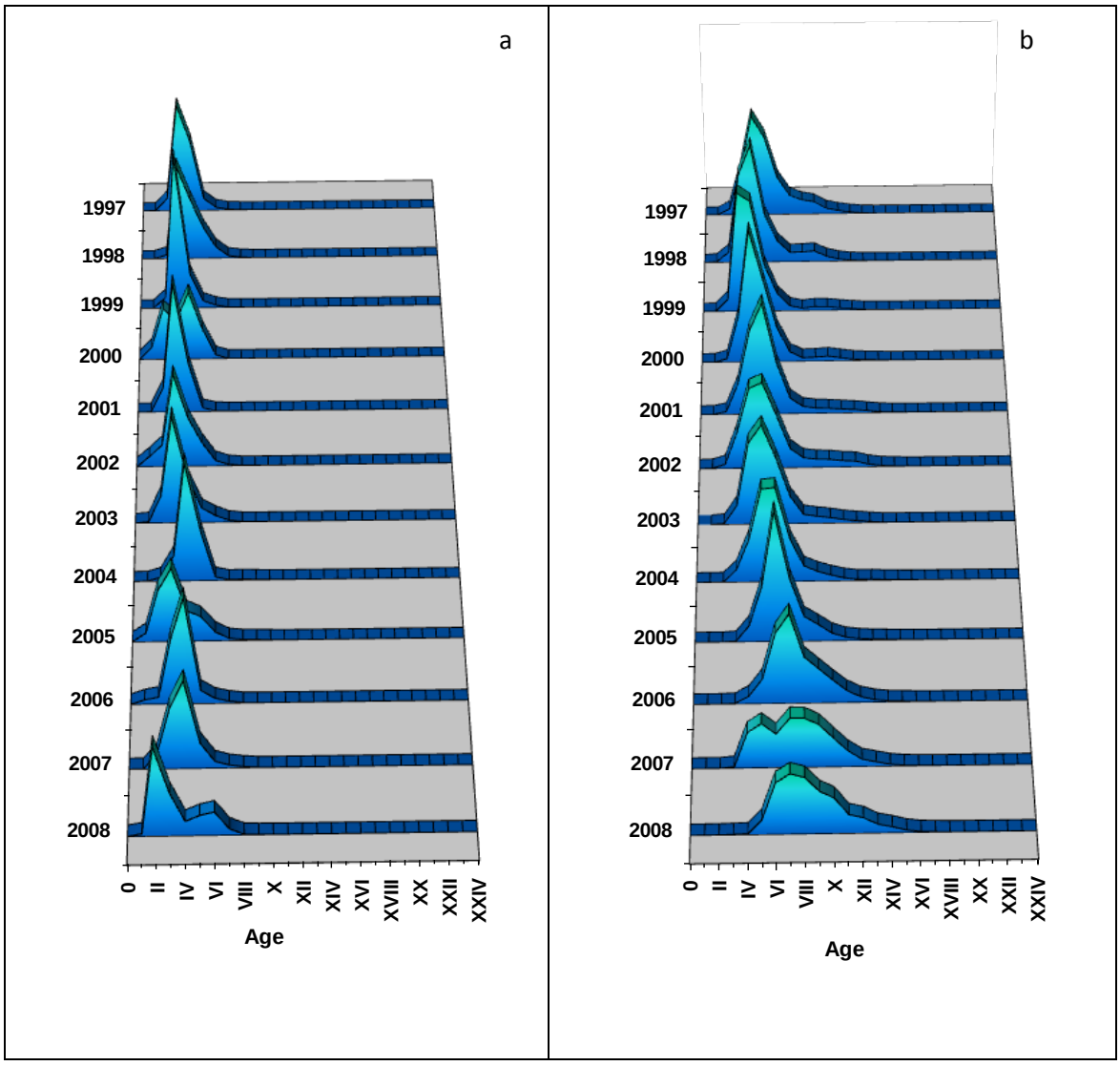

Figure 25. Age structure of jack mackerel catches in percentages; a) Northern fishery; b) South-central fishery, 1997-2008. (From SP-08-SWG-JM-09)

- There is a spatial segregation of the size/age structure of jack mackerel in Chilean catches, with the smallest sizes/ages being mainly caught in the northern zone of Chile, with larger sizes/ages being caught off the south-central zone, where the main fishery is located. The purse-seine gear used is capable of catching all fish larger than ~15cm, so this difference appears to reflect genuine differences in size of available fish in each region.
- The catches in the southern fishery have shown a progressive "ageing" of the age structure and progression in modal age, particularly as a result of weak recruitment in the last 8 years.

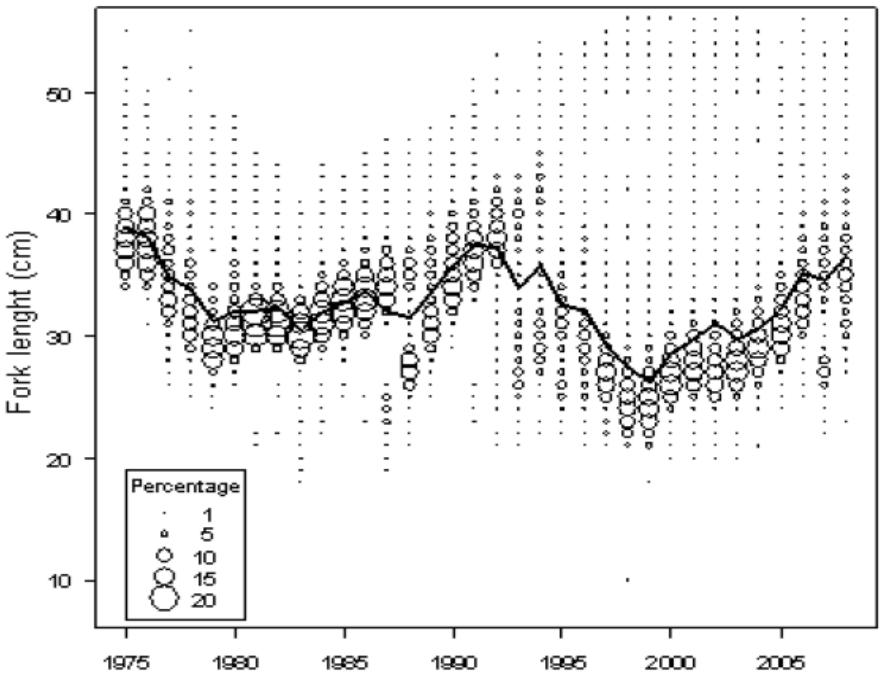

Figure 26. Size composition of catches in the Chilean central southern jack mackerel fishery: 1975 - 2008. (From SP-08-SWG-JM-04)

- Size-frequency composition of jack mackerel catches by the Chinese fleet over 2000 - 2008 shows a similar trend of increasing fish size, with absence of small fish <25cm in the last three years.

9. Oceanographic Conditions

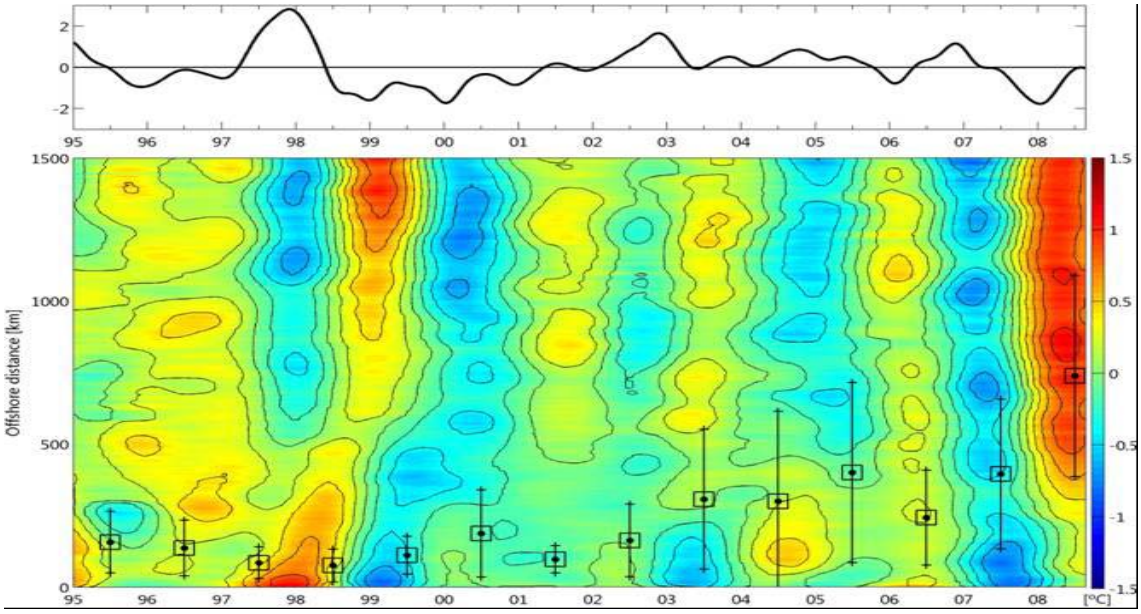

Figure 27. Hovmöhler time- zonal plot of SST anomalies (ºC) in the CHJM habitat off central-southern Chile, considering the 39ºS band. Boxes represent the CHJM mass centers for 1995-2008. Time-series of ENSO index variability are also included.

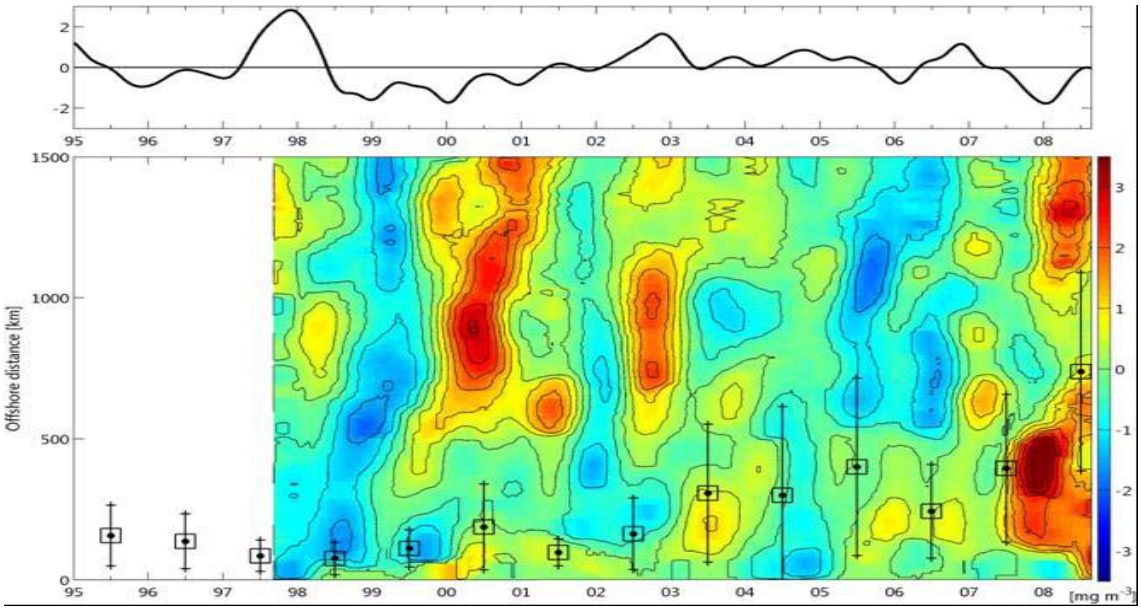

Figure 28. Hovmöhler time- zonal plot of surface chlorophyll anomalies (mg m-3) in the CHJM habitat off central-southern Chile, considering the 39ºS band. Boxes represent the CHJM mass centers for 1995-2008. Time-series of ENSO index variability are also included.

- Inter-annual changes in sea surface temperature and chlorophyll distribution off south central Chile demonstrate that oceanographic conditions in the area of distribution of jack mackerel are highly dynamic between years and also within seasons.
- Distribution patterns of jack mackerel are believed to be influenced by these changes. Environmental changes are likely to have particular strong influences on egg and larval survival and recruitment.

10. Stock Assessments and Biological Reference Points

Chilean Stock Assessment

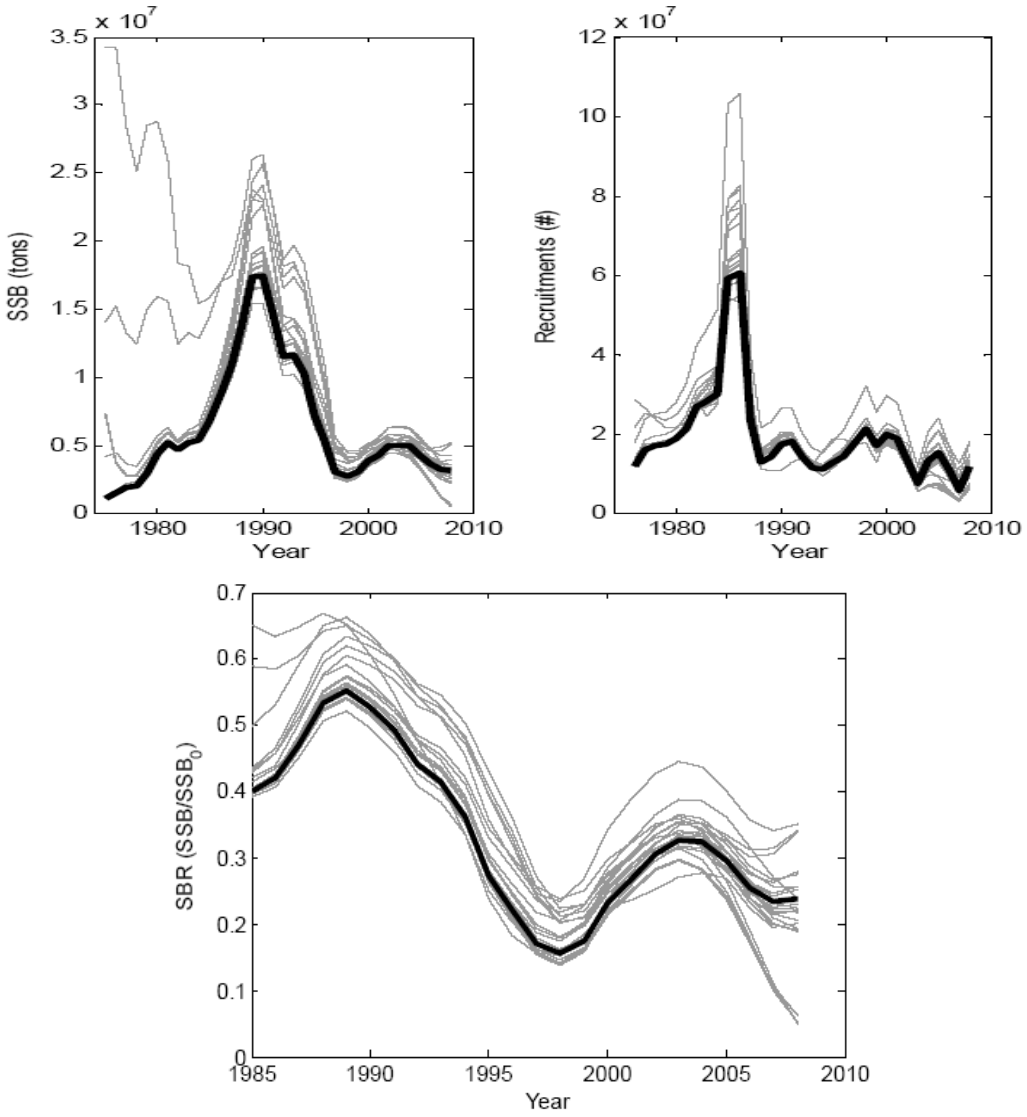

Figure 29. Chilean jack mackerel spawning biomass (SSB), recruitment and spawning biomass ratio (SBR) trends from the 26 scenarios. The bold line represents the baseline case. (From SP-08-SWG-JM-08)

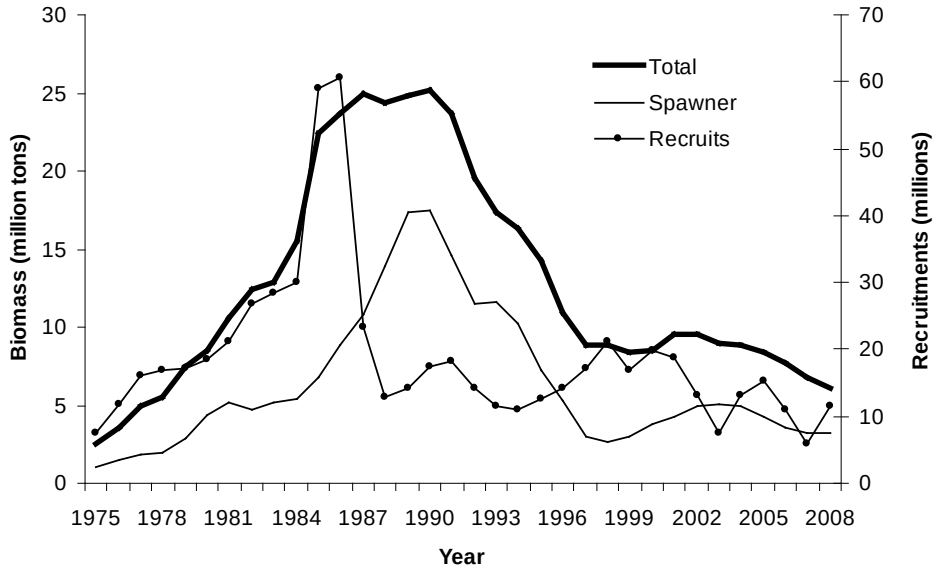

Figure 30. Biomass and recruitments of Chilean jack mackerel total biomass from the baseline model. (Source:IFOP) (From SP-08-SWG-JM-08)

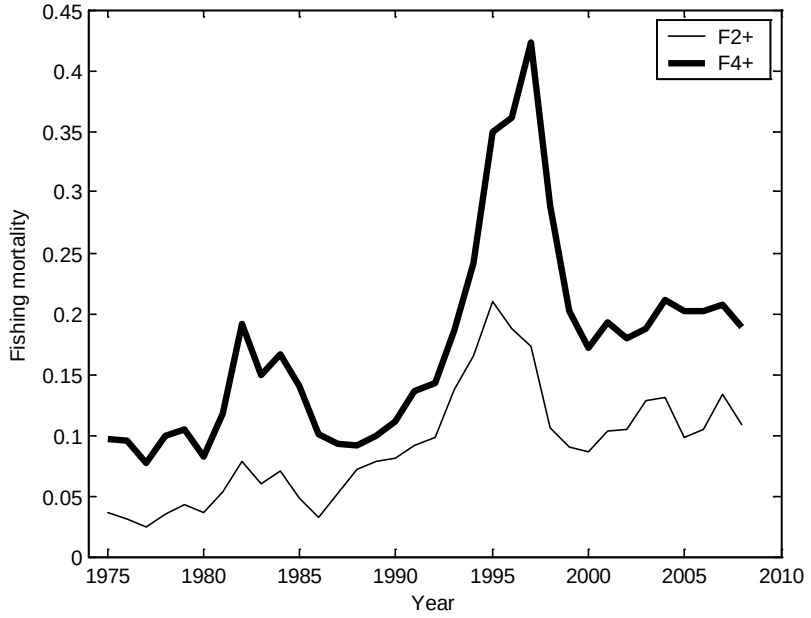

Figure 31. Weighted fishing mortality rate of the Chilean jack mackerel for ages 2 and 4 plus. (Source:IFOP) (From SP-08-SWG-JM-08)

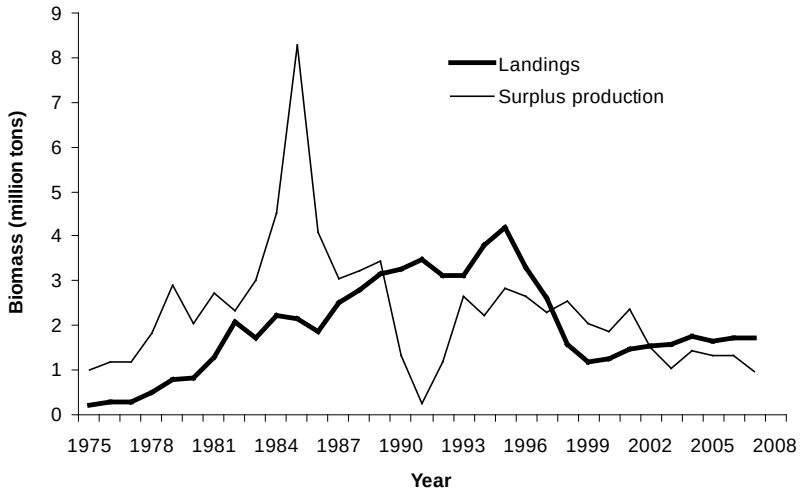

Figure 32. Landings and surplus production of the Chilean Jack Mackerel. (Source:IFOP) (From SP-08-SWG-JM-08)

- The updated Chilean stock assessment indicates that the jack mackerel biomass increased from 1975 to 1985 due to a steady increase in the size of the 1973 to 1982 year classes, followed by two successive exceptional year classes in 1983 and 1984 (each estimated to be almost 60 billion individuals at age 2). Estimated year class strengths have subsequently been much smaller (an average of about 15 billion age 2 individuals over the period 1986 to 2006). Model estimates of spawning biomass declined substantially to low levels (about 15% of the peak in 1989-90) over 1990 - 1997, increased slowly to 2003 and declined slowly again to 2008.
- Simultaneously with the increase in estimates of biomass, landings grew rapidly from less than 100,000 t in 1975 to a maximum of 4.2 million t in 1995. Thereafter, landings have declined to less than half of the peak, although they have exhibited a moderate increasing trend since about 1998.
- Fishing mortality (F) was estimated to have increased from about 1986 to the mid-1990s: for fish of 4 years and older, it exceeded 0.4 in 1997, dropping to approximately 0.2 by 1998 and remaining at about that level until the present. Landings have exceeded the estimated surplus production of the stock over two periods: 1990-1997, and 2002 onwards. The estimated spawner biomass ratio (SBR) (currently about 25%) is well below the commonly-used reference level of 40% and has been below that level since about 1993.

Peruvian Stock Assessment

- Available biomass off Peru estimated by 3 assessment models showed similar trends with slight differences. Over 1999 to 2008, the highest biomass (between 1 and 2 million t) was observed in 2001. Thereafter biomass remained almost constant (about 0.3 million t). 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 (from Peru National Report 2009).

Deepwater Sub-Group

Scientific Working Group

8th International Consultations on the Establishment of the SPRFMO

5 November 2009

Auckland, New Zealand.

Draft Meeting Report

1. Opening of the Meeting

The Sub-Group meeting was opened by Dr Andrew Penny, Chair of the SWG.

2. Adoption of Agenda

The agenda was adopted without change

3. Administrative Arrangements

Five documents, SWG-DW-01 to SWG-DW-05, were tabled for discussion by the DWSG.

4. Chairmanship of the Deepwater Sub-Group

Mr Rodolfo Serra was unanimously elected Chair for the DWSG. Mr Serra will serve a term of 2 years.

5. Nomination of Rapporteurs

Ms Kelly Denit and Dr Ilona Stobutzki were appointed as rapporteurs.

6. SPRFMO Benthic Assessment Standard

Review of the initial draft SPRFMO Bottom Fishery Impact Assessment Standard (BFIAS)

Ms Denit summarised the process to date that produced the initial draft BFIAS (SP-08-SWG-DW-01): after discussion at the 7th SWG - DWSG an inter-sessional taskforce (led by the US and including Australia, Chile, New Zealand) contributed to the interim draft. Ms Denit summarised the main changes that were made inter-sessionally.

The DWSG agreed to review the initial draft BFIAS section by section, noting that further inter-sessional work was needed, with the aim of adopting the BFIAS at the next DWSG meeting. Comments on relevant sections are provided below:

1. Introduction

The discussion on whether an Introduction was required in a technical standards document such as the BFIAS was revisited. In the interim the Introduction will remain but may be removed from the final version.

The term "deep sea fish stocks" will be changed through-out to "deep sea fisheries resources" reflecting the draft Convention text. Although noting the Interim Measures refers to "deep sea fish stocks".

3. Area of Application

The text describing the area of application will be bracketed and reflect changes, if any, from the 8th Meeting of the Participants in the consultations on the establishment of a South Pacific RFMO.

4. Bottom Fishery Impact Assessment Process

The first two bullet points will be changed to reflect that the requirement of BFIAS is described in the Interim measures.

5. Bottom Fishing Impact Assessment Standard

5.1 Definitions

5.1.2 Risk

The wording regarding the objectives will be changed to reflect that the objectives are implicit in the Interim Measures.

5.1.3 Low Productivity Deep Sea Resources

The term "low productivity deep sea resources" will be simplified, but consistent with the FAO Guidelines.

5.1.5 Surrogates to Identify Vulnerable Marine Ecosystems

The term "indicator" will be used instead of "surrogates".

It was noted that there is a need to identify areas known or likely to contain VMEs. In the absence of specific information, the indicators listed in this section should form

the scientific basis of identifying areas likely to contain VMEs. It was noted that there have been further research on indicators of VMEs. This will be reviewed inter-sessionally (New Zealand) for potential additions to the list of indicators.

5.1.7 Hierarchy of Bottom Fishing Impacts

There was discussion on the use of a hierarchy of gear impacts based on research in a specific area. It was agreed that the BFIAS should include a ranking of the different levels of impact of gear types (independent of intensity, characteristics of VMEs etc). This ranking should be based on available research and at the time Chuenpagdee et al. (2003) was the only available comparison of all gear types.

It was noted that more research on gear impacts is now available to inform the ranking. This will be reviewed inter-sessionally to determine whether the hierarchy should be modified.

6. Detection of VMEs

The outcomes of the recent CCAMLR workshop (August 2009, SP-08-SWG-INF-03) on VMEs will be considered inter-sessionally (New Zealand). Relevant aspects may be included in the BFIAS, particularly Section 6.

6.1 Detection of 'Evidence of VMEs'

It was clarified that the proposed thresholds for identifying evidence of interaction with a VME were per tow or operation.

There was discussion whether the proposed thresholds should be site/area specific. There is currently no scientific justification for area specific thresholds. However it was noted that as new research or analyses become available the BFIAS could be reviewed and updated (stated in BFIAS Section 2). Participants may present analyses for consideration to future SWG meetings.

The proposed thresholds are based on analyses of trawl data and so analyses to determine thresholds for longline and other gear are still required. It was noted that CCAMLR has undertaken an analysis of the interaction of benthic longlines and VMEs. The CCAMLR analysis will be considered inter-sessionally and relevant aspects may be included in the BFIAS.

7. Bottom Fishery Impact Assessment Sections

7.1.1 Description of the Proposed Fishing Activities

The reference to "the list of approved SPRFMO vessels" will be changed to "authorized vessels" reflecting the current situation.

7.1.3 Impacts Assessment

The need for a transparent scoping process will be included in the text.

The list of examples of risk assessment approaches will be updated inter-sessionally to reflect advances in risk assessment approaches in fisheries and marine ecosystems and current best practice.

The determination of overall risk (pg 21) will be reviewed inter-sessionally (Australia) to reflect that the level of overall risk will be based on scientific analysis.

7.1.4 Information on Status of the Deepwater Stocks to be Fished

This section will be revised inter-sessionally to reflect the reporting requirements in the FAO guidelines and provide more guidance on what is expected in the impact assessment for deepwater stocks (New Zealand).

It was also reiterated that in addition to further developing this section of the BFIAS, more progress should be made on the assessment of deepwater stocks under that specific DWSG agenda item.

7.1.5 Monitoring, management and mitigation measures

The BFIAS will reflect the requirement to demonstrate the effectiveness of mitigation measures to reduce the risk. This would involve re-evaluating the risk with proposed mitigation measures in place, using the same risk assessment process.

Fishing Footprint Scale

There was further discussion on the appropriate spatial scale for the SPRFMO bottom fishery footprint, with some participants expressing the view that the agreed 20 x 20 minute grid was too large. It was noted that New Zealand had previously reviewed the impact of different scales of fishing footprint (SP-04-SWG-05). Analyses and maps of alternative proposals will be developed inter-sessionally for discussion at the next DWSG, recognizing that compliance aspects need to be considered.

VME Identification Guide

New Zealand provided an updated VME identification guide that is used by observers in their fishery. This guide can be used freely by other participants.

New/Exploratory Fisheries

Chile presented two documents (SP-08-SWG-DW-04 and SP-08-SWG-DW-05) related to the draft BFIAS. The DWSG discussed the various proposals and concluded that a new term (new/exploratory fisheries) should be added to the BFIAS (reflecting Article 22 in the draft Convention text). In addition, the DWSG agreed there should be a specific section within the Standard related to new/exploratory fisheries, though it was clearly noted that all elements within the Standard and the process for reviewing benthic fishery impact assessments apply to new/exploratory fisheries. An initial list of elements for this additional section include: information on approaches to use for assessments when data is limited and guidance on monitoring measures aimed at rapid detection and response to encounters with VMEs (New Zealand). The task team will review and revise this section inter-sessionally for consideration at the next meeting of the DWSG.

7. Review of Bottom Fishery Impact Assessments

The only new impact assessment received was from the EU, for the Spanish demersal gillnet fishing in 2008/09 and 2009/10 (SP-08-SWG-DW-02).

As the document had only recently been posted on the website; substantially less time had been provided for review and comments than the 30 days required. The quality of the electronic document provided was particularly poor, particularly the figures relating to the gear which are illegible and lack sufficient detail. The DWSG agreed that impact assessment documents should be submitted in a clear, readable format.

In the absence of a finalised Bottom Fishery Impact Assessment Standard, the DWSG reviewed the assessment against the eight questions noted by the SWG-Chair at SPRFMO-4 as a basis for reviewing assessments and provided initial comments. Final comments would be provided 60 days after the date it was posted on the website, ensuring participants had sufficient time to review the assessment and consistent with the agreed assessment review process.

Initial review of the EU impact assessment for the Spanish demersal gillnet fishing (SP-08-SWG-DW-02)

The DWSG agreed on the following responses to the questions to be answered when reviewing assessments:

Interim Measure	Question to be answered when reviewing assessments	DWSG Response
1	Will the proposed fishing activity be within recent average (2002 – 2006) effort levels?	The demersal gillnet fishing activities described are not within the recent average (2002-2006) effort levels. There was no demersal gillnet fishery in the proposed SPRFMO area between 2002-06 and so this is essentially a new fishery
2	Will the proposed fishing activity be within areas where fishing is 'currently occurring'?	There is no established "footprint" of demersal gillnet fishing.
6	Is proposed fishing going to be conducted in areas where VMEs are known or likely to occur? If so, will those areas be closed to fishing? If such areas won't be closed, will adequate conservation and management measures be put in place to prevent 'significant adverse impact' on VMEs, and to ensure the long-term sustainability of deep-sea fish stocks?	Due to the poor quality of the document submitted it is unclear where the fishing occurred and the overlap with areas where VMEs occur or are likely to occur. There are not adequate conservation and management measures in place to prevent significant adverse impacts on VMEs or ensure long-term sustainability of deep-sea fish stocks. The only management measure included is the move-on rule, which has inappropriate trigger thresholds as noted below. Nothing is included in the assessment to ensure the long-term sustainability of deep-sea fish stocks.
7	What provisions have been made to detect evidence of fishing on VMEs, and to move 5nm away from such areas? How will such evidence be documented and reported?	There are provisions to move 5 nm away from a VME but the DWSG questions the high threshold limits for the evidence of detecting VMEs, in particular '1000 kg live sponge'. The assessment provides general information suggesting that documentation and reporting will occur, but the information provided is insufficient and the DWSG requests further details.

9	Will observers be appointed to each vessel, and will observer coverage levels be 'appropriate'?	The assessment says there is 100% observer coverage. The DSWG noted that the catch and observer data should have been reported in the EU annual report to the SWG. The Interim Secretariat advised that a report of observer and catch data has been provided, however, the poor quality of the document has prevented the Interim Secretariat from being able to input and provide the data to participants.
10	Have all vessels been equipped with operational VMS?	The assessment reports that VMS are present but it is not clear that it is consistent with the SPRFMO data standards.
11	Are the proposed fishing activities likely to have significant adverse impacts on VMEs? If so, will such activities be managed to prevent such impacts, or not authorized to proceed?	The limited information provided in the assessment, particularly the lack of information on likely bycatch and areas fished makes assessing this question difficult. However, based on other studies of deepwater demersal gillnet fishing there is likely to be impacts on VMEs and potentially significant adverse impacts on likely bycatch species.

In addition, the DSWG provides the following initial comments on the submitted impact assessment.

- The preliminary assessment does not constitute a proper impact assessment; there is no scoping of issues, statement of objectives, evaluation of issues, ranking of risks, or any discussion of realistic mitigation or management measures.
- Only the impact of demersal gillnetting on VMEs is considered and suggested to be 'not seem[ing] to be significant'. There is no consideration of impacts on low productivity deepwater fish stocks or the issue of lost gear.
- No conservation or management measures are reported to be in place or planned. Those commonly used in other fisheries and that should be considered include:
  - Soak time limits
  - Net length limits
  - Mesh size rules
  - Gear marking rules
  - Gear discarding rules
  - Monitoring and compliance arrangements
- Although reference is made to the areas that New Zealand has bottom fished in the past, it is not clear whether the vessels will operate in the New Zealand footprint and whether they are respecting the New Zealand closed areas.
- Ghost fishing (continued fishing by lost or discarded gear) and its impacts increase with the length of nets used, soak times, and depths fished (FANTARED 2 study).
  - The preliminary assessment does not report the length of nets to be used nor soak times. Fishing depths are proposed to be 400–2000 m.

- Lost gillnets are suggested to have “some impact … decreasing with the time” but the only supporting reference reports research on lost gear set “on open grounds” in waters <100 m deep. This is very different from the proposed operation.
- A paper on gear loss in the Greenland halibut fishery on the Norwegian continental slope, published in the same volume of Fisheries Research, was not cited (Humborstad et al. 2003). In that study, catch rates were observed to level off at about 20–30% of commercial catch levels after 45 days at depths of 537–851 m. Other studies in this fishery suggest that these nets can fish for at least 2–3 years and sometimes even longer (Furevik & Fosseidengen 2000).
- In the NE Atlantic, EC demersal gillnet vessels, in a fishery similar to that proposed, were using up to 400 km of net. Due to difficulties in managing used nets, gear was commonly lost or dumped; up to 30 km of net was routinely discarded per trip (Hareide et al 2005). An estimated 25 080 nets with a length of 1254 km were lost each year. Deepwater sharks were commonly targeted with high levels of bycatch and wastage caused by long soak times (up to 10 days).

- Because of their non-selective nature and these issues, demersal gillnetting has been prohibited or severely restricted in many areas. It is banned by CCAMLR and in waters deeper than 200 m by NEAFC. It is also prohibited in waters deeper than 600 m in EC waters and heavily regulated in shallower waters.
- The conclusions that the fishing activity will have a low impact and is of low risk are completely unjustified. Available information for other fisheries and research suggest that the fishing activity is likely to be a high risk for VMEs and deepwater low productivity species, particularly deepwater sharks.

References

FANTARED 2. A study to identify, quantify and ameliorate the impacts of static gear lost at sea. EC contract FAIR-PL98-4338. ISBN No. 0 903941 97 X, 2003.

Humborstad O-B, Løkkeborga S, Hareide N-R, Furevika D-M. (2003). Catches of Greenland halibut (Reinhardtius hippoglossoides) in deep water ghost-fishing gillnets on the Norwegian continental slope. Fisheries Research 64(2–3):163–70.

Furevik D.M. and Fosseidengen J.E. (2000) Investigation on naturally and deliberately lost gillnets in Norwegian waters. Working Document to the Fisheries Technology Fish Behaviour Group. Harlem Netherlands, April 10-14, 2000.

Hareide N-R., Garnes G., Rihan D., Mulligan M., Tyndall P., Clark M., Connolly P., Misund R., McMullen P., Furevik D., Humborstad O.B., Høydal K. & T. Blasdale (2005). A preliminary Investigation on Shelf Edge and Deep-sea Fixed Net Fisheries to the West and North of Great Britain, Ireland, around Rockall and Hatton Bank. Bord Iascaigh Mhara, Fiskeridirecktoratet, NEAFC, Sea Fish Industry Authority, Joint Nature Conservation Committee, Marine Institute Foras na Mara.

8. Deep water species assessment and management

New Zealand has completed the evaluation of alternative methods for assessing and establishing sustainable catch limits for deep water species on the high seas (such as orange roughy). A full report of the results of this evaluation will be provided to participants at the next meeting of the DWSG.

9. Other Matters

Participants expressed gratitude for Mr R. Serra chairmanship of the DWSG.

10. Adoption of the Deepwater Sub-Group Report and Summary

The report and summary were adopted.