Science and the Challenge of Managing Small Pelagic Fisheries on Shared Stocks in Northwest Africa

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Biology and ecology of main resources and status of fisheries

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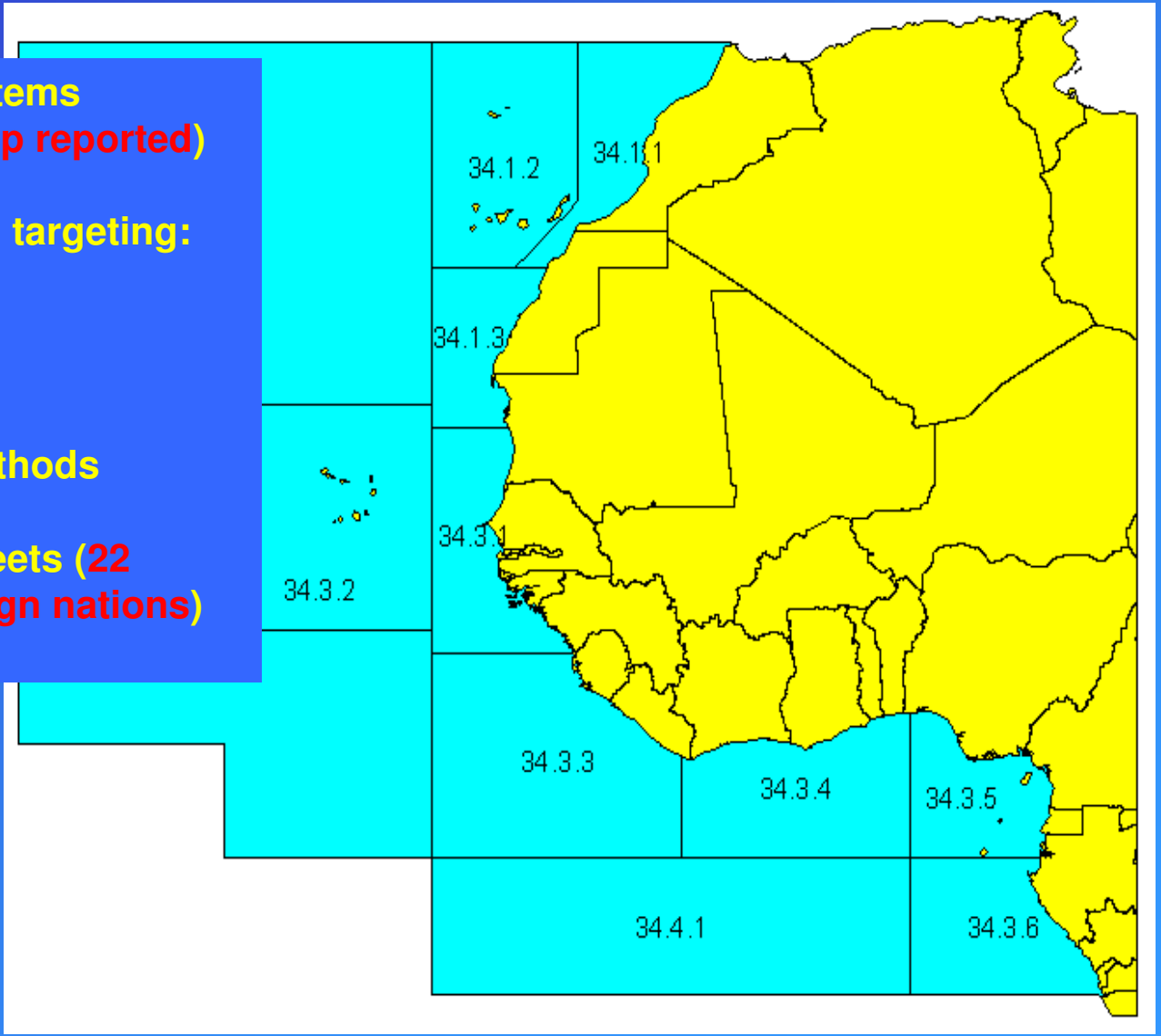
OUTLINE

1. Characteristics of the region
2. Small pelagics resources
3. Biological information
4. Fisheries
5. Assessment
6. Management advice and decision making
7. Conclusions

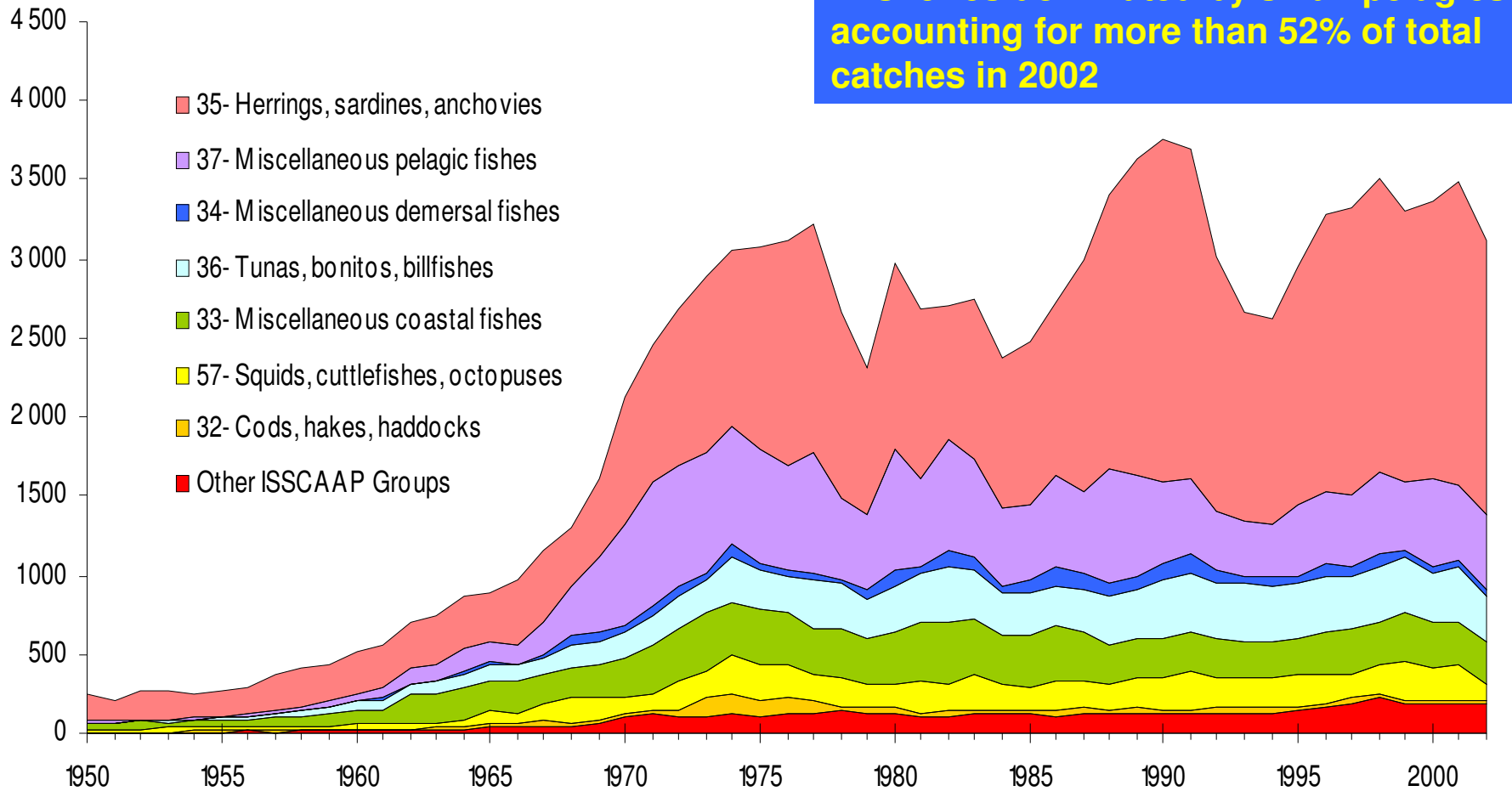
CHARACTERISTICS OF THE REGION

- two (three) major ecosystems
- great biodiversity (190 spp reported)
- old fishing history
- well established fisheries targeting:
    - crustaceans
    - cephalopods
    - small pelagics
    - demersal fish
- huge range of fishing methods (artisanal and industrial)
- concurrence of fishing fleets (22 coastal states and 47 foreign nations)
- transboundary stocks



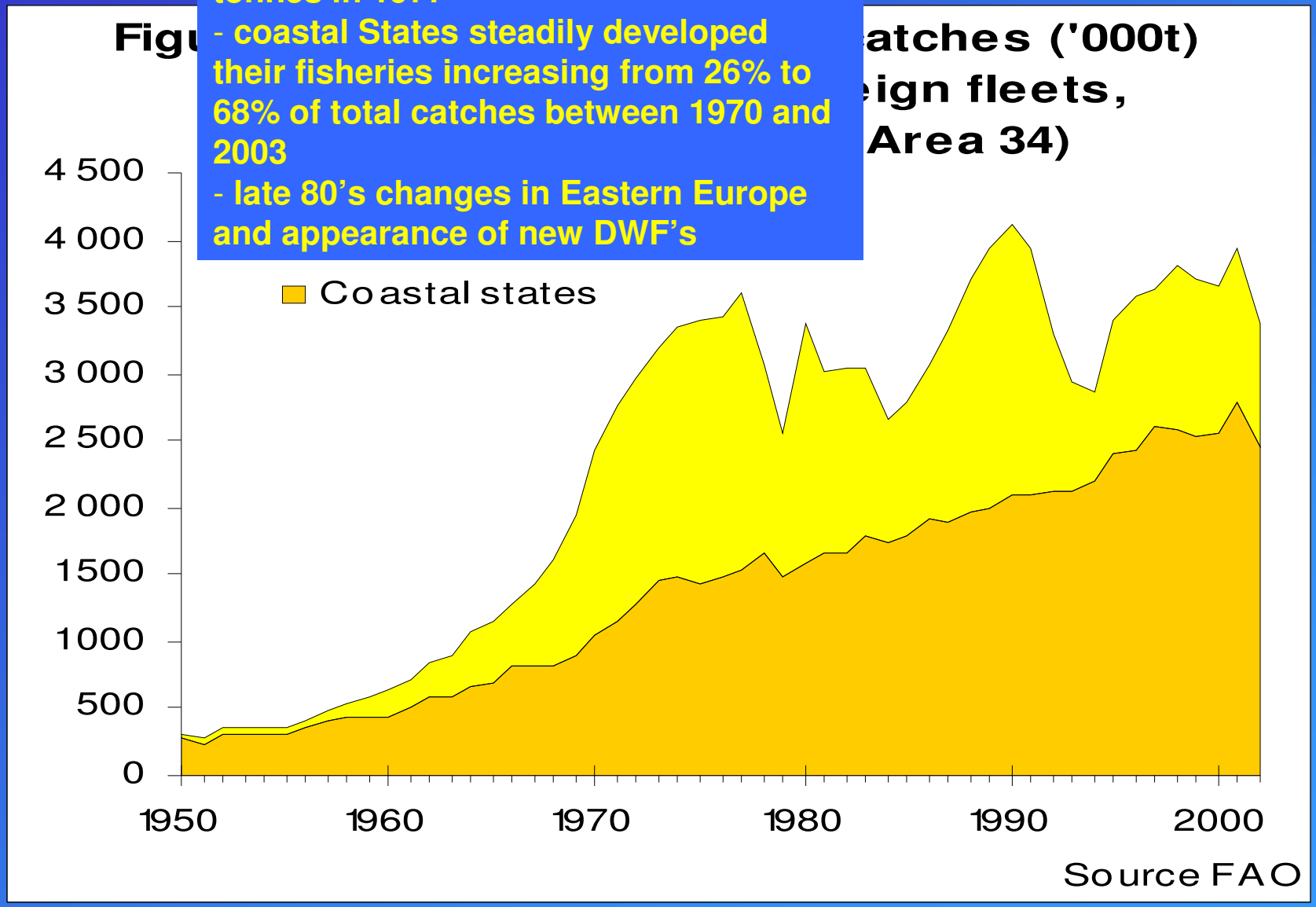
- 14 fold increase in catches between 1950 and 1990
- since mid 90's stable catches around 3.5 million t
- fisheries dominated by small pelagics accounting for more than 52% of total catches in 2002

Figure B4.2 - Annual nominal catches ('00
in the Eastern Central A



Source: FAO 2005

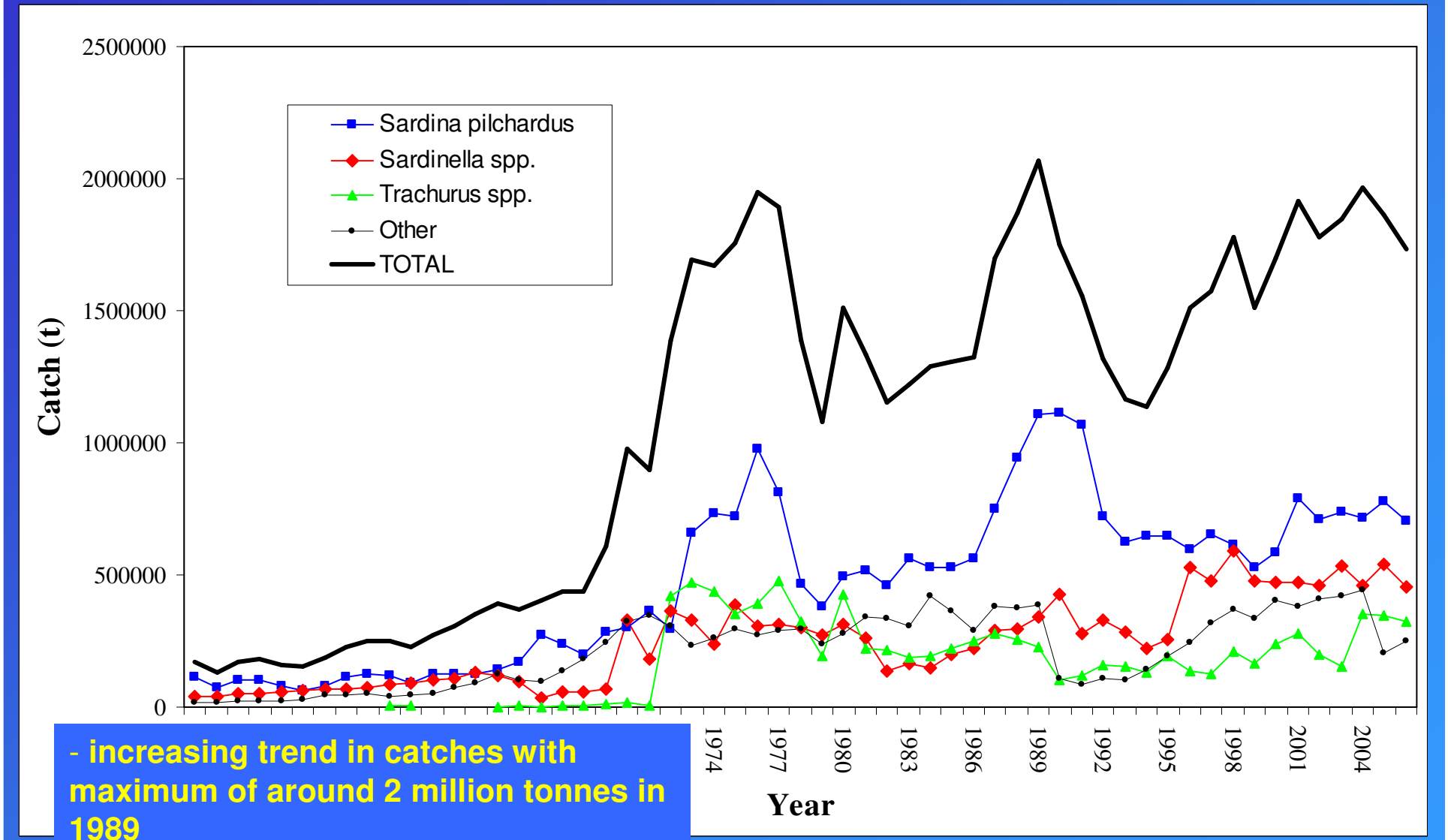
- DWF's developed during the 60's reaching a maximum of over 2 million tonnes in 1977
- coastal States steadily developed their fisheries increasing from 26% to 68% of total catches between 1970 and 2003
- late 80's changes in Eastern Europe and appearance of new DWF's



SMALL PELAGICS RESOURCES

1. Sardine (*Sardina pilchardus*)
   - fisheries between Morocco and Mauritania
   - exploited by Moroccan coastal fleet and (seasonally) by EU and Russian trawlers
2. Sardinellas (*Sardinella aurita* and *Sardinella maderensis*)
   - fisheries in Mauritania and Senegal
   - exploited by Senegalese artisanals and EU and Russian trawlers
3. Horse mackerels (*Trachurus trecae*, *Trachurus trachurus* and *Caranx rhonchus*)
   - main fishery in Mauritania
   - Exploited by Russian, Ukrainian and other trawlers
4. Chub mackerel (*Scomber japonicus*)
   - Northern fishery between Tanger and Cape Bojador, Southern fishery south of Cape Bojador
   - Northern fishery exploited by Moroccan coastal fleet and Southern fishery by trawlers from Russia, Ukraine, EU and others
5. Bonga (*Ethmalosa fimbriata*)
6. Anchovy (*Engraulis encrasicolus*)

CATCHES

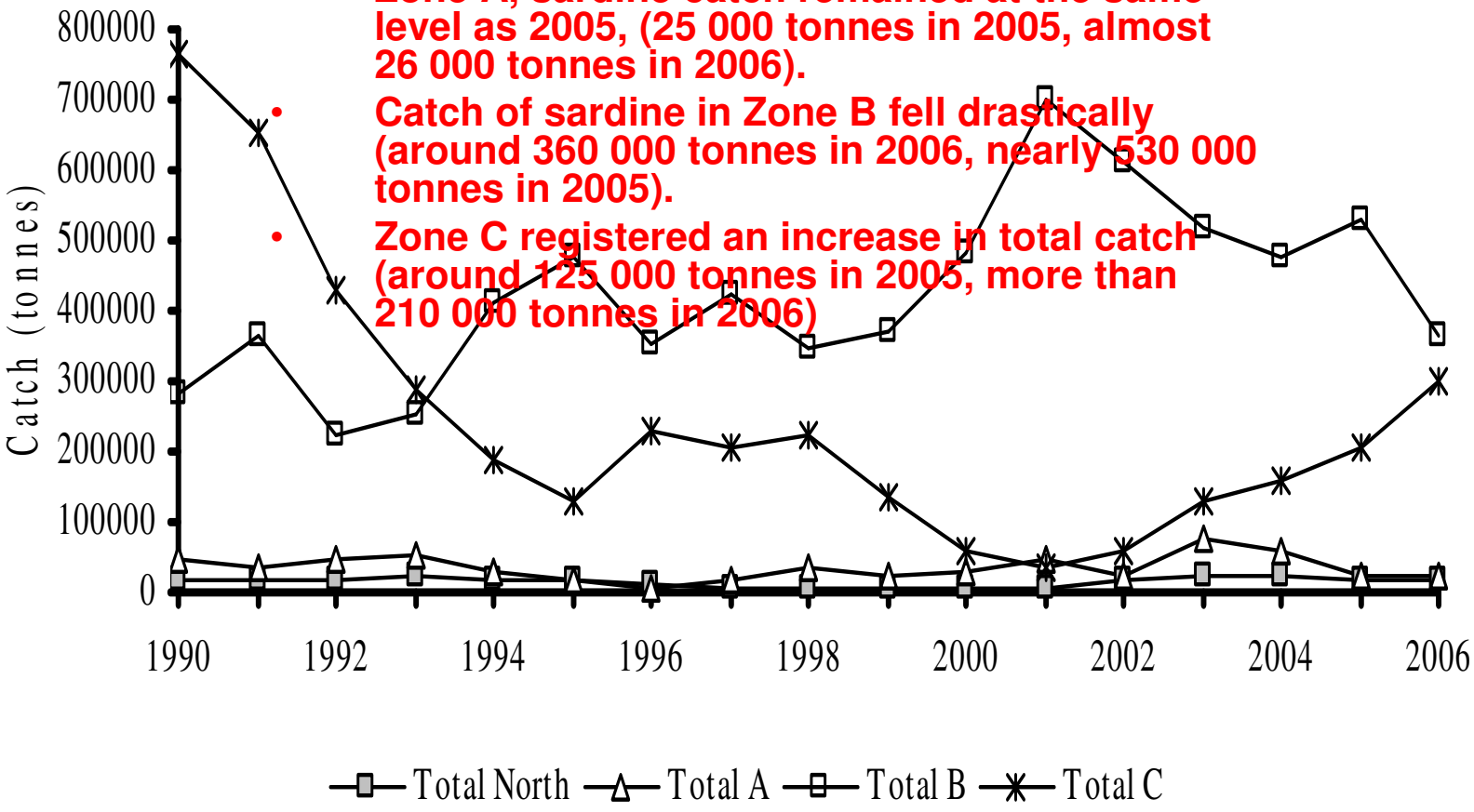


- increasing trend in catches with maximum of around 2 million tonnes in 1989
- Sardine (37%), Sardinella (21%), Horse mackerel (>9%)

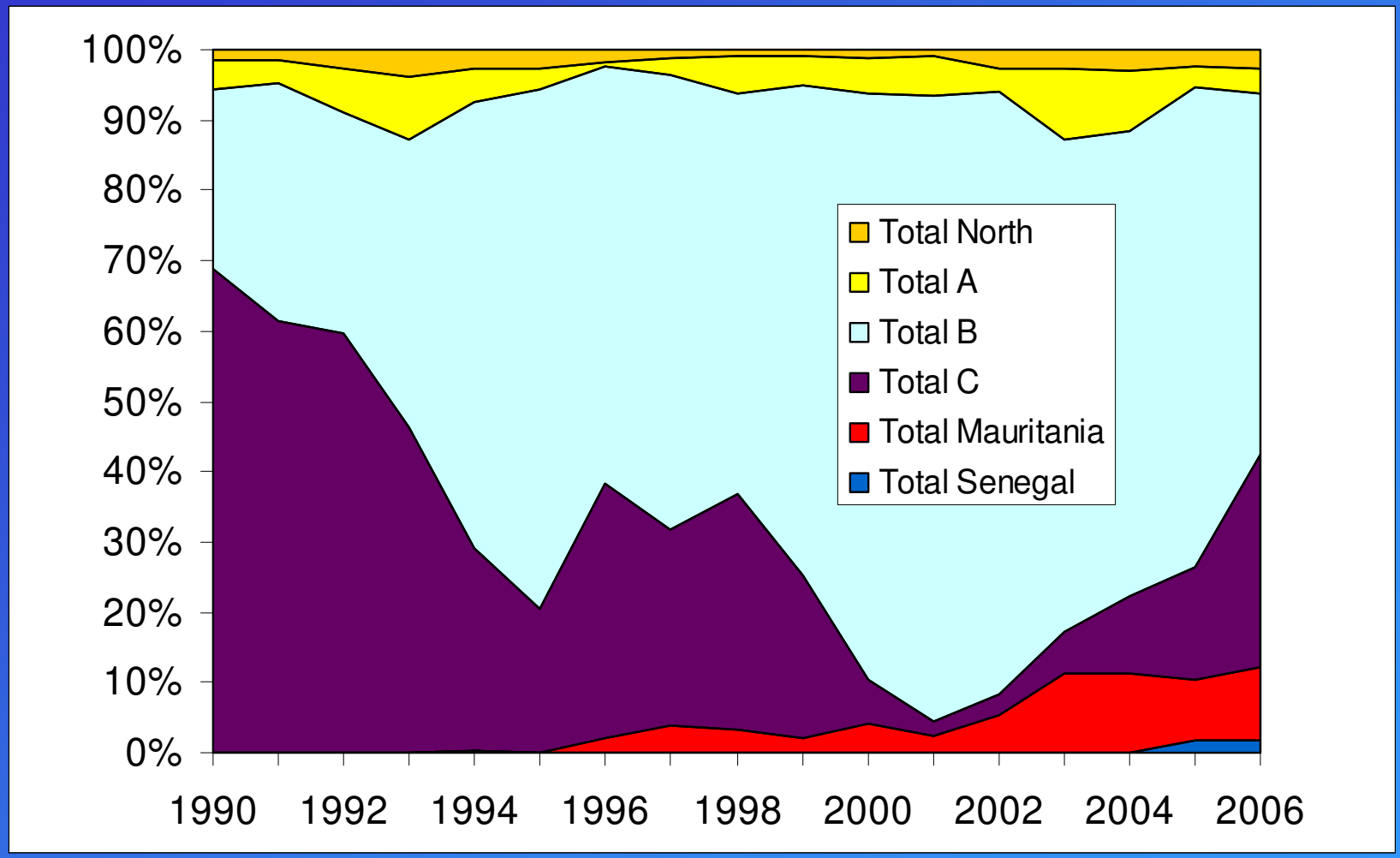
CATCHES

Sardina pilchardus

- Zone A, sardine catch remained at the same level as 2005, (25 000 tonnes in 2005, almost 26 000 tonnes in 2006).
- Catch of sardine in Zone B fell drastically (around 360 000 tonnes in 2006, nearly 530 000 tonnes in 2005).
- Zone C registered an increase in total catch (around 125 000 tonnes in 2005, more than 210 000 tonnes in 2006)

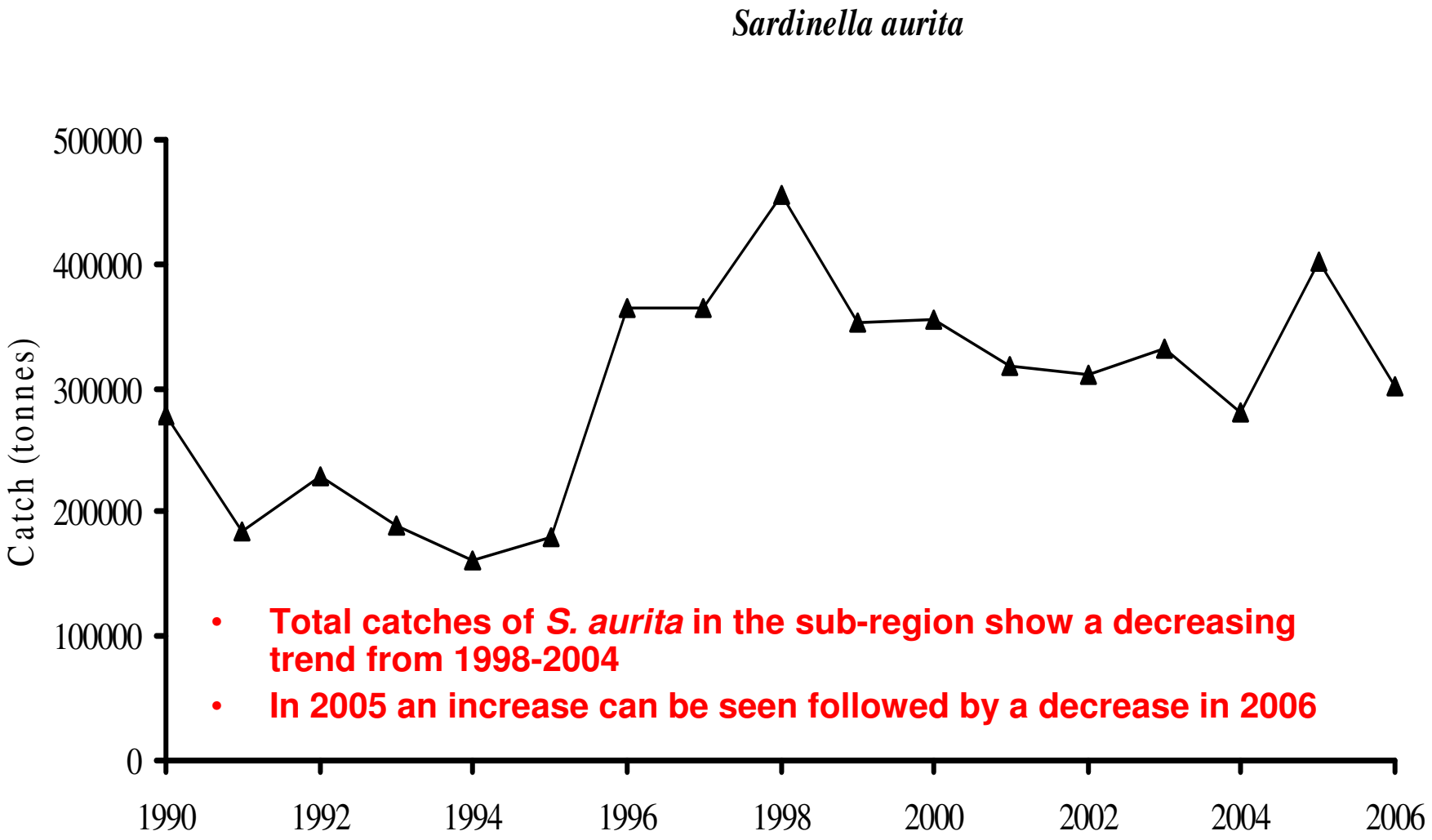


CATCHES



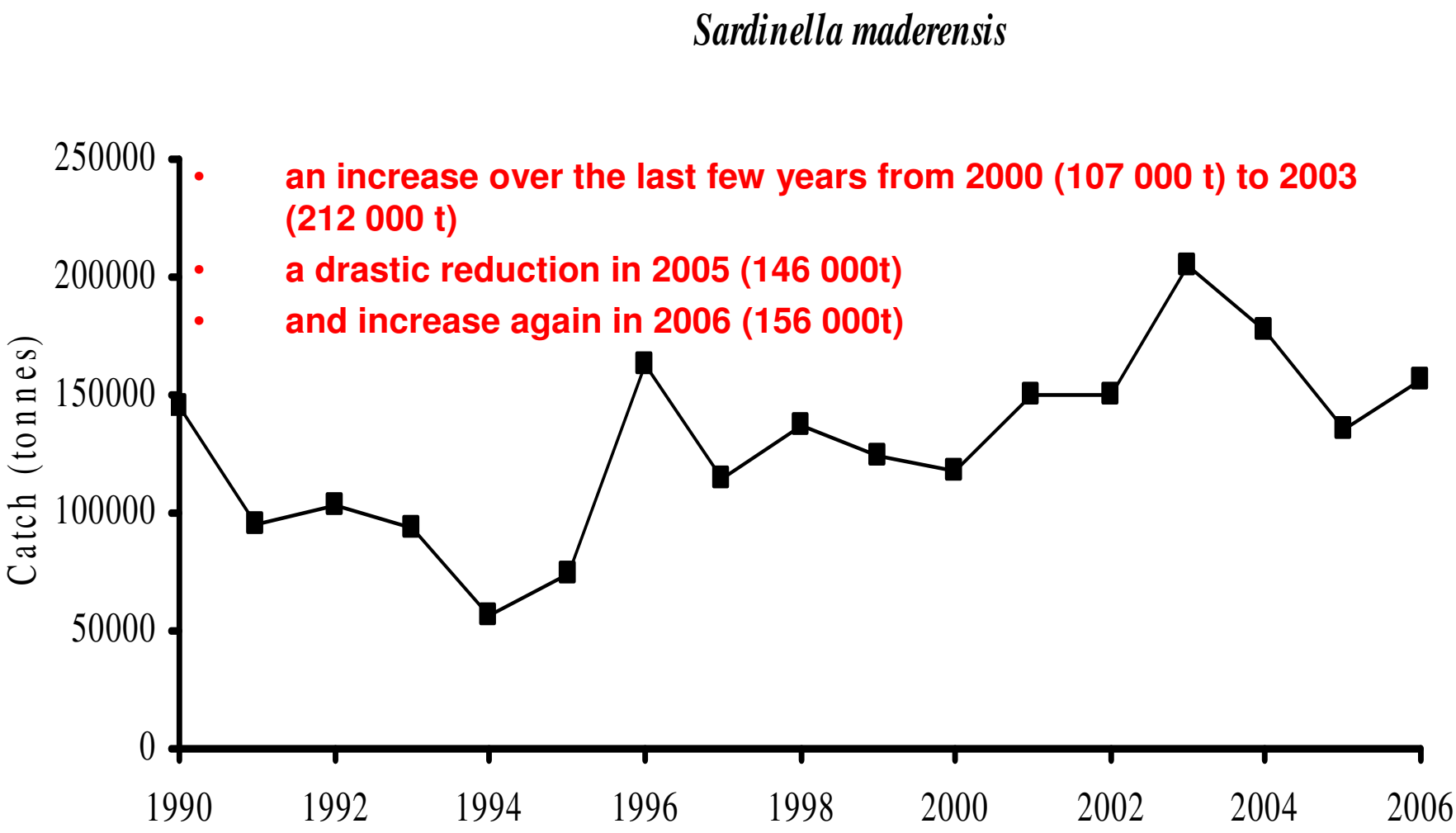
Sardine catches by fishing zone

CATCHES



- **Total catches of *S. aurita* in the sub-region show a decreasing trend from 1998-2004**
- **In 2005 an increase can be seen followed by a decrease in 2006**

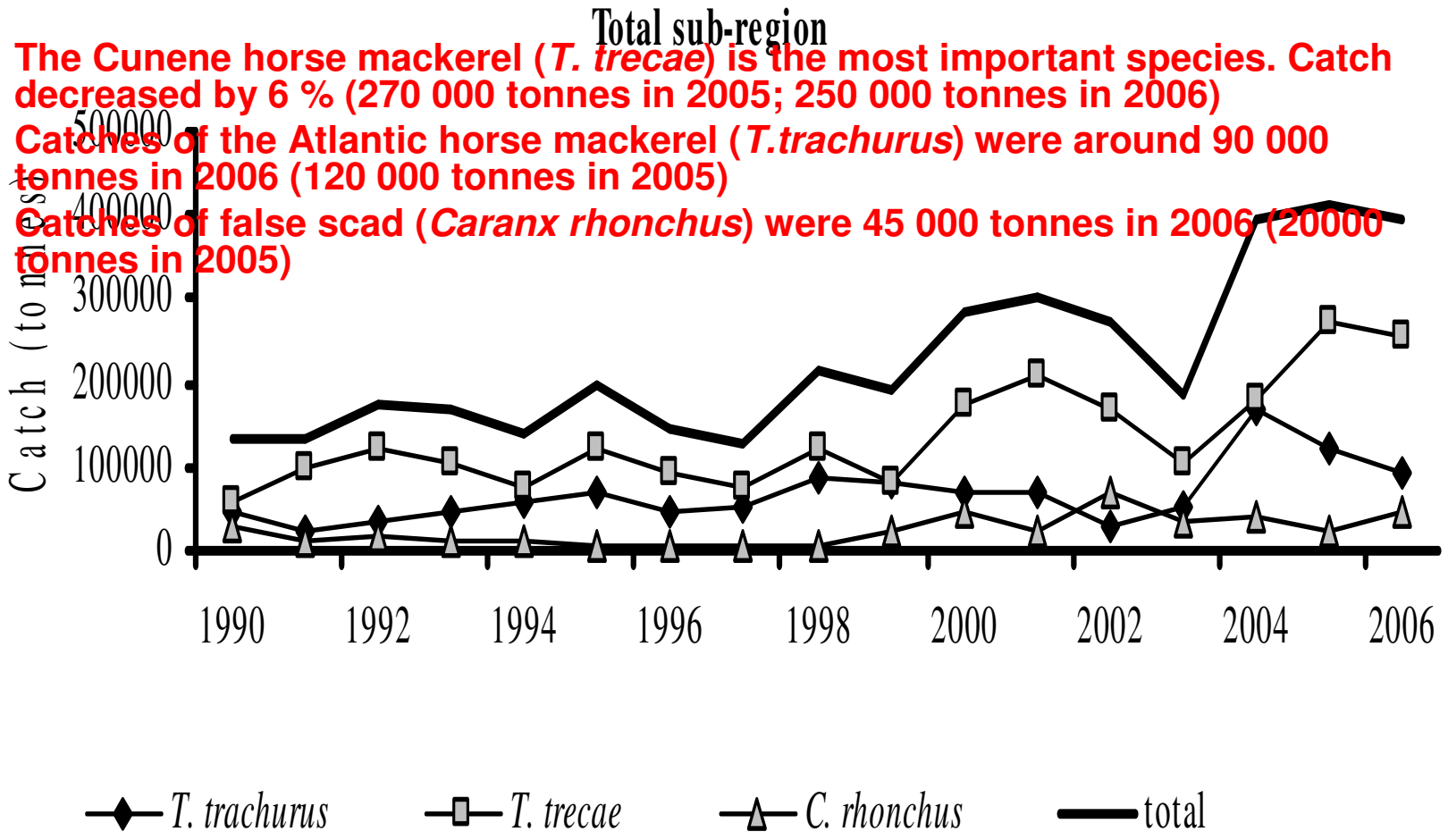
CATCHES



- an increase over the last few years from 2000 (107 000 t) to 2003 (212 000 t)
- a drastic reduction in 2005 (146 000t)
- and increase again in 2006 (156 000t)

CATCHES

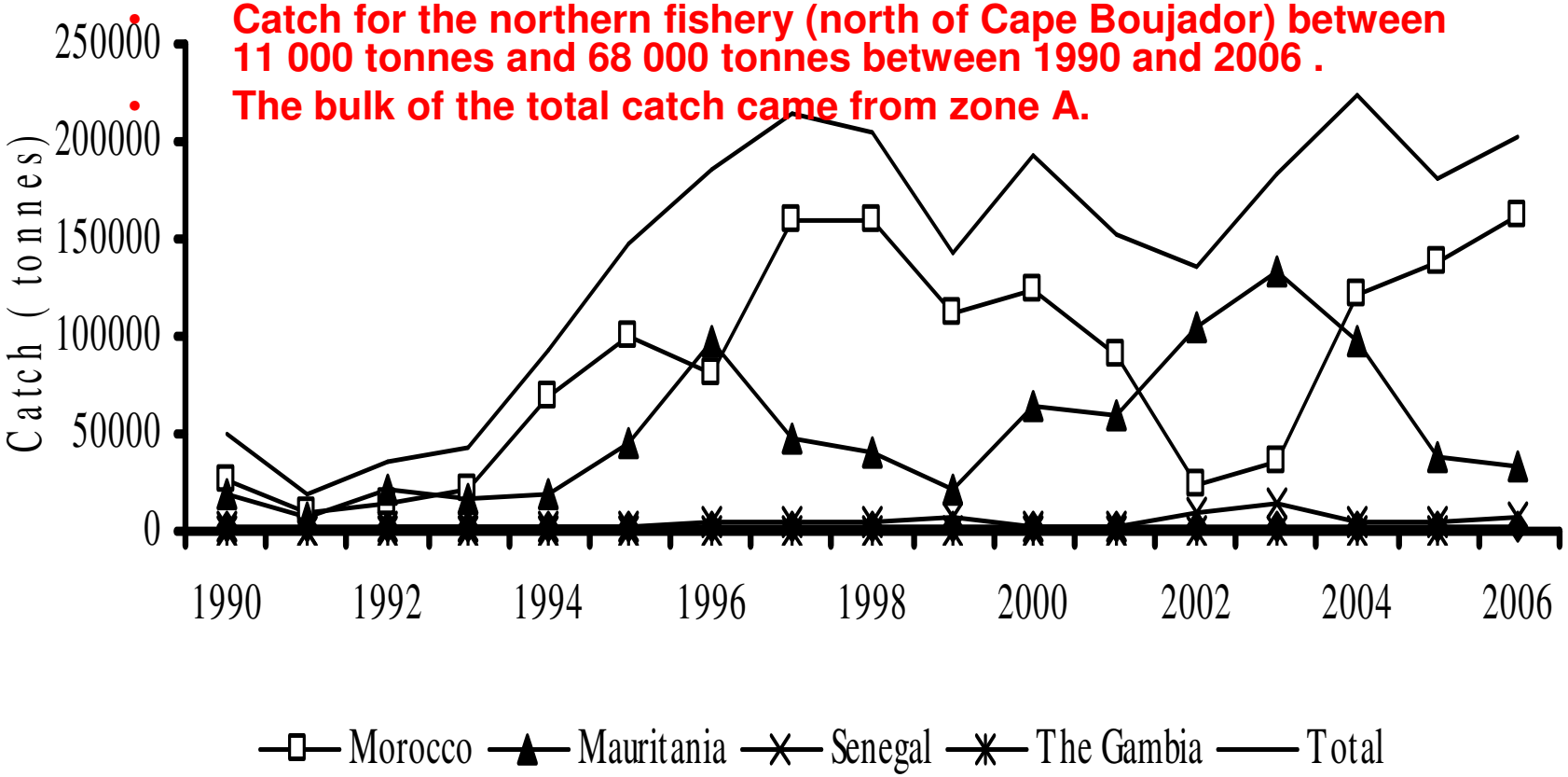
- **The Cunene horse mackerel (*T. trecae*) is the most important species. Catch decreased by 6 % (270 000 tonnes in 2005; 250 000 tonnes in 2006)**
- **Catches of the Atlantic horse mackerel (*T.trachurus*) were around 90 000 tonnes in 2006 (120 000 tonnes in 2005)**
- **Catches of false scad (*Caranx rhonchus*) were 45 000 tonnes in 2006 (20000 tonnes in 2005)**



CATCHES

Scomber japonicus

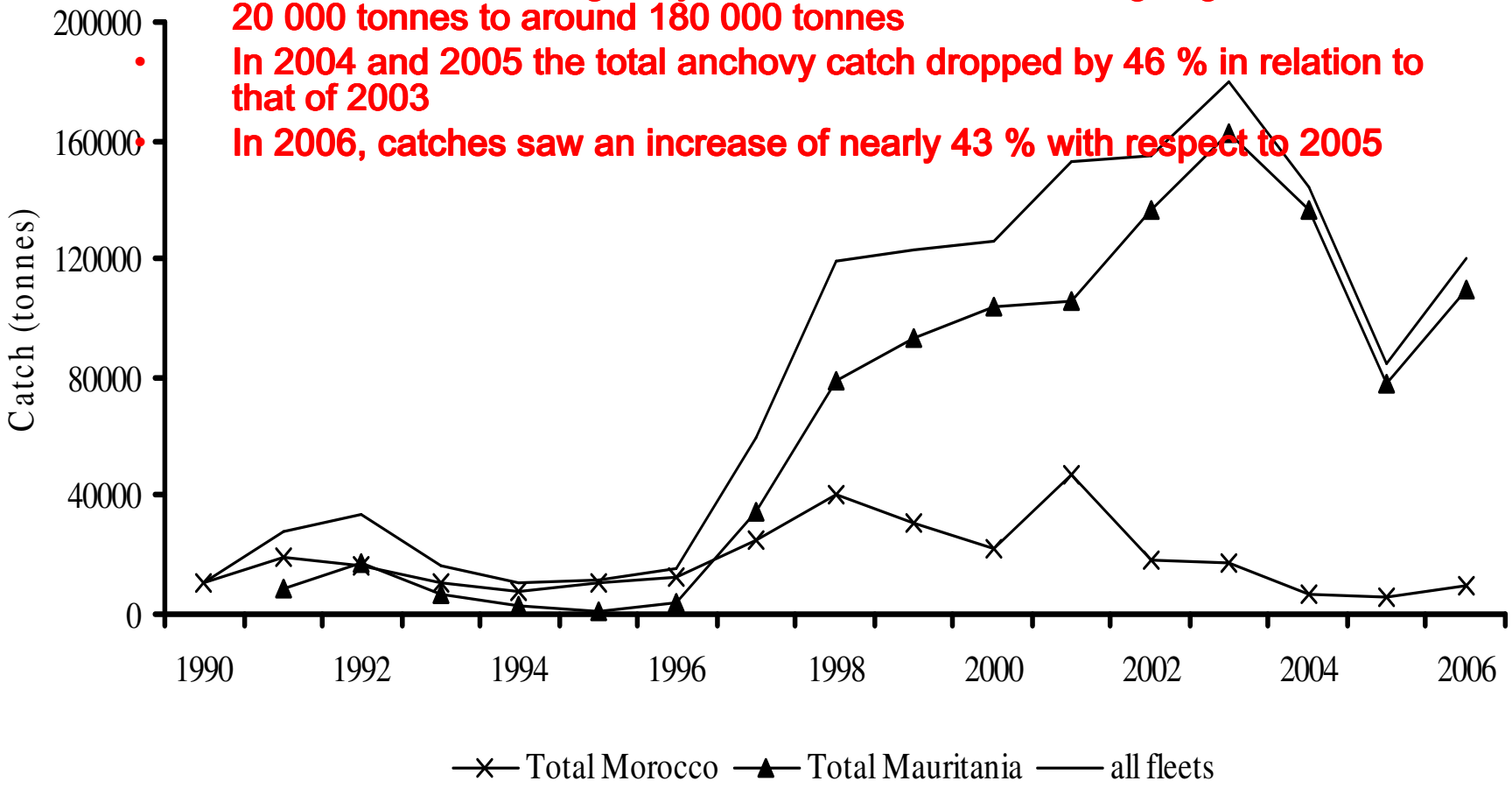
- Since 2002, an increase has been noted with a record of 224 000 tonnes in 2004 and a catch of 210 000 tonnes in 2006
- Catch for the northern fishery (north of Cape Boujador) between 11 000 tonnes and 68 000 tonnes between 1990 and 2006 .
- The bulk of the total catch came from zone A.



CATCHES

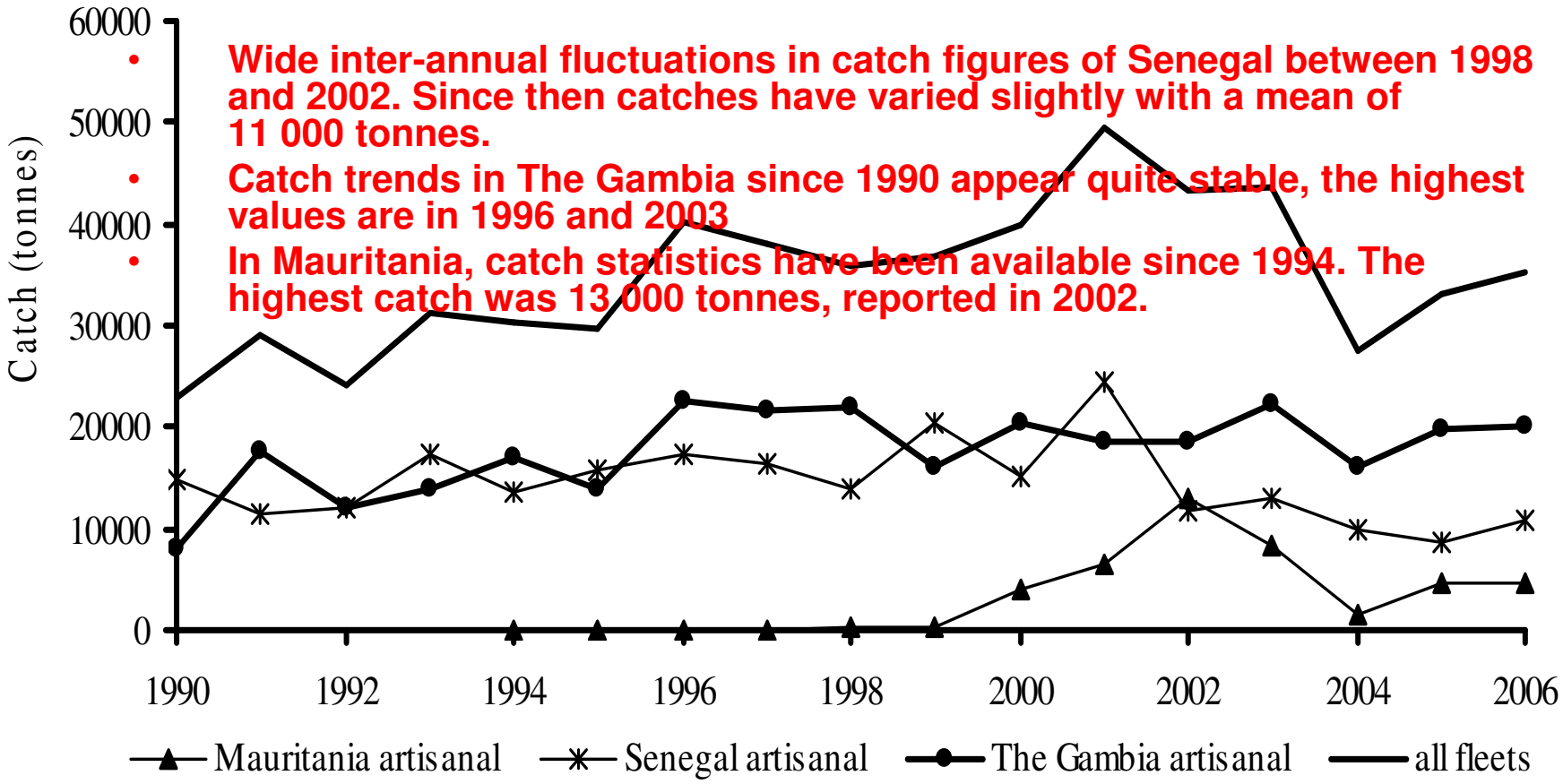
Engraulis encrasicolus

- Catches increased regularly between 1996 and 2003, going from 20 000 tonnes to around 180 000 tonnes
- In 2004 and 2005 the total anchovy catch dropped by 46 % in relation to that of 2003
- In 2006, catches saw an increase of nearly 43 % with respect to 2005



CATCHES

Ethmalosa fimbriata

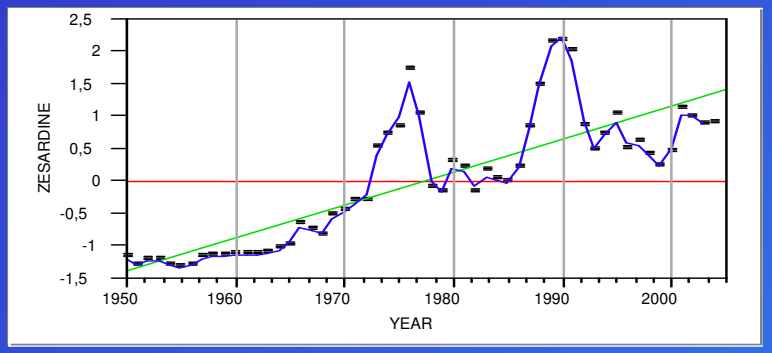


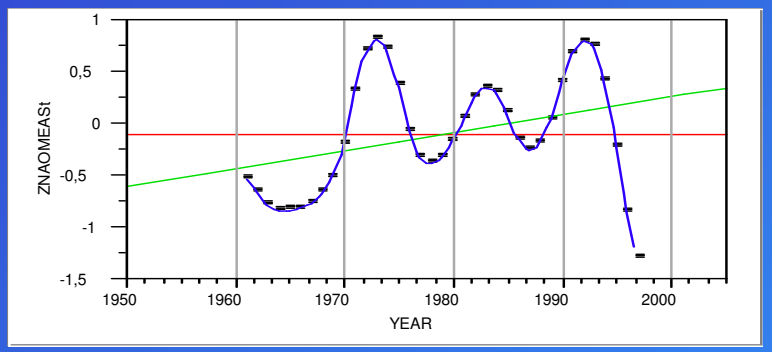
- **Wide inter-annual fluctuations in catch figures of Senegal between 1998 and 2002. Since then catches have varied slightly with a mean of 11 000 tonnes.**
- **Catch trends in The Gambia since 1990 appear quite stable, the highest values are in 1996 and 2003**
- **In Mauritania, catch statistics have been available since 1994. The highest catch was 13 000 tonnes, reported in 2002.**

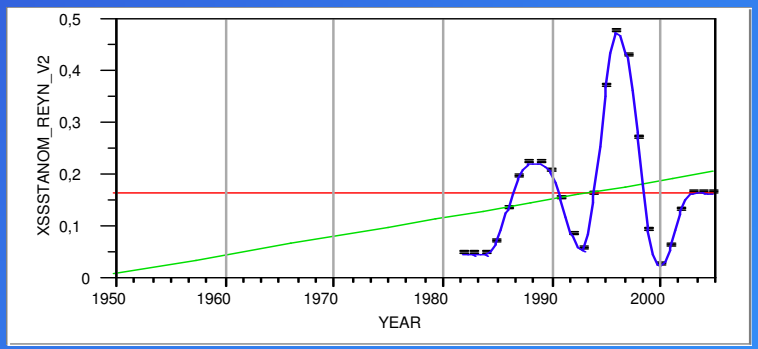
BIOLOGICAL INFORMATION

Species	Stock identity	LFD	ALK	maturity	M
Sardine	some studies	partial	partial	partial	estimate
Sardinellas	na	partial	na	partial	estimate
Horse mackerels	na	partial	na	partial	estimate
Chub mackerel	na	partial	partial	partial	estimate
Bonga	na	na	na	na	estimate
Anchovy	na	na	na	na	estimate

ECOLOGY







Evironmental forcing factors (premilinary): smoothed series

- Atmospheric pressure data from Ponta Delgada, Azores (middle caption)
- Mean Sea Surface Temperature Anomaly (Reynolds v. 2; bottom caption).

ASSESSMENT

- The CECAF: established in 1967 by the FAO to assess stocks and to provide (no binding) management advice on fisheries other than tuna
- Current structure:
  - Committee (decision making)
    - Scientific Sub-Committee (advice to Committee and guidance to Working Groups)
      - Working Groups (stock assessment and formulation of management options):
        - small pelagics (north and south)
        - demersal fish (north and south)
        - artisanal fisheries

ASSESSMENT PROCESS

- Gathering of basic information on fisheries (flagging countries):
  - industrial fisheries
  - artisanal fisheries
  - IUU fisheries
  - effort units

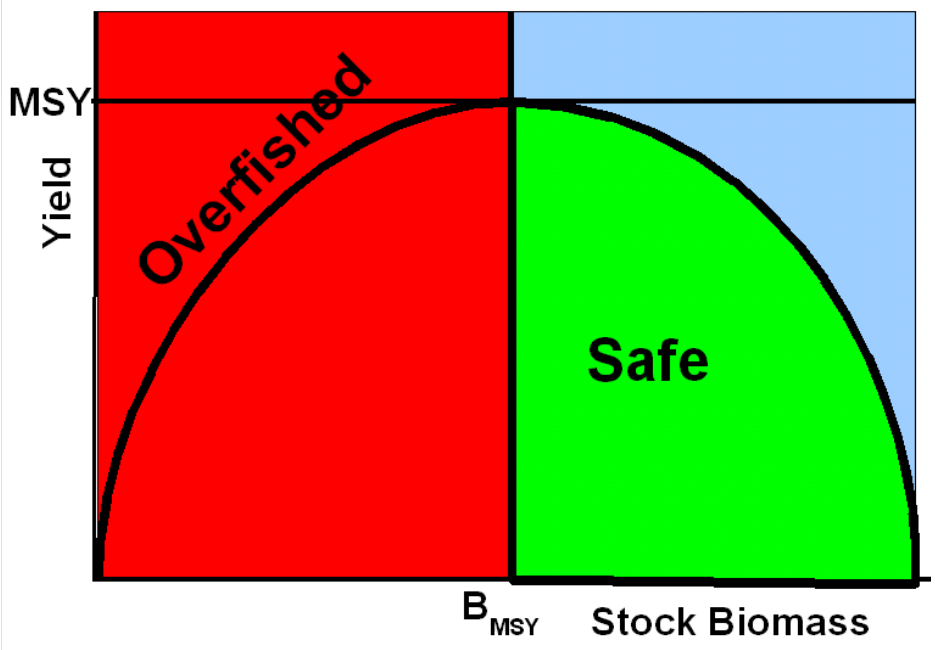
  } frequently outdated!!!

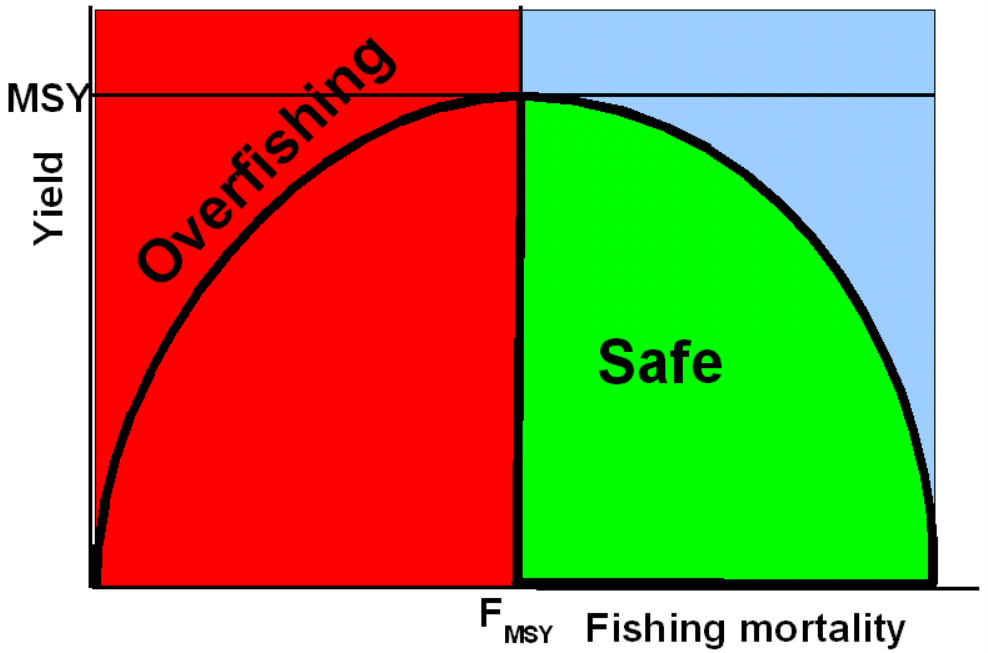
- Biological and population studies (research institutions):
  - stock identification (spatio-temporal distribution)
  - age and growth
  - reproduction
  - natural mortality

- Estimation of fishery independent abundance indices (research institutions):

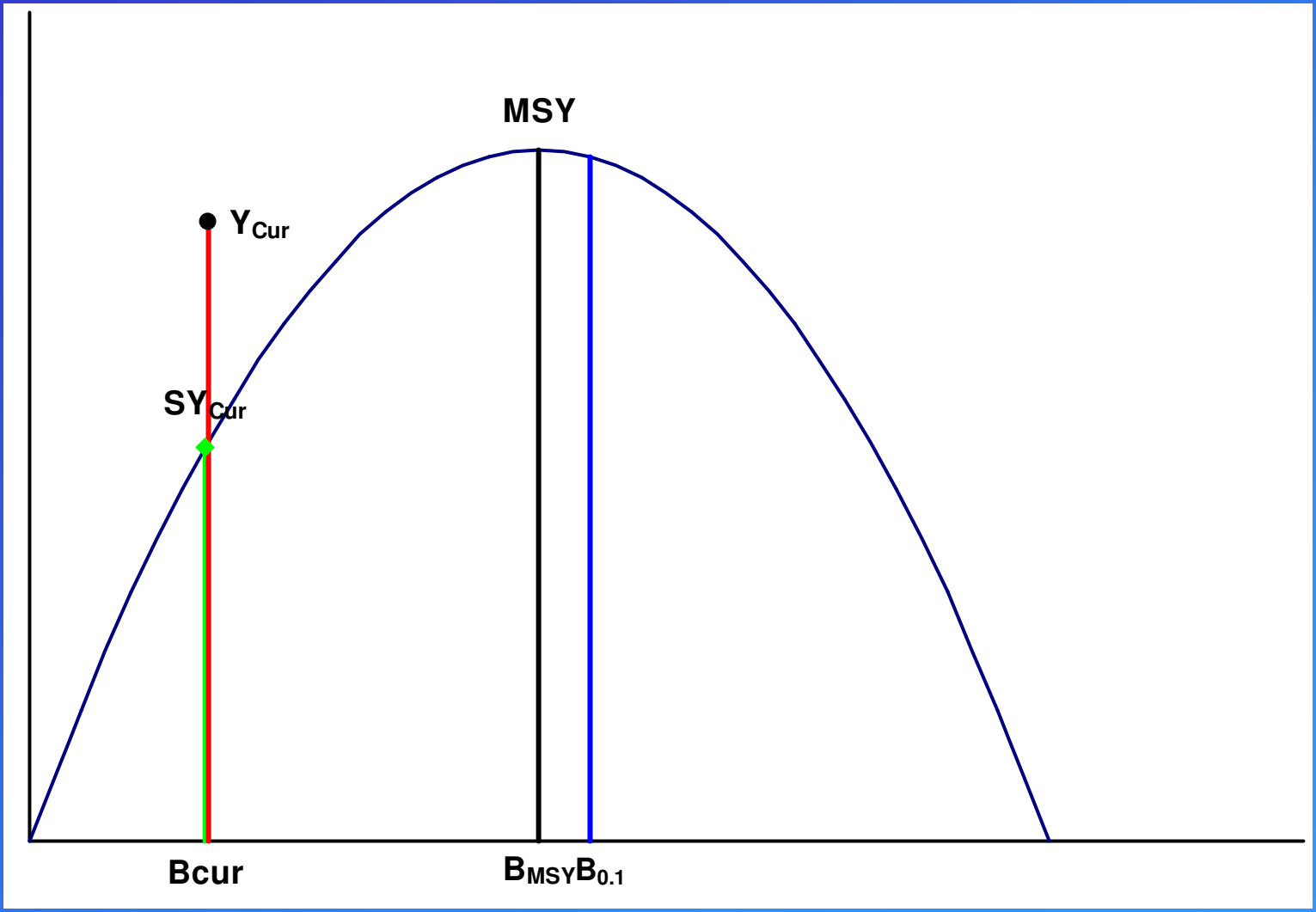
- Application of assessment models/methodologies (WG's):
  - 6 administrative small pelagics stocks being assessed
  - deterministic models (BioDyn)
    - not adapted to biology of many species
    - no variability of estimates
    - short term deterministic projections (recently)

Production model – RP's





ASSESSMENT PROCESS



STATE OF THE STOCKS

Stock	Last year 2006 catch in 000 t (2001–2006 average)	$B/B_{0.1}$	$F_{cur}/F_{0.1}$	Assessment	Management recommendations
Sardine *S. pilchardus* Zone A+B	389 (540)	19%	395%	Stock is overexploited.	Decrease effort by 20% corresponding to a catch level of 350 000 tonnes in 2008.
Sardine *S. pilchardus* Zone C	299 (170)	112%	3%	Stock is not fully exploited.	The total catch level may be temporarily increased, but should be adjusted to natural changes in the stock.
Sardinellas *S. aurita* and *S.maderensis* *Sardinella* spp. Whole subregion	300 (325) 150 (163) 450 (488)	44% 89%	481% 154%	Stock of *S. aurita* overexploited No reliable results for *S. maderensis*	Decrease effort in total sardinella fishery by 50%. For 2008, catches should not exceed the level recommended last year 220 000 tonnes.

STATE OF THE STOCKS

Stock	Last year 2006 catch in 000 t (2001–2006 average)	$B/B_{0.1}$	$F_{cur}/F_{0.1}$	Assessment	Management recommendations
Horse mackerel *T. trachurus* *T. trecae* Whole subregion	120 (90) 220 (180)	36% 129%	427% 121%	Stock of *T. trachurus* is over exploited. Stock of *T. trecae* is fully exploited.	Because of the mixed horse mackerel fishery, decrease effort by 20%. For 2008 total catches of the two species should not exceed the level recommended last year i.e. 260 000 tonnes.
Chub Mackerel *Scomber japonicus* Whole subregion	202 (185)	-	-	Stock is not fully exploited.	As a precautionary measure, catch level should not exceed the current level (2006) i.e. 200 000 tonnes by 2008.

STATE OF THE STOCKS

Stock	Last year 2006 catch in 000 t (2001–2006 average)	$B/B_{0.1}$	$F_{cur}/F_{0.1}$	Assessment	Management recommendations
Anchovy *Engraulis encrasicolus* Whole subregion	120 (134)	NA	NA	NA, acoustic estimates show a decrease in biomass from 2005 to 2006.	As a precautionary measure, catch level should not exceed the average over the three last years (115 000 tonnes).
Bonga *Ethmalosa fimbriata* **Whole** subregion	35 (37)	NA	NA	NA, but catch rates have been stable since 2002.	As no new information is available on this species, the recommendation from 2006 is maintained i.e. catch level should not exceed 42 000 tonnes.

MANAGEMENT ADVICE

- **Formulation of management options (WG's):**
  - catch and/or effort regulation based on MSY (0.1)
    - outdated information on the state of the stock (data problem!!!)
    - no probability in projections
    - difficulty in determining relation between F and f
    - difficulty in controlling catches (no scientific problem!!!)
    - difficulty in distributing catch/effort in shared stocks
- **Management advice (SSC):**
  - little discussion on WG's assessments
  - endorsement of WG's management options without amendments
  - no feedback (guidance) to WG's

DECISION MAKING

- **Credibility on the advice provided by the SSC:**
  - difficulty in conveying the scientific advice (communication between scientist and managers)
  - practicality of implementation of management advice
  - sometimes contradictory results from assessments in different projects

SOME PRAGMATIC SOLUTIONS

- **DATA:**
  - Identify most important stocks in the region (project?)
  - Identify natural boundaries of selected stocks (workshop? project?)
  - Better monitoring of basic information from fisheries
  - Continue biological studies on selected species (project?)
  - Initiate/continue ecological studies
  - Continue analyses of survey data and standardization of methodologies (workshop?)
- **ASSESSMENT:**
  - Apply (develop) methods better adapted to the biology of the species (technical assistance?):
    - define appropriate BRP
    - probabilistic short term projections
    - conduct simulations on different management options
  - Periodicity of assessments
- **DECISION MAKING:**
  - Strength the role and the coordination of Regional Organisations
    - CECAF, CSRP
    - coordination with other projects
  - Support activities of Regional Organisations??
  - Improve dialogue between scientists and managers


THANK YOU FOR YOUR ATTENTION!!