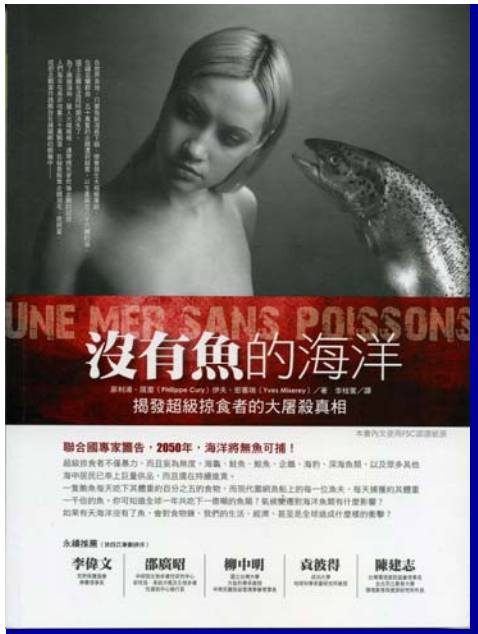


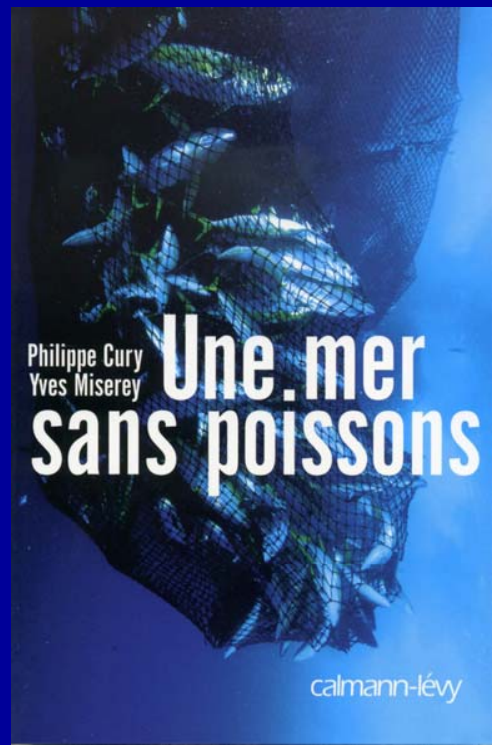
Managing world fisheries

Towards the ecosystem approach to fisheries

Philippe Cury

ENVIM

January 2014



IRD
Institut de recherche pour le développement

Sustainable development of marine resources

1. State of world fisheries and Marine resources
2. Managing fisheries
3. Building scenarios for marine resource in a global change context

Scientific expertise in world fisheries negociation

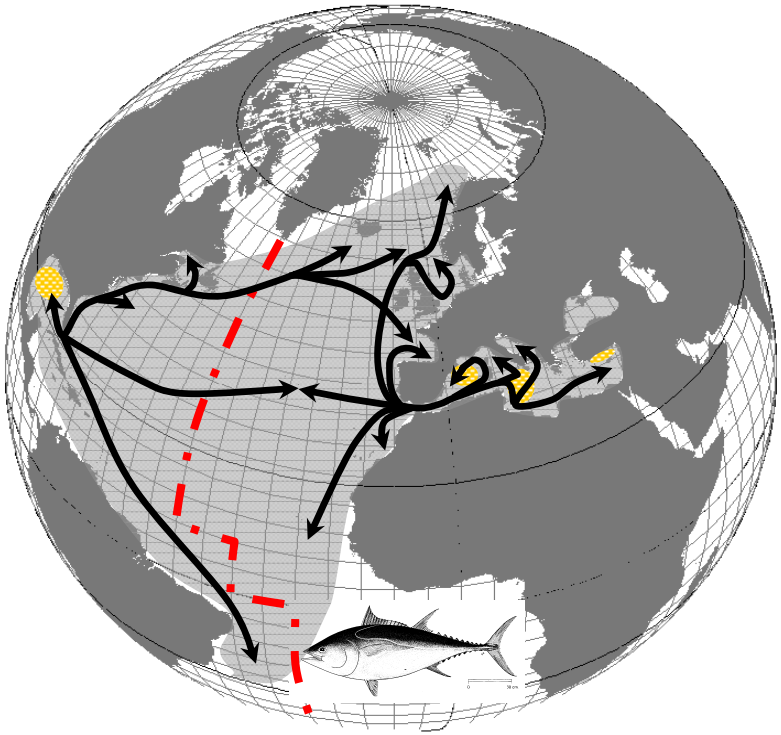
- RFMOs - Regional fisheries management organisations -, objectives, current practice, and evaluation

- Ecosystem approach and the implication for management

Ocean Global Framework interfaces science/policy : the main world assessments

- FAO state of fisheries and aquaculture (SOFIA)
- GIWA Global International Water Assessment (UNEP) WOA World Ocean Assessment (one report in 2014)
- ICES activities at the EU level
- GEF Transboundary diagnostic assessments for large marine ecosystems - LME
- IPCC/IPBES to coordinate with WoA

Bluefin tuna: 3m, 680kg, 40 years



The High Sea (where the tunas and migratory fishes are!)

- Close to 60% of the oceans are outside national juridiction, i.e. beyond the 200nm mile Exclusive Zones (EEZs) of coastal countries
- Following the United Nations Convention on the Law of the Sea (Montego Bay 1982) they belong to the High Sea
- 1950s , catch from the high sea amounted to under 2 million tonnes and this had grown to over 10 million tonnes in 2006 (respectively 0% to 15% of the total marine

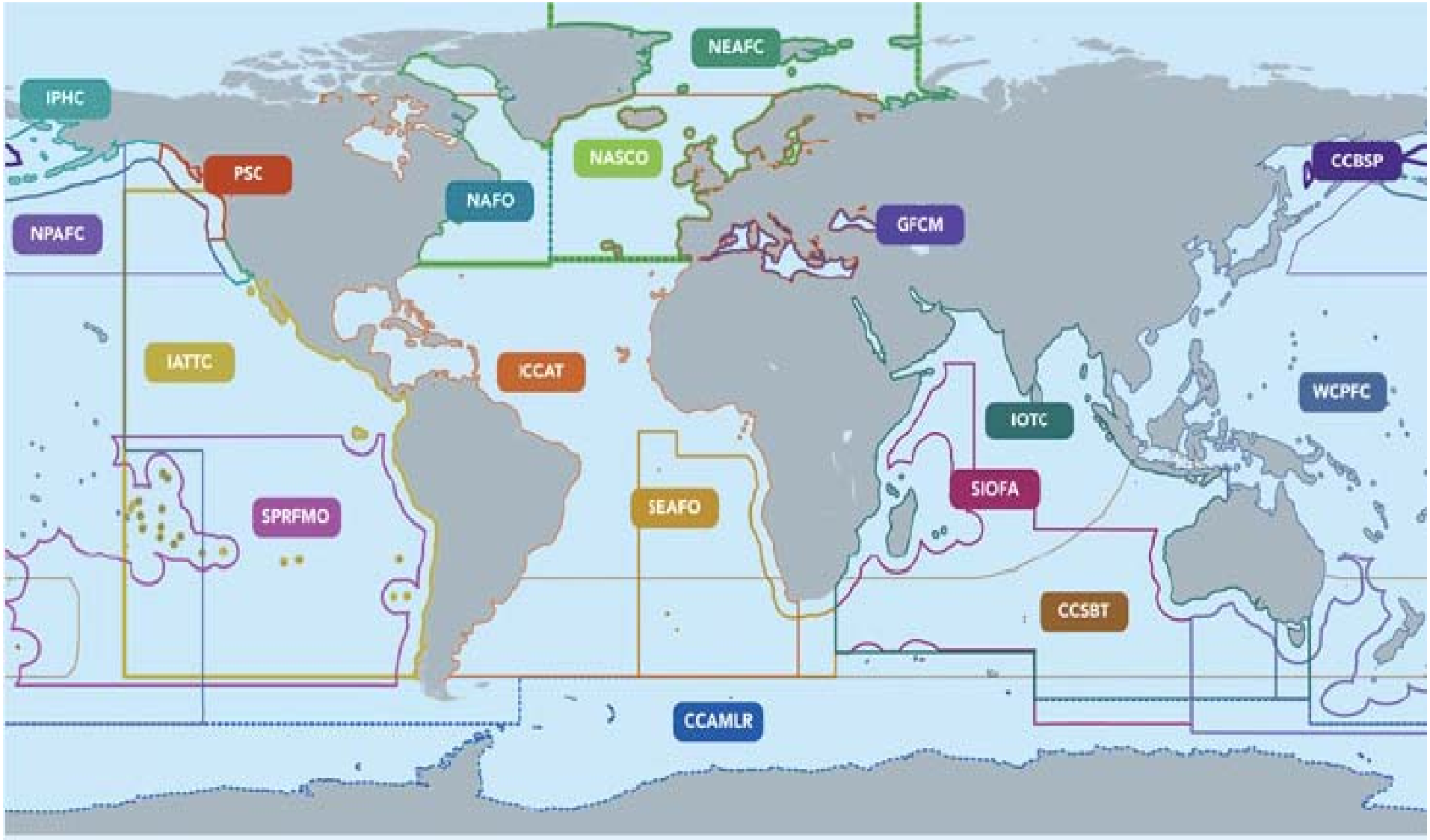
Lack of management of the high sea

- Hugo Grotius ‘the free sea’ and open access (anyone and everyone had rights to fish (17th century)
- The RFMOs are currently the only legally mandated fisheries management bodies on the high seas and countries fleet must abide by RFMO regulations in order to fish in these areas (1995 straddling fish stocks agreement-UN)

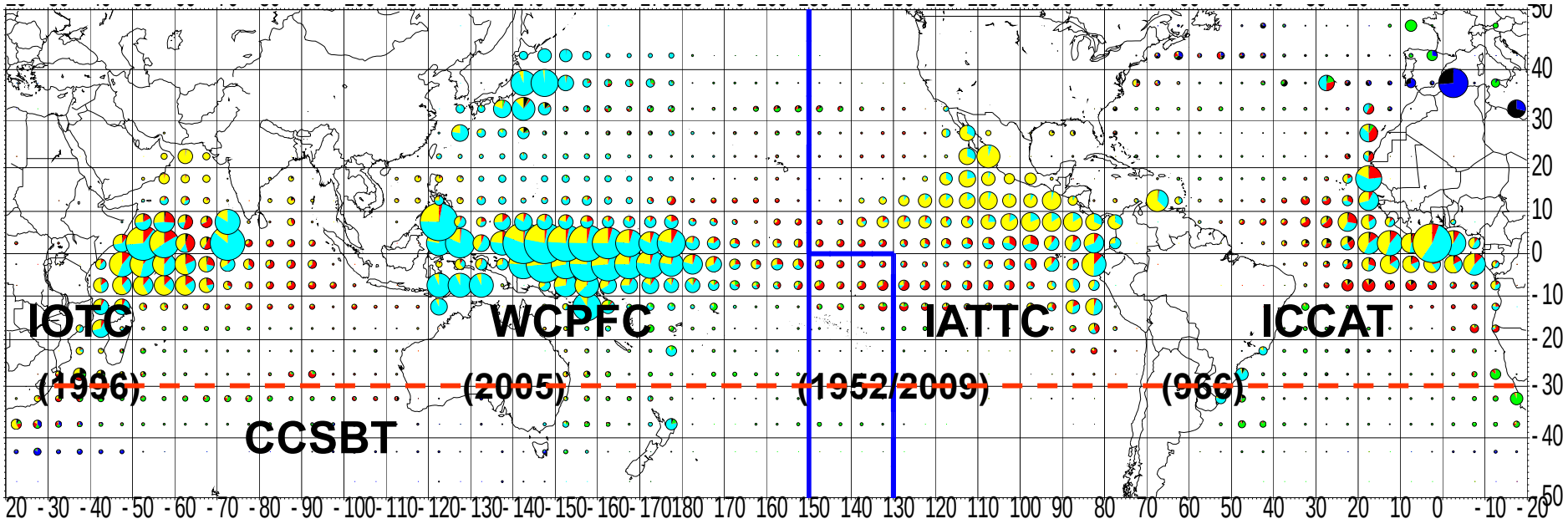
RFMOs
(Regional fisheries management organisations)

- RFMOs are international organisations formed by countries with fishing interests in an area
- Some of them manage all the fish stocks found in a specific area, while others focus on particular highly-migratory species, notably tuna, throughout vast geographical areas
- The organisations are open both to countries in the region (“coastal states”) and countries with interests in the fisheries concerned
- While some RFMOs have a purely advisory role, most have management powers to set catch and fishing effort limits, technical measures, and control obligations
- The EU, represented by the Commission, plays an active role in six tuna organisations and 11 non-tuna organisation

18 RFMOs cover the global Oceans



Conservation of tunas:
5 disconnected ORPs



BFT catches / Japan LL 1990-2008

10000 t.

Prises moyennes de thons par secteurs de 5° et commission thonières en activité

The international Scientific procedures at stake

(A. Fonteneau, pers. com.)

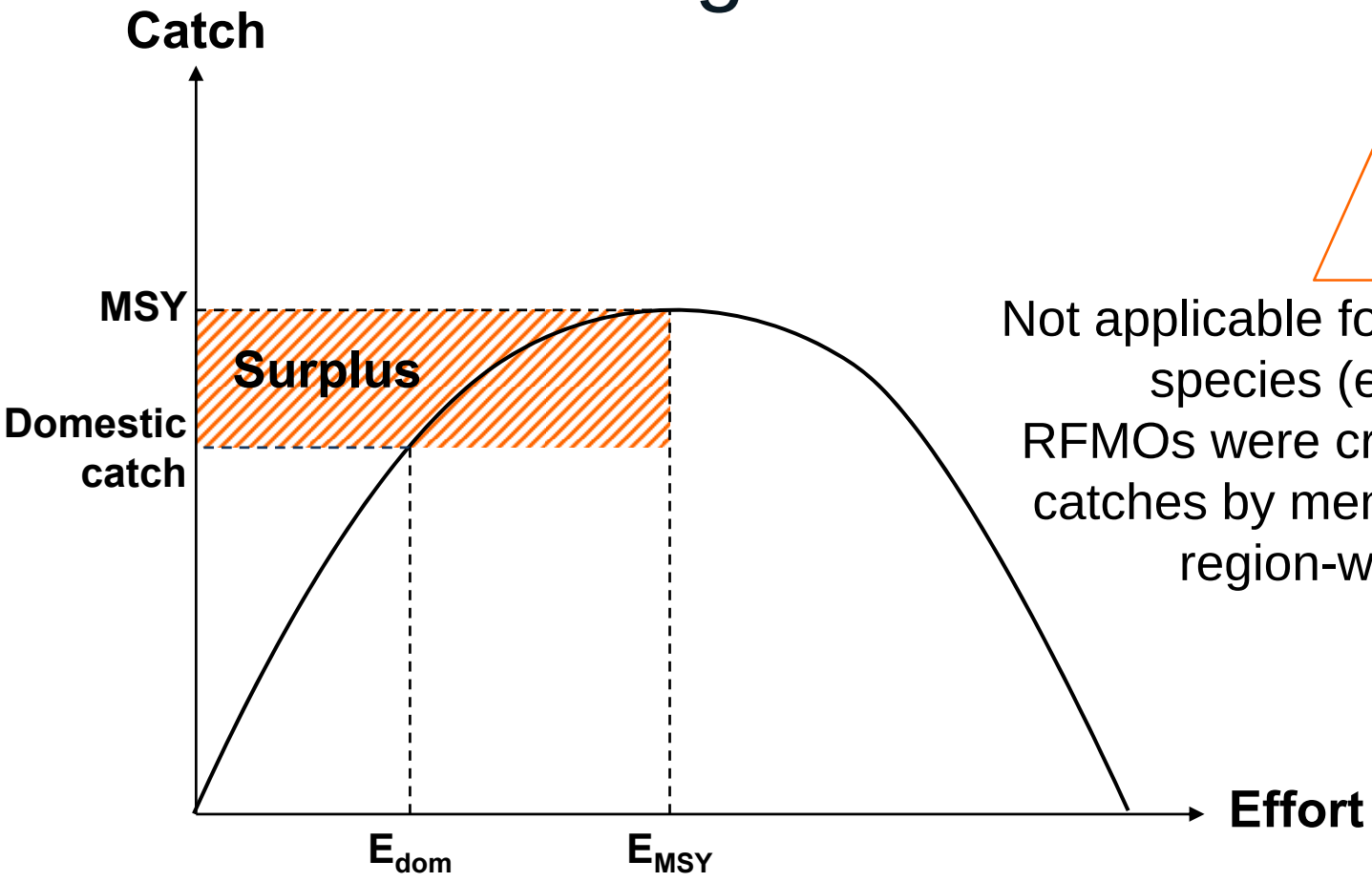
- The 5 tuna RFMOs work independently: each has its own functioning ways: regarding statistics, researches, modeling, and also rules to establish scientific consensuses and management recommendations to their Committees, the management organs, where the representatives of the fishing countries sit

✓ ICCAT and IOTC with national scientists only : scientific consensuses negociated between heterogeneous skilled experts, and generally with quite feeble / blurred results …

✓ IATTC and WCPFC: scientific consensuses which are unilaterally set and in a more or less opaque/transparent way by scientific staff paid for that purpose by the 2 RFMOs: firmer recommendations, not always reliable: a danger that in this system the structures refuse to acknowledge their past mistakes, even the worse ones!

- Very little coordination role held by FAO

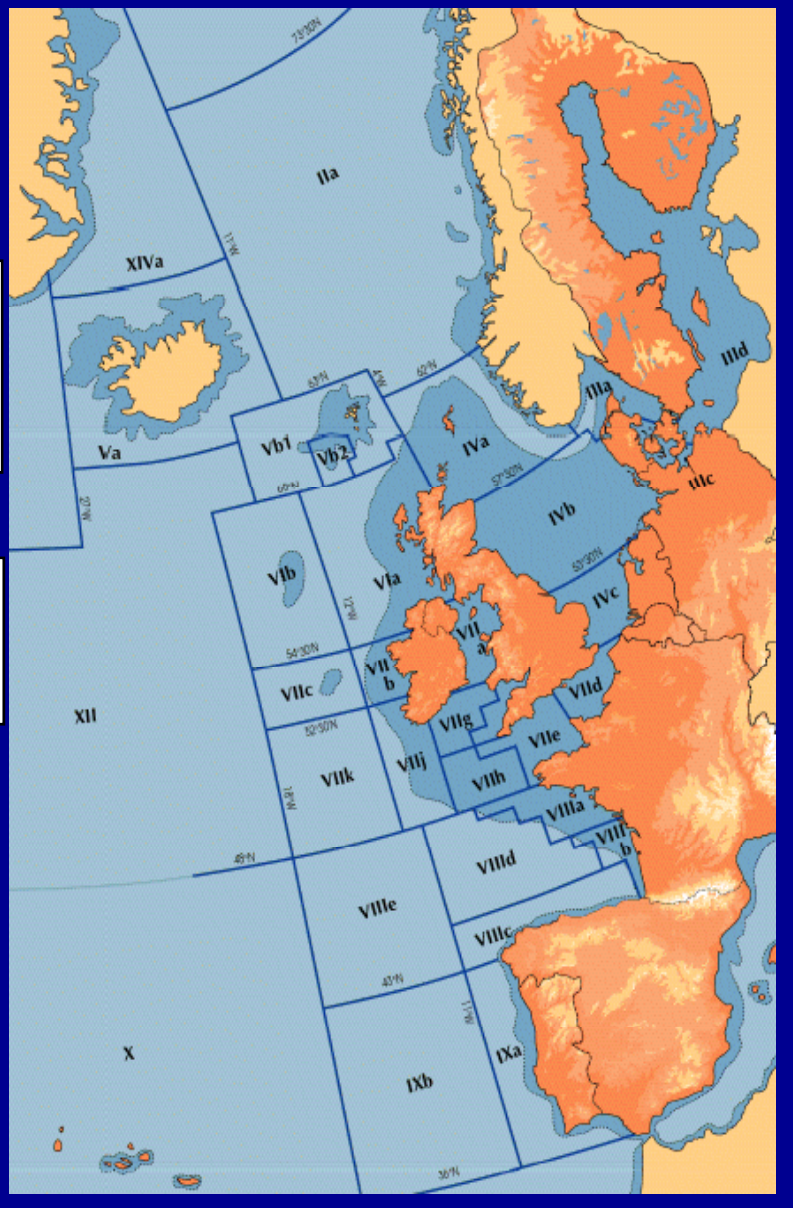
‘Surplus’ = Basis of fishing access agreements



Not applicable for highly migratory species (e.g., tunas).
RFMOs were created to allocate catches by member states on a region-wide basis)

The european evaluation of fish stocks CIEM/ICES

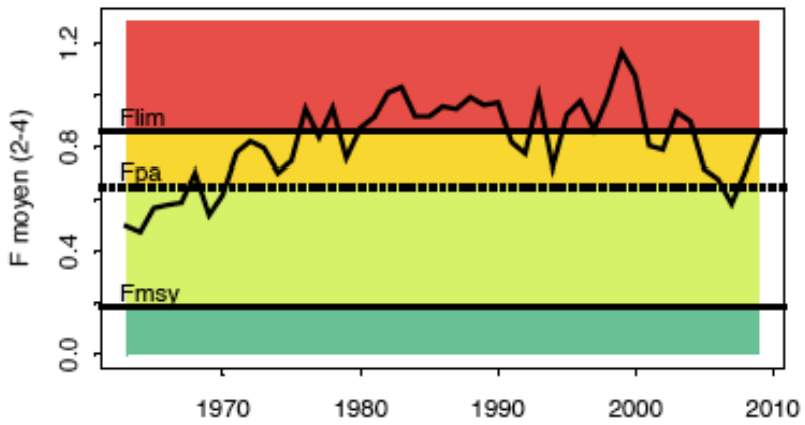
- Exclusive Economic Zone , European waters (EEZ)
- A Hundred of stocks rated every year by the International Council for the Exploration of the Sea (ICES / ICES)
- And setting (TAC Total Allowable Catches) by the Council of European fisheries ministers distributed as a fixed distribution key



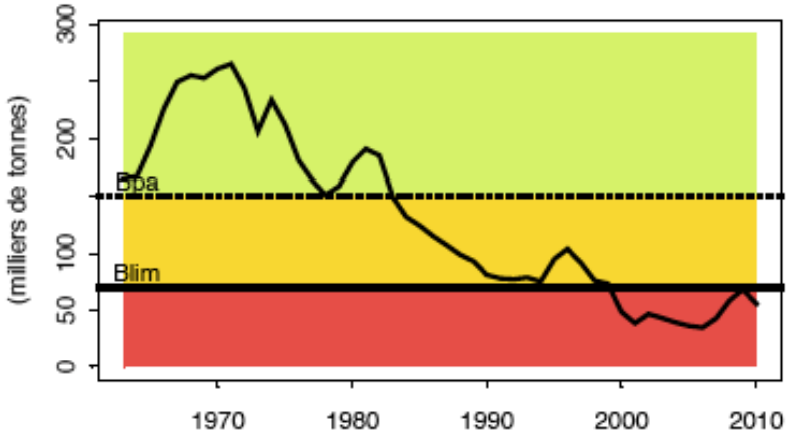
Cod in the North Sea

Diagnostic

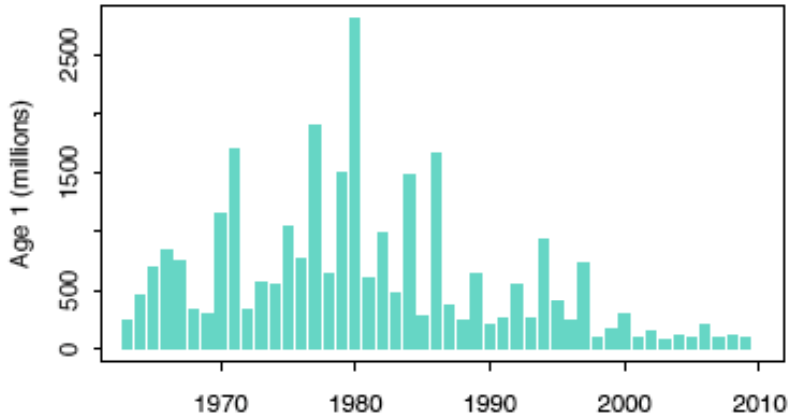
Mortalité par pêche



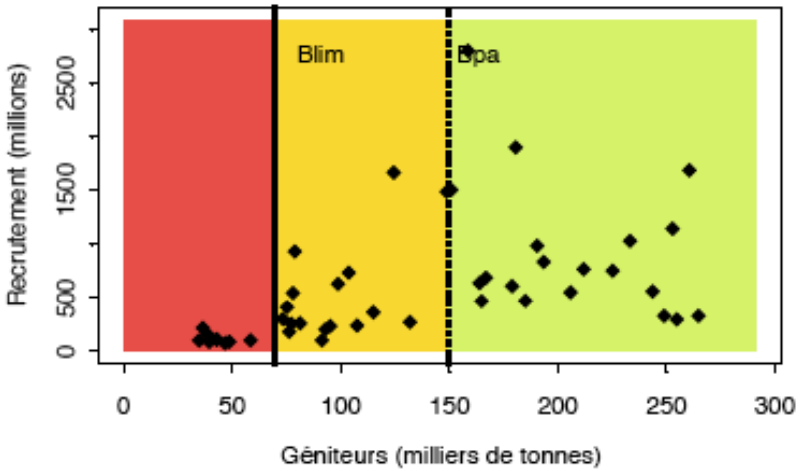
Stock de géniteurs



Recrutement



Stock-Recrutement



Data collection…

Source of information

1. Fishery statistics :

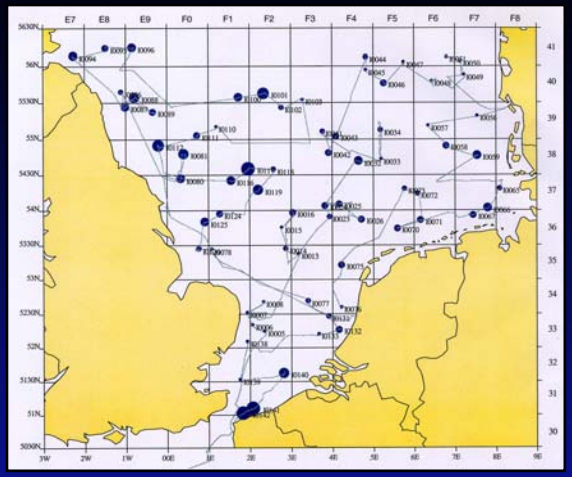
+ many fishery stat in continuous (C, f, VMS…)
- incomplete, difficult to check, sometimes difficult to collect (small scale fisheries)

2. Scientific surveys:

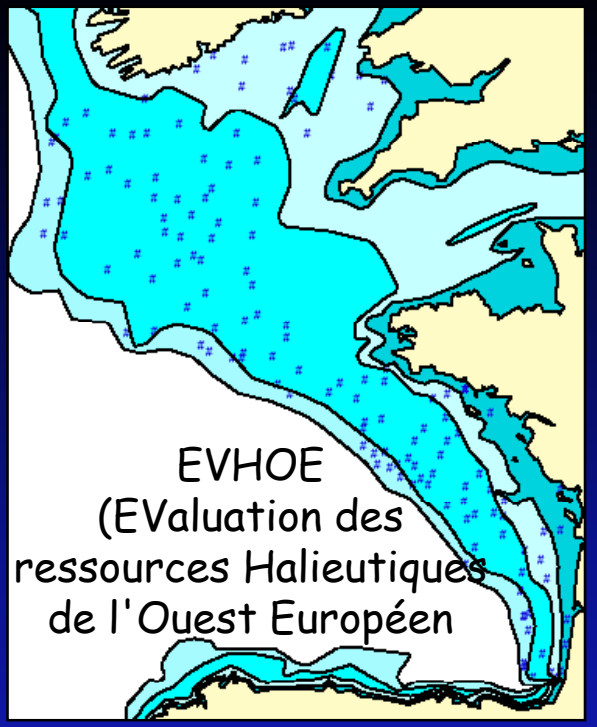
+ standardized, reliable, objective
- expensive, rare

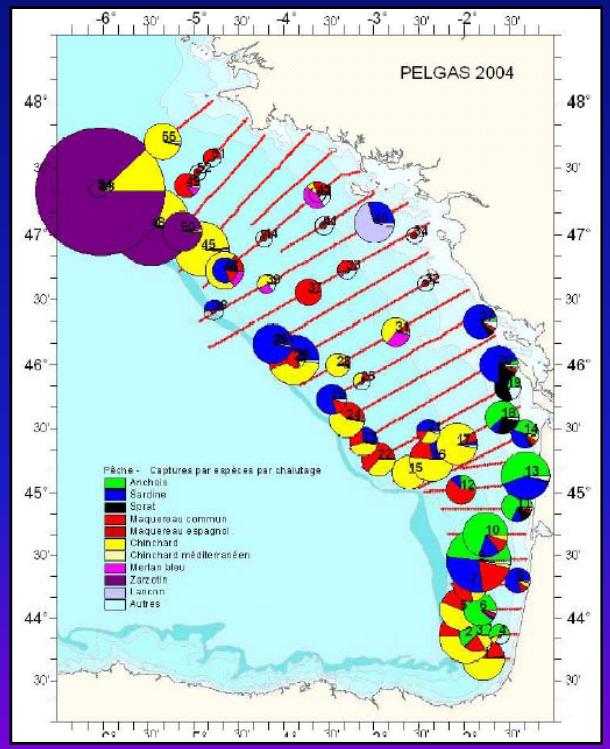
European Framework Initiative: DCR (Data Collection Regulation) - www.datacollection.jrc.cec.eu.int/

Scientific surveys in France

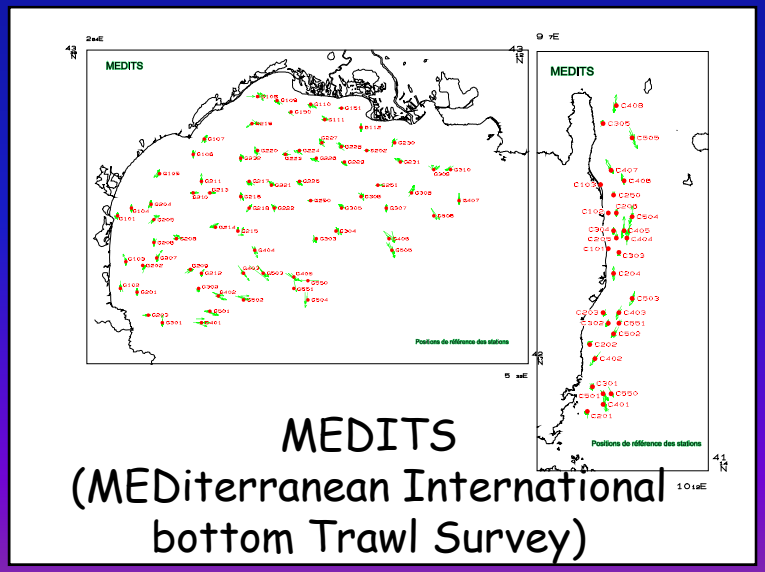


IBTS
(International Bottom Trawl Survey)





PELGAS
(PELagiques GAScogne)



MEDITS
(MEDiterranean International bottom Trawl Survey)

Scientific assessment methods of tuna resources

(A. Fonteneau, Pers. Com.)

- Data of large tagging campaigns essential, but they are expensive and stay globally much too scarce and their number limited
- Direct assessment of biomass unforunately impossible!
- All tuna RFMOs diagnosis rely at 95% on fisheries data only : often false, incomplete or distorted. The exemplary case where increases of thel'efficiency of boats hides the decline in abundancy.
- With major changes, in all the world tuna fisheries' fleet

19ème siècle

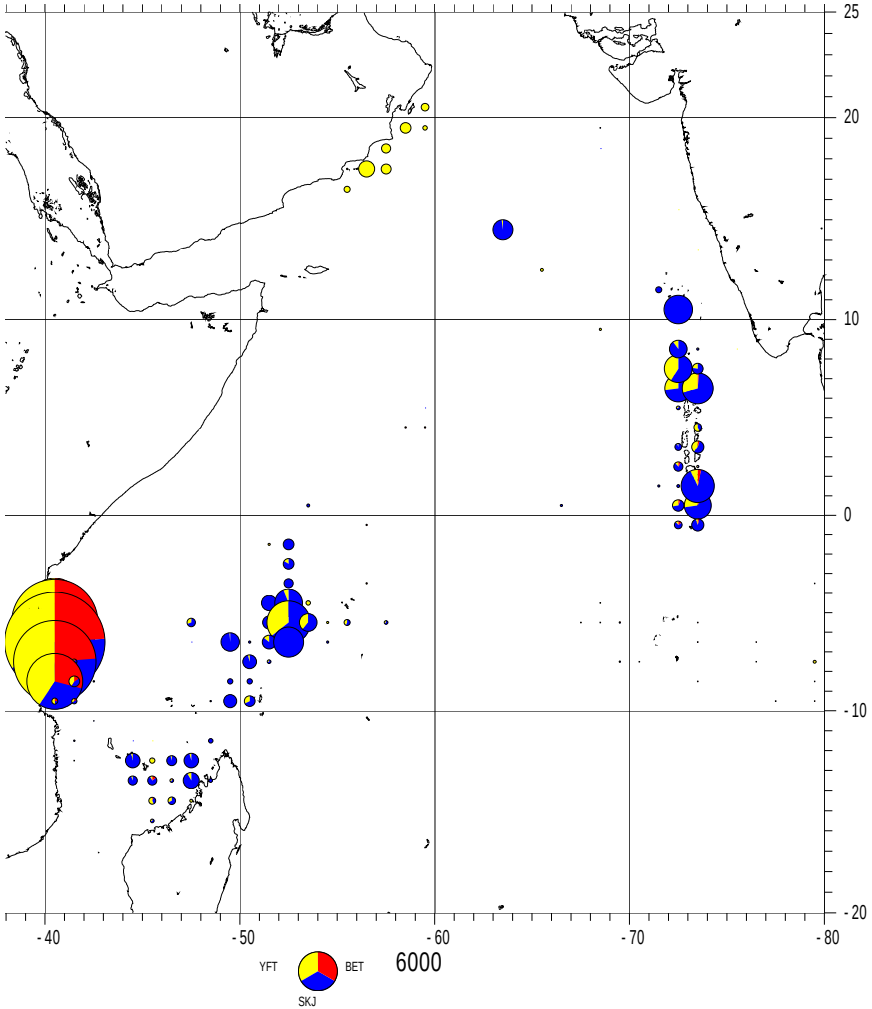
1955

1975

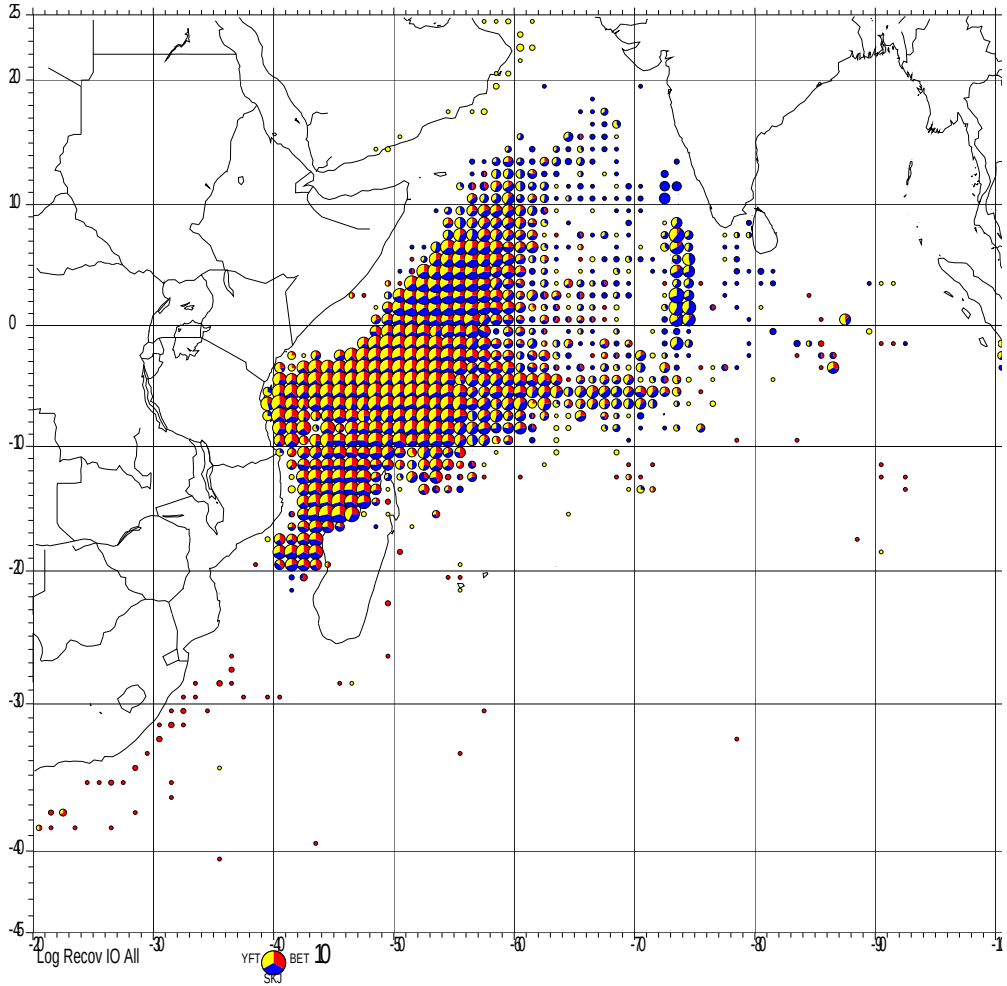
2000

The IOTC tagging program

- 201 425 tunas tagged & a very good balance between the 3 species tagged: yellowfin **32 %,** skipjack **50 %** and bigeye **18** %.
- Most of these tunas being very **well tagged** and well measured, many with double tags & with tetracycline injection
- 34.250 recoveries, many of them being very well documented for their **species, dates**, **location, and sizes of recovered tunas**
- Very **few of the short term recoveries** that are quite useless for scientists & that have been frequent in other tuna tagging programs,
- Very **high and well estimated reporting rates** of the EU & Seychelles purse seiners
- **Sex of recoveries** identified since 2009 for most yellowfin & bigeye recoveries by purse seiners



Location of tropical tunas tagged by species in the Indian ocean (*60% of tags released in the coastal area off Tanzania)*



Location of tuna recoveries by species (log Nb)

Decision Process

COMMISSION INTERNATIONALE POUR LACONSERVATION DES THONIDES DE L'ATLANTIQUE(CICTA - ICCAT)

créée en 1996: 47 contractantes (Union Européenne depuis 1997)

COMMISSION

Propositions de mesures de gestion

Examen des résultats scientifiques

Policy committee

Avis

SCRS

Comité permanent pour la Recherche et les Statistiques

Scientific Committee

Groupes d'évaluation d'espèces

Sous-Comité pour les statistiques

Sous-Comité écosystémique

Divers groupes de travail *ad hoc*

Groupe de travail Méthodes

Groupe de travail sur l'approche de précaution

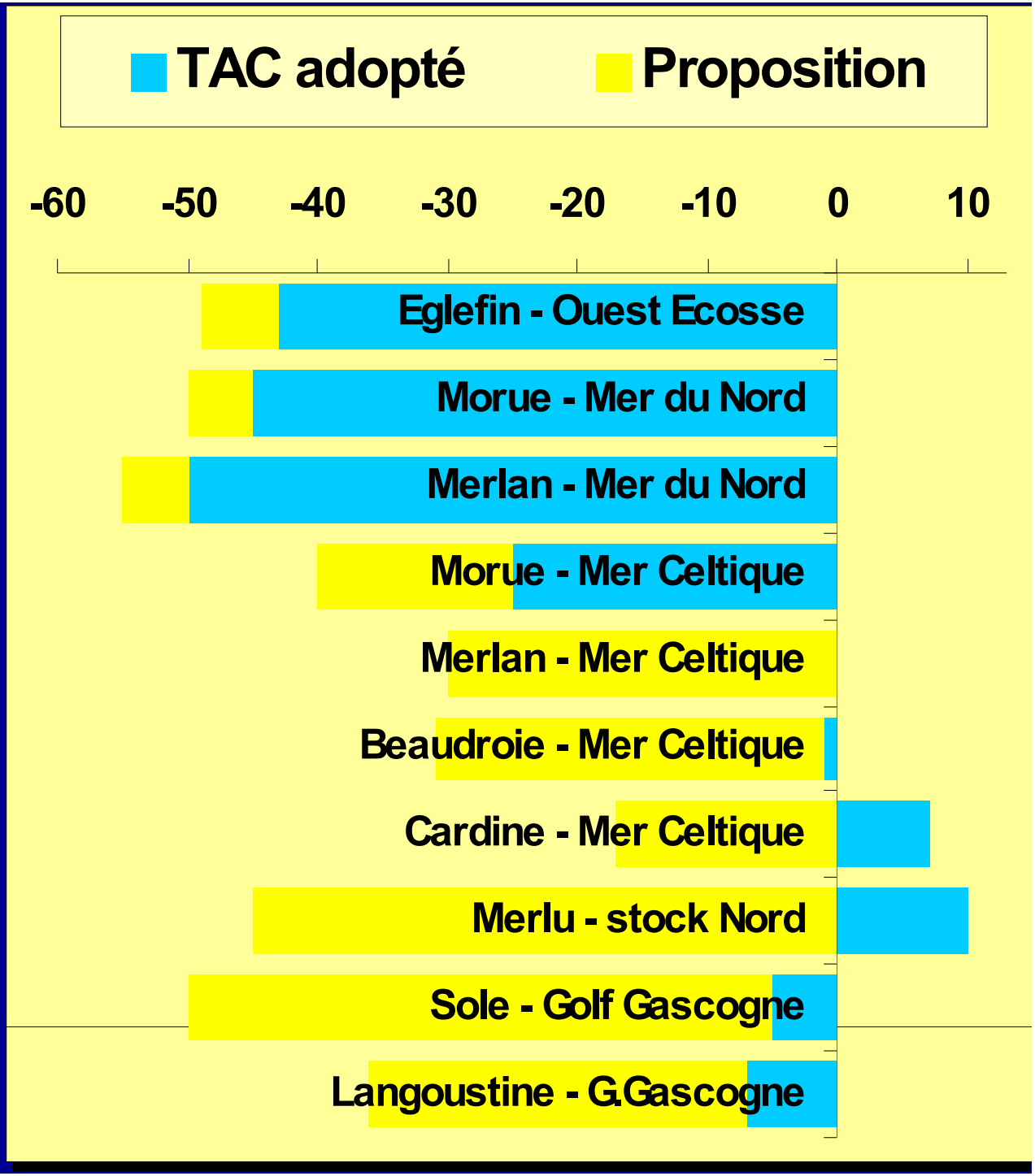
Scientific assessment methods of tuna resources are little-convincing (A. Fonteneau, Pers. Com.)

- The stocks assessment models currently used by scientists which are more and more complex, heavy statistics models integrating multiple parameters on fish, fisheries and environment, but which are not necessarily more realiable….. On the opposite: numerous diagnosis blatant mistakes….
- A few scientists are able to correctly use them
- Very few scientists are able to understand the mistakes and the limits, and the problems of the models often being cryptic (hidden by their instigators?)
- The mistakes in the tuna diagnoses therefore stay significant, but are mostly underestimated by scientists.
- The paradox is that the easiest model often used by the FAO, the trend of the annual catch of a stock is often more reliable!

Scientific advice

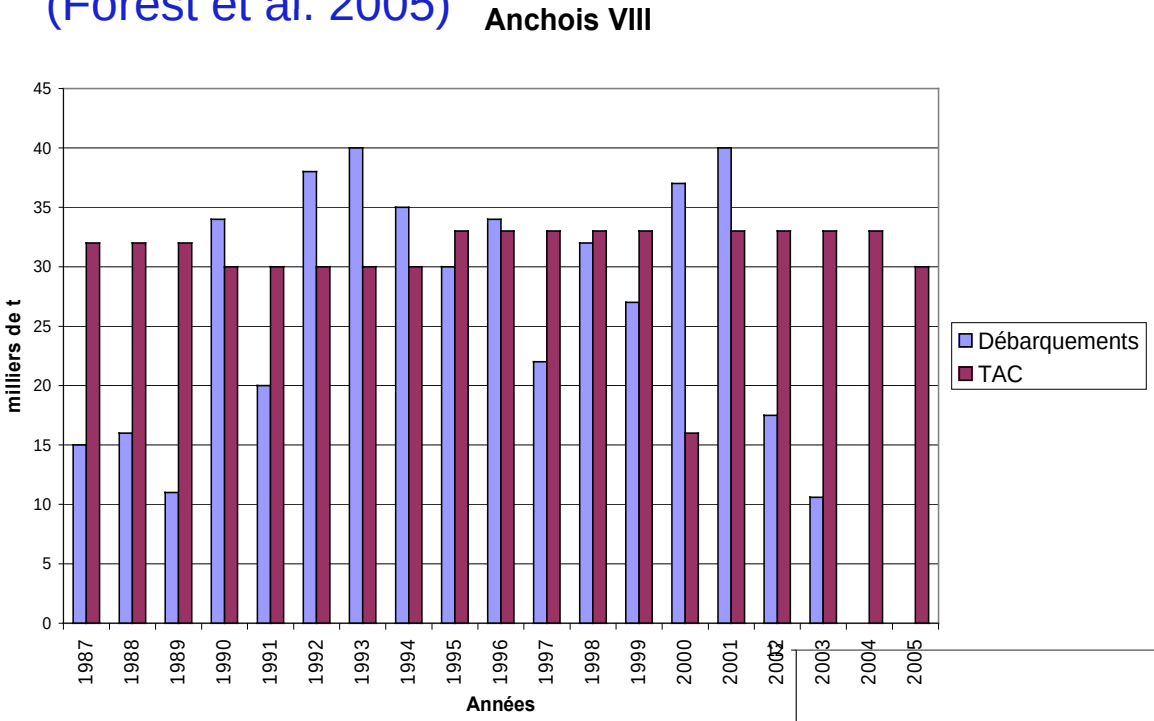
≠

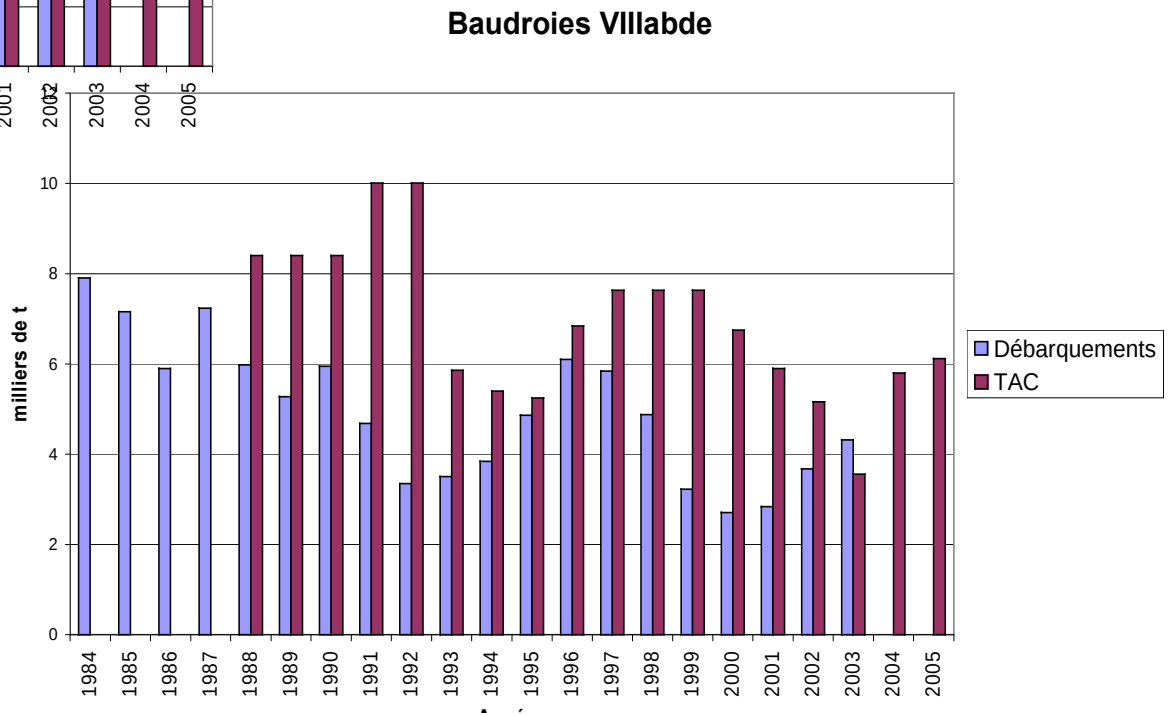
Political decision



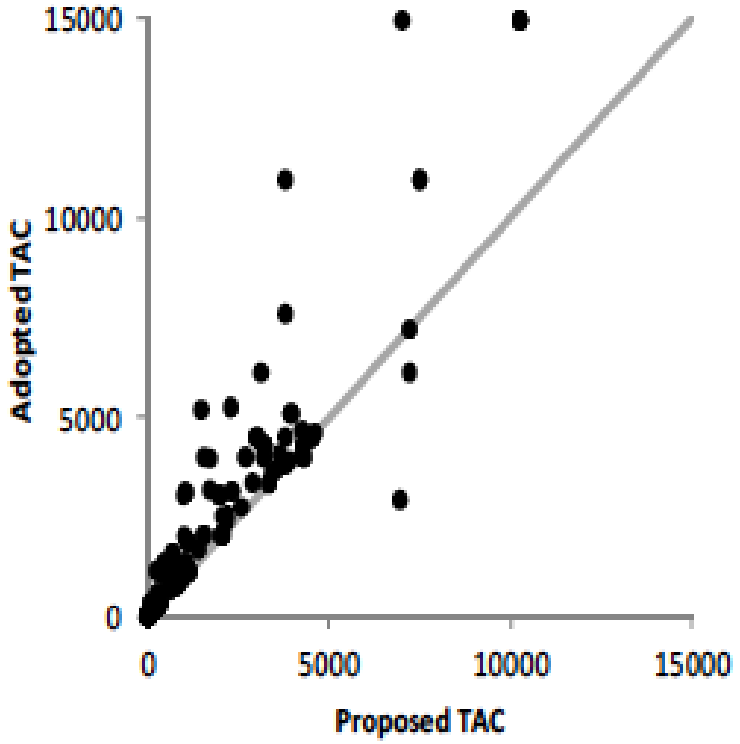
Bay of Biscay: Catch & Total Allowable Catch

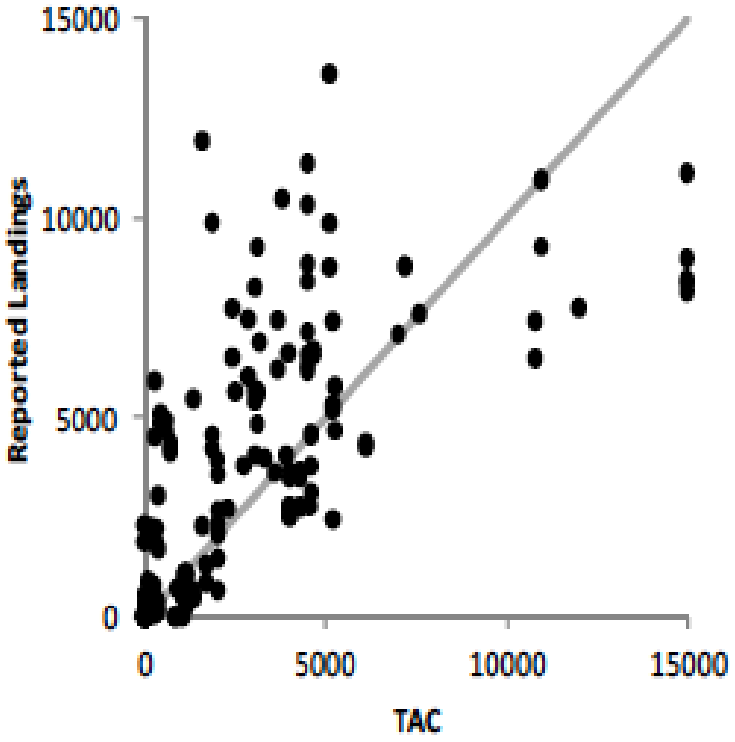
(Forest et al. 2005)





TAC proposal versus TAC approved and Catch for deep sea fish in the North Atlantic (Vilasante et al 2012)





Weak acceptation from the fishers

pêche

Propositions de Tac 2003 :

pêche

Démonstration le 11 décembre dans le détroit :

Non aux diktats de la Commission, oui à une Europe participative intégrant les professionnels aux décisions. Les 9 délégations nationales réunies à Boulogne le mercredi 11 décembre ont donné l'image d'une communauté faisant bloc.

les pêcheurs européens unis contre la Commission

Une motion adoptée

Marine

La lettre ouverte de Franz Fischler suscite l'exaspération

La pêche ira contester à Bruxelles

« Non à l'holocauste des marins pêcheurs »

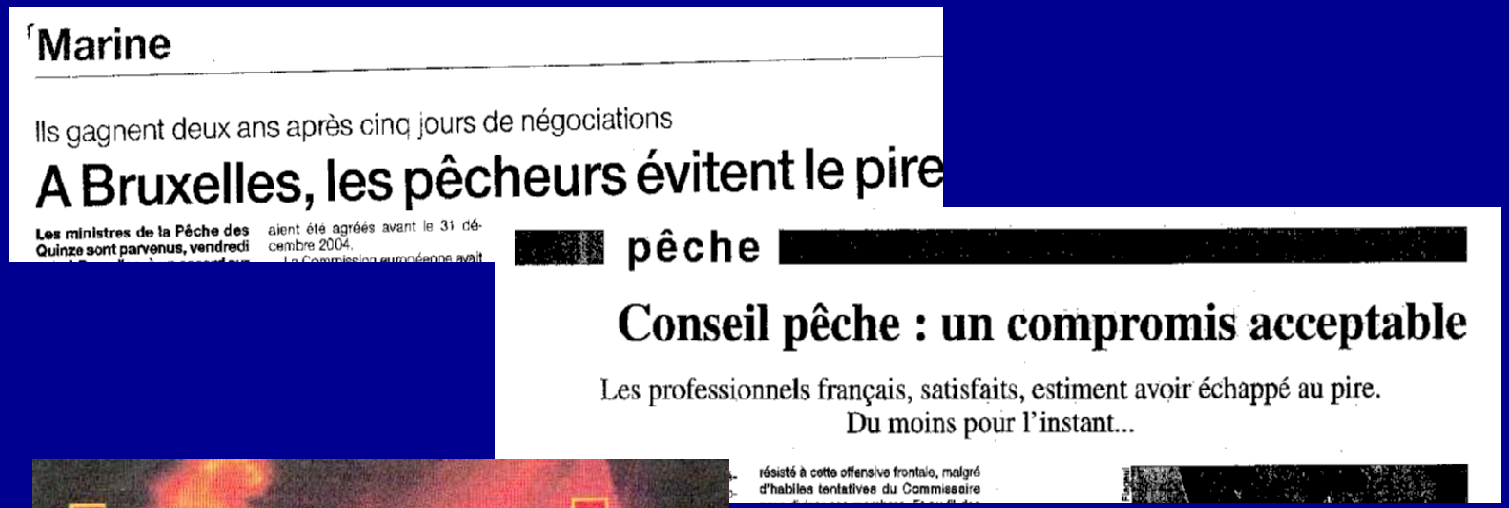
L Jagot, Secrétaire fédération de producteurs

« Les poissons ont toujours été sujets à des cycles »

A.Le Berre, Président du Comité des pêches de Bretagne

Fixation des TAC en décembre (2003) : de l'inquiétude … à la mobilisation!

Fishers as a strong lobby



Marine

Ils gagnent deux ans après cinq jours de négociations

A Bruxelles, les pêcheurs évitent le pire

Les ministres de la Pêche des Quinze sont parvenus, vendredi aient été agréés avant le 31 décembre 2004.

pêche

Conseil pêche : un compromis acceptable

Les professionnels français, satisfaits, estiment avoir échappé au pire. Du moins pour l'instant...

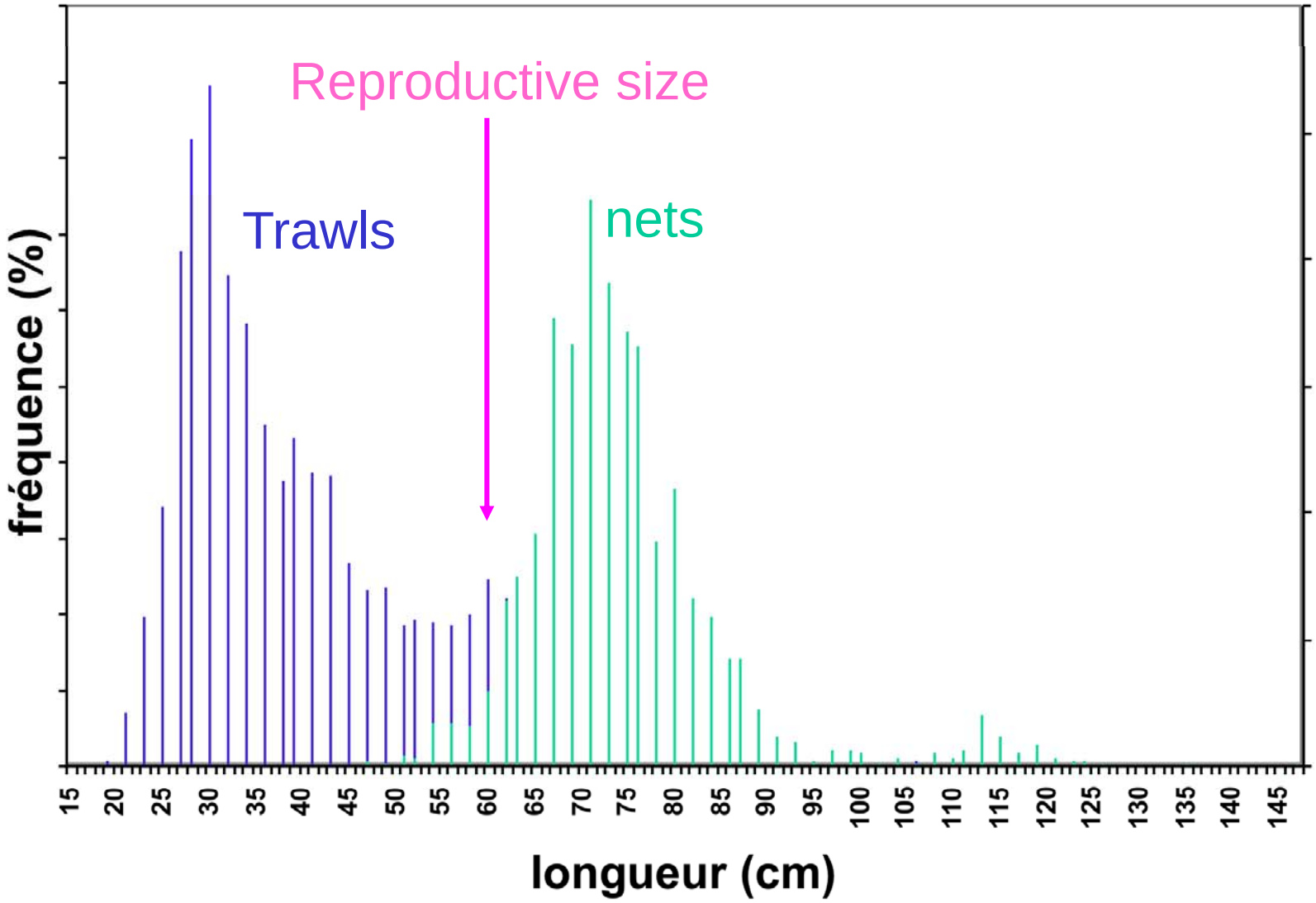
résisté à cette offensive frontale, malgré d'habiles tentatives du Commissaire

Mais sur le long terme :

. des situations de crise économique,

. et une forte dégradation des ressources

Size cath in the Mediterranean Sea

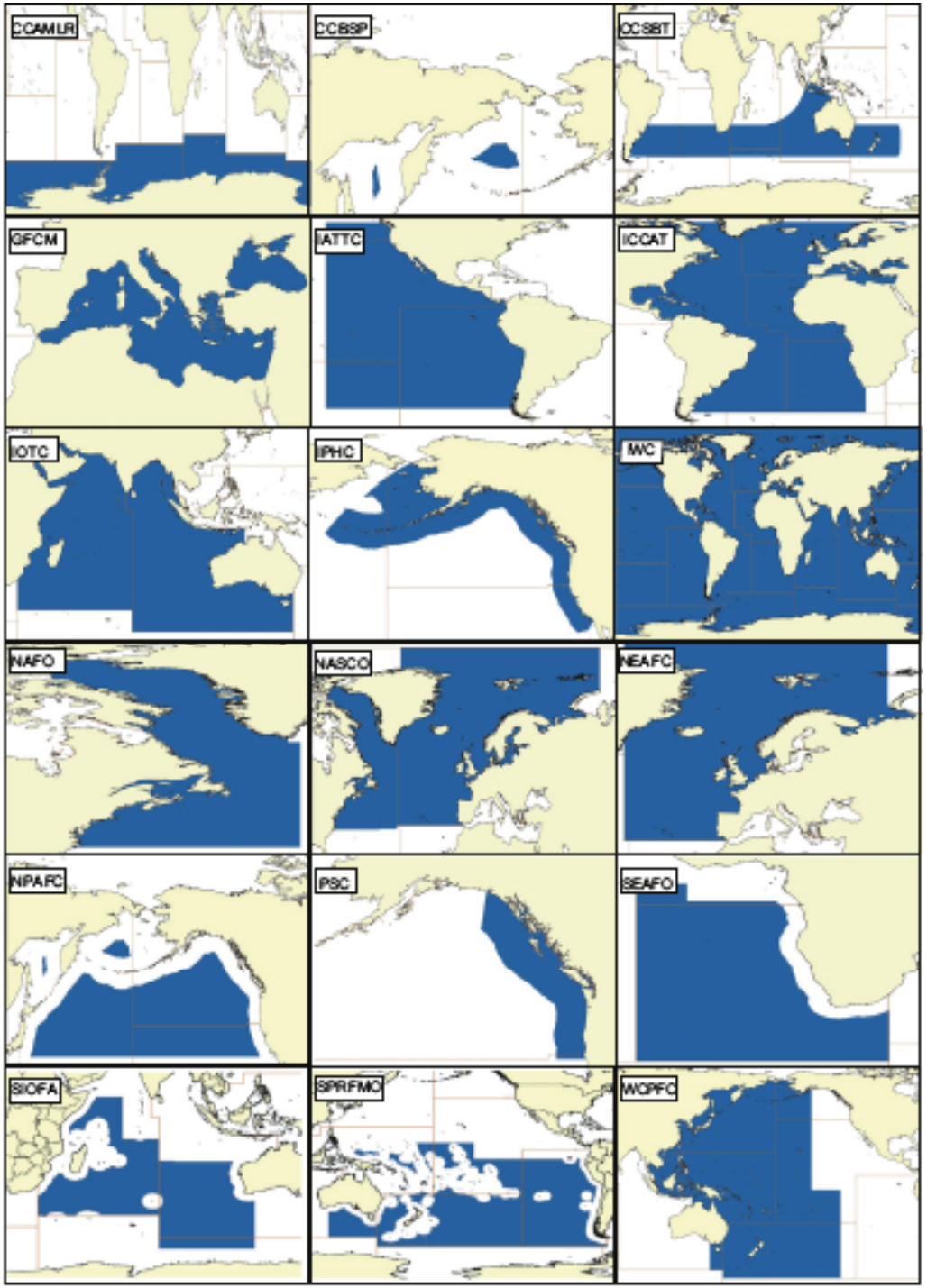


Results

The tuna committees : Procedures for management decisions which are often ineffective

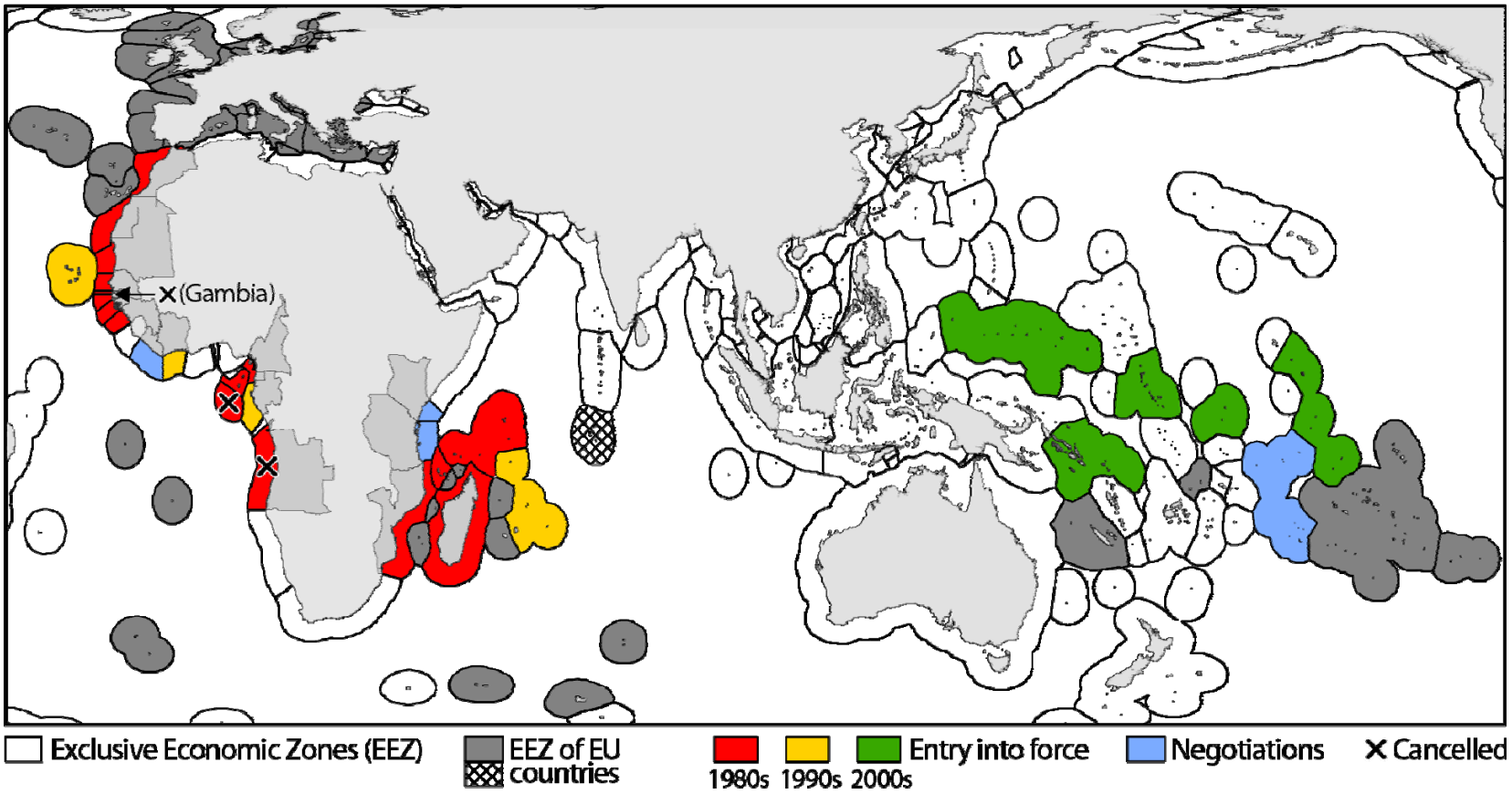
- In 2015: most of the tuna stocks are fully exploited and require management measures
- A strong global tuna fleet overcapacity
- Also often problems of incidental mortality of sensitive species: sharks, turtles, birds, dolphins, that these RFMOs must impératively estimate and if necessary reduce, under the watchful eye of WWF, Greenpeace et PEW
- Most management decisions are taken by consensus RFMO, when it is nearly impossible to obtain unanimity of management projects between coastal and industrial countries (Japan and EU being the 2 most important)
- These differences will greatly increase with the current overcapacity of global tuna fleets : industrialized countries wanting to keep their catch potential, developing countries wanting to increase it…
- This is often the result of soft or ineffective management measures, or no measure at all …
- Often these measures are decided, but purely cosmetic or never used by fishing nations, without control nor punishment of offenses.
- A common tragedy of the commons: sea resources remain largely self-service **res nullius** objects

18 RFMOs: 2/3 of stocks fished on the high seas and under management are either depleted or overexploiote d

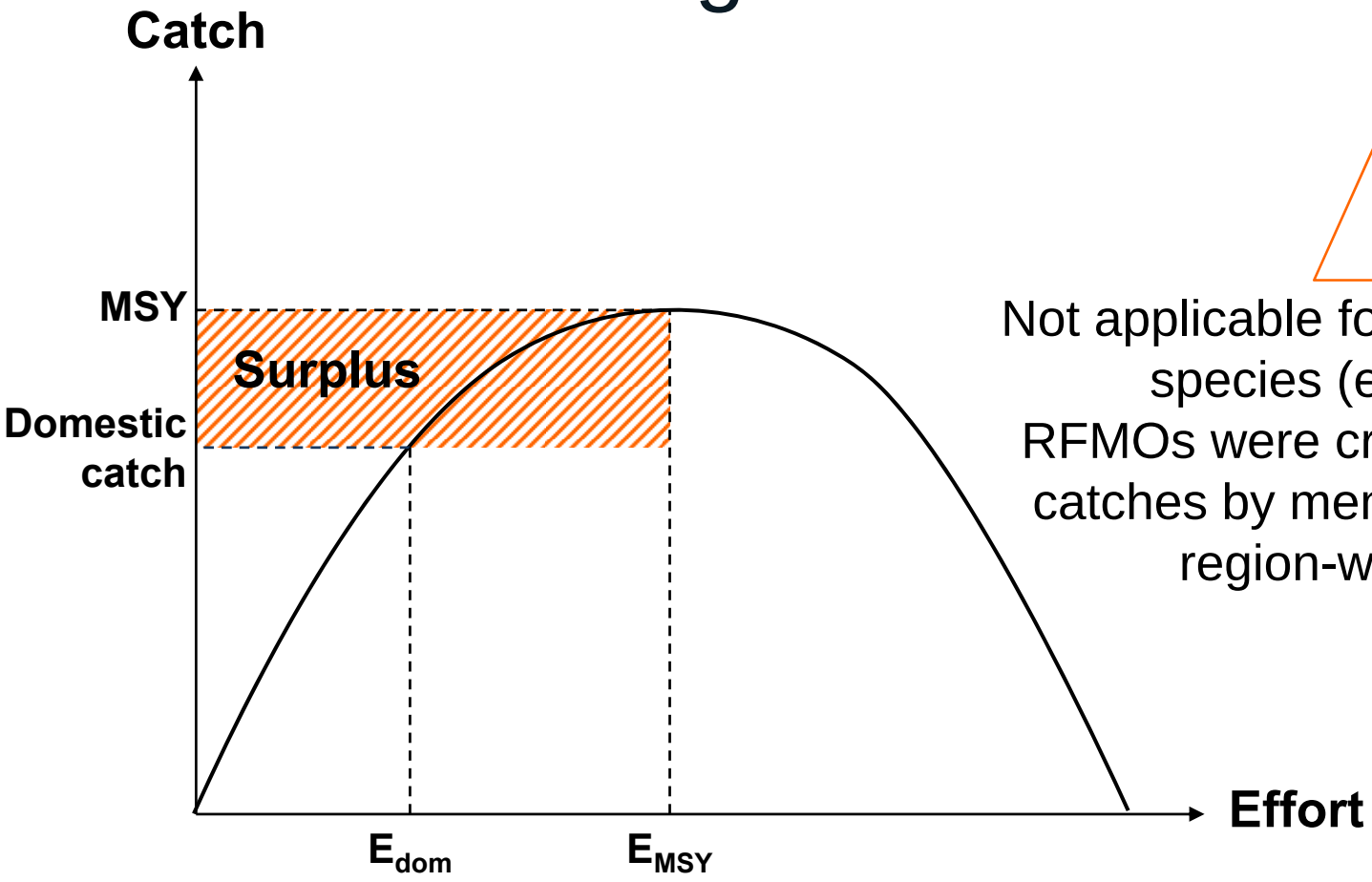


Publicly-funded EU fishing access agreements

The current situation (mostly « tuna agreements »)

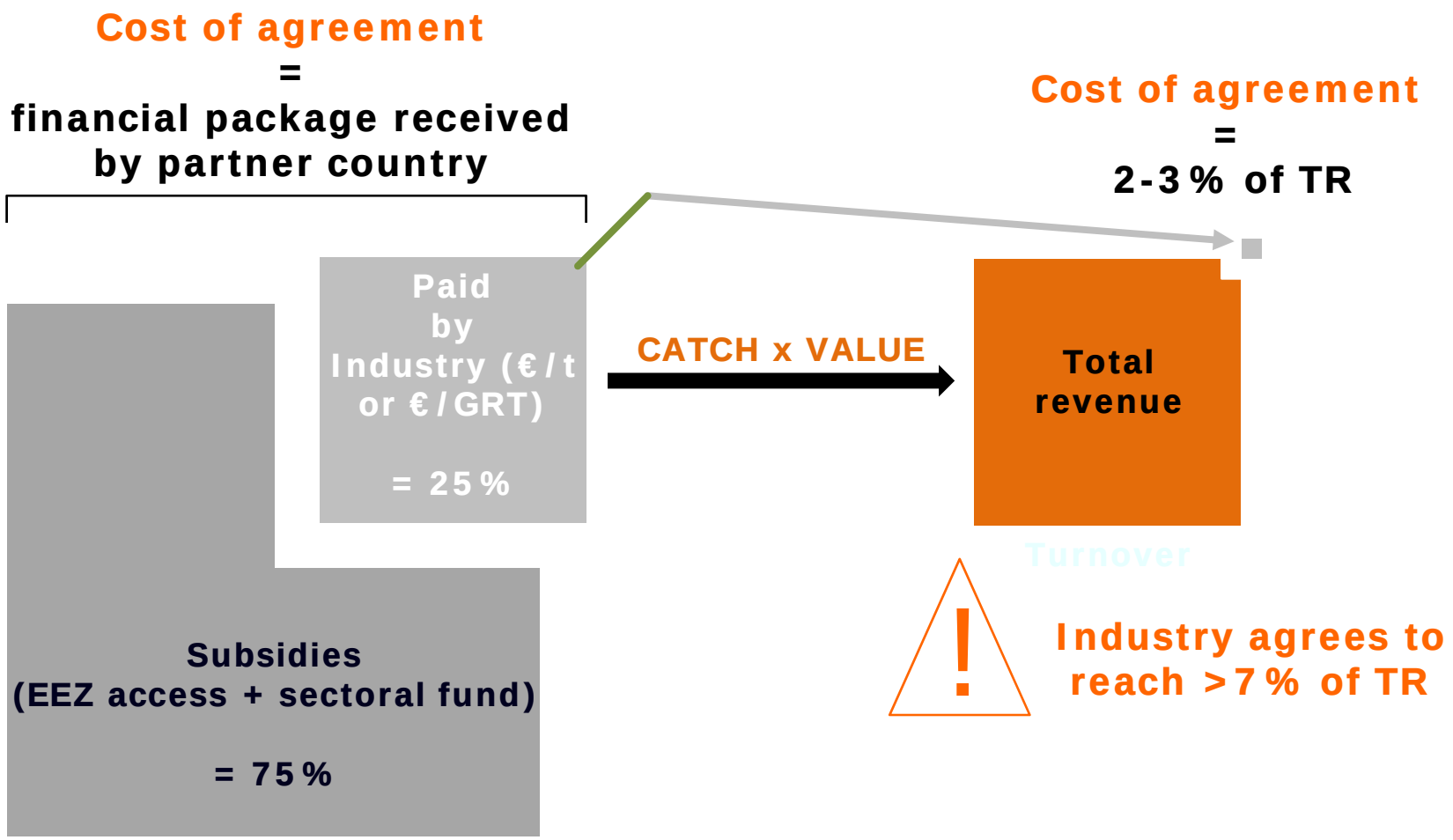


‘Surplus’ = Basis of fishing access agreements



Not applicable for highly migratory species (e.g., tunas).
RFMOs were created to allocate catches by member states on a region-wide basis)

Financial aspect of these EU agreements



Ifremer 1999, Le Manach et al 2014

Non-financial aspects of these agreements

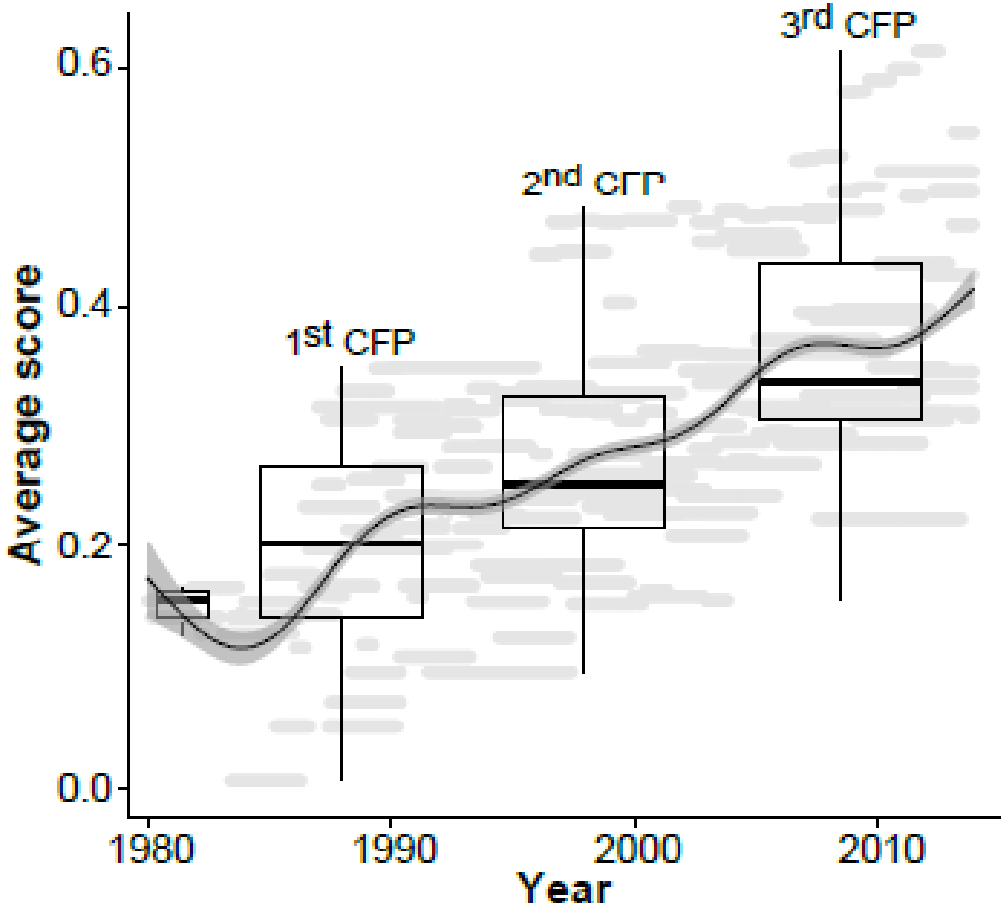


Figure 55. Evolution of the overall scores, 1980–2013.
Each data point (on which the boxplot are based; light grey circles in the background) corresponds to the monthly average score of a given country (all provisions included; n = 4,577). The black line and grey ribbon on top of the boxplot correspond to the generalized additive model fitted by the *stat_smooth* function of *ggplot2* and *mgcv* packages in R. The ANOVA and pairwise comparisons were performed in R, using the *aov* and *pairwise.t.test* functions.

Improvement of EU agreements over time, BUT observation of fishing activities remains weak (e.g., lack of observers due to piracy)

Le Manach (2014) Past, present and future of publicly-funded European Union's fishing access agreements in developing countries. PhD thesis, University of University of British Columbia, Vancouver (Canada). xiii + 174 p.

European agreements

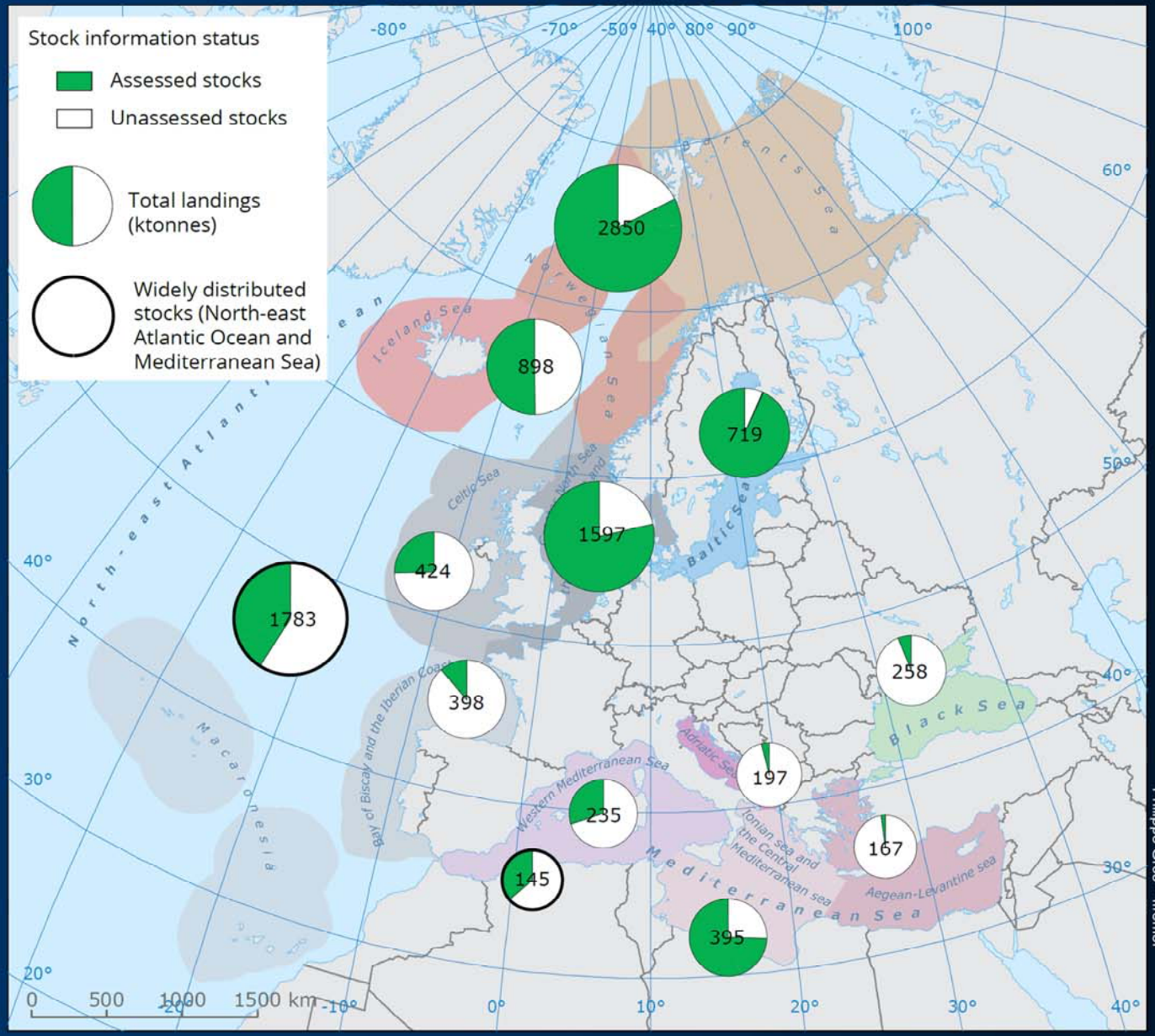
- Developing countries underestimate their marine catch by 100-300%, mainly due to **poor accounting of all small-scale fisheries**, discards and illegal catches
- Developed (high GDP) countries underestimate their marine catch by 30-50%, mainly due poor-accounting of small-scale non-commercial catches and industrial discards
- **Surpluses do not exist in most fisheries** (including tunas)
- EU Commission **develops transparent agreements** compared to other countries (e.g. China, Russia,…)
- But **negotiation process is not transparent** + **poor public access to fisheries data**;
- Several countries aim to develop offshore fisheries => **increasing conflicts with EU fleets**
- Fishing access agreements should be reframed to fit in the **new framework of the Agenda 2030 (ODD)**

RFMOs Low score

- The Free Sea is still a reality
- The high seas undergo a widespread and rampant illegal fishing
- RFMOs should act as stewards of the high seas and become accountable for their actions

and in European waters….

Reported landings (~10 Mt, FAO areas 27 and 37): 60% of landings are from assessed stocks



Philippe Gros – Ifremer

Source:
State of Europe's seas
EEA Report No. 2 (2015)

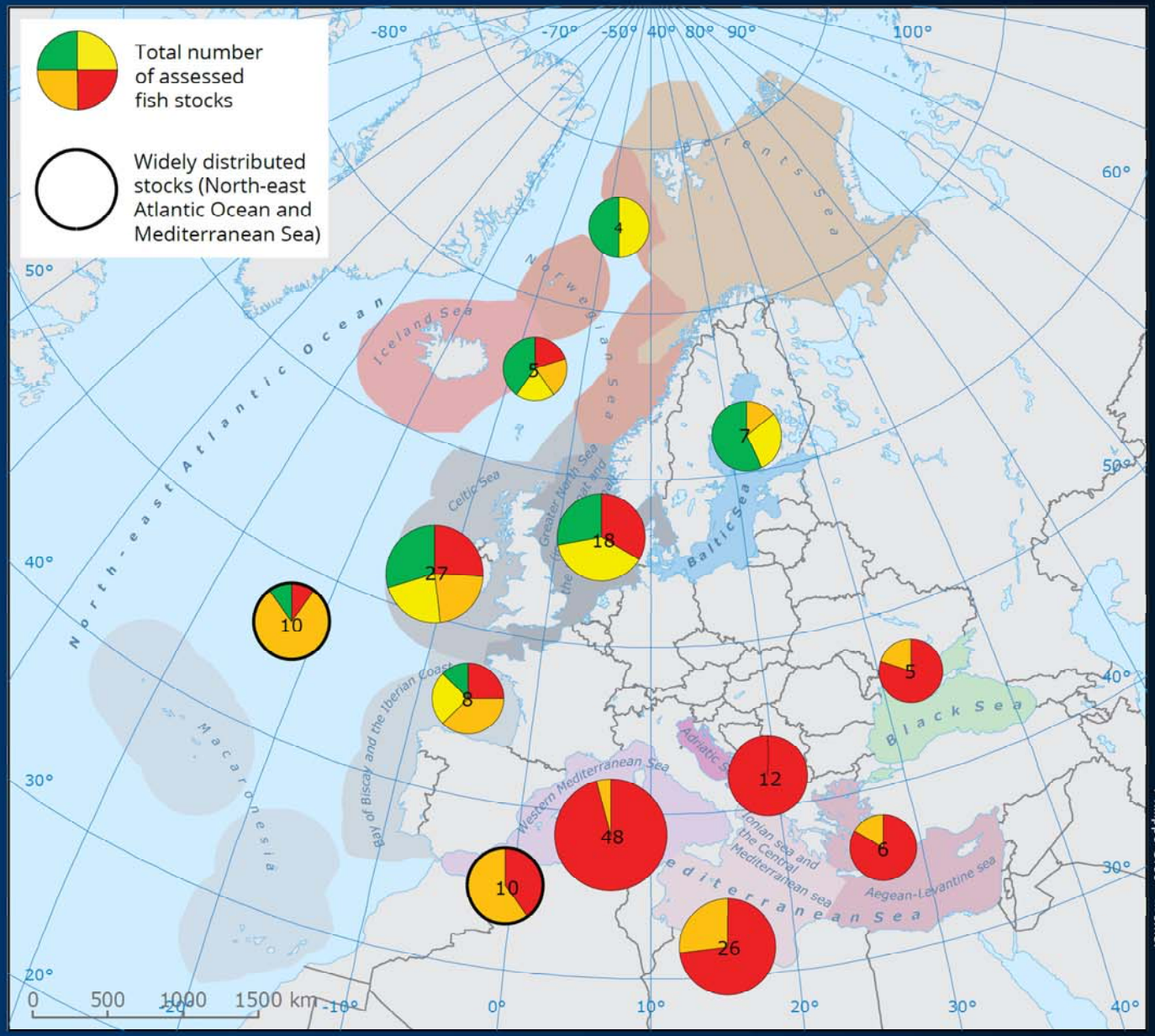
- North-eastern Atlantic and Baltic Sea stocks provide 93% of landings (of which 35% are from unassessed stocks).
- Mediterranean and Black Seas: 68% of the total regional landings are not assessed.
- Even our knowledge about commercial fish species as a subset of overall fish species remains partial.

.

European Environment Agency

Status of assessed fish stocks from regional seas around Europe

104 stocks : $F > F_{MSY}$ and $B < B_{MSY}$; 34 : $F < F_{MSY}$; 20 : $B > B_{MSY}$; 22 : $F < F_{MSY}$ and $B > B_{MSY}$



Philippe Gros – Ifremer

Source:
State of Europe's seas
EEA Report No. 2 (2015)

Two additional aspects to 'good environmental status' (GES) that are crucial to understand the health of fish stocks are:

- the age,
- and size structure of the populations.

However, no threshold level for GES is currently available.

NB: In the Mediterranean and Black Sea, 84% of the regionally assessed stocks are overexploited.

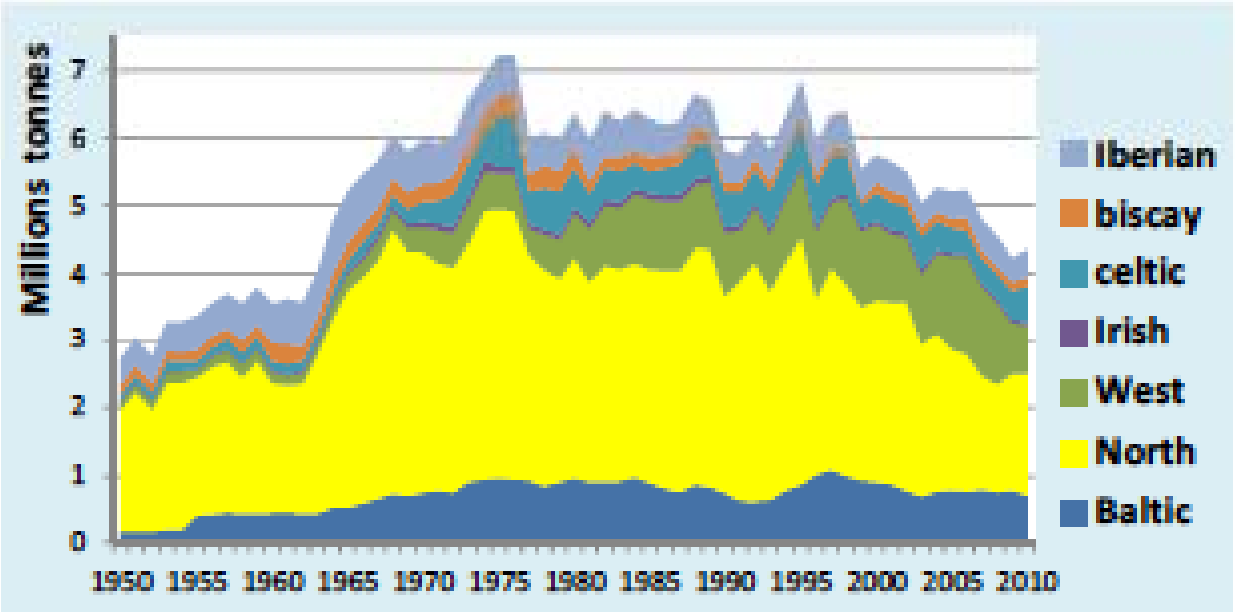
European Environment Agency

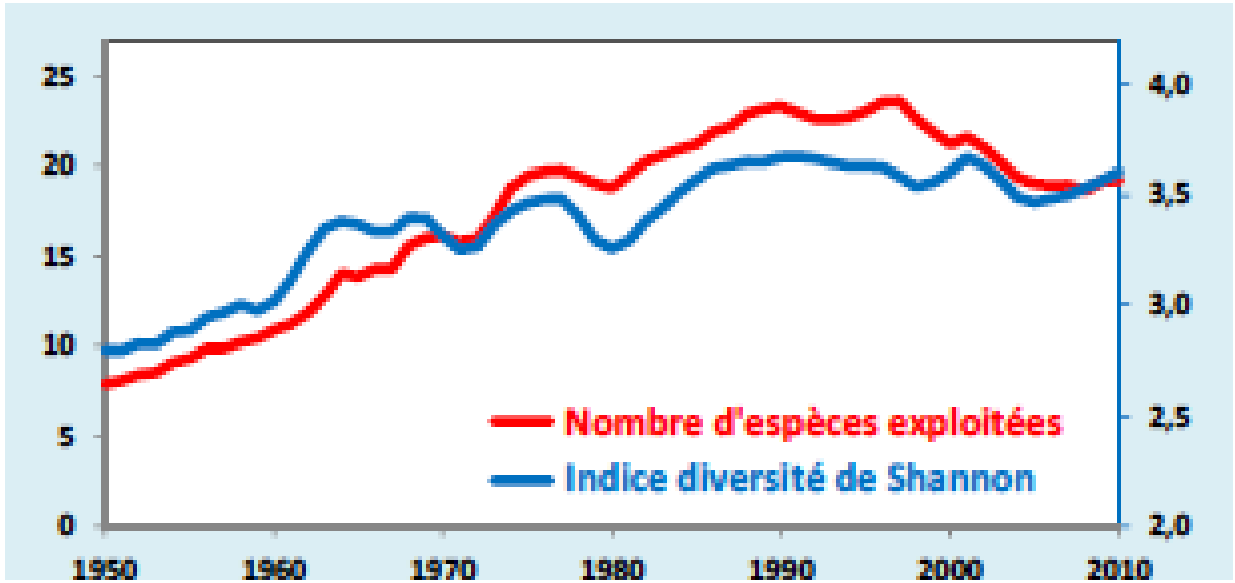
New Common Fisheries Policy of the EC:

The Good, the Bad, the Worrisome

A Critical Look at the
(from R. Froese)

Strong decrease from 7.2 to 4.3 mt in EU waters but increasing number of species caught (Gascuel et al 2013)





Background

- Member States of the EC have deferred fisheries management to the European Community (Commission, Parliament, Council)
- The Common Fisheries Policy of the past decades aimed to keep fish stocks just above the border to collapse
- Many stocks (e.g. North Sea cod) collapsed under fishing pressure 3 times *F*

The Good (I)

- The new CFP, to be implemented from 2014 onward, finally recognizes the legally binding fisheries reference points set by UNCLOS (1982) and UNFSA (1995)
- CFP: "..objective of [] restoring and maintaining [] fish stocks above biomass levels capable of producing maximum sustainable yield“

The Good (II)

- “.. ensure that negative impacts of fishing activities on the marine ecosystem are minimized ..“
- “gradually eliminate discards [..] by avoiding and reducing [..] unwanted catches and gradually ensuring that all catches are landed“
- “.. make the best use of unwanted catches, without creating a market for such catches that are below the minimum conservation reference size“

The Good (III)

- “.. be coherent with the Union environmental legislation, in particular the objective of achieving a good environmental status by 2020..“

The Good (IV)

- “ecosystem-based fisheries management means [..] to manage fisheries within ecologically meaningful boundaries [..] while preserving both the biological wealth and the biological processes necessary to safeguard the composition, structure and functioning of the habitats of the ecosystem..”

The Bad (I)

- Fishing opportunities (the catch allowed in the next year for 100+ stocks) continue to be decided by the Council of agriculture/fisheries ministers, even if multiannual plans exist
- Parliament has to be involved in the decision of multi-annual plans, but the details of such involvement are disputed

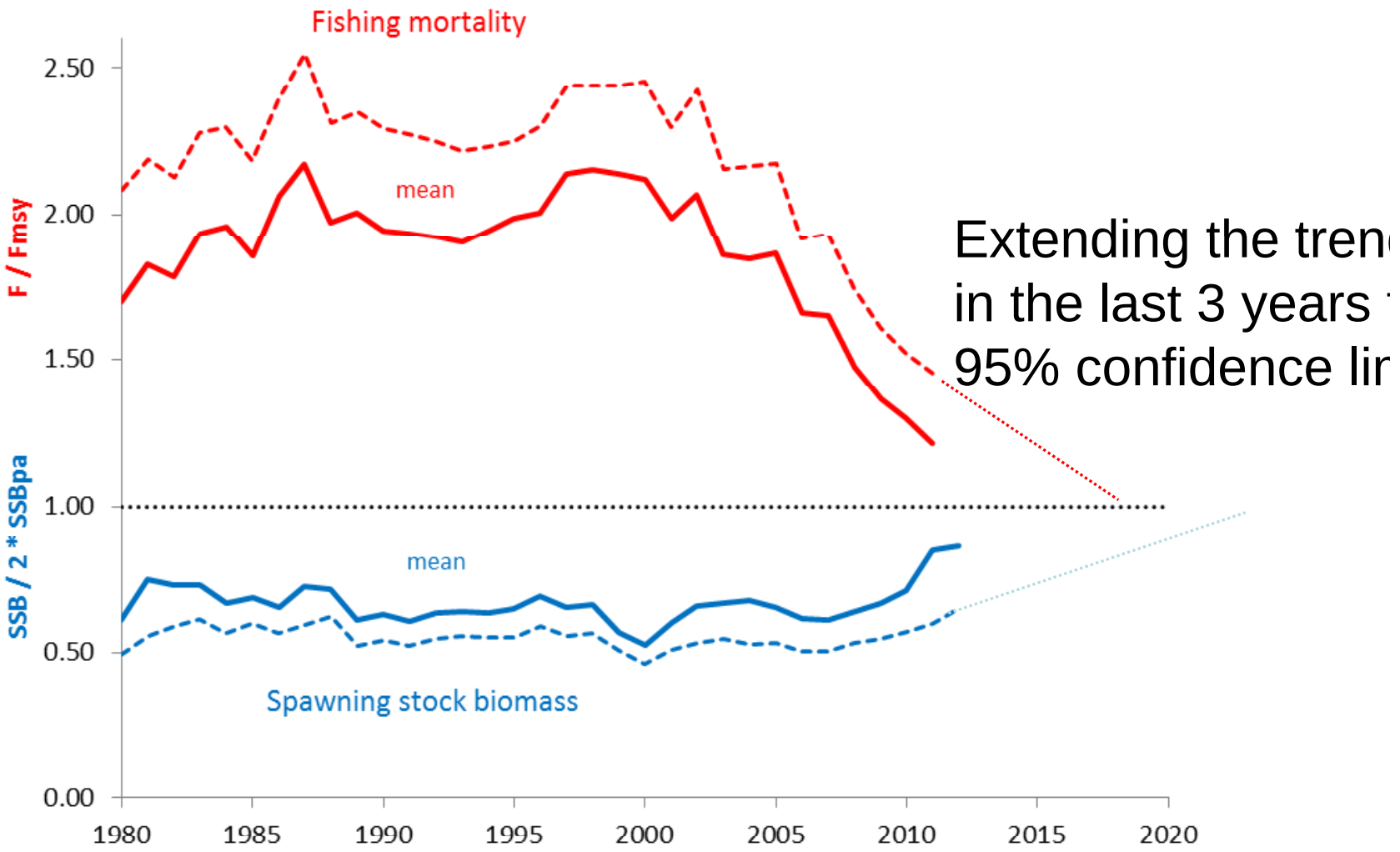
The Bad (II)

- No deadline for restoring stocks above the size that can produce MSY.
- “In order to reach this objective of [..] restoring [..] fish stocks [..], the maximum sustainable yield exploitation rate shall be achieved by 2015 where possible and [..] latest by 2020 for all stocks.”

The Bad (III)

- “provisions of de minimis exemptions of up to 5% of total annual catches of all species subject to an obligation to land [..]”
- Lots of vagueness by using language such as “may”, “should”, “shall”, “gradually”, “progressively”, “where necessary”, “where appropriate”, “where applicable”, “taking into account”, “avoiding disproportionate costs”

Status of Stocks



Based on the ICES Stock Summary database 10/2013 with data for 45 stocks [relF_relB.xlsx]

The Worrisome (I)

- CFP decisions are to be “based on best available scientific advice”
- But how independent and good is that advice?

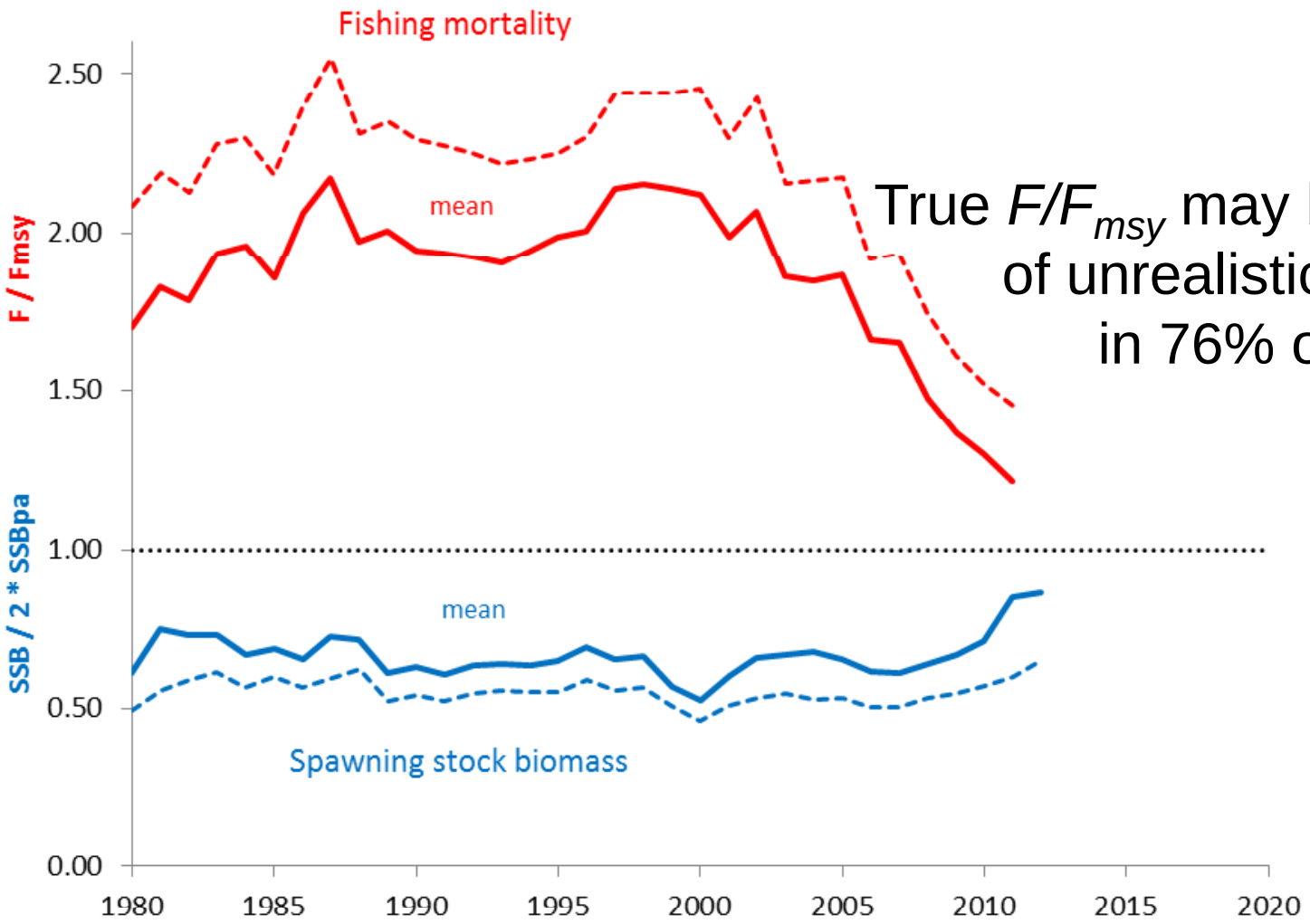
The Worrisome (II)

- Most fisheries scientist in Europe are directly or indirectly employed by the Ministers of Agriculture (the same who decide about fisheries management in Brussels)
- The policy-setting Council of ICES (the advisory body to the EC) consists of national representatives who are determined by the Ministers of Agriculture (the same…)

The Worrisome (III)

- Fisheries science holds that mortality caused by sustainable fishing (F_{msy}) should be less than natural mortality (M) caused by e.g. predation, diseases, natural hazards or old age
- However, in 29 of 38 stocks (76%) with available data, the ICES estimate of F_{msy} exceeded M, on average by 62%

Status of Stocks



True F/F_{msy} may be highe
of unrealistically hig
in 76% of the st

Based on the ICES Stock Summary database 10/2013 with data for 45 stocks

The Worrisome (III)

- ICES provides estimates of the border of safe biological limits (SSB_{pa})
- However, in 14 of 43 stocks (33%) with available data, the ICES estimate fell below the median estimate of three independent methods

The Worrisome (IV)

- The CFP asks for an ecosystem-based approach to fisheries management
- ICES has started providing "Multispecies considerations", e.g. for the Baltic. In there, ICES recommends maximization of catch from the ecosystem. The resulting "multispecies advice" for F_{msy} exceeds single species advice for all species.

See: http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2013/2013/Baltic%20Multispecies%20Advice.p

Ecosystem Approach to Fisheries - EAF: Challenges and opportunities

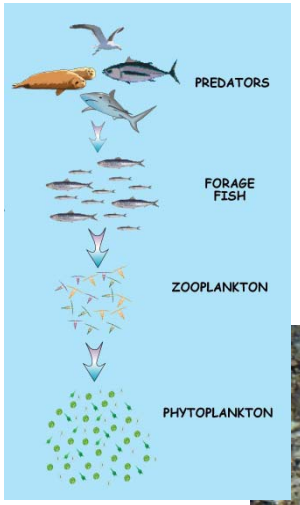
Plan

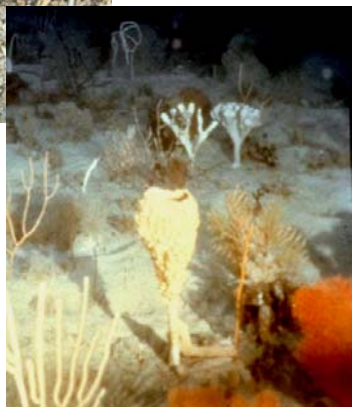
1. **What is EAF?**
2. **A long path towards EAF**
3. **Moving towards EAF: managing predator-prey interactions**
4. **Scientific strategy for EAF**
5. **Implementing & Communicating EAF**

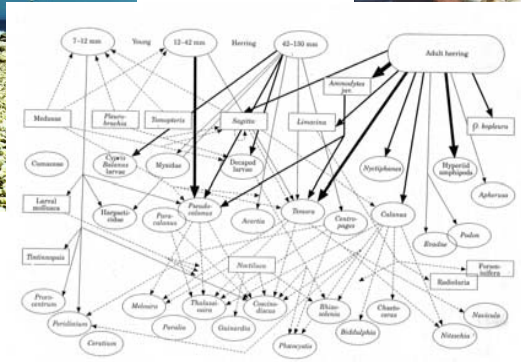
1. What is EAF ?
Ecosystem-Approach to Fisheries

(or Ecosystem-Based Fisheries Management - EBFM ?)

To reconcile different views: fishers, industry, scientists, environmentalists, consumers, tourists, future generations, …







Vision for marine ecosystems

‘A vision can change the world, indeed it is one of the few things which really can!’

‘The most critical task to which humankind is faced with is the creation of a shared vision of a sustainable and desirable society, which could produce a permanent prosperity, knowing the biophysical constraints of the real world, in such a way that it would be just and fair for all humankind, *other species and future generations*’

(Costanza 2000)

EAF :

To reconcile exploitation and conservation of *(exploited and non-exploited)* species

It sounds paradoxical to consider that an apparently more complex approach could be more effective… but the change is unavoidable and requested by society across all sectors exploiting natural resources.

Definition: Ecosystem Approach to Fisheries

FAO as:

- An ecosystem approach to fisheries strives to balance diverse societal objectives, by taking into account the knowledge and uncertainties about biotic, abiotic, and human components of ecosystems an their interactions and applying an integrated approach to fisheries within ecological meaningful boundaries.

NMFS as:

- A geographically specified process, which is adaptive, takes account of ecosystem knowledge and uncertainties, considers multiple external influences and strives to balance diverse societal objectives.

FAO Guidelines on the EAF, 2002. Sissenwine and Murawski MEPS 2004

Overall objectives of EAF

(Pikitch et al. Science 2004)

Healthy marine ecosystems and viable fisheries they support :

- **Avoid degradation of ecosystems**, as measured by indicators of environmental quality and system status
- **Minimize the risk of irreversible change to natural assemblages of species and ecosystem processes**
- Obtain and maintain long-term socioeconomic benefits without compromising the ecosystems
- Generate knowledge of ecosystem processes sufficient to understand the likely consequences of human actions
- Where knowledge is insufficient, robust and precautionary fishery management measures that favor the ecosystem should be adopted

2. A long path towards EAF


© IRD, C. Peignon

A multilateral framework for managing fisheries

A complex framework that started 40 years ago

(P. Gros 2008)

The UN Law of the Sea was signed by 117 countries in 1982. More than 150 nations were signatories in 2008.

UN agreement relating to conservation & management of straddling– and highly migratory fish stocks (1995)

Entered into force in 2001. One of the legal instrument of UNCLOS: focuses on MSY, obliges signatories to employ the precautionary approach and sets broad objectives (eg, preservation of biodiversity, …).

UN Convention on the Law of the Sea (UNCLOS, 1982)

The "**Constitution of the Oceans**": the fundamental legal framework governing the use of the oceans and seas, entered into force in 1994. The "mother law" underlying conservation, management and research of, and into, marine resources.

Johannesburg Declaration WSSD implementation plan

2002: deadlines for achieving targets such as the application of the **ecosystem approach** (by 2010) and the maintenance or restoration of stocks to levels that can produce the **MSY** (no later than 2015).

1992: Rio Declaration

Proclaims "the integral and interdependent nature of the Earth, our home".

Agenda 21

Chapter 17: Protection of the oceans, rational use and development of their living resources

Convention on Biol. Diversity

Conservation, sustainable and equitable use of biodiversity. Entered into force in 1993.

1972: Stockholm Declaration

Man is both creature and moulder of his environment, which gives him physical sustenance and affords him the opportunity for intellectual, moral, social and spiritual growth (26 principles follow).

FAO Reykjavik Declaration (2001)

Ecosystem Approach to Fisheries

FAO Code of conduct for responsible fisheries (1995)

Holistic in nature (12 articles covering all aspects of fisheries and aquaculture), the Code is voluntary, but refers to UNCLOS and to other legal instruments.

Cancún Declaration (1992)

Responsible fishing: "sustainable utilization of fisheries resources in harmony with the environment. Capture and aquaculture practices without harmful effects on ecosystems, resources or their quality. Added value through transformation processes meeting sanitary standards. Commercial practices providing consumer access to good quality products".

1965: Committee on Fisheries (COFI)

Ph Gros – Ifremer

UN Convention on the Law of the Sea (UNCLOS)

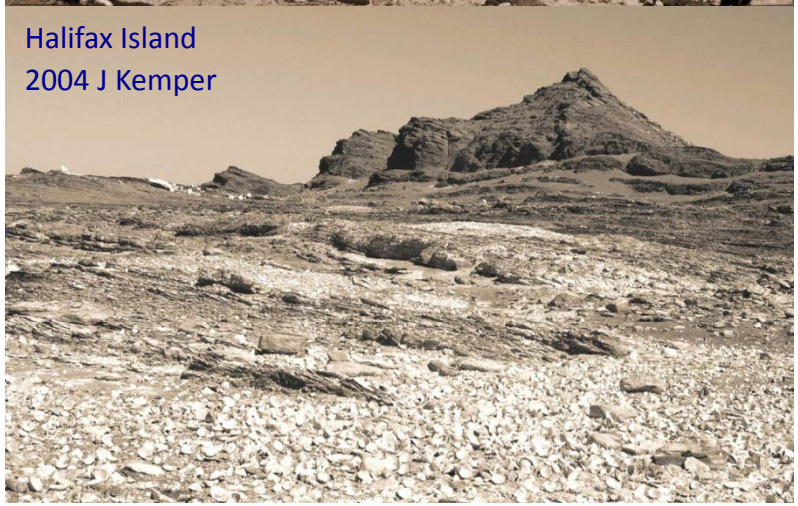
UN Conferences on Environment and Development (UNCED)

UN Food and Agriculture Organisation (FAO)

United Nations (UN) - 1945

A long path towards EAF


Halifax Island
1930s Eberlanz Museum, Lüderitz


Halifax Island
2004 J Kemper

UN Convention of the "Law of the Sea" (1992)

A mutual obligation to consider the impact of their policies on marine ecosystems. To manage ecosystem resources based on the interdependence of the system components

FAO Code of Conduct for Responsible Fisheries (1995)

Management measures should not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species.

Reykjavik Declaration (2001)

Incorporation into fisheries management of ecosystem considerations "such as predator-prey relationships".

World Summit on Sustainable Development (2002)

Encourage the application by 2010 of the ecosystem approach, noting the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem

Marine Strategy Framework Directive

MSFD

The Integrated European Maritime Policy aims to provide a coherent framework for joined up governance of the marine environment

The environmental pillar for this integrated policy is Directive 2008/56/EC on establishing a framework for community action in the field of marine environmental policy - known as the MSFD

It was formally adopted by the European Union in July 2008

Marine Strategy Framework Directive

MSFD

The MSFD outlines a transparent, legislative framework for an ecosystem-based approach to the management of human activities which supports the sustainable use of marine goods and services

The overarching goal of the Directive is to achieve ‘Good Environmental Status’ (GES) by 2020 across Europe’s marine environment

Marine Strategy Framework Directive

MSFD

Qualitative descriptors for determining Good Environmental

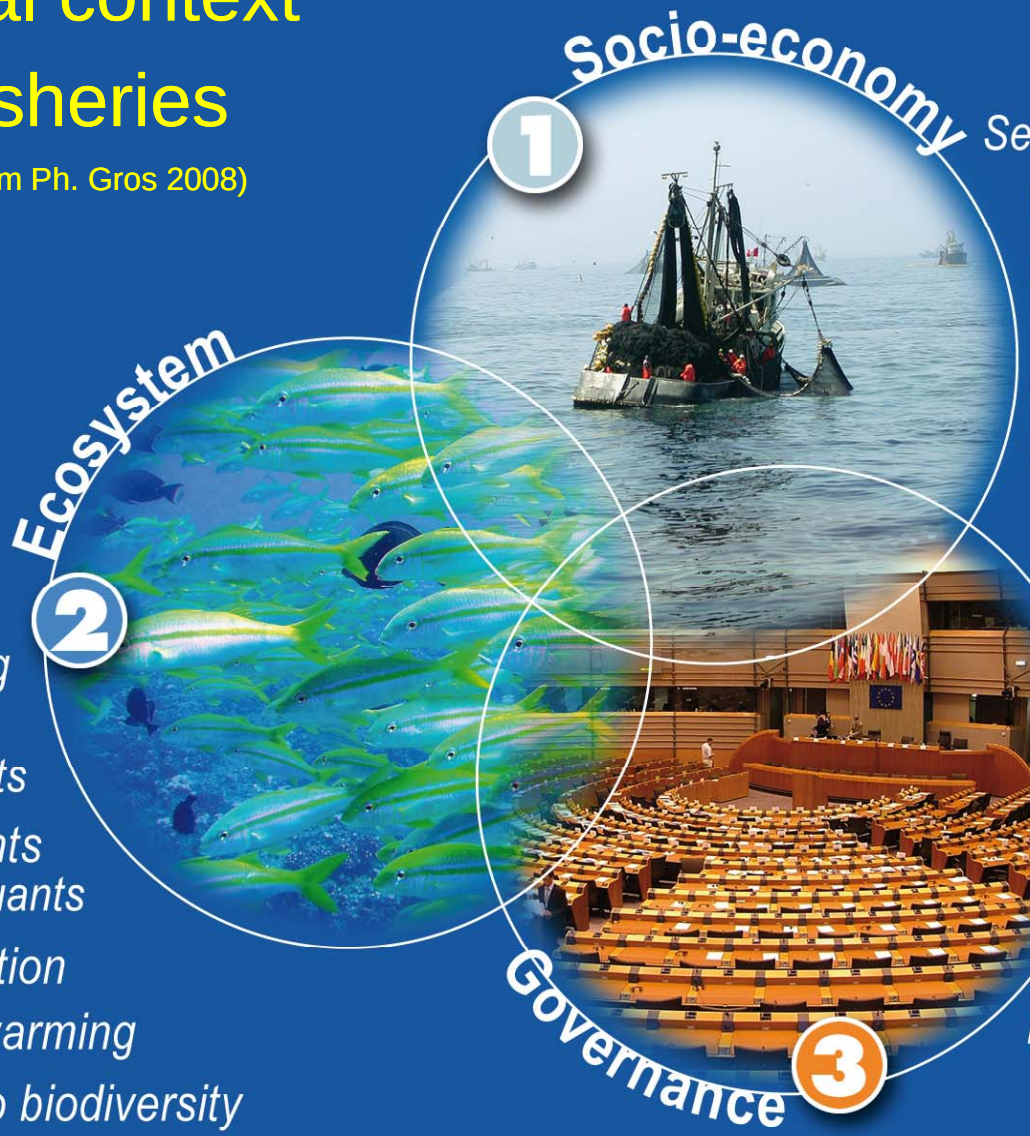
Descriptor 1: Biological diversity
Descriptor 2: Non-indigenous species
Descriptor 3: Population of commercial fish / shell fish
Descriptor 4: Elements of marine food webs
Descriptor 5: Eutrophication
Descriptor 6: Sea floor integrity
Descriptor 7: Alteration of hydrographical conditions
Descriptor 8: Contaminants
Descriptor 9: Contaminants in fish and seafood for human consumption
Descriptor 10: Marine litter
*Descriptor 11: Introduction of energy, including underwater noise

3. Good reasons to move (quickly) towards EAF:

Managing predator-prey interactions

A global context for fisheries

(adapted from Ph. Gros 2008)



Seafood demand

Globalization of trade

Overcapacity / Overexploitation

Evolution of subsidies

Profitability of fisheries

Impacts of fishing

Destruction of habitats

Contaminants and polluants

Acidification

Global warming

Threat to biodiversity

Reform of the CFP

MPA's

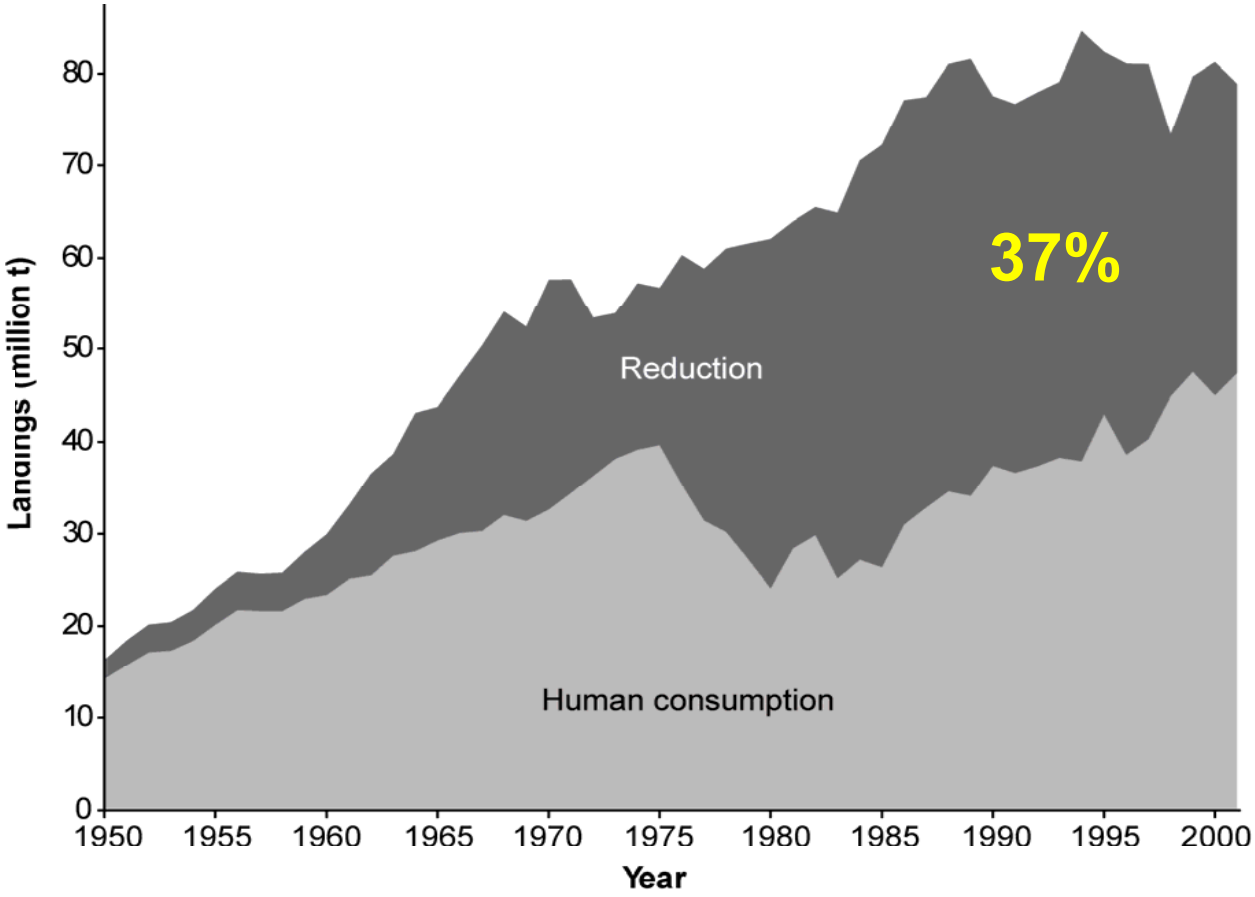
Multilateral agreements: UNCLOS, UNCED, FAO

An operational basis for ecosystem-based fisheries management faces many additional difficulties

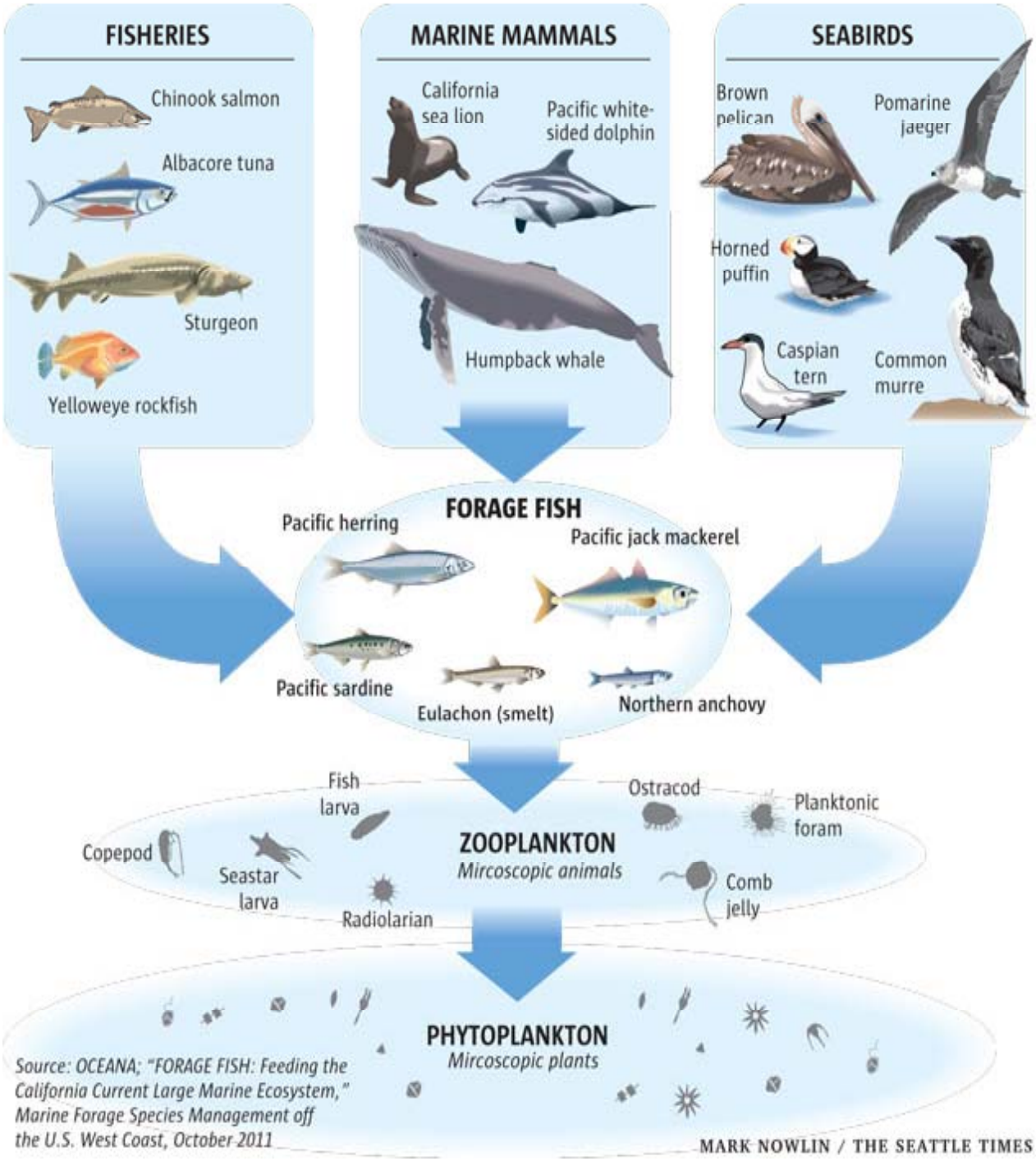
- Defining controls in marine ecosystems (predator-prey interaction)
- Defining proper long-term, ecosystem-related objectives
- Determining meaningful reference values and indicators for ecosystem health
- Link EAF with existing management operational framework
- Quantifying ecosystem services


Little fish
BIG IMPACT
How much forage fish should we leave in the Oceans ?

Over 1/3 of the world's fish catch comes from forage fish and is turned into animal feeds…



Source: Watson, Alder & Pauly, 2006

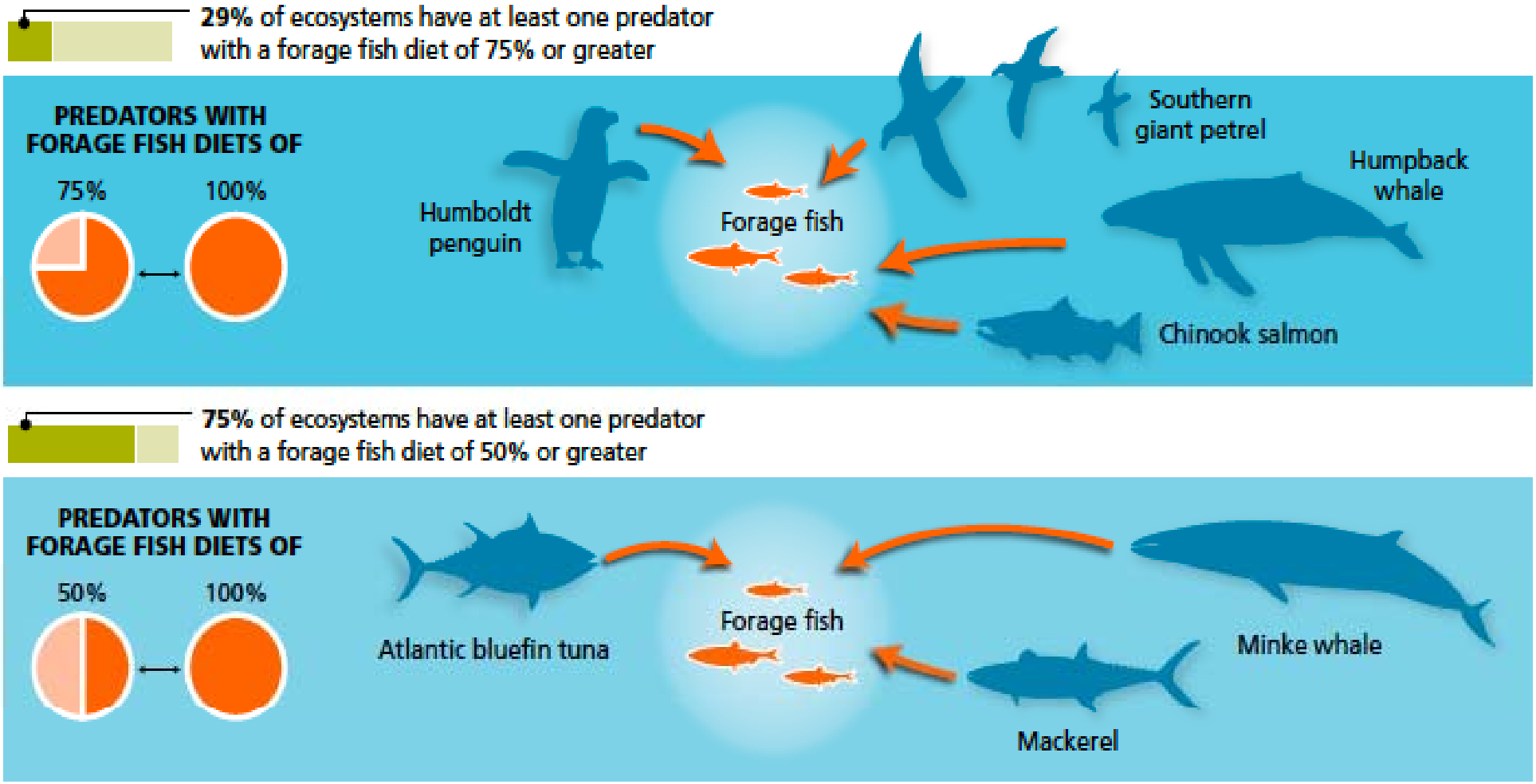


Pelagics and food webs in wasp-waist ecosystems

(Cury et al 2000)

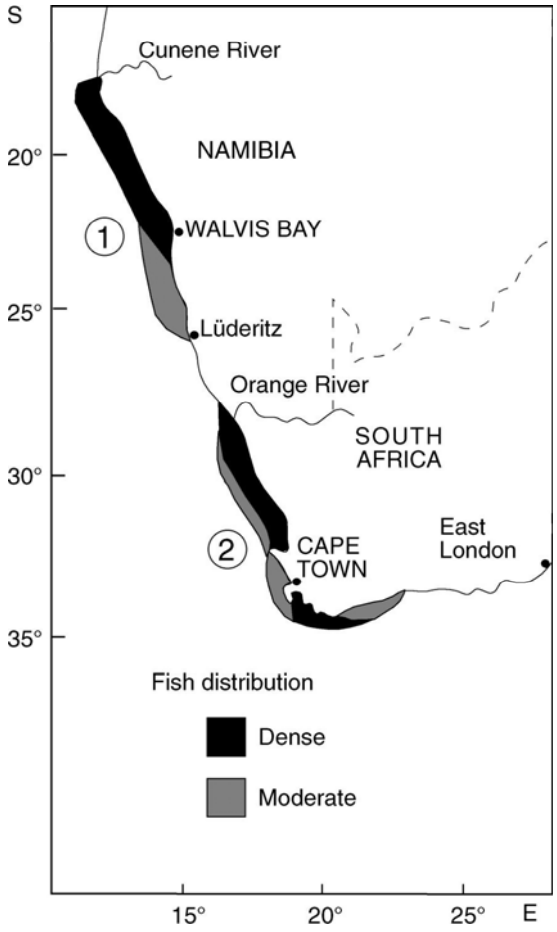
Forage fish : ‘the fuel’ of marine ecosystems

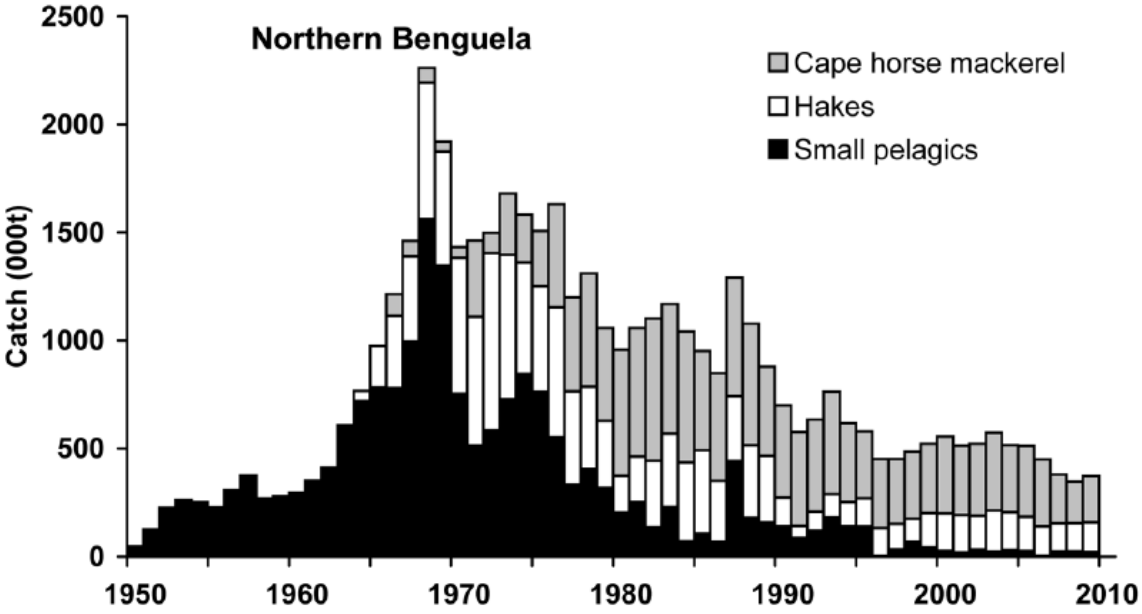
(Pikitsch et al 2012)

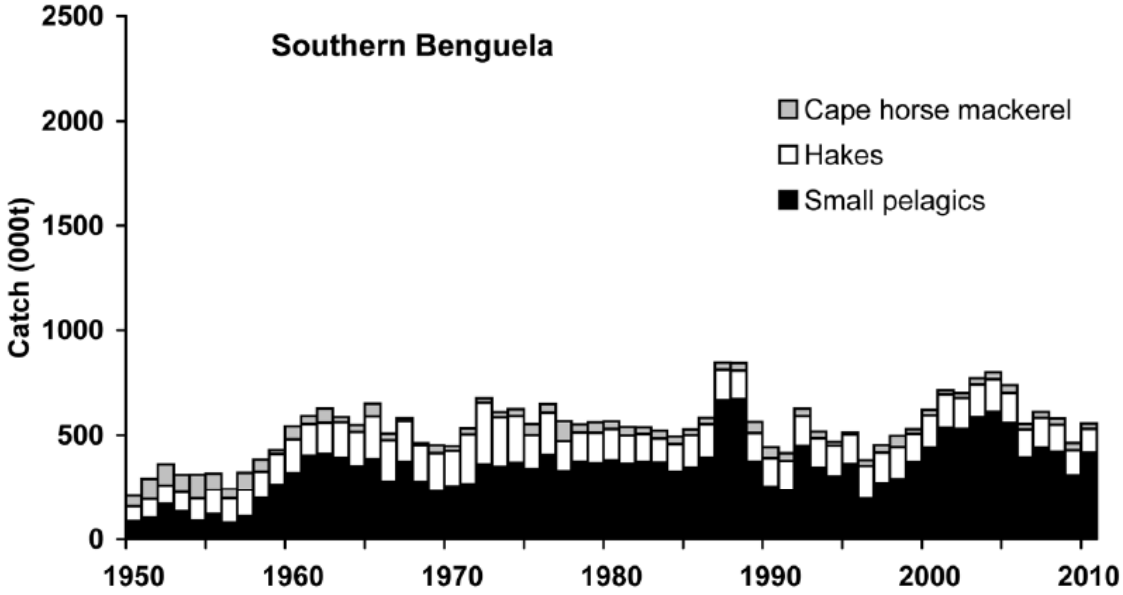


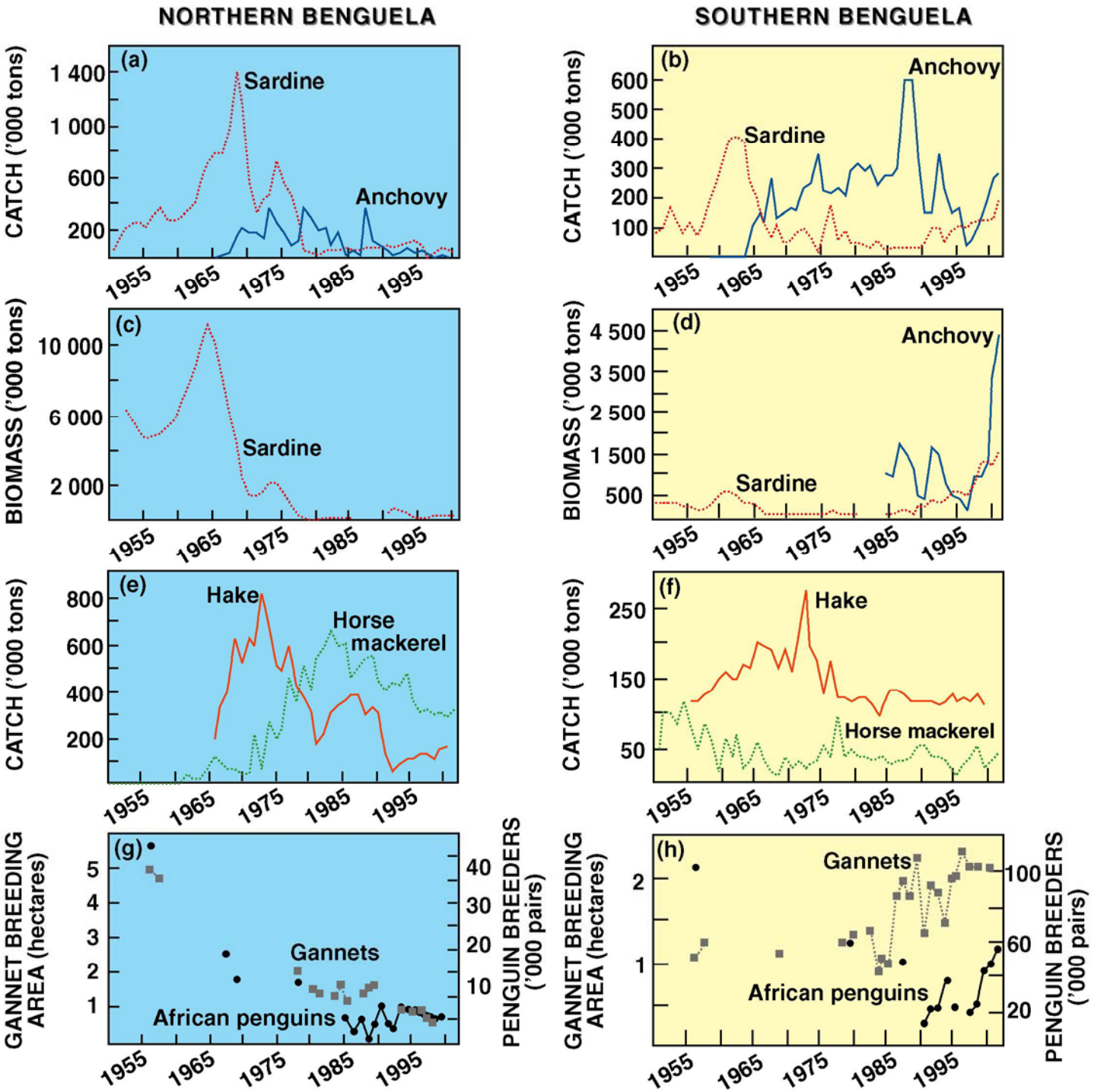
Climate change, exploitation and regime change in the Benguela

(Cury and Shannon 2004)



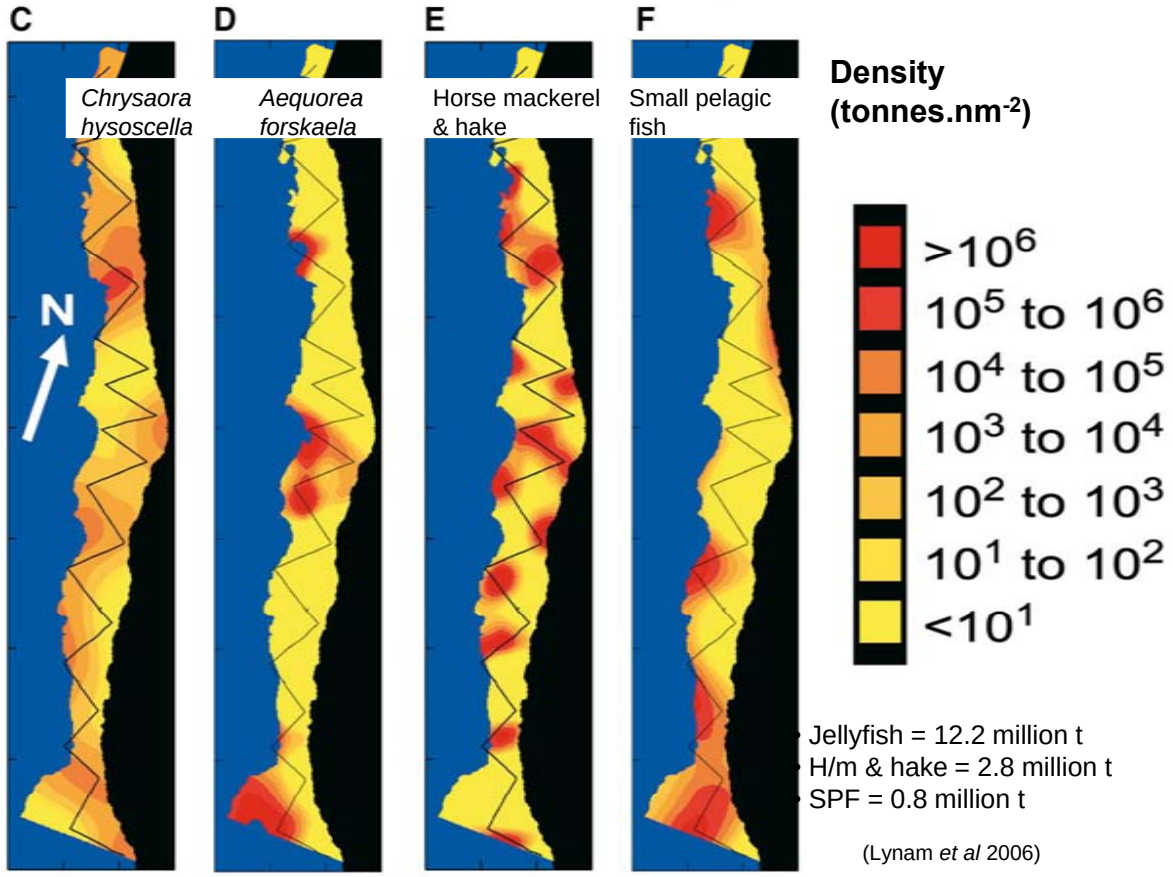





NORTHERN BENGUELA
SOUTHERN BENGUELA
(a)
Sardine
Anchovy
CATCH ('000 tons)
1 400
1 000
600
200
(b)
Anchovy
Sardine
600
500
400
300
200
100
(c)
Sardine
BIOMASS ('000 tons)
10 000
6 000
2 000
(d)
Anchovy
Sardine
4 500
3 500
2 500
1 500
500
(e)
Hake
Horse mackerel
800
600
400
200
(f)
Hake
Horse mackerel
250
150
50
(g)
Gannets
African penguins
GANNET BREEDING AREA (hectares)
PENGUIN BREEDERS ('000 pairs)
5
4
3
2
1
40
30
20
10
(h)
Gannets
African penguins
2
1
100
60
20
1955
1965
1975
1985
1995

‘Jellification’ of the Namibian ecosystem!

jellyfish (*Cnidaria, Medusozoa*), negligible before 1970s, reached 40 MMT in the 1980s and 12.2 MMT in the 2000s (Lynam et al. 2006), approximating 2.5 times the combined biomass of present exploited fish populations.



- Jellyfish = 12.2 million t
- H/m & hake = 2.8 million t
- SPF = 0.8 million t

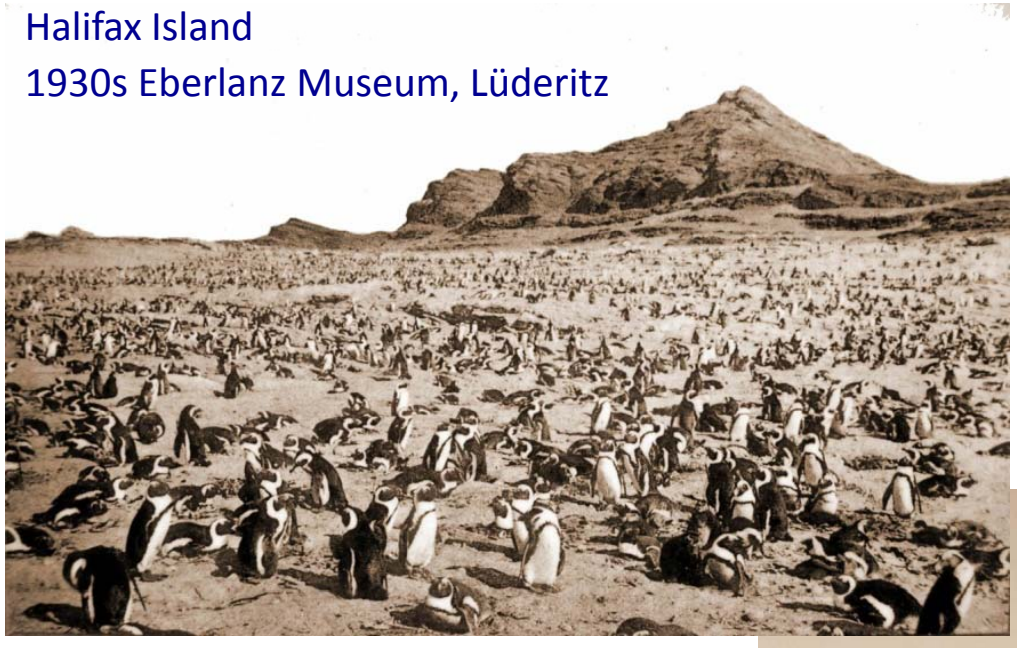
(Lynam *et al* 2006)

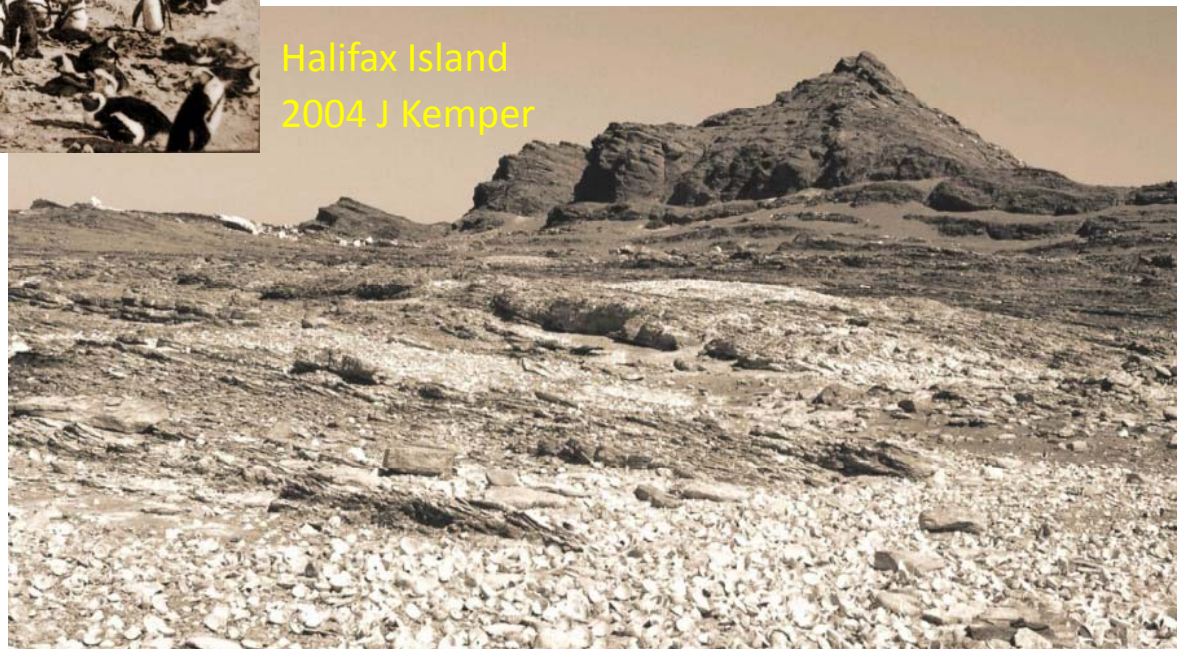
“for these fishermen [jellyfish] have become an increasingly irritating nuisance”

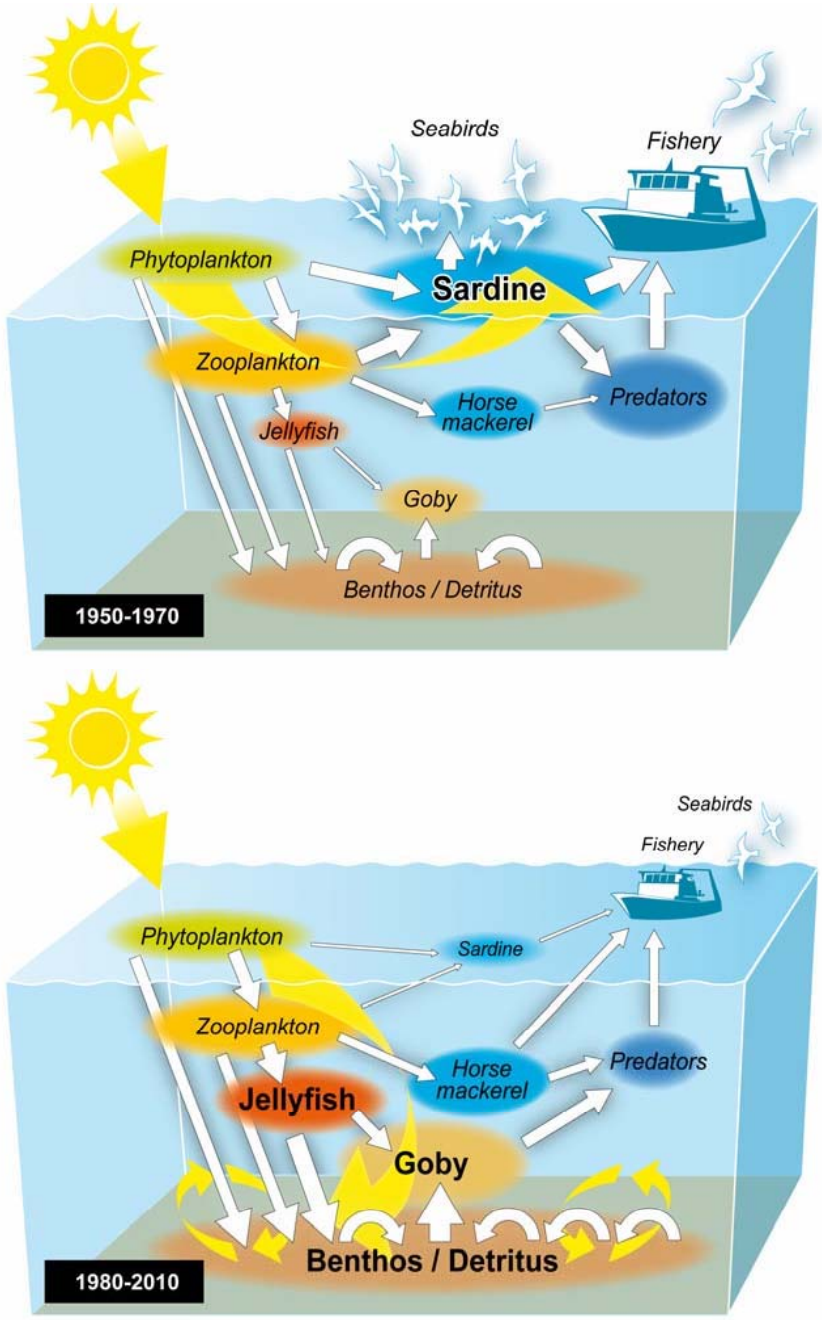
(Venter 1988)

The African penguin and Cape gannets have declined by 77% and 94% respectively

(Ludynia et al. 2010)





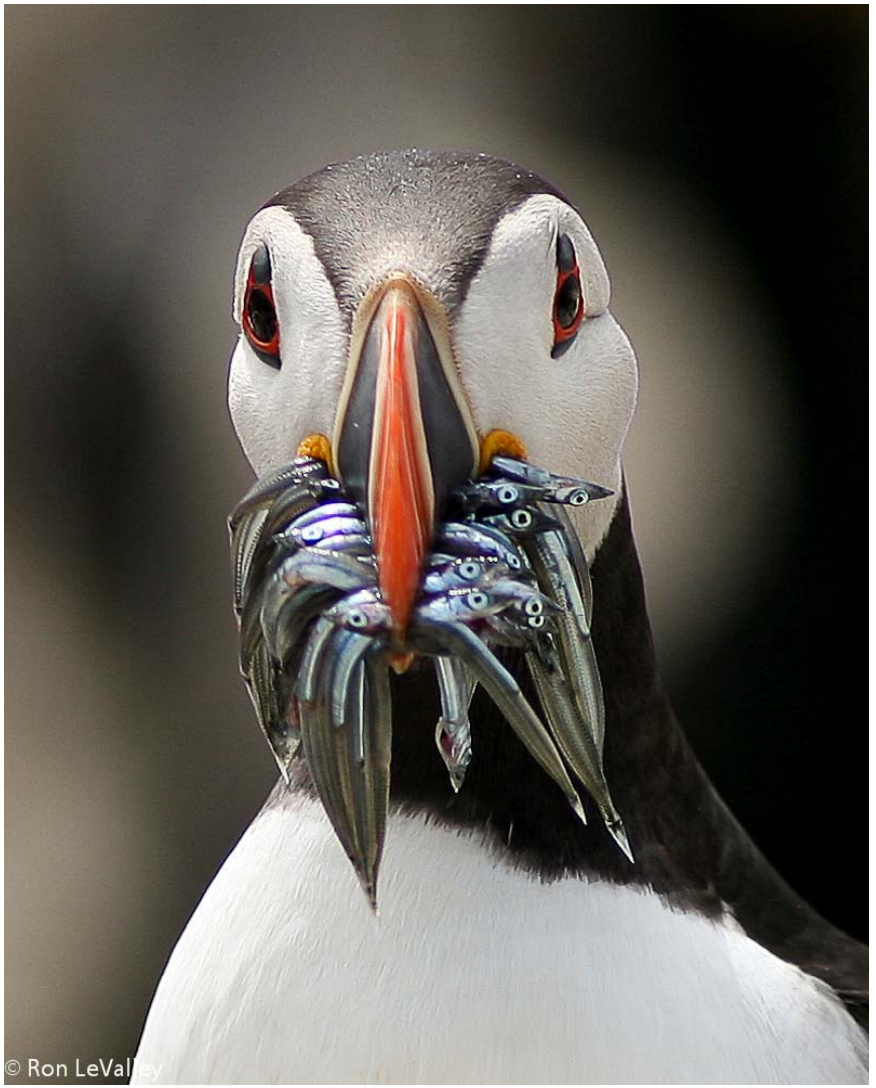


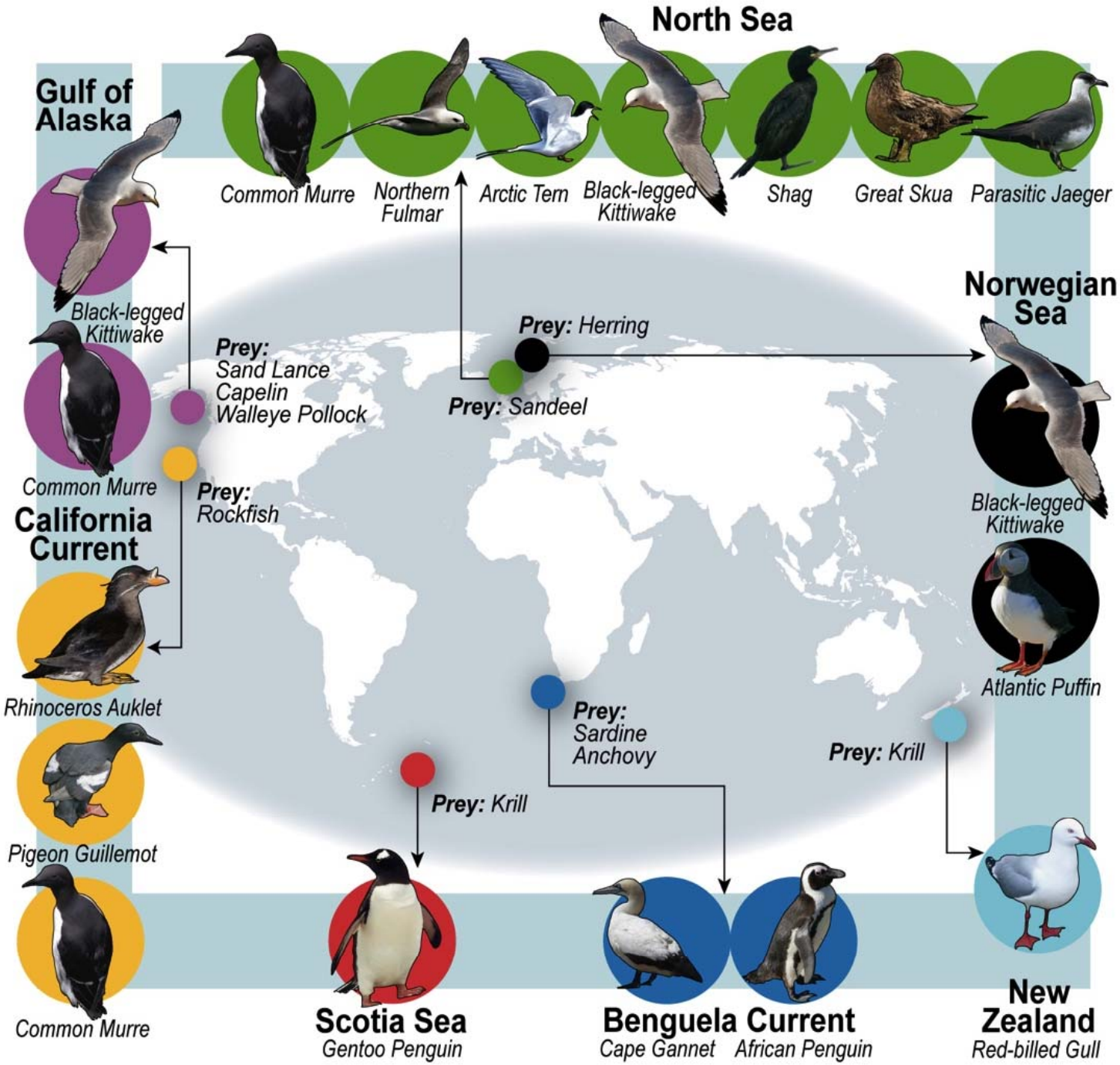
Change in trophic pathways towards jellyfish in the Northern Benguela

(Roux, Cury et al. 2012)

Global seabird response to forage fish depletion one-third for the birds (Science 23rd December 2011)

Philippe M. Cury
Ian L. Boyd
Sylvain Bonhommeau
Tycho Anker-Nilssen
Robert J.M. Crawford
Robert W. Furness
James A. Mills
Eugene J. Murphy
Henrik Österblom
Michelle Paleczny
John F. Piatt
Jean-Paul Roux
Lynne Shannon
William J. Sydeman



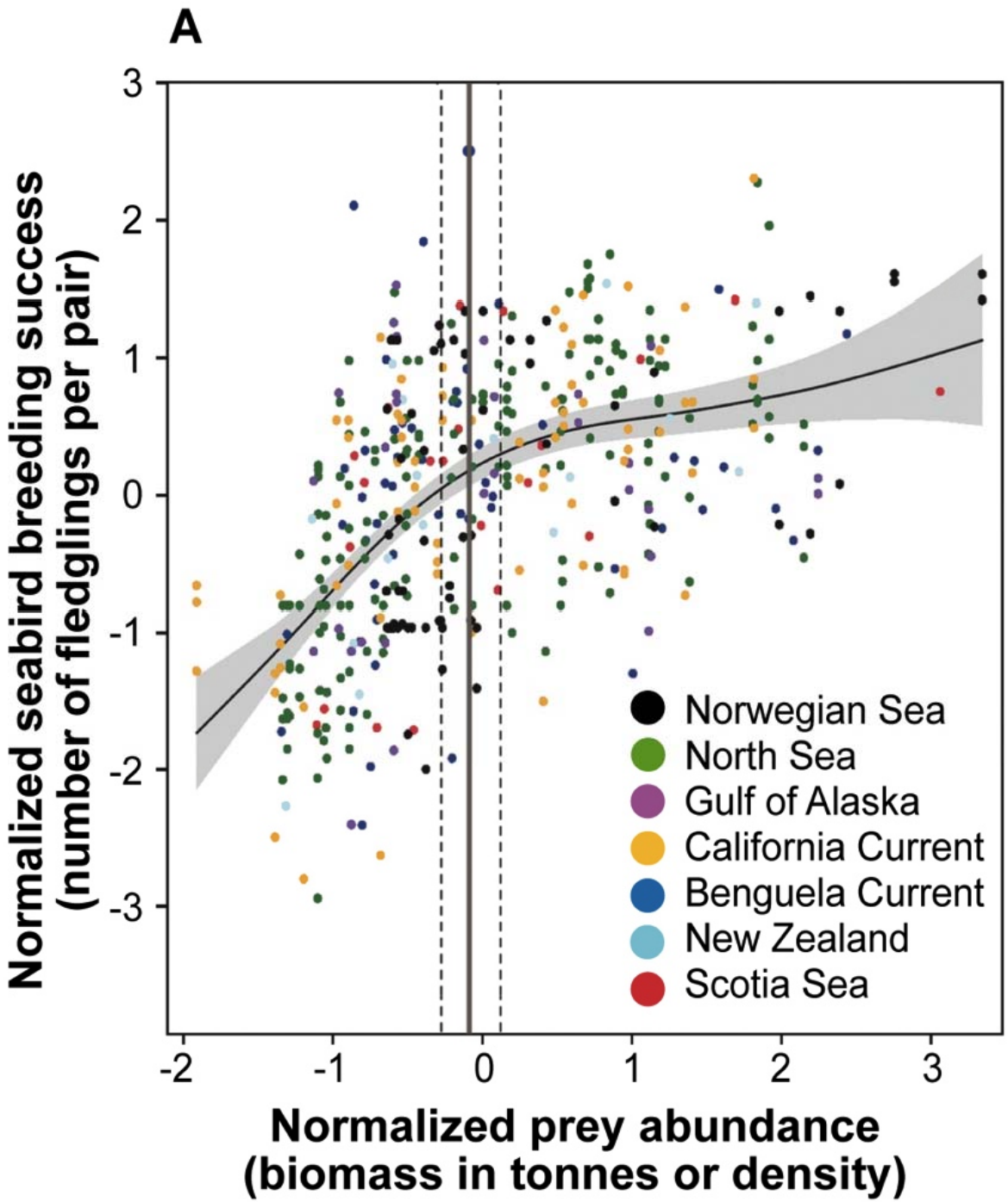


Meta-analysis:

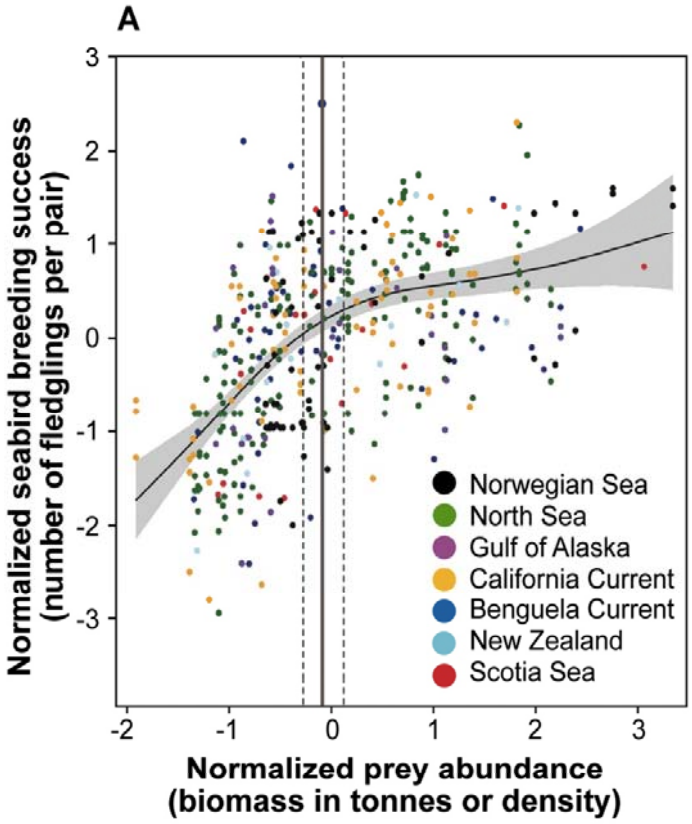
7 marine ecosystems

14 seabird species

438 years of observation


A
Normalized seabird breeding success
(number of fledglings per pair)
3
2
1
0
-1
-2
-3
-2
-1
0
1
2
3
Normalized prey abundance
(biomass in tonnes or density)
Norwegian Sea
North Sea
Gulf of Alaska
California Current
Benguela Current
New Zealand
Scotia Sea

‘One third for the birds’ as a limit reference point for EAF



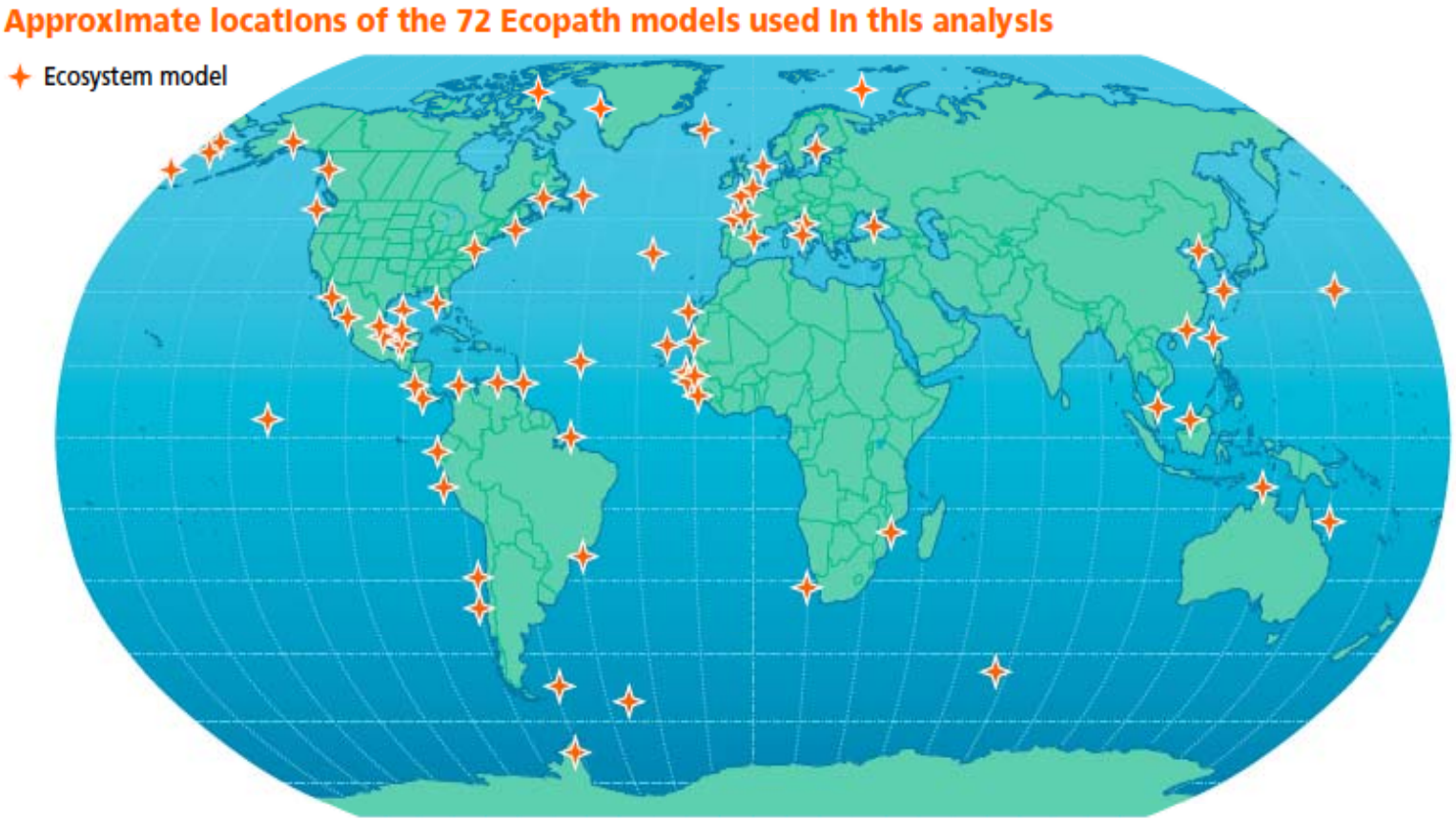
From target reference points towards limit reference points

1/3 to be implemented in several countries (USA, Autsralia,New Zealand, South Africa, European – MSDF?)

What about the other predators ?

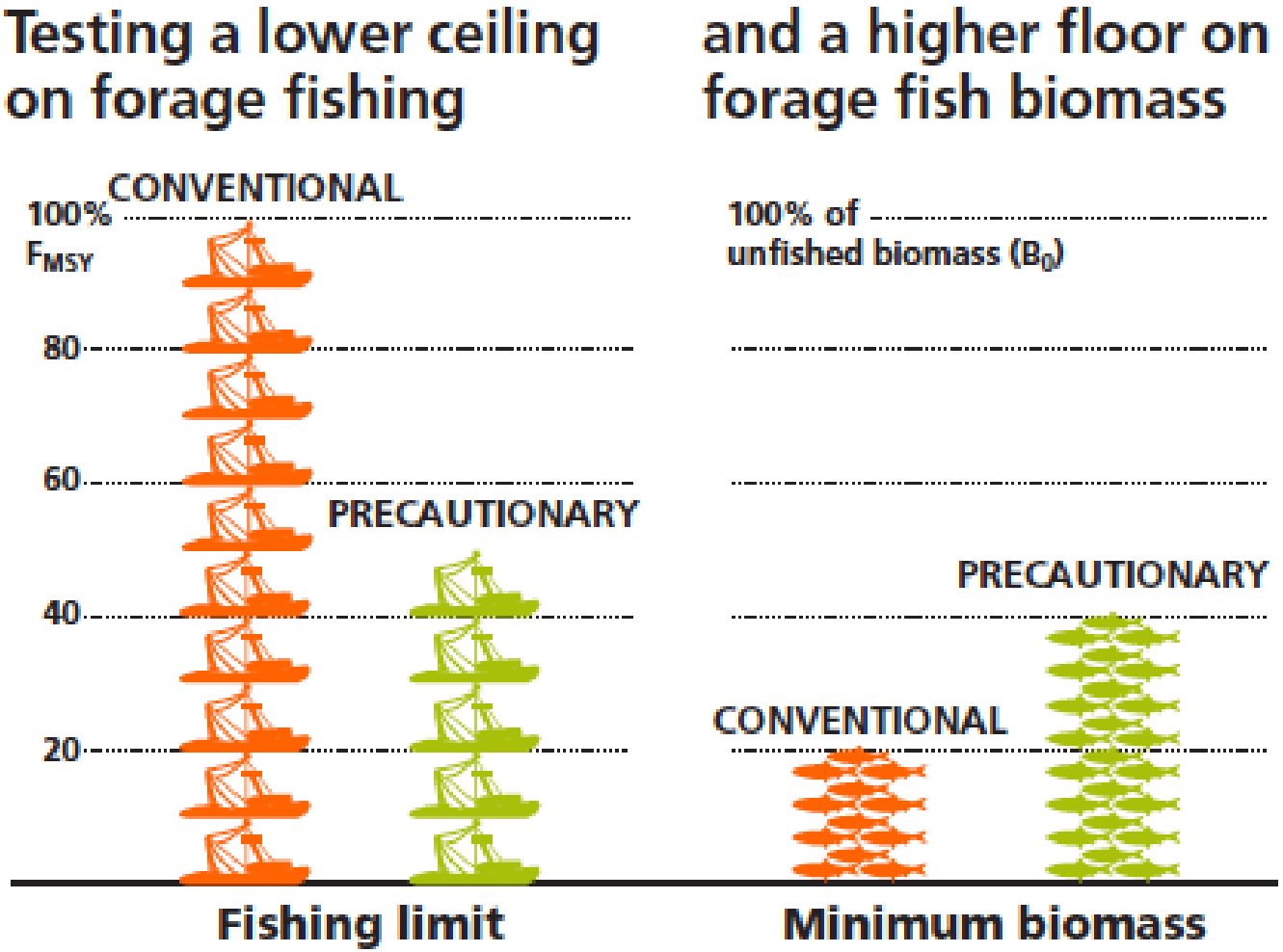
The Lenfest forage fish task force 2009-2012

Exploring ecosystem resilience under different forage fish exploitation patterns (Pikich et al. 2012)



Conventional & EAF approach

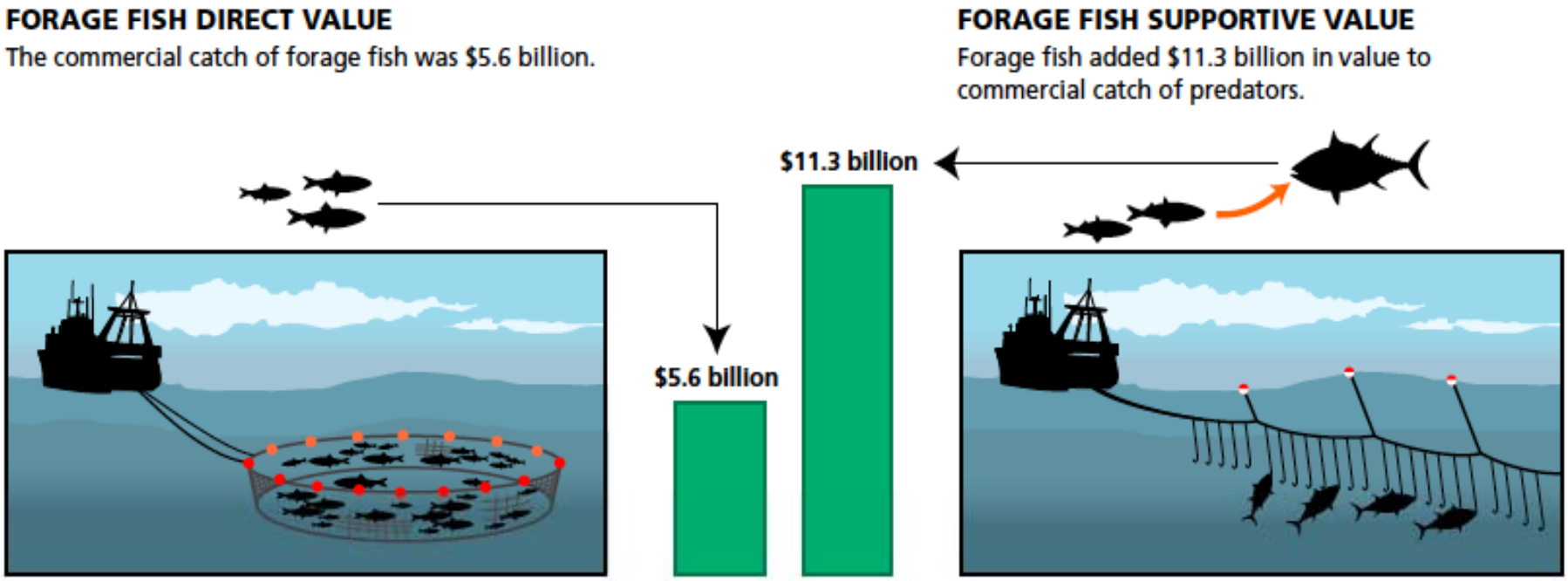
(Pikitch et al 2012)



Forage fish

Direct value = 5.6 b$

Supportive value = 11.3 b$



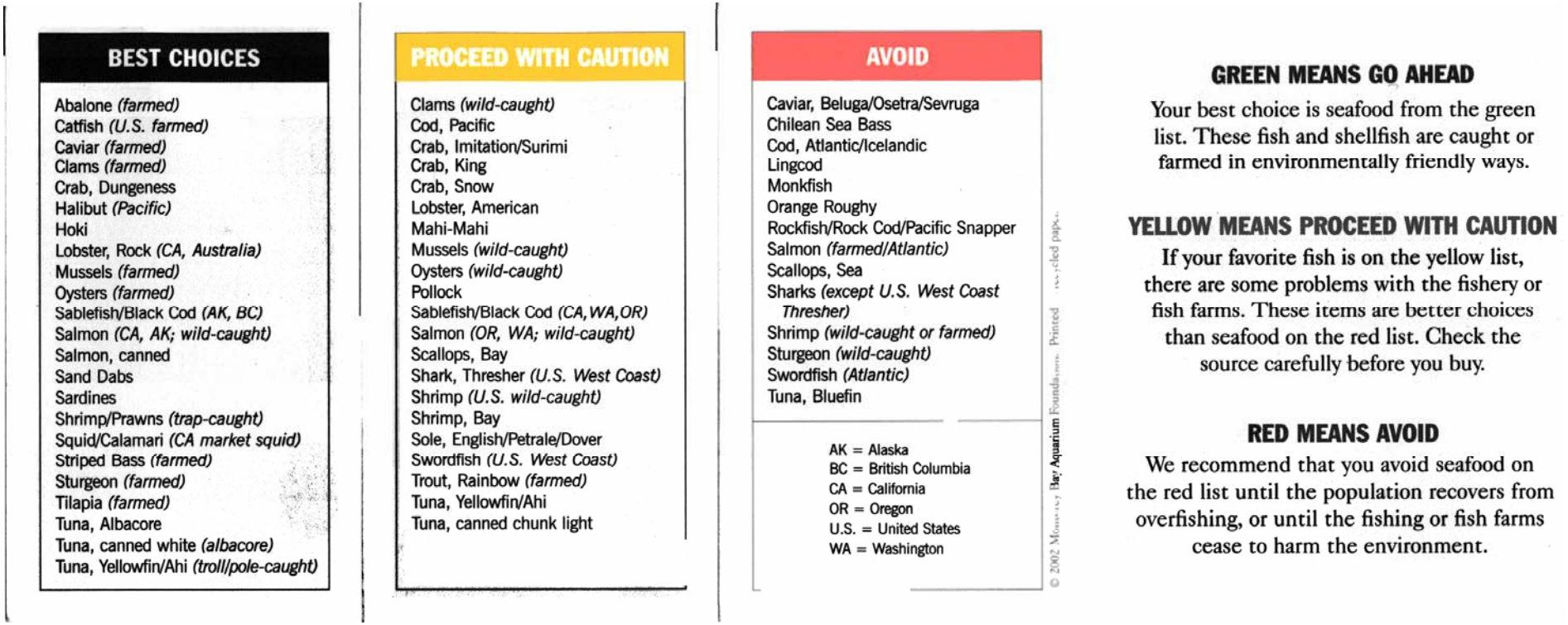
THE LENFEST FORAGE FISH TASK FORCE REPORT (PIKITSCH ET AL 2012)

- Forage fisheries should be **managed to sustain both forage fish and predators**. Managers should set catch levels that protect forage populations from collapse and, with high probability, do not make predator species vulnerable to extinction.
- The Task Force recommends that, in most ecosystems, **fishing should be half the conventional rate and twice the amount of forage fish should be left in the ocean (0.4B0)**.
- Use **greater caution when there is less information** on forage fish and their interactions with predators and the environment.


© IRD, C. Peignon

The various tools for fisheries management (*MSY*, Ecolabels, MPAs, and ITQ …)

Labels: influencing consumer's choice



BEST CHOICES

Abalone *(farmed)*
Catfish *(U.S. farmed)*
Caviar *(farmed)*
Clams *(farmed)*
Crab, Dungeness
Halibut *(Pacific)*
Hoki
Lobster, Rock *(CA, Australia)*
Mussels *(farmed)*
Oysters *(farmed)*
Sablefish/Black Cod *(AK, BC)*
Salmon *(CA, AK; wild-caught)*
Salmon, canned
Sand Dabs
Sardines
Shrimp/Prawns *(trap-caught)*
Squid/Calamari *(CA market squid)*
Striped Bass *(farmed)*
Sturgeon *(farmed)*
Tilapia *(farmed)*
Tuna, Albacore
Tuna, canned white *(albacore)*
Tuna, Yellowfin/Ahi *(troll/pole-caught)*

PROCEED WITH CAUTION

Clams *(wild-caught)*
Cod, Pacific
Crab, Imitation/Surimi
Crab, King
Crab, Snow
Lobster, American
Mahi-Mahi
Mussels *(wild-caught)*
Oysters *(wild-caught)*
Pollock
Sablefish/Black Cod *(CA,WA,OR)*
Salmon *(OR, WA; wild-caught)*
Scallops, Bay
Shark, Thresher *(U.S. West Coast)*
Shrimp *(U.S. wild-caught)*
Shrimp, Bay
Sole, English/Petrale/Dover
Swordfish *(U.S. West Coast)*
Trout, Rainbow *(farmed)*
Tuna, Yellowfin/Ahi
Tuna, canned chunk light

AVOID

Caviar, Beluga/Osetra/Sevruga
Chilean Sea Bass
Cod, Atlantic/Icelandic
Lingcod
Monkfish
Orange Roughy
Rockfish/Rock Cod/Pacific Snapper
Salmon *(farmed/Atlantic)*
Scallops, Sea
Sharks *(except U.S. West Coast Thresher)*
Shrimp *(wild-caught or farmed)*
Sturgeon *(wild-caught)*
Swordfish *(Atlantic)*
Tuna, Bluefin

AK = Alaska
BC = British Columbia
CA = California
OR = Oregon
U.S. = United States
WA = Washington

GREEN MEANS GO AHEAD

Your best choice is seafood from the green list. These fish and shellfish are caught or farmed in environmentally friendly ways.

YELLOW MEANS PROCEED WITH CAUTION

If your favorite fish is on the yellow list, there are some problems with the fishery or fish farms. These items are better choices than seafood on the red list. Check the source carefully before you buy.

RED MEANS AVOID

We recommend that you avoid seafood on the red list until the population recovers from overfishing, or until the fishing or fish farms cease to harm the environment.

ECOLABELS : control through the market

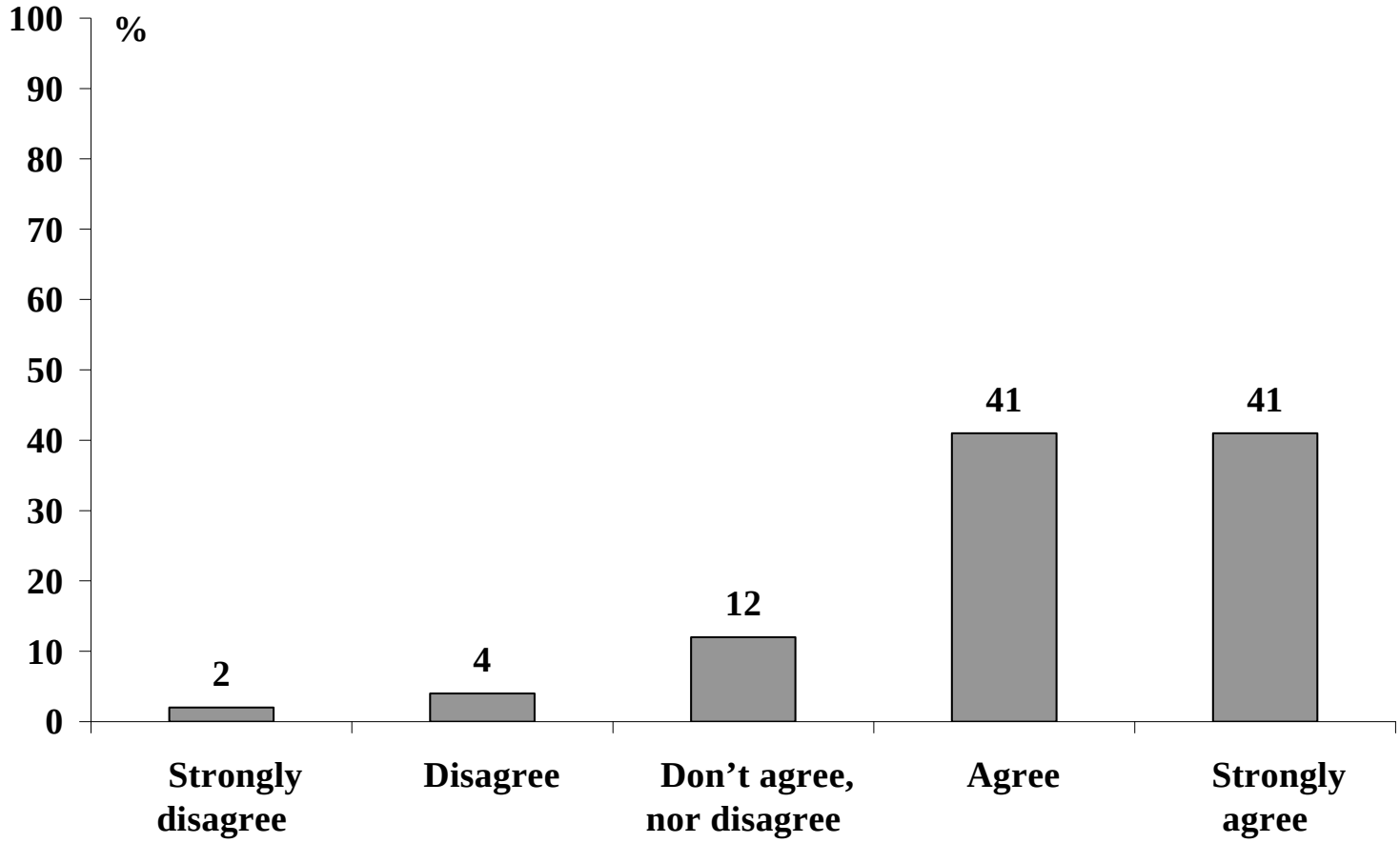
- **Increasing Number of ecolabels « auto-promotion »**

  => Profusion = confusion for the consumers (tyranny of choice!) (Jacquet et Pauly 2007)

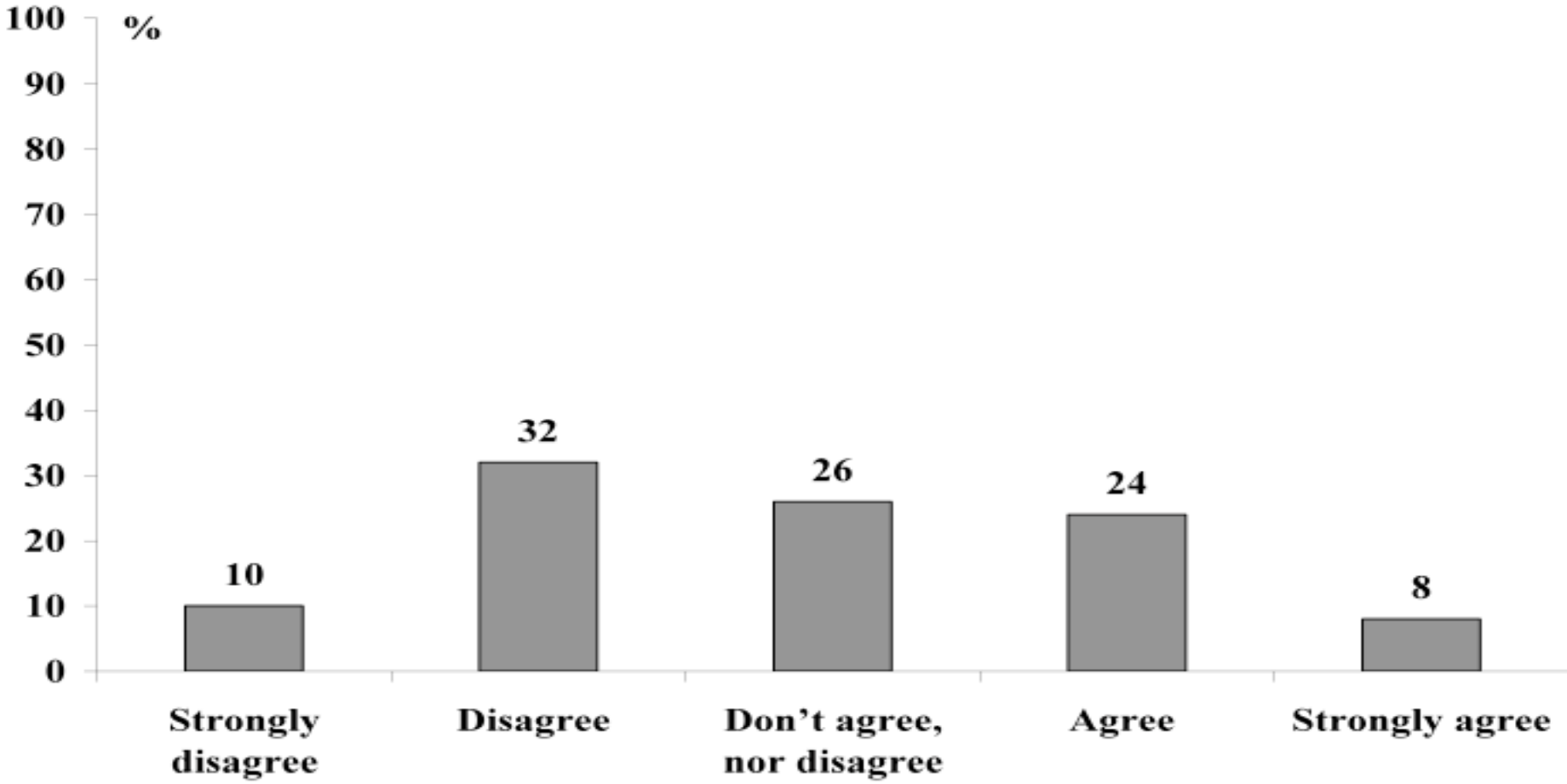
- **complex meaning? (well managed stocks, ecosystem health, *food miles*…)**

Fish should be ‘ecolabeled’

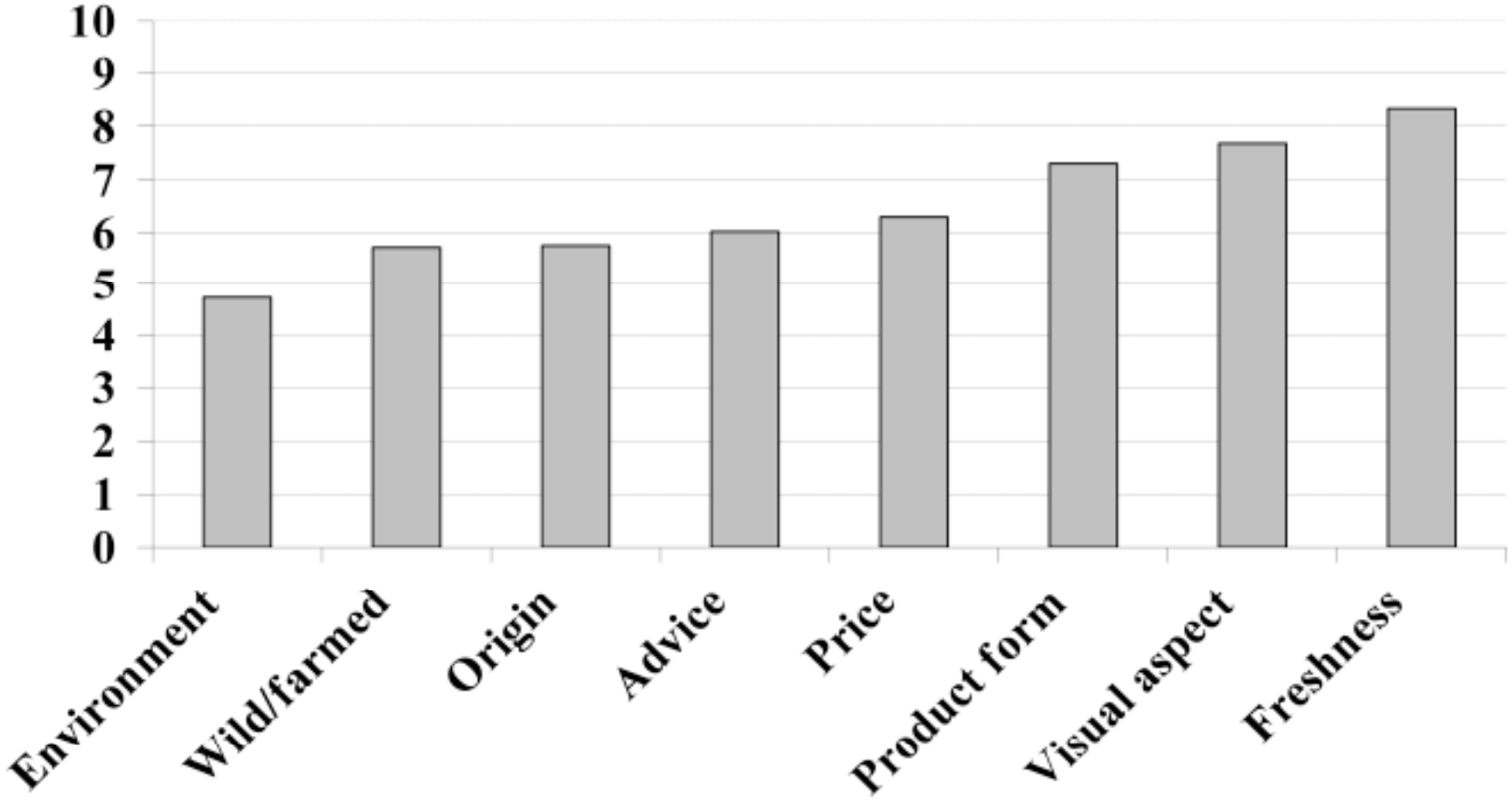
4748 surveys in Pays-Bas, Belgium, Danemark, France Italy in 2007



When you buy fish do you take care of the exploitation status?

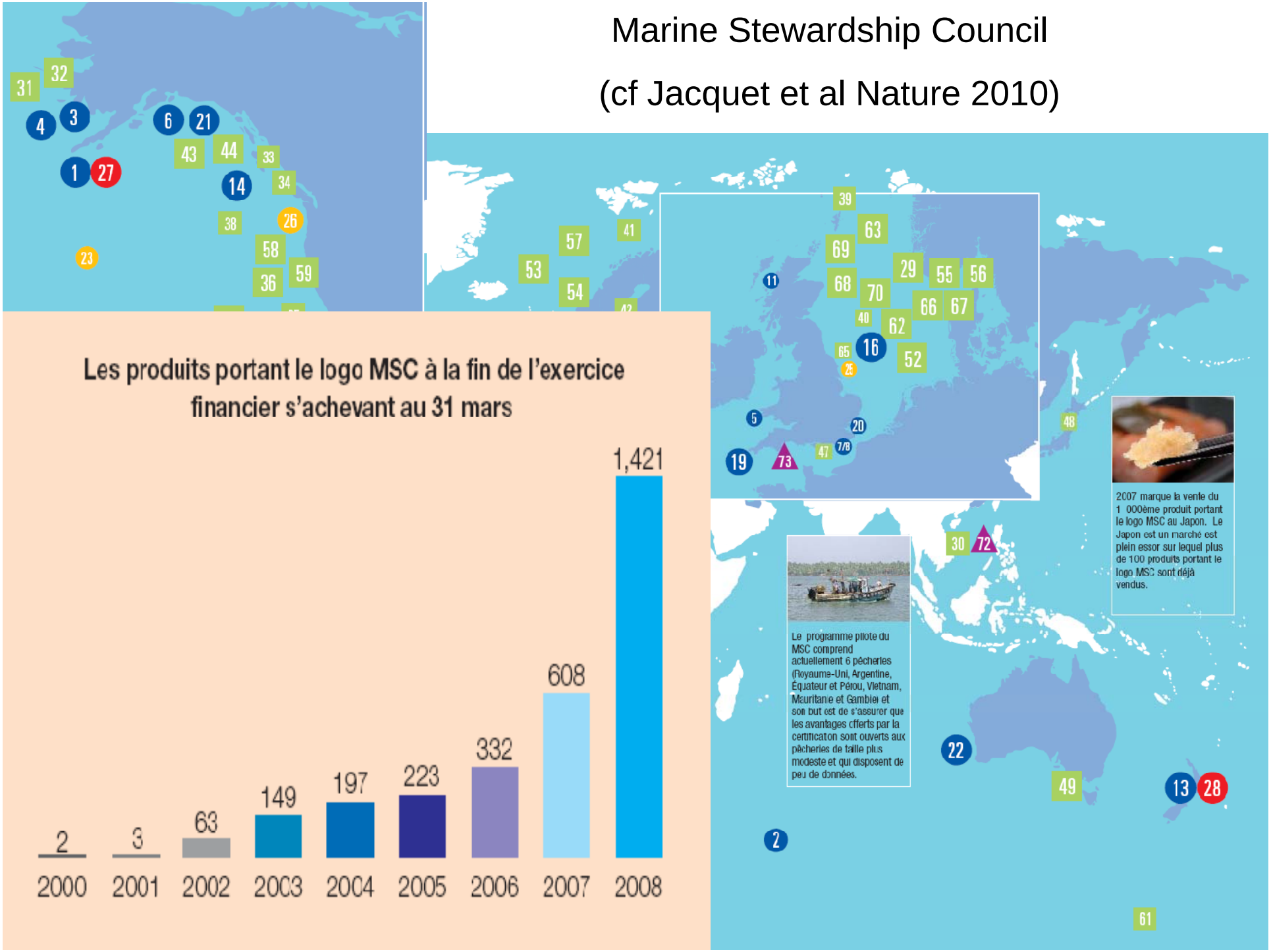


People do not consider ecolabel when they buy fish…..



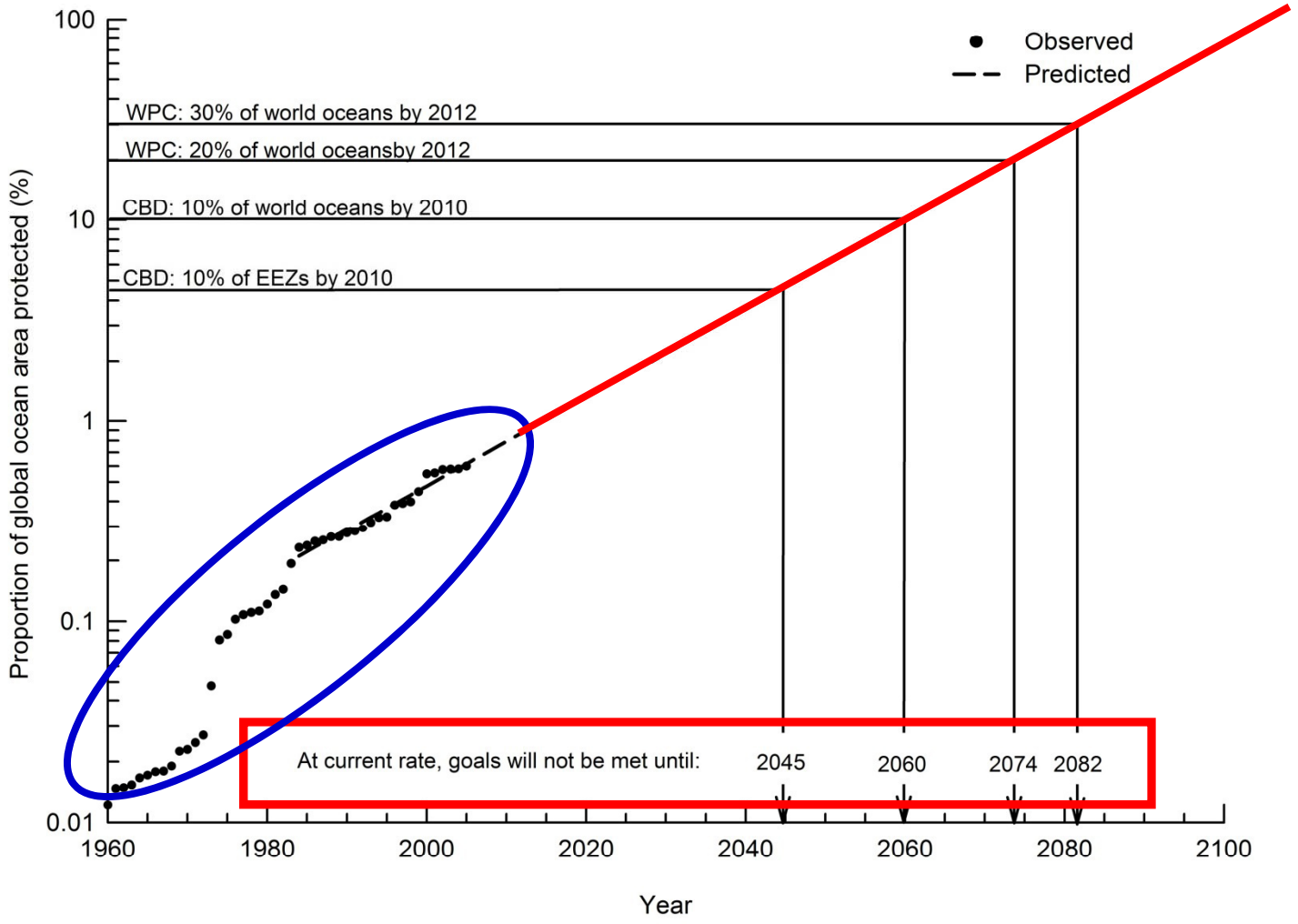
Marine Stewardship Council

(cf Jacquet et al Nature 2010)



MPAs : Marine Protected Areas

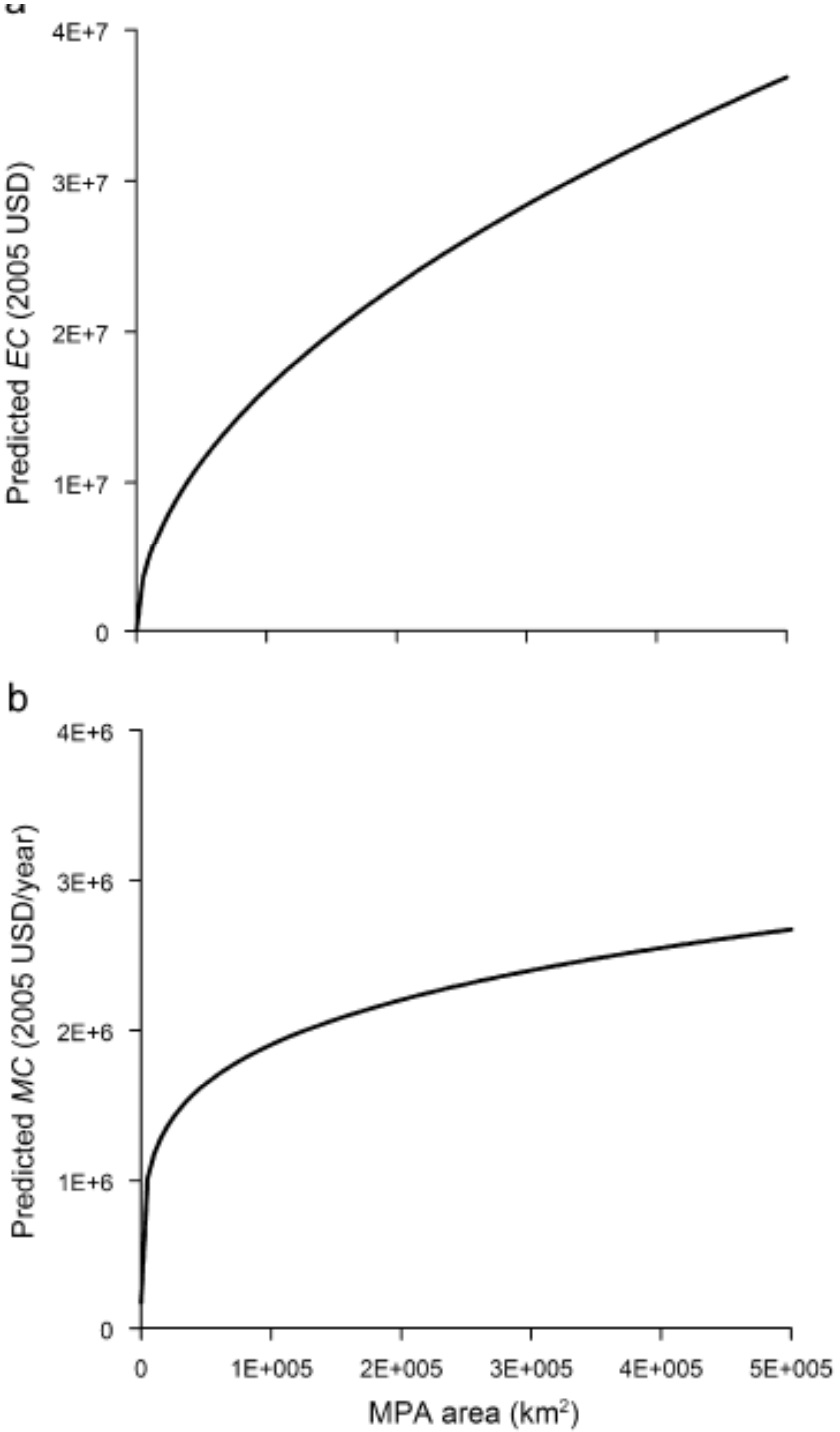
As a result, the growth of the global MPA network is so slow that we will miss all the targets…



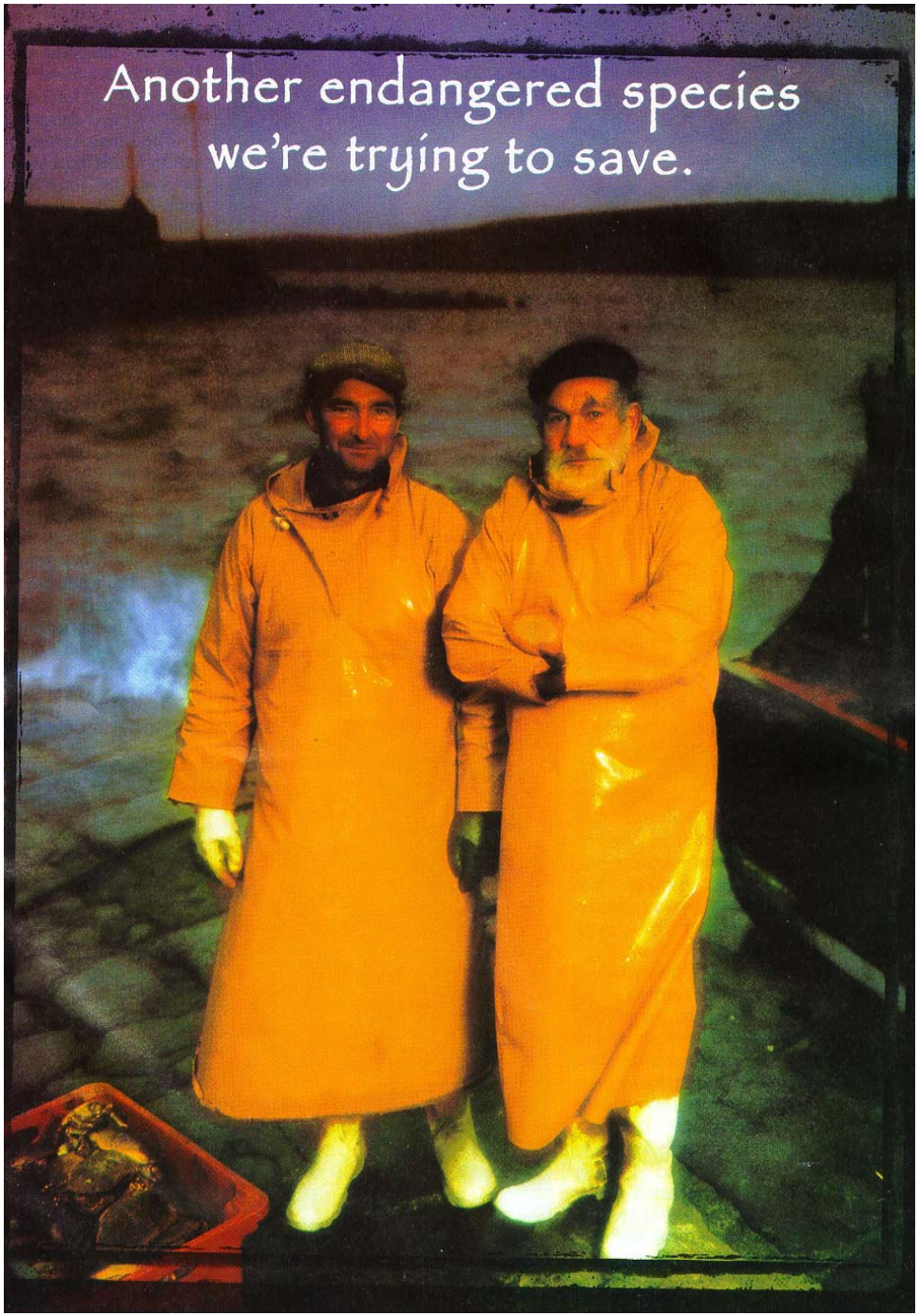
Wood *et al.* (2008)

Total predicted establishment cost and annual maintenance costs of MPAs

(McCrea-Strub 2011)



Role of NGOs



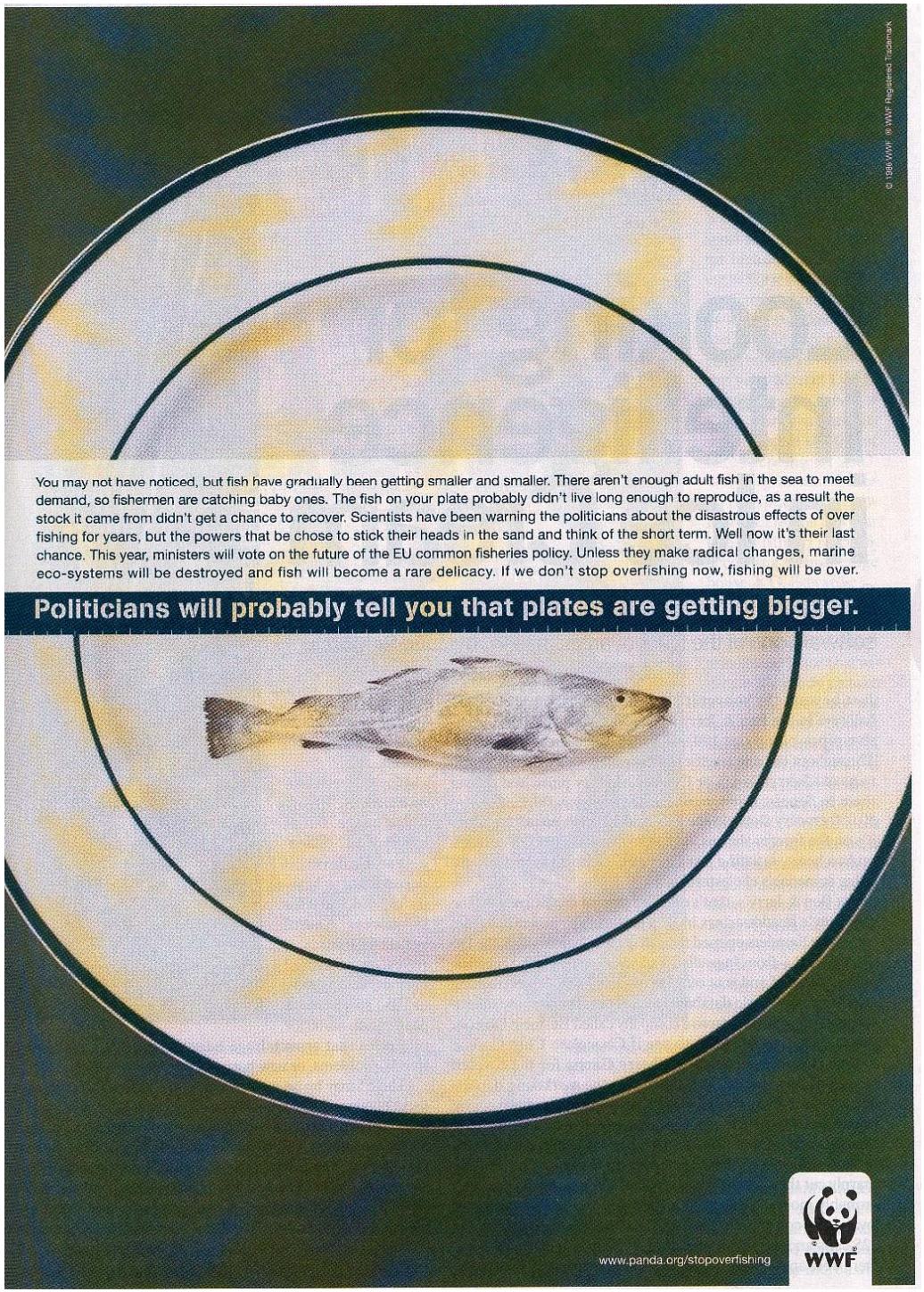
Campagne de publicité de WWF/MSC

(Time Magazine, Mars 2000)

Agissez maintenant pendant qu'il y a encore des stocks de poissons:

... chaque année des milliards sont payés par les contribuablespour subventionner la surpêche de resources marines, au détriment des stocks et de l'industrie de la pêche elle-même …WWF presse les gouvernements et les entreprises afin de protéger nos mers et en appelle aux consommateurs de n'acheter que des produits de la mer qui proviennent de pêcheries durables

(WWF, Fortune, mars 2000)



Les politiciens vous diront probablement que nos assiettes deviennent plus grandes…

Campagne publicitaire WWF

(Fortune Magazine Mars 2003)

Individual Tranferable Quotas (ITQ)

- Racing for fish: Fishers tend to maximize their catch in order to catch the most important part of the TAC

- Towards ITQ : Individual and transferable : + responsabilization

Limits of ITQ

- Difficult to fix the TAC level
- Controls are difficult
- Lead to selective catch («*highgrading*») + important discards (tri « sur le pont » + que « sur le fond »)
- Risk of market concentration and speculation

Process of implementing EAF has started in many countries (Australia, South Africa, USA, Canada…)

Ecosystem approach and management of fisheries : The experience of the Benguela (Namibia & South Africa)

Photo: Graham Shillington

Ecological Risk Assessment: A Tool for Implementing an Ecosystem Approach for Southern African Fisheries

BCLME Benguela Current Large Marine Ecosystem Programme

WWF South Africa Report Series - 2007/Marine/002

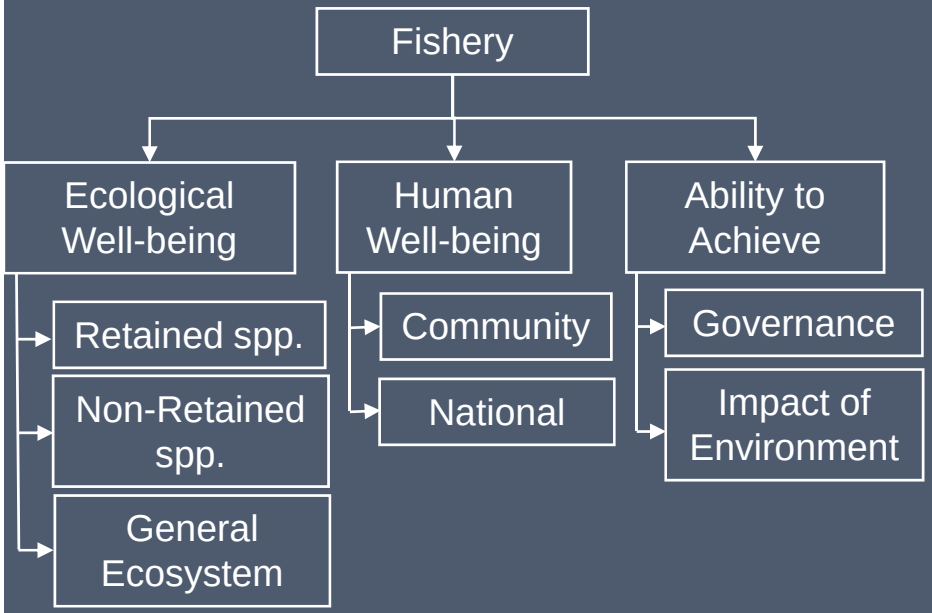
incofish

Deon C. Nel, Kevern Cochrane, Samantha L. Petersen, Lynne J. Shannon, Ben van Zyl and Maria B. Honig (Editors)

RISK ASSESSMENT FOR SUSTAINABLE FISHERIES

1. Identification of risks/issues

Using broad categories…



2. Prioritisation of issues

Risk = Impact x Likelihood

Impact Level	Description
0 Negligible	Very insignificant, probably not measurable against background variability
1 Minor	Possibly detectable but minimal impact
2 Moderate	Maximum acceptable level of impact
3 Severe	Above acceptable limit. Wide and long-term negative impacts
4 Major	Very serious, likely to require long restoration time to undo
5 Catastrophe	Widespread and probably irreversible

Likelihood	Description
1 Remote	Insignificant probability of occurring
2 Rare	May occur in exceptional circumstances
3 Unlikely	Uncommon, but has been known to occur either here or somewhere comparable
4 Possible	Evidence that it could occur
5 Occasional	May occur
6 Likely	Expected to occur

3. Develop Performance Reports

Operational objective
Indicators
Performance Measure/Limit
Data Requirements
Evaluation
Robustness
Fisheries Management (current, future…)

How can science contribute to an ecosystem approach to the South African hake fishery?

Diagram to show the different stages in the EAMR approach

Shannon, L.J., Cury, P.M., Nel, D., van der Lingen, C.D., Leslie, R.W., Brouwer, S.L., Cockcroft, A.C. and Hutchings, L. 2006.
How can science contribute to an ecosystem approach to pelagic, demersal and rock lobster fisheries in South Africa?
African Journal of Marine Science **28**(1): 115-157.

An effective and pragmatic EAF approach in South Africa

Extreme risk

An issue : Implications of removal of forage fish on species bound to breeding sites on land (seabirds)

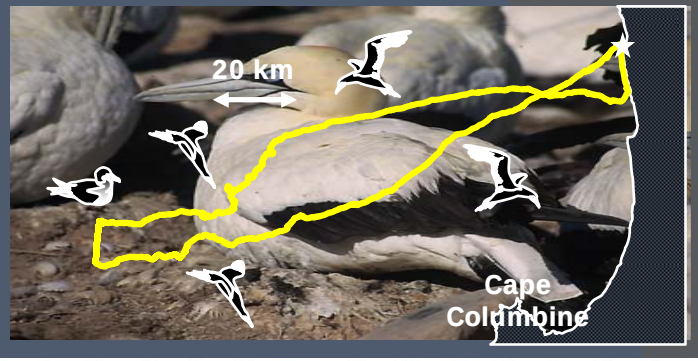
Indicators : Bird population sizes; breeding success, (breeding proportion); seabird diet composition; spatial indicators (seabird foraging and pelagic fisheries using GIS)

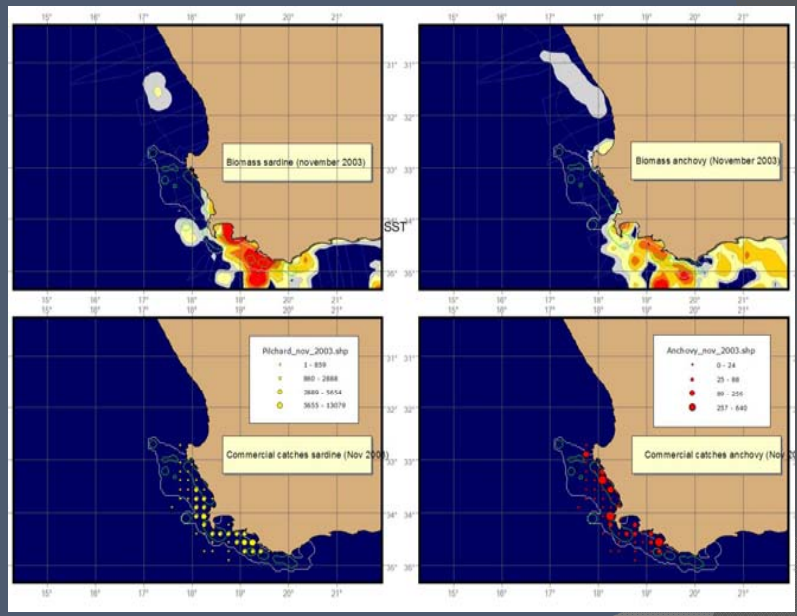
Approaches/Studies Routine monitoring of seabird colonies; Satellite tracking of foraging ranges; Spatialized models of pelagic fish around seabird colonies, acoustic surveys of pelagic fish stocks (biomass, fish size); catch distributions monitored by means of GIS

Measures/Eval : Avoid populations reaching levels that exceed limit reference points (IUCN conservation criteria) (TAC or closed areas within foraging ranges); allow sufficient escapement of forage fish for predators

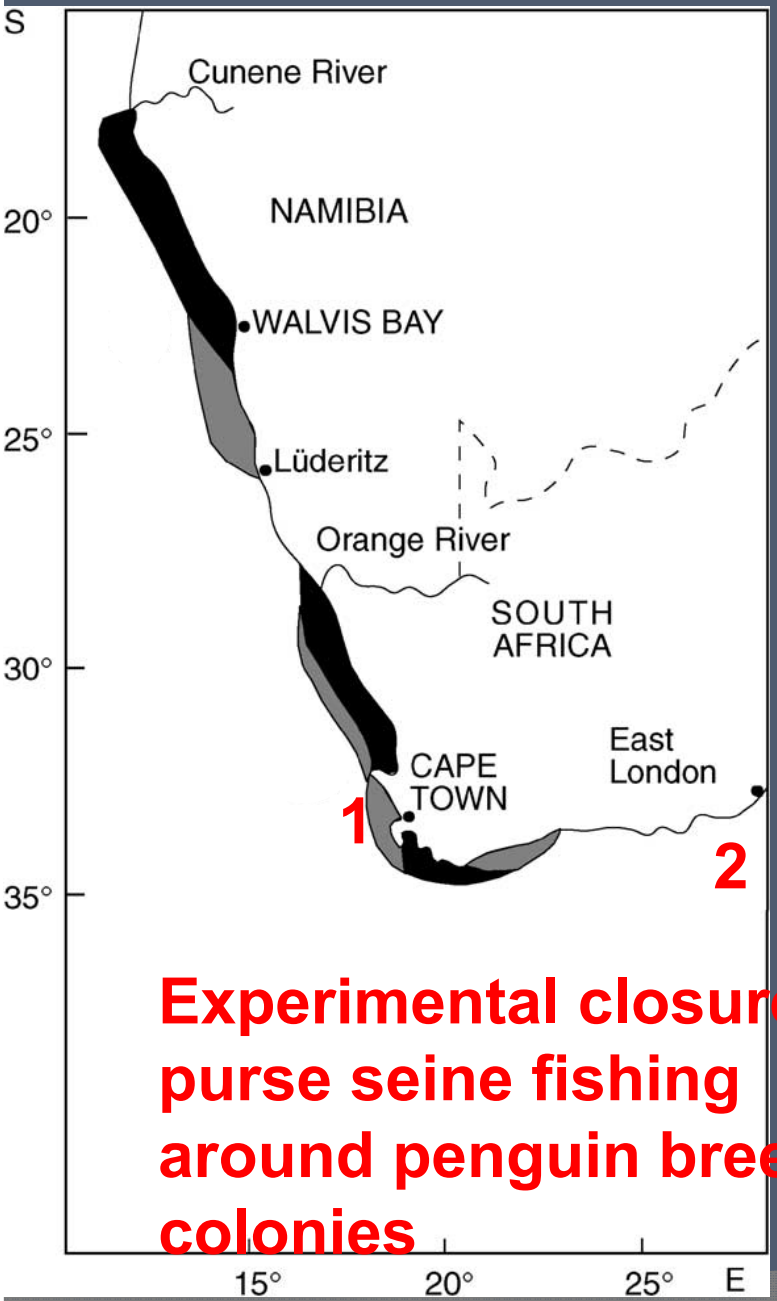
Implement ease : *Limited ** fair *** good

Foraging constraints on seabird population dynamics

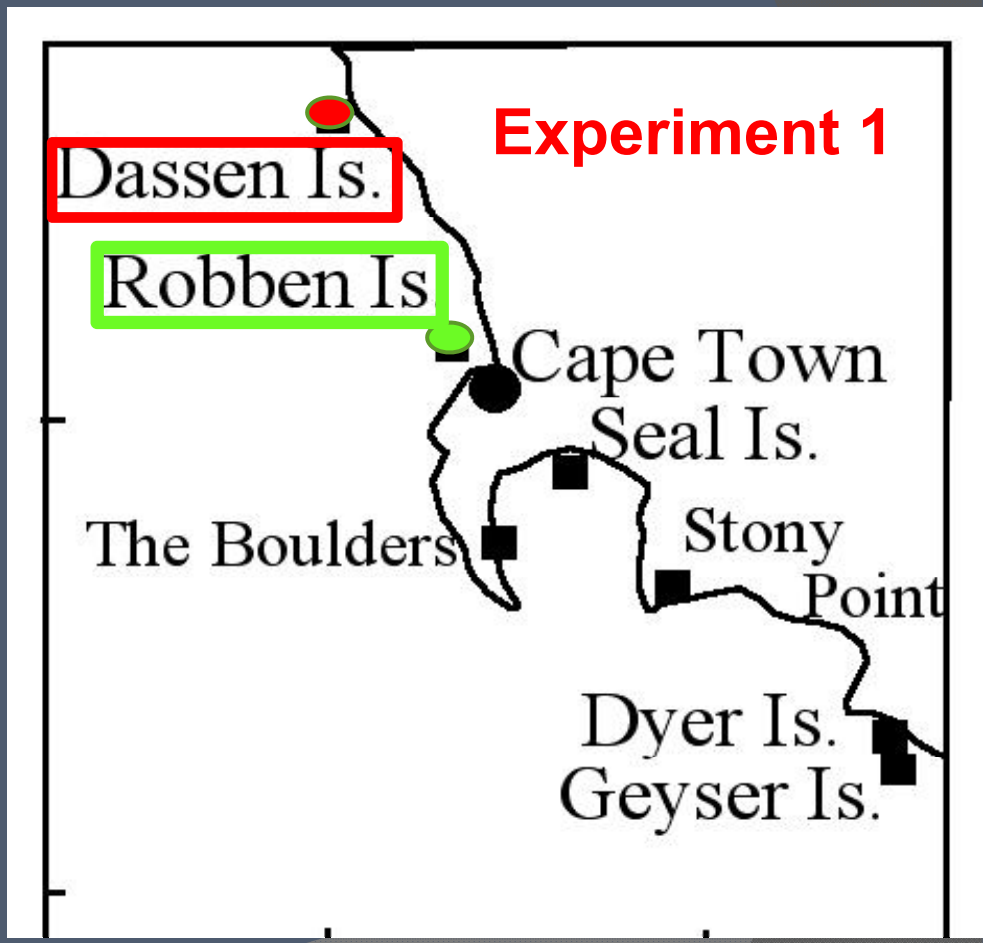




Top Predators as Biological Indicators of Ecosystem Change
Utility of top predators as biological indicators of ecosystem change in the BCLME



Experimental closures: purse seine fishing around penguin breeding colonies



implementing EAF in SAF: (Augustyn et al 2013)

1. **Bringing the fishing industry on board** is an important aspect of rolling out an EAF. In South Africa, a Responsible Fisheries Alliance (RFA) between the World-wide Fund for Nature (WWF) and four major fishing companies in collaboration with other NGOs and government has been a successful initiative
2. With regard to **capacity building for EAF, fishers, fisheries observers and compliance officers must have the adequate and appropriate skills** to implement changes such as those for the management of bycatch, maintenance of food webs and protection of vulnerable marine habitats. This is critical to translating policy and science into effective action.
3. **EAF is likely to increase the complexity of regulations and management requirements** through the additional consideration of broader ecosystem, social and economic issues, it is important to ensure the **regulatory framework is adequately supported by incentives and voluntary compliance mechanisms.** Locally three initiatives have incentivized implementation, namely the Marine Stewardship Council (MSC) certification of the South African hake trawl fishery, WWF's Southern African Sustainable Seafood Initiative (WWF-SASSI) and the development of the Responsible Fisheries Alliance (RFA)

TRACKING THE IMPLEMENTATION (Augustyn et al 2013)

1. Ecological Risk Assessments: A mechanism to review EAF implementation : BCLME ran a series of locally-adapted Ecological Risk Assessments (ERA) (Petersen et al. 2010) workshops to test the feasibility of implementing the approach
2. Each ERA provides a snapshot of the current state of a fishery relative to overarching ecosystem objectives.
3. To address the need to track and stimulate EAF implementation a tracking tool was developed (Paterson and Petersen 2010), reviewing progress against ten objectives …

How science is feeding EAF: (Augustyn et al 2013)

1. International project (BCC program, FAO Nansen, ICEMASA,….)
2. Trophic ecosystem models
3. Indicators (environment, pred-prey, Indiseas, …)
4. Key Immediate Research Challenges
   - investigate how social-ecological systems change state over time (Starfield and Jarre, 2011)
   - spatial aspects will need further research effort (e.g. in the South African sardine fishery (Van der Lingen, 2011).

Successful implementation (Augustyn et al 2013)

1. **Stakeholder participation is critical** to the successful implementation of an EAF. Complexity creates confusion, frustration and reduces the chances of success.
2. **A structured approach** provides a platform for views to be aired, broadens perspectives, improves understanding of the issues. the EAF tracking tool is simply a means to structure and facilitate discussion
3. **All views must be represented and no group or individual allowed to dominate.**
4. **The advantage of a generic approach is that it allows for comparison, interrogation and reporting at any leve**l. operational managers can track progress of management actions in a participatory and transparent manner to develop a work plan to address issues.
5. **NGOs such as WWF have played an important role** in assisting the implementation of EAF and environmental initiatives.

Recent implementation in SAF, Namibia and Angola

(Augustyn 2013)

- Some management measures to address important ecosystem issues have been applied both regionally and nationally, for example, **management of species caught as bycatch in fisheries** (mainly in South Africa and Namibia) **and seabird by-catch mitigation in longline and trawl fisheries** (all three countries).
- **South Africa has developed a National Plan of Action (NPOA) for Seabirds which is well implemented, implementation of by-catch regulations in demersal fisheries, sharks and to a limited extent turtles, management of beach-seining for small-scale fisheries and mandatory gear exclusion devices in the shrimp fisheries to reduce by-catch and discards** (Angola and SA)
- **A pioneering measure related to foodweb considerations** is implementation of closed areas for seabird protection: South Africa is exploring, by means of a feasibility study, closed areas around some penguin breeding islands to enhance food availability, and is trying to include top predators in Operational Management Procedures in the small pelagics fishery (Robinson et al., 2010).
- Implications for future trends in penguin numbers at island colonies of reducing future TAC for sardine and anchovy were considered.

Gaps in implementing EAF: (Augustyn et al 2013)

1. no dedicated fishery management “units” or staff
2. no fishery-specific EAF Management Plans
3. absence of an over-arching, supporting structure that would facilitate the merging of scientific information and the balancing of management objectives of fisheries (and other resource users) and conservation

Conclusion SAF, Namibia and Angola (Augustyn 2013)

- In order to maintain quality and improve the objectivity of scientific inputs into management, **scientific institutions related to fisheries and conservation may need to be more independent and better integrated with country science systems**
- **At the same time scientists need to make greater efforts to communicate ecosystem issues more effectively to politicians.**
- In all three countries**, involvement of a wider range of stakeholders is needed with respect to the management of fisheries.**

5. Implementing & Communicating EAF

Ecological Indicators

Four key uses for ecosystem indices in the context of EBFM:

(1) Motivation for socio-political action

(2) Information for individual users to modify their behavior

(3) Implementation of decision rules for management evaluation

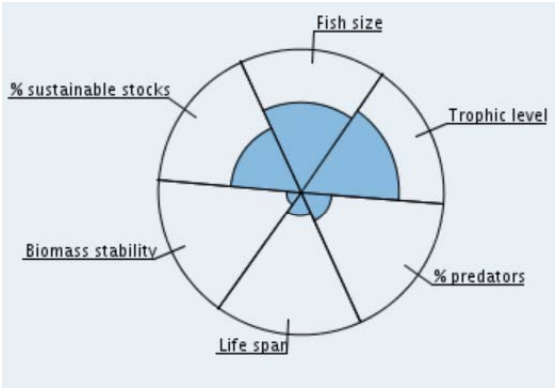
(4) Discovery of ecosystem functions to advance scientific knowledge

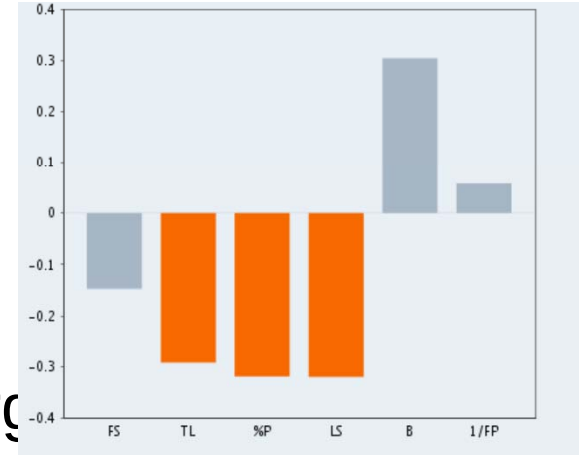
Powers and Monk

The IndiSeas international initiative
(www.indiseas.org)

The role of indicators and reference values is fundamental to an EAF: can be of a bio-ecological, techno-ecological and socio-cultural nature. References points as targets, limits and thresholds

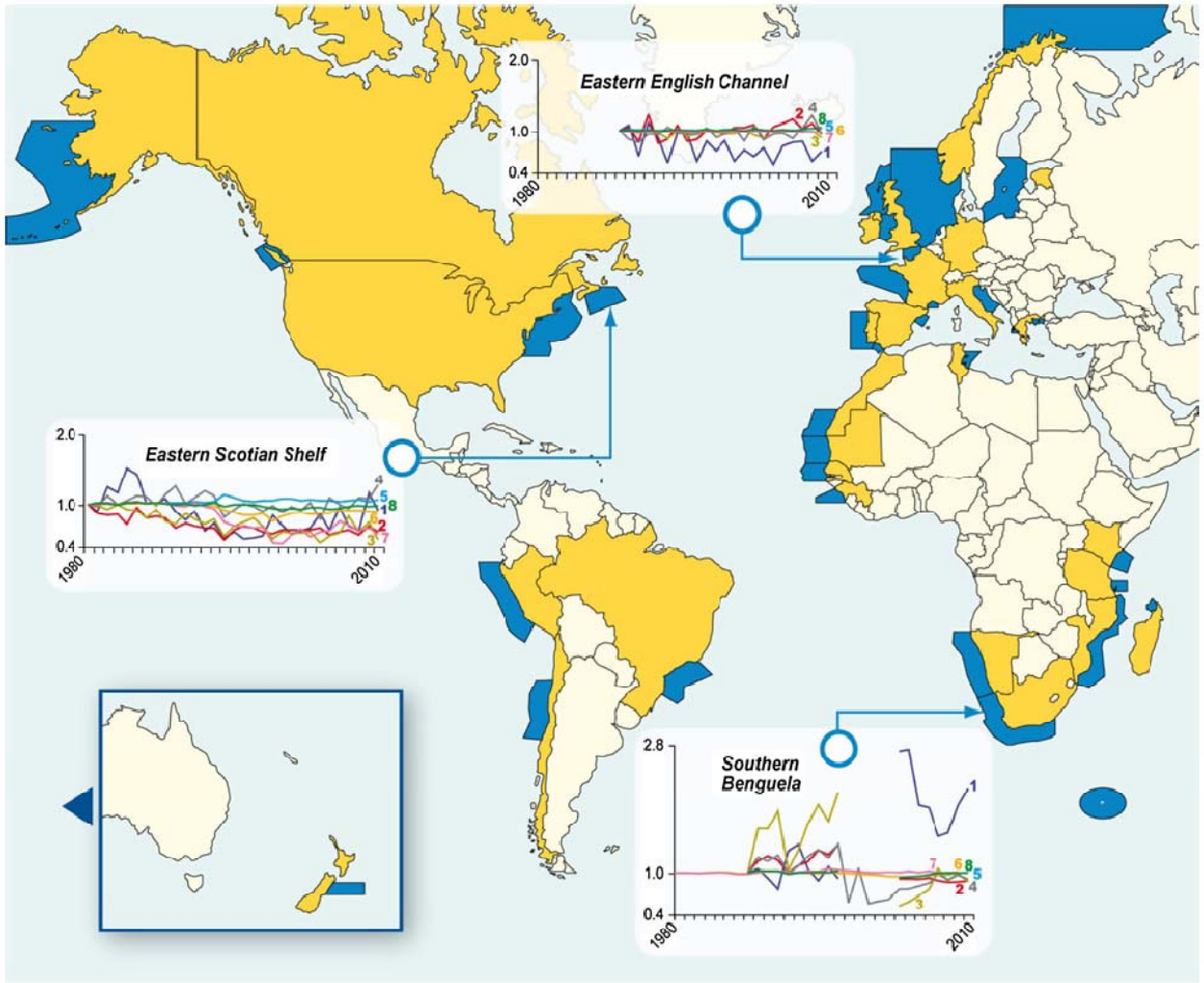
www.indiseas.org





Shin et al. 2010,

Marine ecosystems covered by the IndiSeas program



Blue, the marine ecosystem; yellow, the countries participating in the analyses. Examples of time series of standardized ecological indicators collated by the program. 1 total biomass surveyed, 2 mean length of fish in the community, 3 proportion of predatory fish, 4 mean lifespan, 5 intrinsic vulnerability index of the catch, 6 trophic level of the landings, 7 Marine Trophic Index, 8 trophic level of the surveys

www.indiseas.org

Shin et al. 2010, 2(

Building free access data bases on marine ecosystems

GROUP ON EARTH OBSERVATIONS | GEO BON

GEO Home

Biodiversity Community of Practice

GEO BON: Biodiversity Observation Network

- About
- Contributors
- Working Groups
- Meetings
- Documents
- Outreach
- Observations
- Links
- Contact

Highlights

Adequacy of Biodiversity Observation Systems

In response to a decision taken last November at the Nagoya conference of the Convention on Biological Diversity, GEO BON has produced and submitted to the CBD a report entitled "Adequacy of Biodiversity Observation Systems to support the CBD 2020 Targets". The report can be read here.

EC JRC launches DOPA, a Digital Observatory for Protected Areas

The Joint Research Centre of the European Commission has launched the Digital Observatory for Protected Areas (DOPA). A GEO BON contribution to the monitoring of biodiversity, the DOPA is designed as set of distributed web services to assess the state of, and pressure on, Protected Areas and to prioritize them accordingly in order to support decision making and fund allocation processes. It is also conceived as a monitoring and ecological forecasting service.

DOPA is supported by the European projects EuroGEOSS and UncertWEB and developed in collaboration with GBIF, UNEP-WCMC, Birdlife International, RSPB and others. Read here a description of the use of DOPA for Africa presented at MapAfrica, 23-25 November 2010, Cape

GEO BON

Biodiversity Observation Network

The Group on Earth Observations Biodiversity Observation Network – GEO BON – coordinates activities relating to the Societal Benefit Area (SBA) on Biodiversity of the Global Earth Observation System of Systems (GEOSS). Some 100 governmental, inter-governmental and non-governmental organizations are collaborating through GEO BON to organize and improve terrestrial, freshwater and marine biodiversity observations globally and make their biodiversity data, information and forecasts more readily accessible to policymakers, managers, experts and other users. Moreover, GEO BON has been recognized by the Parties to the Convention on Biological Diversity.

The Biodiversity Observation Network is both a Community of Practice and a Task in the GEO Work Plan. It is a voluntary partnership that is guided by a steering committee comprising the key stakeholders, including DIVERSITAS, GBIF, IUCN, NASA, UNEP-WCMC and others. GEO BON draws on GEO's work on data-sharing principles to promote full and open exchange of data, and on the GEOSS Common Infrastructure to enable interoperability through adoption of consistent standards.

To assist both holders and users of biodiversity information to engage with GEO BON, this website contains links to information resources, activities and GEO BON documents, meetings and other

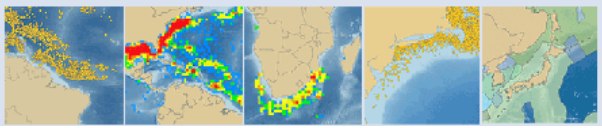
Copy

OBIS OCEAN BIOGEOGRAPHIC INFORMATION SYSTEM

Welcome to OBIS!

Last updated on Thu, 2011-01-13 09:49. Originally submitted by evberghe on 2010-05-25 15:58.

OBIS allows users to search marine species datasets from all of the world's oceans.



‘Slow food’ – ‘slow fish’

- Go slowly
- Stay small
- Eat less and better

‘Slow fish’ concept

(Pauly 2010)

FISHERY *BENEFITS*	**LARGE SCALE** 	**SMALL SCALE** 
Number of fishers employed	 about ½ million	 over 12 millions
Annual catch of marine fish for human consumption	 about 29 million tonnes	 about 24 million tonnes
Capital cost of each job on fishing vessels	 $30,000 - $300,000	 $250 - $2,500
Annual catch of marine fish for industrial reduction to meal and oil, etc.	 about 22 million tonnes	 Almost none
Annual fuel oil consumption	 14 – 19 million tonnes	 1 – 3 million tonnes
Fish caught per tonne of fuel consumed	 2 – 5 tonnes	 10 – 20 tonnes
Fishers employed for each $1 million invested in fishing vessels	 5 - 30	 500 – 4,000
Fish and invertebrates discarded at sea	 10-20 million tonnes	Little

Slow fish: go slowly

- Make consistent the exploitation by fisheries and the renewal of marine resources
- Implementation of a policy of active development and social programs to reduce the impact of fishing (via subsidies)

Slow fish: stay small

- Artisanal/small Scale fisheries - passive gear – adopt fishing gear that are fuel efficient
- Voluntary choice not to maintain a state of chronic poverty of fishers, but accept that they will have to decide by themselves their own future

Slow fish: eat differently

- Stop the 'fish elsewhere!' syndrome and finish with expansionism
- Eat low in trophic chains (sardines, anchovies,….)
- Eat local fish and not threatened species (e.g. Sharks)

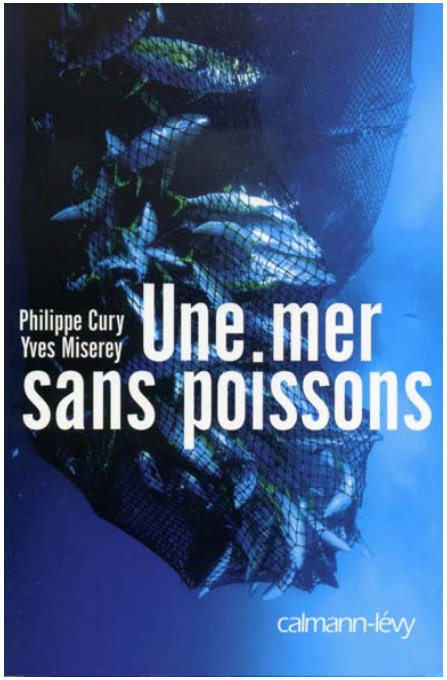
Discussion

- Change our perception of fish stocks : our models are too optimistics ?
- Adopt the Ecosystem Approach to Marine resources
- Envision a future for our marine resources and build scenarios

Discussion

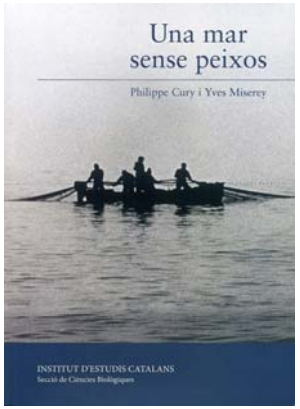
- Fish stock decline is reversible if we avoid regime shifts
- It is the right time to properly manage fish stocks
- To deal with overexploitation is tractable


PHILIPPE CURY, DANIEL PAULY
MANGE
TES MÉDUSES !
RÉCONCILIER LES CYCLES DE LA VIE
ET LA FLÈCHE DU TEMPS
Odile
Jacob


Philippe Cury
Yves Miserey
Une mer
sans poissons
calmann-lévy

Thank you


UNE MER SANS POISSONS
沒有魚的海洋


Una mar
sense peixos
Philippe Cury i Yves Miserey
INSTITUT D'ESTUDIS CATALANS


魚のいない海
水面下で進行する
恐ろしい事態