



# Science as basis for sustainable fisheries management

## CSIS

### Atlantic Media and the Environment

Lidvard Grønnevet  
Tromsø. June 7, 2011



INSTITUTE OF MARINE RESEARCH  
HAVFORSKNINGSINSTITUTTET

# Successful Fisheries Management



Issues, Case Studies and Perspectives

Edited by Stephen Cunningham and Tim Bestock



 Elsevier

# Successful Fisheries Management

## - has at least three dimensions:

- Biological – meeting sustainable use and protection objectives;
- Economic – meeting wealth and efficiency objectives;
- Social – meeting equity objectives, both in terms of distribution and access.

Require institutional capacity both:

- to define an appropriate balance between these management objectives;
- to implement and adapt these responsively over time.



# Sustainable Fisheries Management

- Science and Knowledge
- Fisheries Laws and Regulations
- Implementation - Control of fishing activities
- Sanctions against violations



# Fishing activity

- Normally carried out in a sustainable way
- Three challenges
  - IUU
  - Discards
  - Fishing practice, e.g. Slipping of catch
- No difference whether the stocks are overfished as a result of IUU, discard-policy or slipping of catch



**From depletion to  
Sustainable fisheries  
management:**

**”The fall and rise ” of  
the Norwegian  
spring spawning  
herring – a major  
example of stock  
depletion and  
rebuilding**






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## NORWEGIAN SPRING-SPAWNING HERRING & NORTHEAST ARCTIC COD

100 Years of Research and Management



Edited by Odd Nakken

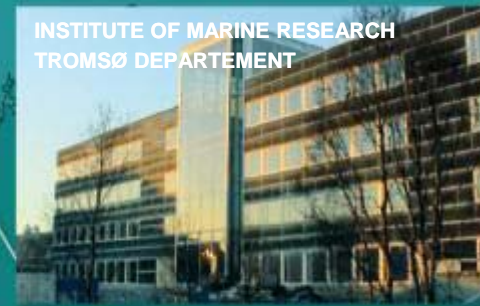
 tapir academic press



► A national institute



Bergen: the IMR headquarters. Offices and laboratories in several buildings at Nordnes



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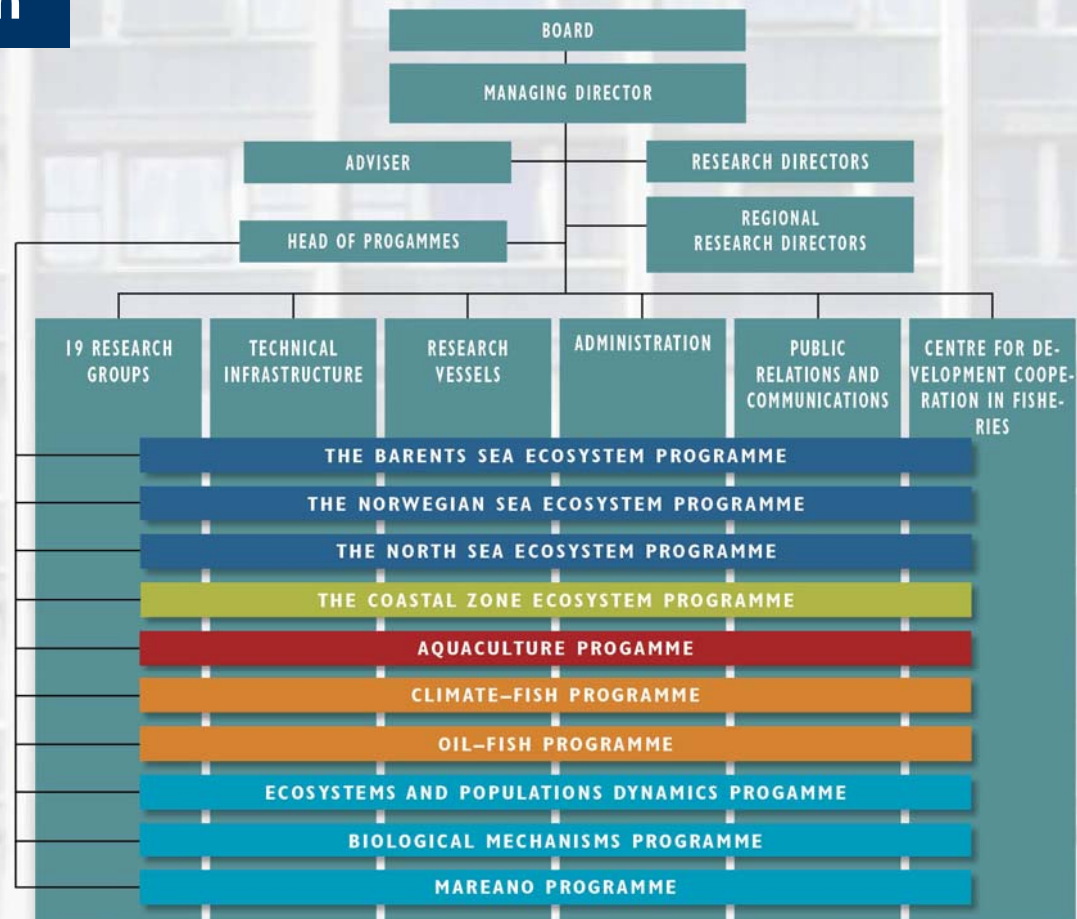


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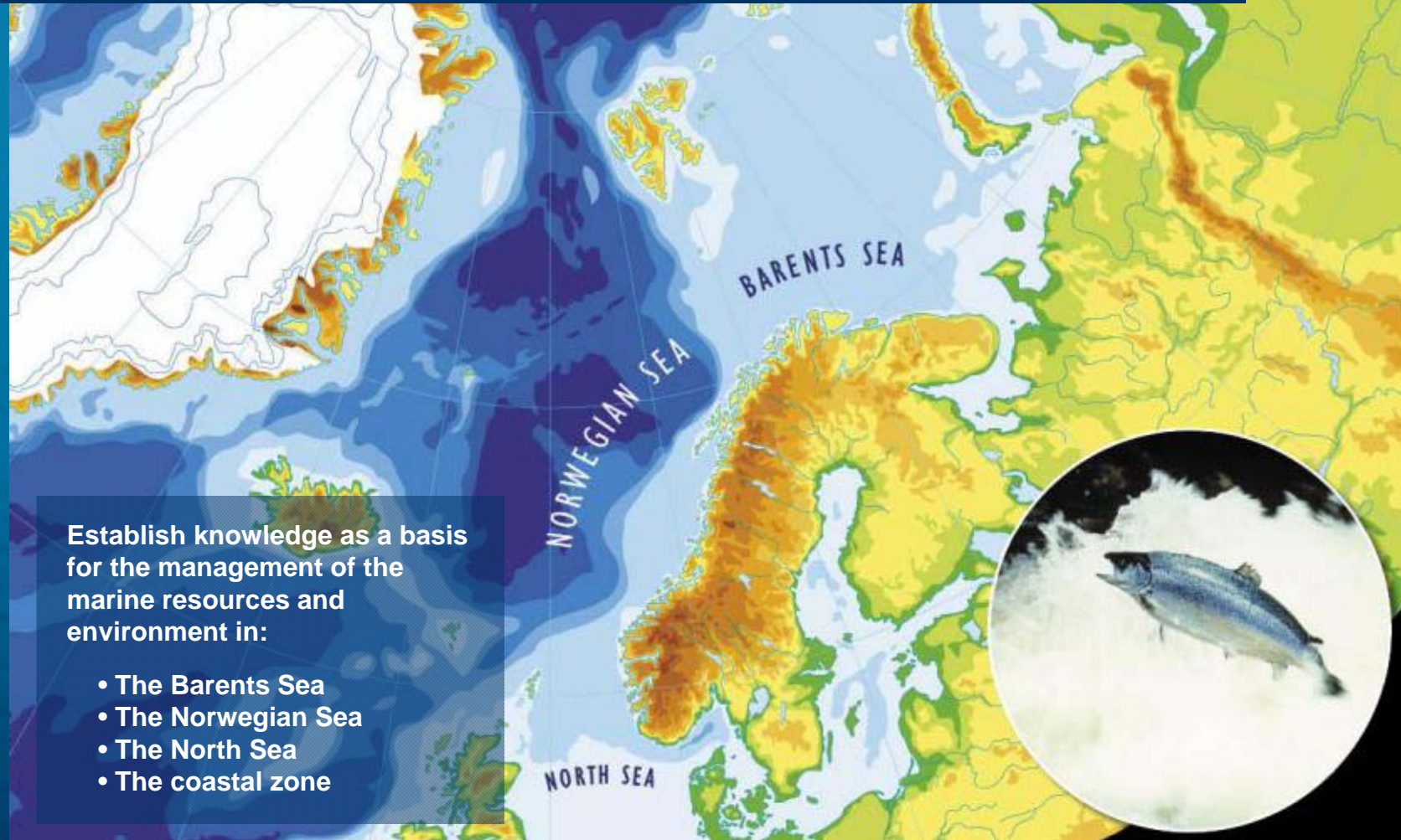




## ► Organisation



► Research and advisory programmes for the ecosystems

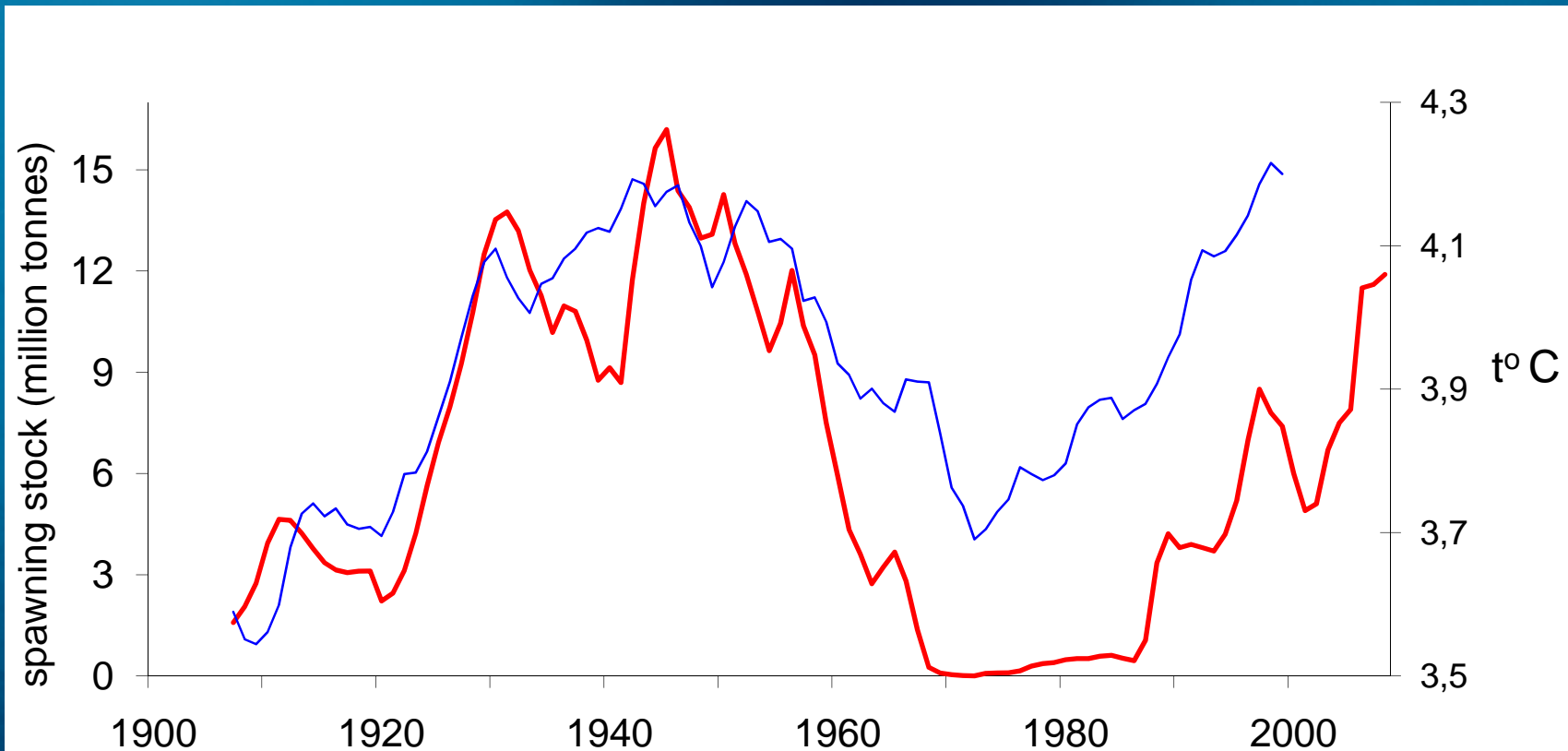


Establish knowledge as a basis for the management of the marine resources and environment in:

- The Barents Sea
- The Norwegian Sea
- The North Sea
- The coastal zone



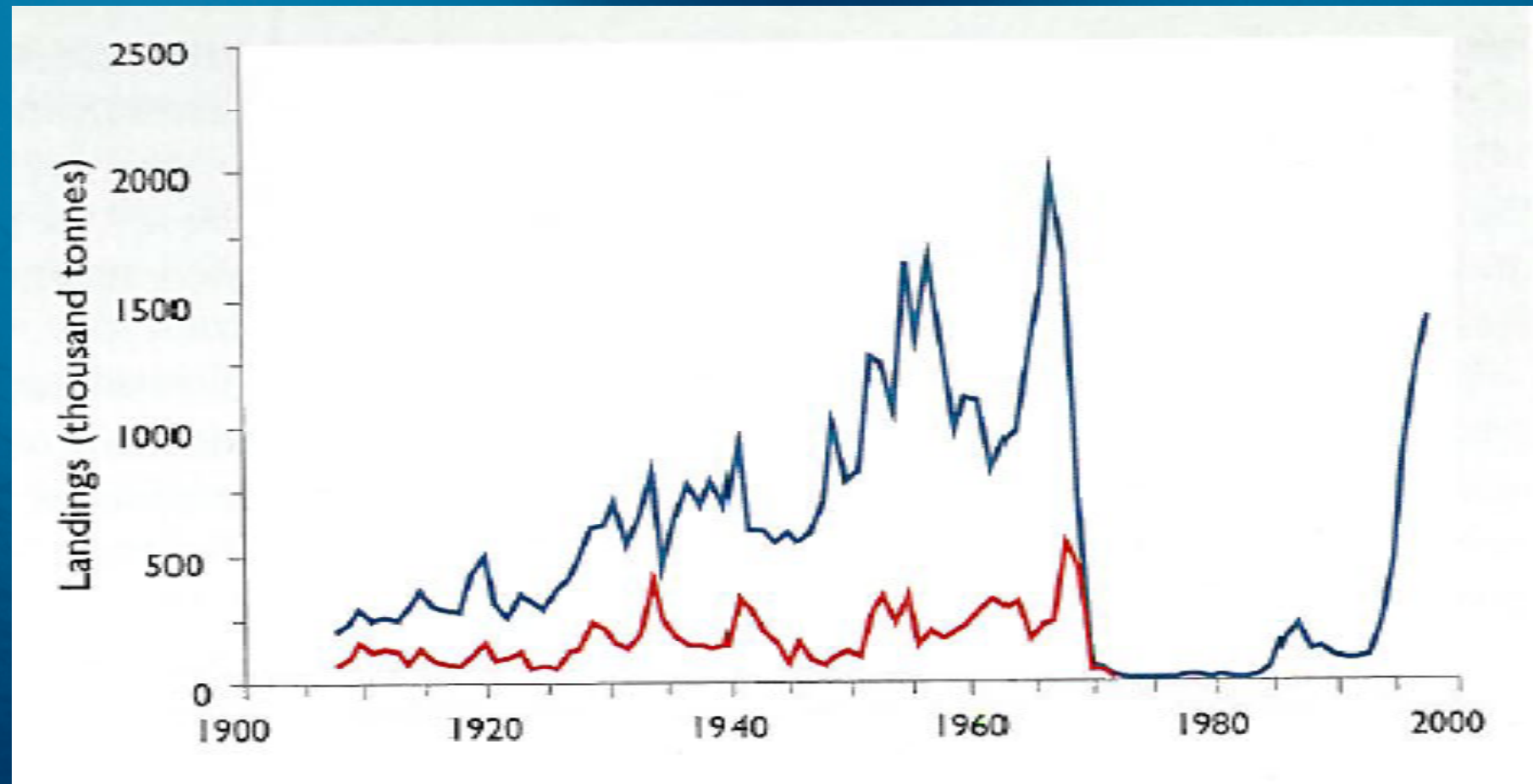
# Depletion of the largest fish stock in the North Atlantic (NSS-Herring) in the 1960s: an eye opener and point of departure for development of sustainable fisheries management



(Based on Toresen and Østvedt 2000)



# Landings of Norwegian spring-spawning herring 1907 – 1997



# Herring fishery in the 1930s



# Herring fishery in the 1950s



# Modern purse seine vessel

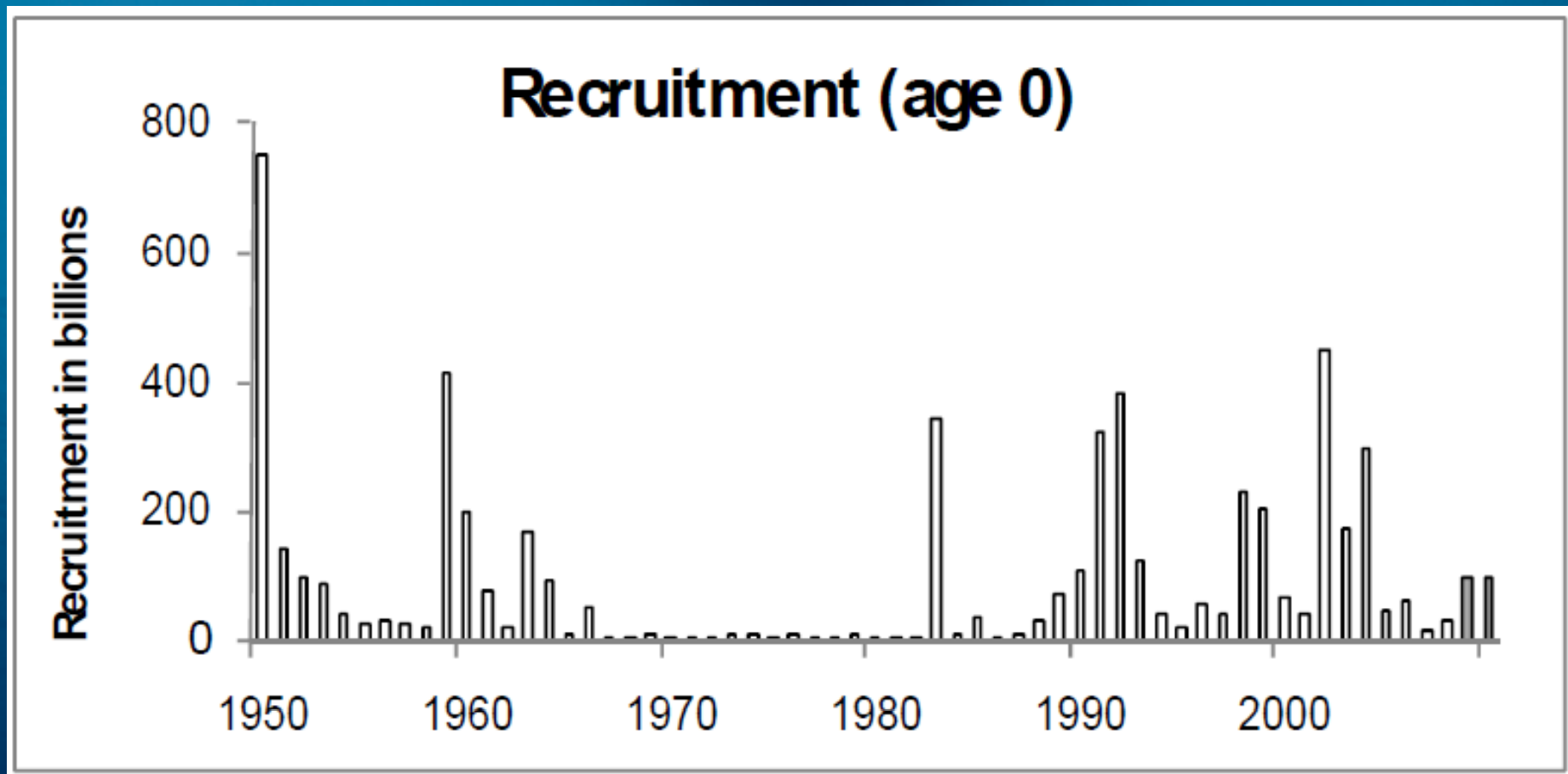


# Modern purse seine vessel with power block

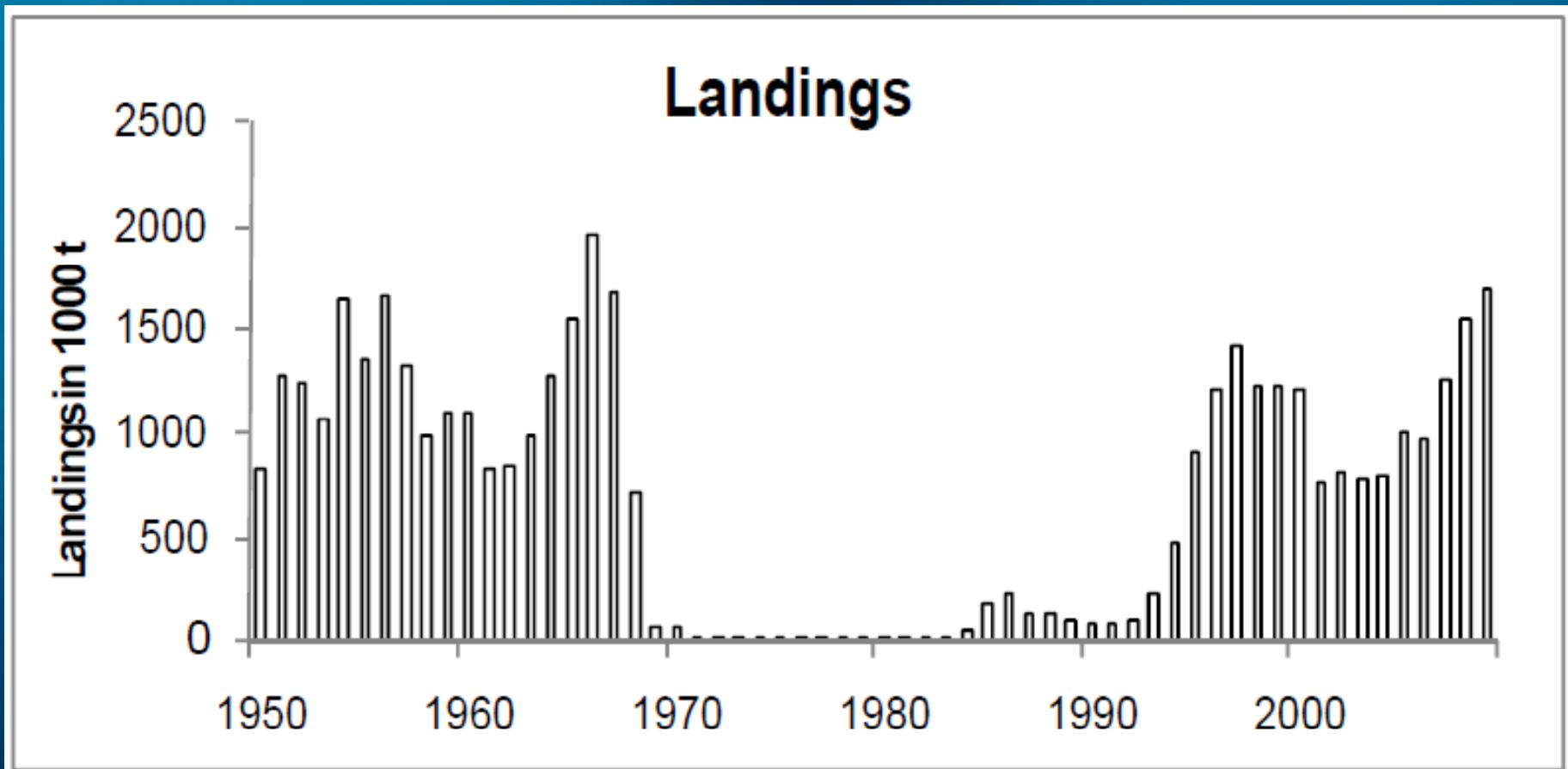




# Norwegian spring-spawning herring recruitment age 0



# Norwegian spring-spawning herring landings 1950 - 2010



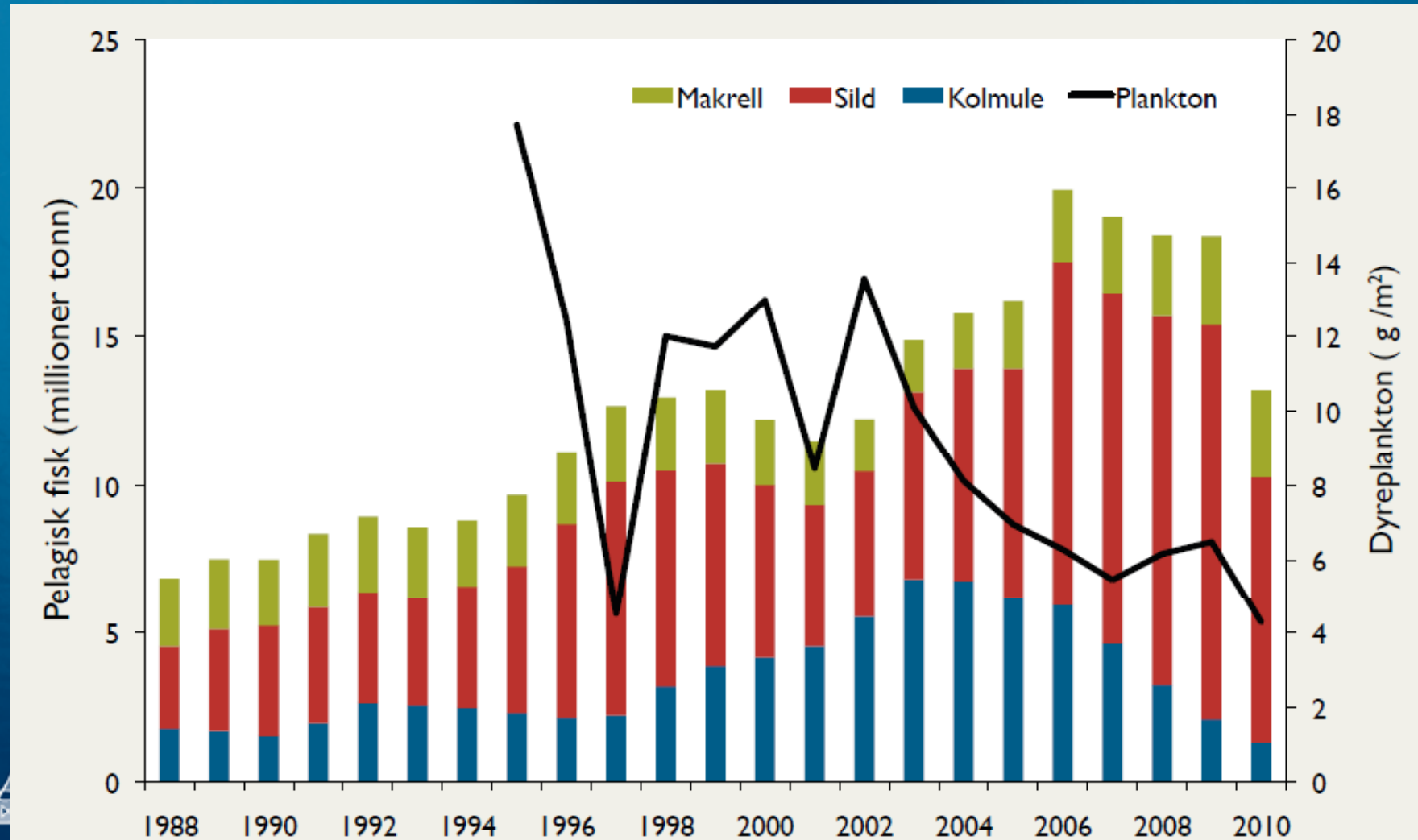
# Norwegian spring-spawning herring long-term management plan

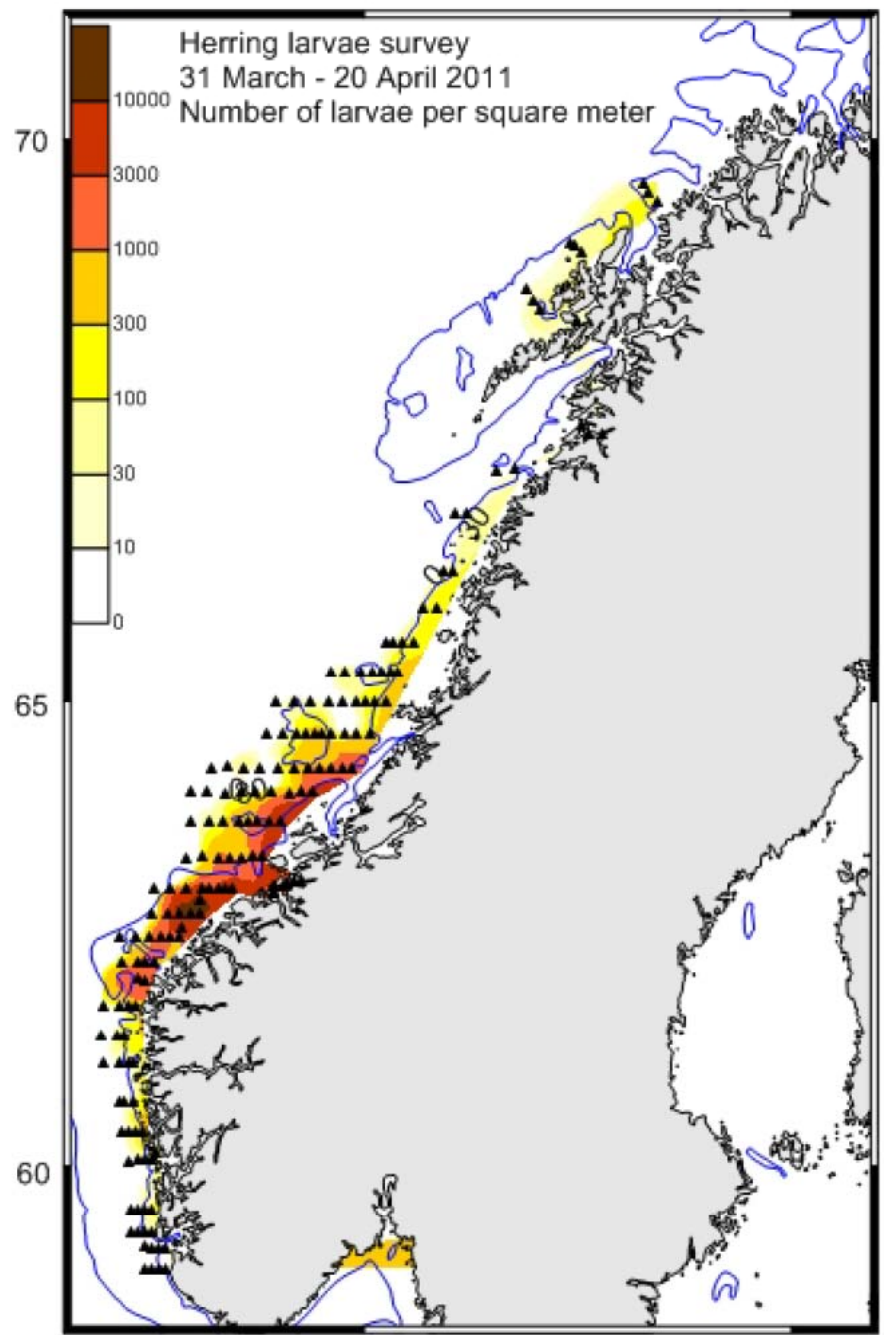
The EU, Faroe Islands, Iceland, Norway, and Russia agreed in 1999 on a long-term management plan. This plan consists of the following elements:

1. *Every effort shall be made to maintain a level of Spawning Stock Biomass (SSB) greater than the critical level ( $B_{lim}$ ) of 2 500 000 t.*
2. *For the year 2001 and subsequent years, the Parties agreed to restrict their fishing on the basis of a TAC consistent with a fishing mortality rate of less than 0.125 for appropriate age groups as defined by ICES, unless future scientific advice requires modification of this fishing mortality rate.*
3. *Should the SSB fall below a reference point of 5 000 000 t ( $B_{pa}$ ), the fishing mortality rate referred to under paragraph 2, shall be adapted in the light of scientific estimates of the conditions to ensure a safe and rapid recovery of the SSB to a level in excess of 5 000 000 t. The basis for such an adaptation should be at least a linear reduction in the fishing mortality rate from 0.125 at  $B_{pa}$  (5 000 000 t) to 0.05 at  $B_{lim}$  (2 500 000 t).*
4. *The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES.*



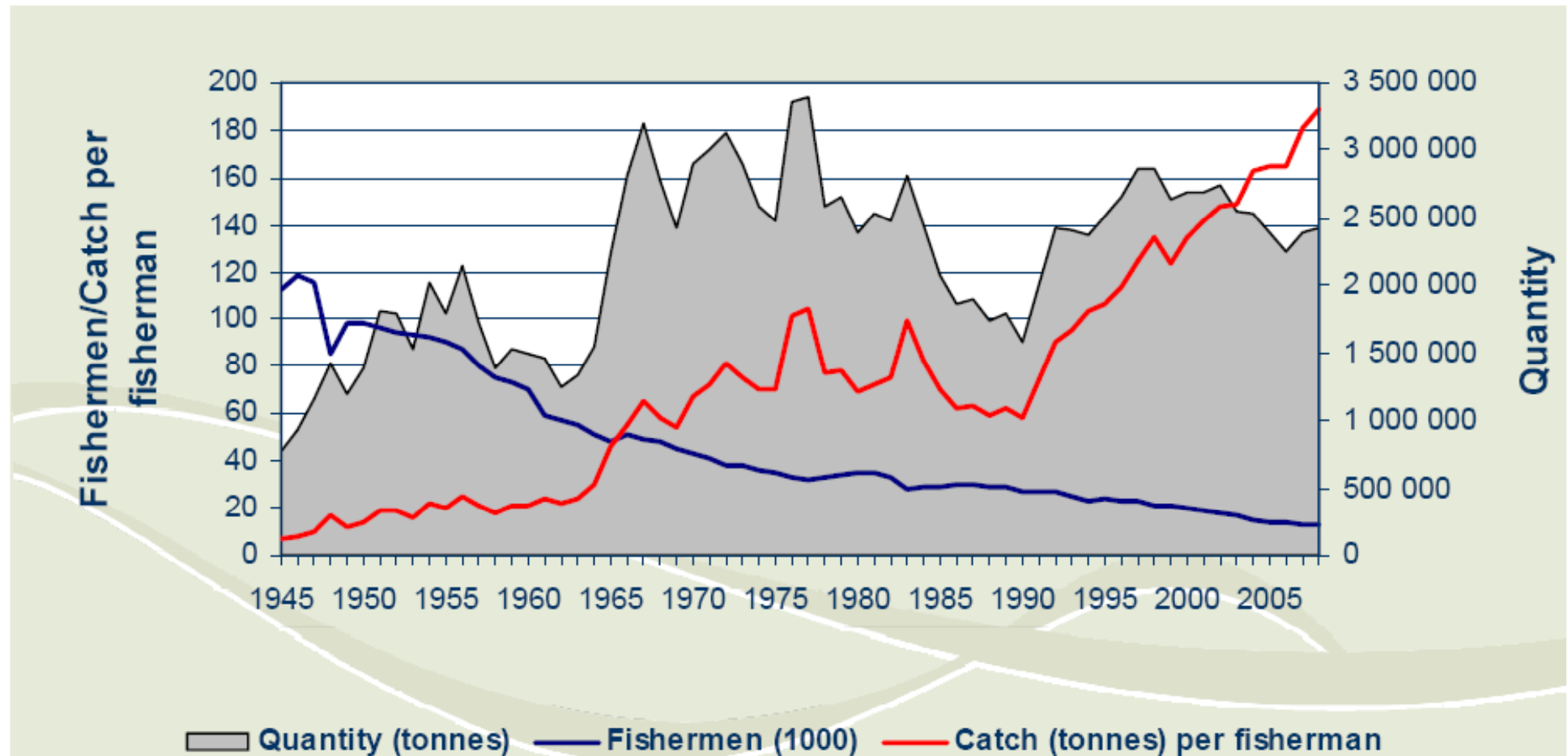
# Abundance of pelagic fish and plankton in the Norwegian Sea since 1988





# Norwegian catches versus fishermen

## 1945 - 2008



# FISHERIES DEVELOPMENT; 1900-present

- **1900-1945: Fishing capacity less than net production from fish stocks; little/no overfishing.**
- **1945-80: Increased fishing capacity, overfishing and depletion of stocks.**
- **1980-present: Gradual development of sustainable fisheries management, rebuilding of stocks – towards sustainable fisheries – and increasing public awareness and growing number of NGO's with a "save the oceans agenda".**



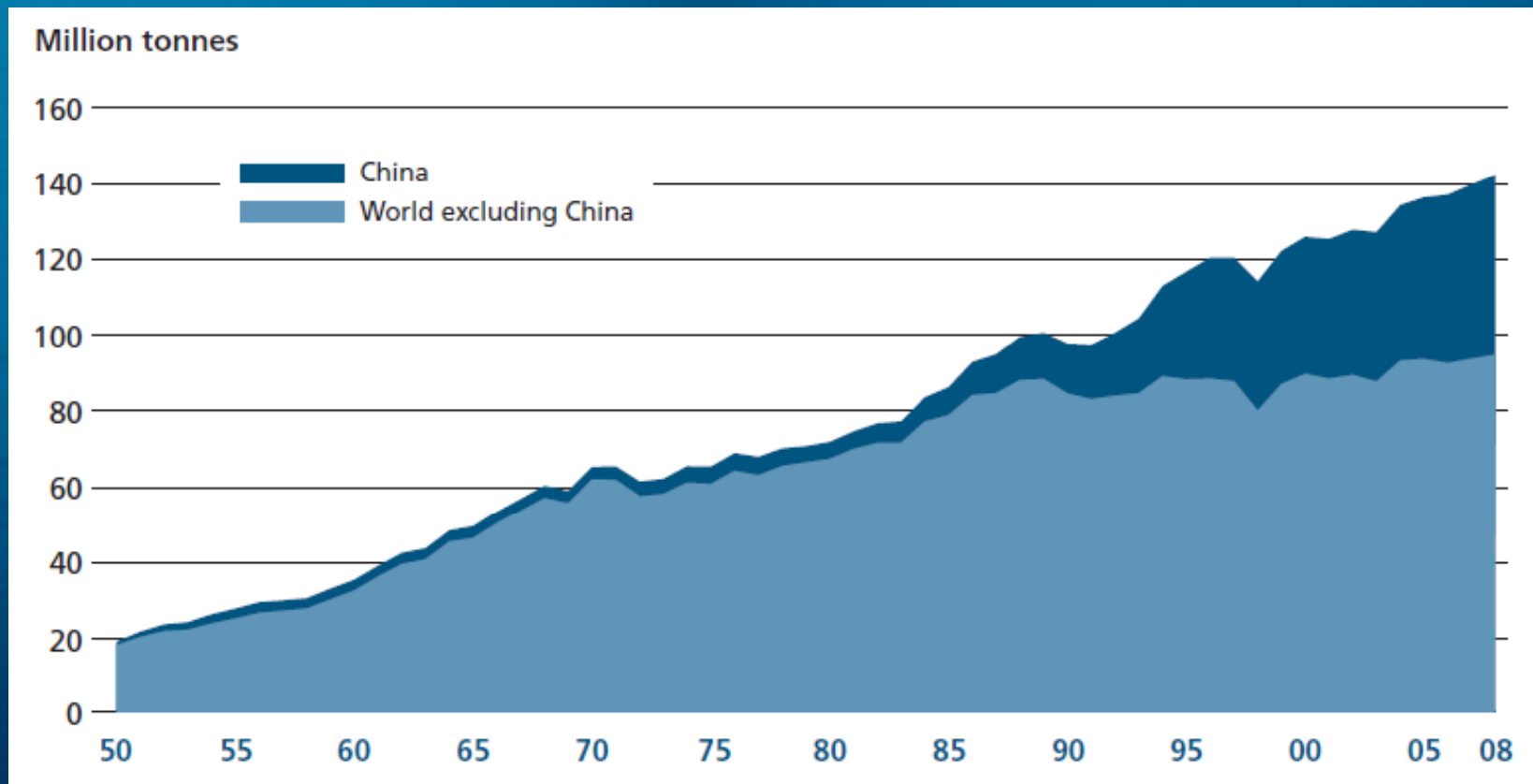
# SUSTAINABLE FISHERIES

- **Norway: among world leading countries in fisheries and sustainable fisheries management.**
- **But: WE HAVE LEARNED IT THE HARD WAY – FROM SERIOUS MISTAKES WITH OVERFISHING AND STOCK DEPLETION in the 1960s-70s – to gradual rebuilding of stocks and fisheries.**
- **To-day: most major stocks rebuilt to sustainable levels, but still several stocks to recover.**





# FAO: The State of World Fisheries and Aquaculture 2010 (SOFIA). World capture fisheries and aquaculture production



# CAPTURE FISHERIES PRODUCTION

- In the 1970s: FAO forecasted the maximum potential fish harvest to be 80 million tones.
- The global marine fish catch production peaked in 1996 at 74.7 million tones.
- Since mid-1990s and throughout the 2000s: Several studies have predicted the rapid decline of marine fisheries worldwide.
- Paradoxically, the total global capture statistics collated by FAO prompts a word that has very rarely been used to describe catch trends: stability.



# How is the situation in fisheries understood and reported?

- Dependent on the development of the SUSTAINABILITY concept and understanding of the limits to acceptable ecosystem effects ("footprints") caused by fisheries.
- How the development in fisheries is understood also depends on the conflicting definitions that different stakeholders gives the sustainability concept and what is considered to be the acceptable footprints made by the fisheries and aquaculture.



# **CONFLICTING AGENDAS on ocean governance and sustainability:**

- A. Management for use: seafood from sustainable harvesting of living marine resources**
- B. Management for protection and conservation: eventually with little or no room – even for sustainable fisheries – with some stakeholders constantly misinterpreting facts and spreading false information**

**SOME EXAMPLES:**



# HEADLINES/ FALSE MESSAGES TO THE PUBLIC:

- "Most fish stocks are depleted or overfished"
- "Fisheries management has failed"
- "Marine protected areas is the only solution"
- "All commercial fish stocks will be gone in 2048"
- "Most large pelagic stocks depleted in the 1980s"



....and more....

## Impacts of Biodiversity Loss on Ocean Ecosystem Services

Boris Worm, *et al. Science* 314, (2006)

Human-dominated marine ecosystems are experiencing accelerating loss of populations and species, with largely unknown consequences.

We conclude that marine biodiversity loss is increasingly impairing the ocean's capacity to provide food, maintain water quality, and recover from perturbations.



## Rebuilding Global Fisheries

Boris Worm & Ray Hilborn *et al. Science* 325, (2009)

After a long history of overexploitation, increasing efforts to restore marine ecosystems and rebuild fisheries are under way.

In 5 of 10 well-studied ecosystems, the average exploitation rate has recently declined and is now at or below the rate predicted to achieve maximum sustainable yield for seven systems.

# One Fish, Two Fish, False-ish, True-ish

New York Times. May 1, 2011

The work led by Dr. Branch is another salvo in a scientific dispute — feud might be a better word — that pits Dr. Branch and his co-author Ray Hilborn at the University of Washington's School of Aquatic and Fisheries Sciences and their allies against scientists at the University of British Columbia and their partisans.

<http://green.blogs.nytimes.com/2011/05/01/one-fish-two-fish-false-ish-true-ish/?ref=science>



# Different interpretations of the FAO/SOFIA-report:

## GLOBAL STATUS OF FISH STOCKS:

- 15% underexploited or moderately exploited
  - 53% fully exploited
  - 32% overexploited, depleted or recovering
- 
- From a fisheries management perspective: 68% of world fisheries are sustainable
  - From a NGO (“protection”) perspective: 85% of world fisheries in crisis/ not sustainable





# Seafood WATCH

## BEST CHOICES

Arctic Char (farmed)  
 Barramundi (US farmed)  
 Catfish (US farmed)  
 Clams (farmed)  
 Cod: Pacific (Alaska longline)<sup>+</sup>  
 Crab: Dungeness, Stone  
 Halibut: Pacific<sup>+</sup>  
 Lobster: Spiny (US)  
 Mussels (farmed)  
 Oysters (farmed)  
 Pollock (Alaska wild)<sup>+</sup>  
 Salmon (Alaska wild)<sup>+</sup>  
 Scallops: Bay (farmed)  
 Striped Bass (farmed or wild\*)  
 Sturgeon, Caviar (farmed)  
 Tilapia (US farmed)  
 Trout: Rainbow (farmed)  
 Tuna: Albacore (US<sup>+</sup>, British Columbia troll/pole)  
 Tuna: Skipjack (troll/pole)

## GOOD ALTERNATIVES

Basa, Swai (farmed)  
 Clams (wild)  
 Cod: Pacific (trawled)  
 Crab: Blue\*, King (US), Snow  
 Crab: Imitation/Surimi  
 Flounders, Soles (Pacific)  
 Herring: Atlantic/Sardines  
 Lobster: American/Maine  
 Mahi mahi/Dolphinfish (US)  
 Oysters (wild)\*  
 Scallops: Sea  
 Shrimp (US farmed or wild)  
 Squid  
 Swordfish (US longline)\*  
 Tuna: Bigeye, Yellowfin (troll/pole)  
 Tuna: canned light, canned white/Albacore\*

## AVOID

Chilean Seabass/Toothfish\*  
 Cod: Atlantic  
 Crab: King (imported)  
 Flounders, Soles (Atlantic)  
 Groupers\*  
 Halibut: Atlantic  
 Lobster: Spiny (Caribbean imported)  
 Mahi mahi/Dolphinfish (imported)  
 Marlin: Blue\*, Striped\*  
 Monkfish  
 Orange Roughy\*  
 Rockfish (Pacific)  
 Salmon (farmed, including Atlantic)\*  
 Sharks\*  
 Shrimp (imported farmed or wild)  
 Snapper: Red  
 Sturgeon\*, Caviar (imported wild)  
 Swordfish (imported)\*  
 Tuna: Albacore, Bigeye, Yellowfin (longline)\*  
 Tuna: Bluefin\*

## Support Ocean-Friendly Seafood

**Best Choices** are abundant, well-managed and caught or farmed in environmentally friendly ways.

**Good Alternatives** are an option, but there are concerns with how they're caught or farmed—or with the health of their habitat due to other human impacts.

**Avoid** for now as these items are caught or farmed in ways that harm other marine life or the environment.

### Key

- \* Limit consumption due to concerns about mercury or other contaminants. Visit [www.edf.org/seafood](http://www.edf.org/seafood)
- + Some or all of this fishery is certified as sustainable to the Marine Stewardship Council standard. Visit [www.msc.org](http://www.msc.org)

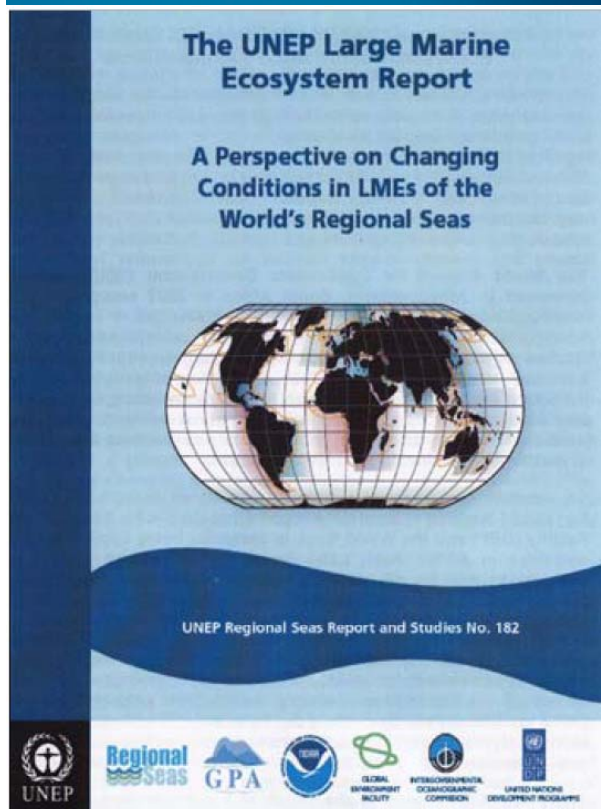
Seafood may appear in more than one column



2009

## The UNEP Large Marine Ecosystem Report: A perspective on changing conditions in LMEs of the world's Regional Seas.

UNEP Regional Seas Report and Studies No. 182. United Nations Environment Programme. Nairobi, Kenya.



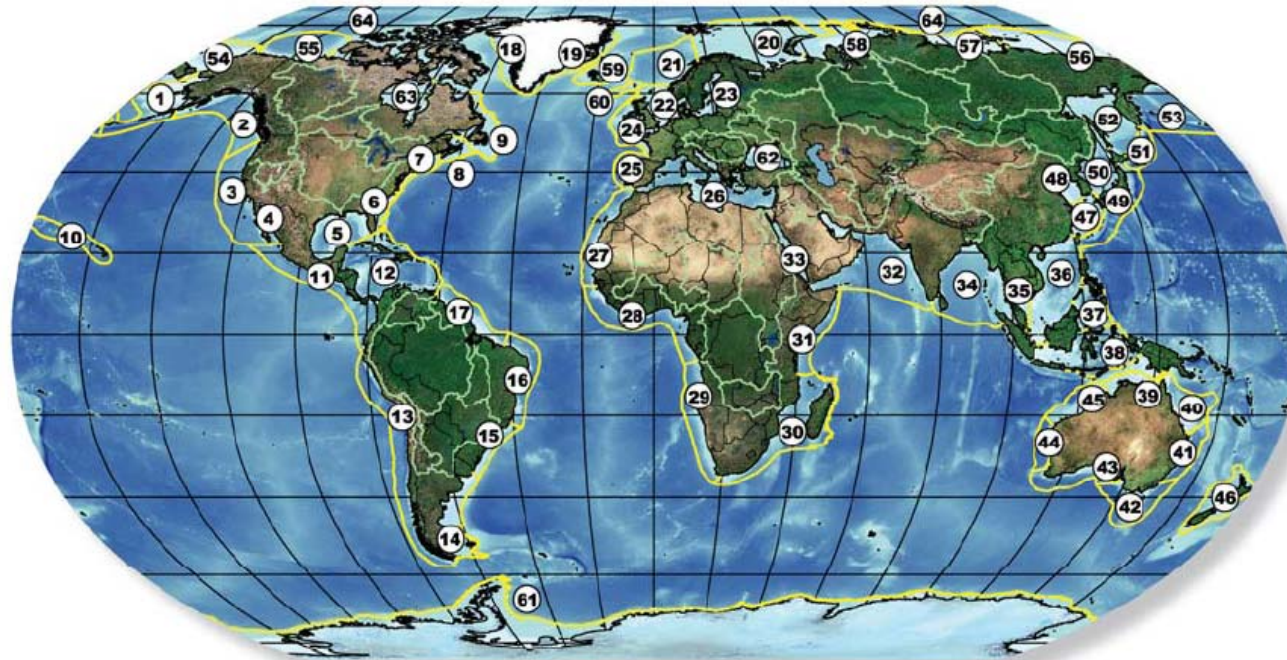
LINK:

[http://www.lme.noaa.gov/index.php?option=com\\_content&view=article&id=178:unep-lme-report&catid=39:reports&Itemid=62](http://www.lme.noaa.gov/index.php?option=com_content&view=article&id=178:unep-lme-report&catid=39:reports&Itemid=62)

[Download](#) the full UNEP LME Report. 872 pages, 100Mb.



# Large Marine Ecosystems of the World and Linked Watersheds

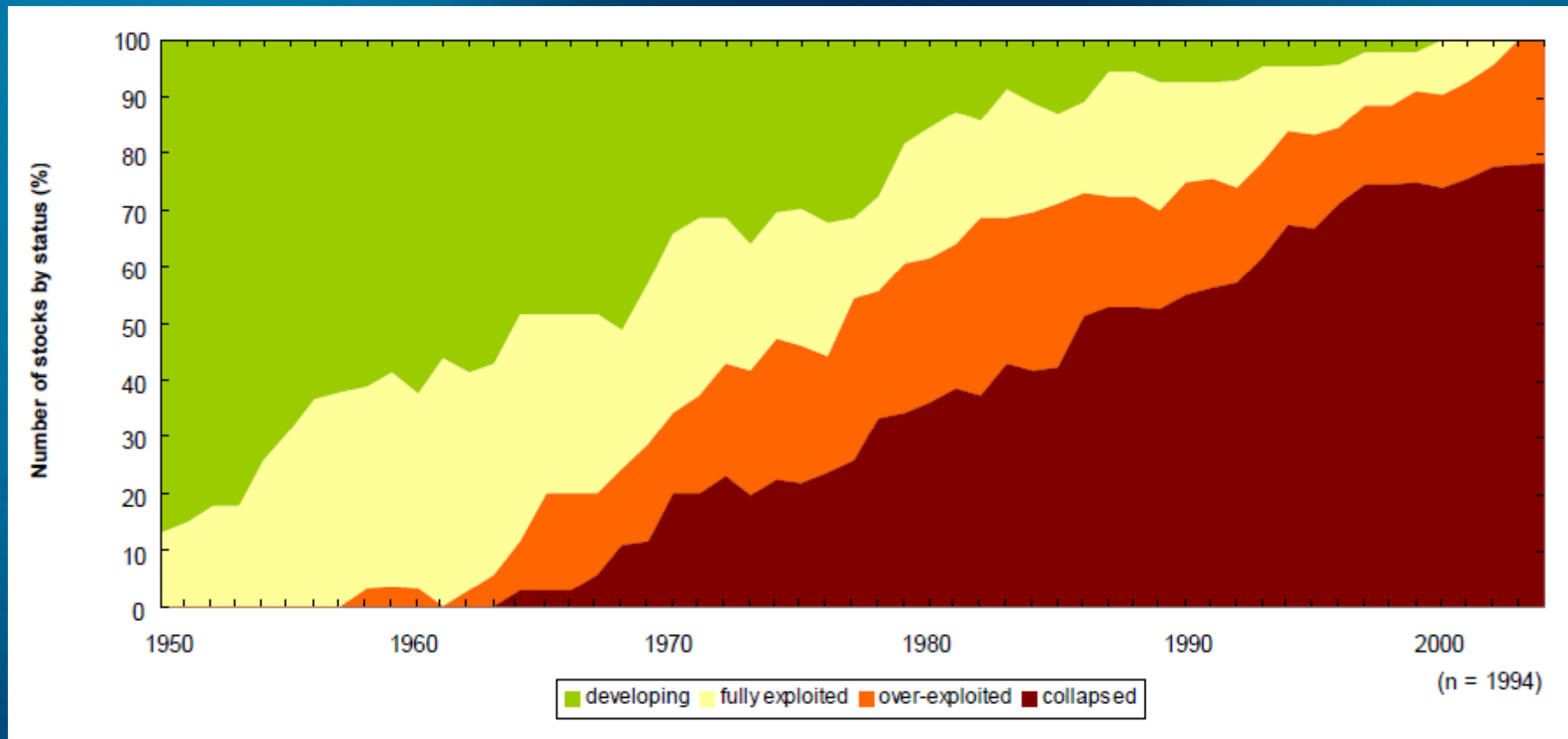


- |                                     |                         |                           |  |                      |                  |
|-------------------------------------|-------------------------|---------------------------|--|----------------------|------------------|
| 1 East Bering Sea                   | 13 Humboldt Current     | 25 Iberian Coastal        | 37 Sulu-Celebes Sea                                  | 48 Yellow Sea        | 60 Faroe Plateau |
| 2 Gulf of Alaska                    | 14 Patagonian Shelf     | 26 Mediterranean Sea      | 38 Indonesian Sea                                    | 49 Kuroshio Current  | 61 Antarctic     |
| 3 California Current                | 15 South Brazil Shelf   | 27 Canary Current         | 39 North Australian Shelf                            | 50 Sea of Japan      | 62 Black Sea     |
| 4 Gulf of California                | 16 East Brazil Shelf    | 28 Guinea Current         | 40 Northeast Australian Shelf-<br>Great Barrier Reef | 51 Oyashio Current   | 63 Hudson Bay    |
| 5 Gulf of Mexico                    | 17 North Brazil Shelf   | 29 Benguela Current       | 41 East-Central Australian Shelf                     | 52 Okhotsk Sea       | 64 Arctic Ocean  |
| 6 Southeast U.S. Continental Shelf  | 18 West Greenland Shelf | 30 Agulhas Current        | 42 Southeast Australian Shelf                        | 53 West Bering Sea   |                  |
| 7 Northeast U.S. Continental Shelf  | 19 East Greenland Shelf | 31 Somali Coastal Current | 43 Southwest Australian Shelf                        | 54 Chukchi Sea       |                  |
| 8 Scotian Shelf                     | 20 Barents Sea          | 32 Arabian Sea            | 44 West-Central Australian Shelf                     | 55 Beaufort Sea      |                  |
| 9 Newfoundland-Labrador Shelf       | 21 Norwegian Shelf      | 33 Red Sea                | 45 Northwest Australian Shelf                        | 56 East Siberian Sea |                  |
| 10 Insular Pacific-Hawaiian         | 22 North Sea            | 34 Bay of Bengal          | 46 New Zealand Shelf                                 | 57 Laptev Sea        |                  |
| 11 Pacific Central-American Coastal | 23 Baltic Sea           | 35 Gulf of Thailand       | 47 East China Sea                                    | 58 Kara Sea          |                  |
| 12 Caribbean Sea                    | 24 Celtic-Diszay Shelf  | 36 South China Sea        |  | 59 Iceland Shelf     |                  |

**Figure 10B. Map of the 64 Large Marine Ecosystems of the world and their linked watersheds (Sherman et al. 2004).**



# THE UNEP LARGE MARINE ECOSYSTEMS REPORT XIII North East Atlantic. 36. Barents Sea LME



The Stock-Catch Status Plots indicate that the number of collapsed stocks has been rapidly increasing, to about 80% of the commercially exploited stocks, with the remainder classed as overexploited (Figure XIII-36.8, top).



# UNEP / IMR

- *It was agreed that the disclosed poor quality of (at least) parts of the “UNEP-LME report” can only be fully mitigated by a complete revision of the report. It must be considered further if such a revision is feasible. A possible alternative could be a number of reports with regional scope.*
- *The “UNEP-LME report” will be removed from the UNEP web site:*
  - **The UNEP Report has been temporarily removed for revisions. It will be made available for download again in early 2011.**

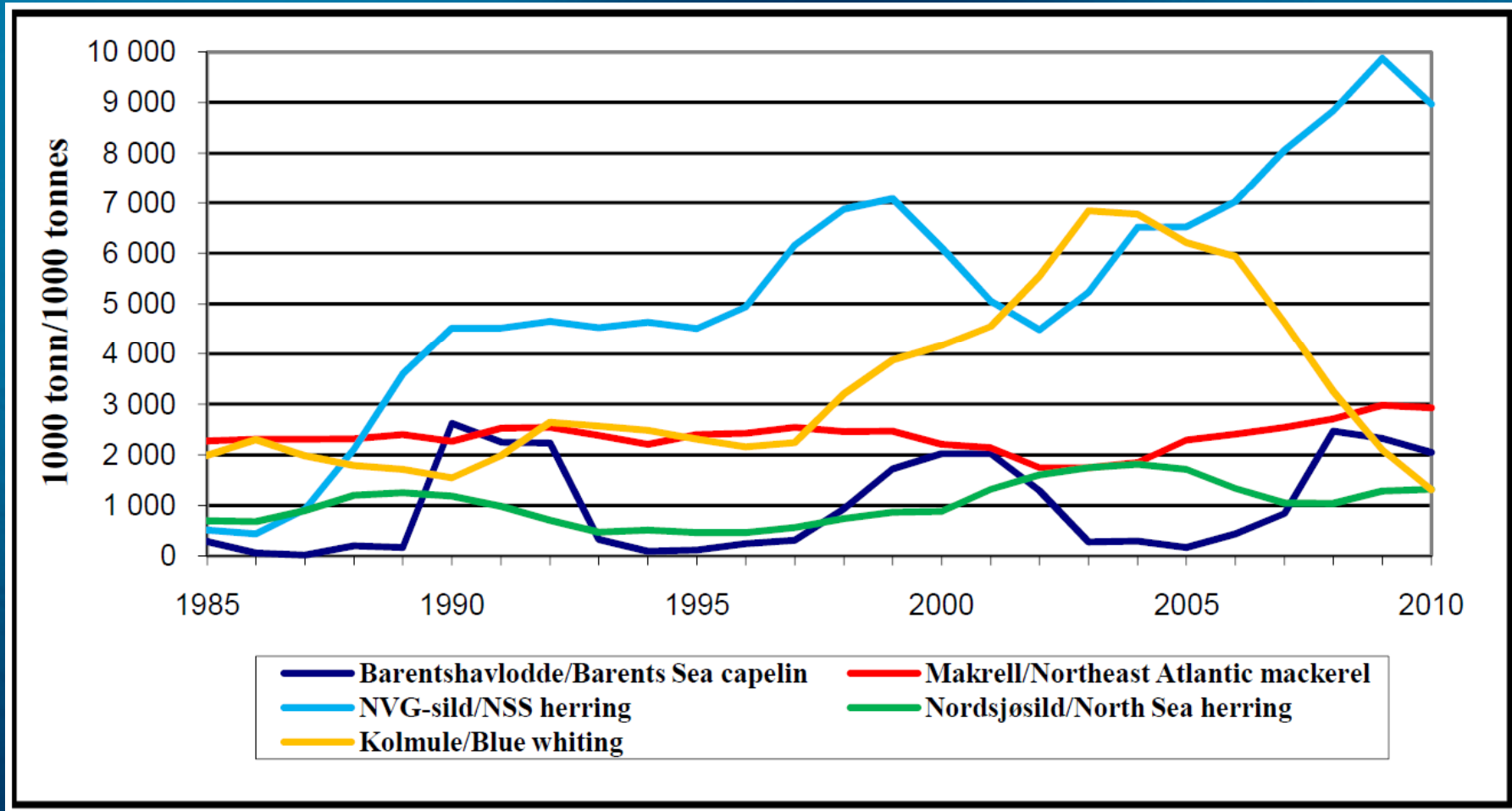


# North Atlantic: The development of some major NE-Atlantic fish stocks

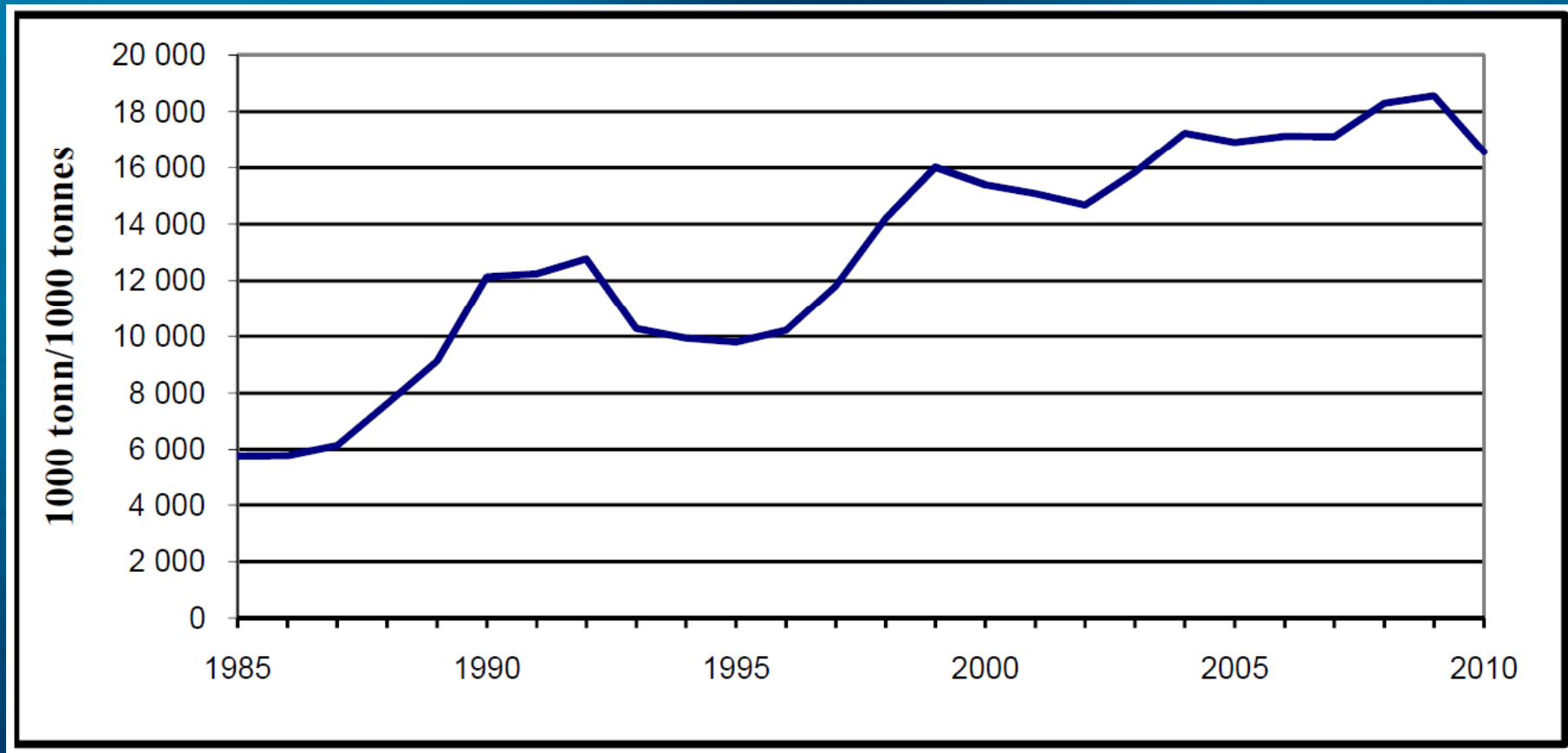
The development in the North East-Atlantic of major fish stocks and fisheries during the period of establishment sustainable fisheries management systems (1985 →)



# Spawning stock development of important pelagic species 1985 – 2010 (1000 tones)

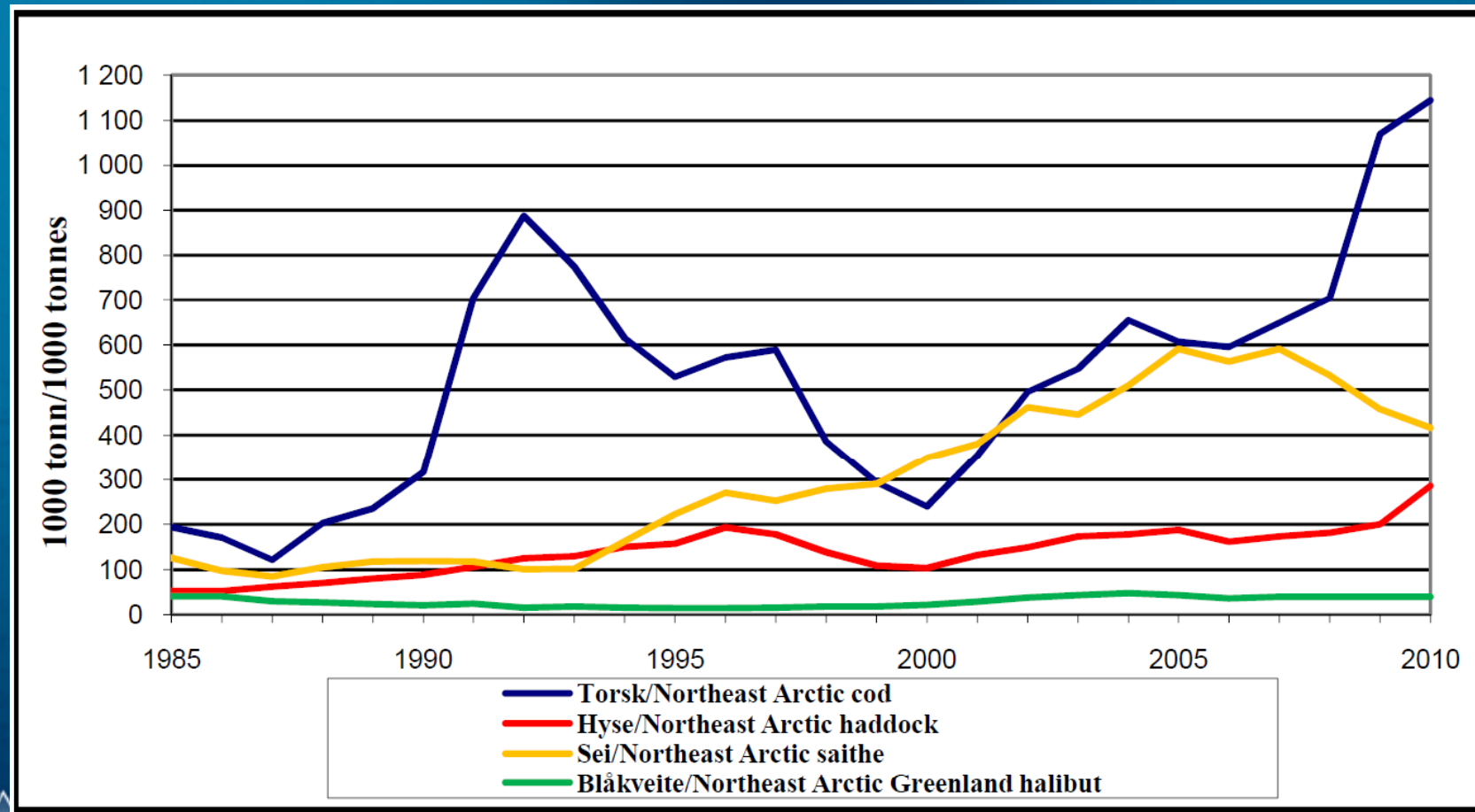


# Aggregated spawning stock development of important pelagic species 1985 – 2010 (1000 tonnes)

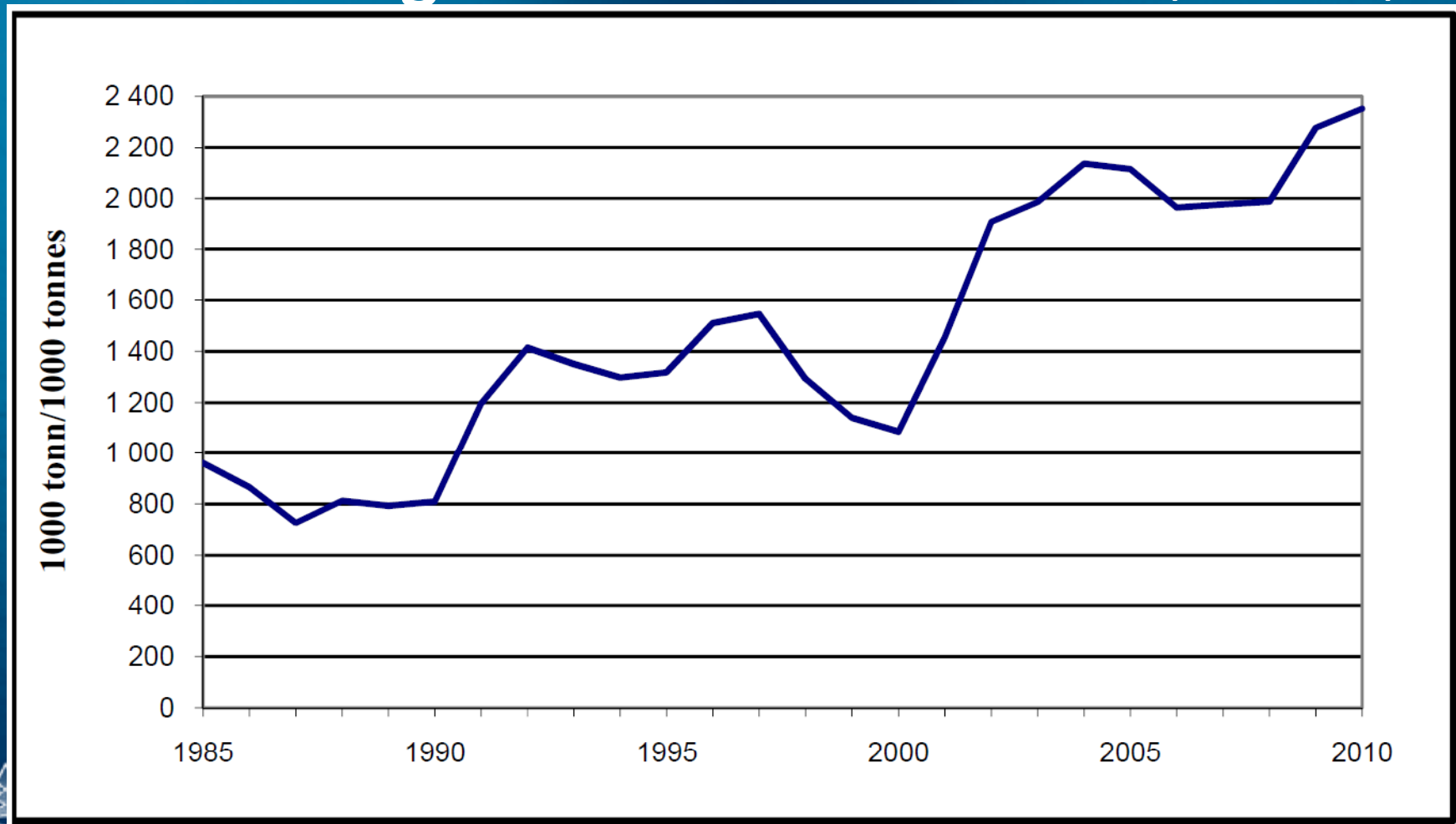




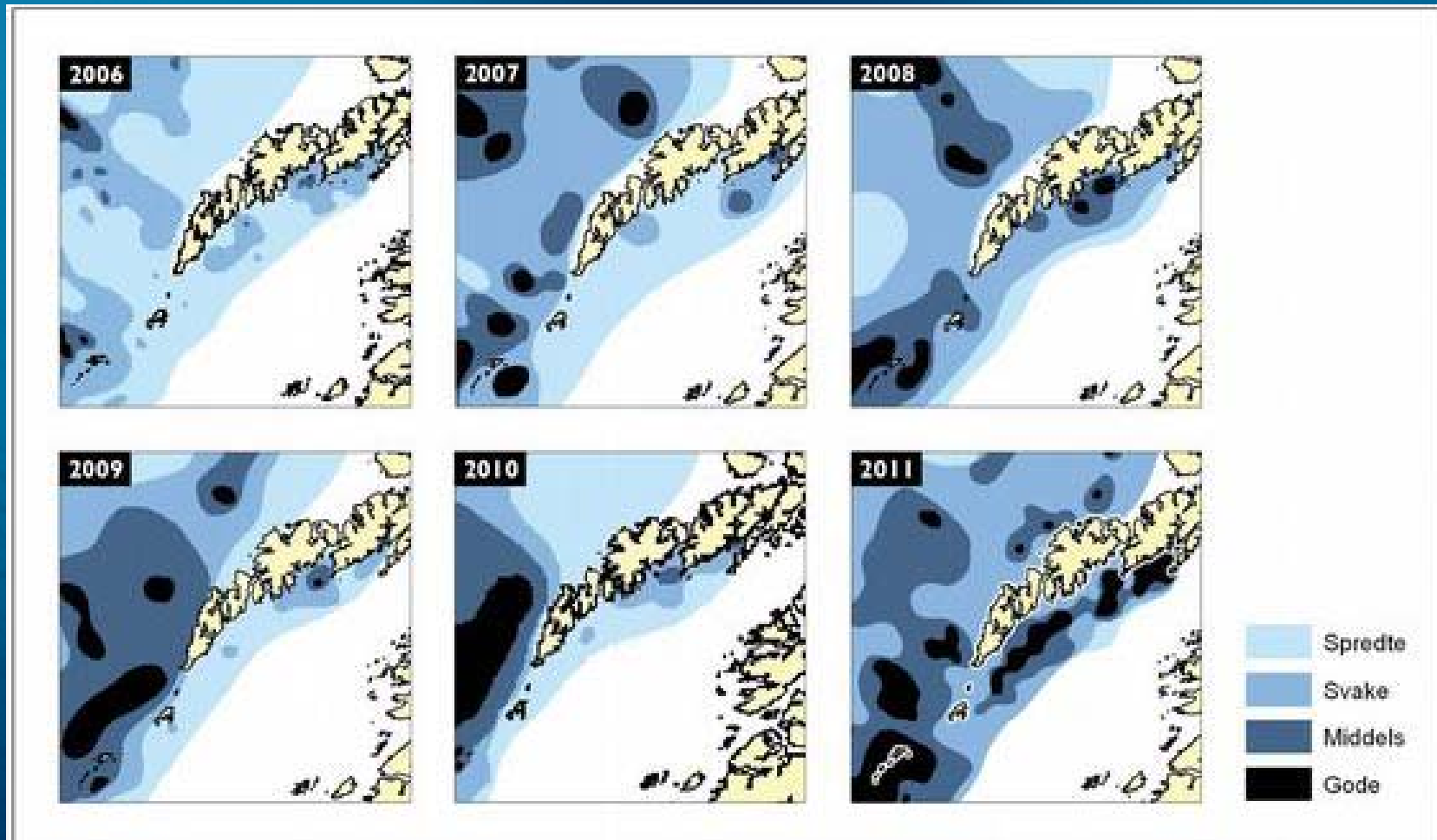
# Spawning stock development of important ground fish species in The Barents and Norwegian Sea 1985 – 2010 (1000 tonnes)



# Aggregated spawning stock development of important ground fish species in The Barents- and Norwegian Seas 1985 – 2010 (1000 tonnes)



# ”SKREI” in Lofoten 2006 - 2011



# TRUE OR FALSE MESSAGES?

- After strong criticism of the poor quality of the LME-report – UNEP decided to withdraw part of the report (fall- 2010).
- BUT: In an IUCN-report (published in February 2011):
  - “In the case of the **Barents Sea LME**, there is a **decreasing biomass trend attributed** to the over-exploited condition of many fish stocks inhabiting the LME”. (IUCN, UNDP, NOAA, Moore Foundation, 248 pp).
- So – the disinformation continues – even against sustainably managed fisheries.



# CONCLUSIONS

- Fisheries: situation is not “black” or “white”
- Sustainable fisheries management works
- Several major fish stocks are rebuilt and harvested sustainably
- Still many stocks to be rebuilt
- Expected stability and slight increase of catches in the North Atlantic
- Stronger effort needed to correct false messages about fisheries – and in the development of a rational concept of the sustainability of marine fisheries





*"I'm not sure what I am, but I believe  
I'm a product of Norway."*





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