
HAVFORSKNINGSINSTITUTTET
INSTITUTE OF MARINE RESEARCH

Drivers of Dynamics of Small Pelagic Fish Resources
Victoria, BC, Canada
March 6 – 11, 2017

Assessment of small pelagic fish populations, - do we cope with it?

Reidar Toresen

HAVFORSKNINGSINSTITUTTET
INSTITUTE OF MARINE RESEARCH

To put this in perspective

In assessments of fish

We are dealing with the basis for management of huge fisheries with big economic interest

The legitimacy of the advice for management is strongly dependent on the quality of what we do

Take this as a reminder of what this really is about

The quality of our work

- from the basic knowledge of the biology of the resources, - abundance estimation, - to assessments

The challenge

- **Ability to update knowledge** of the basic biology (stock definition, reference points, mortality estimates etc.)
- To do **mapping and monitoring with acceptable uncertainty**
- To do estimates of **catch with acceptable uncertainty**
- To transform this knowledge to advice using the data in the best way

Pelagic fish

hardly anything is constant

- Highly dynamic, - variable recruitment
- Highly migratory
- Responsive to environmental forcing
- Often shared between many countries, creates challenges in relation to standardisation of abundance estimation methodology, fishery statistics and sampling

A tale of three stocks
data-rich examples

- Examples of challenges which influence the quality of the assessments

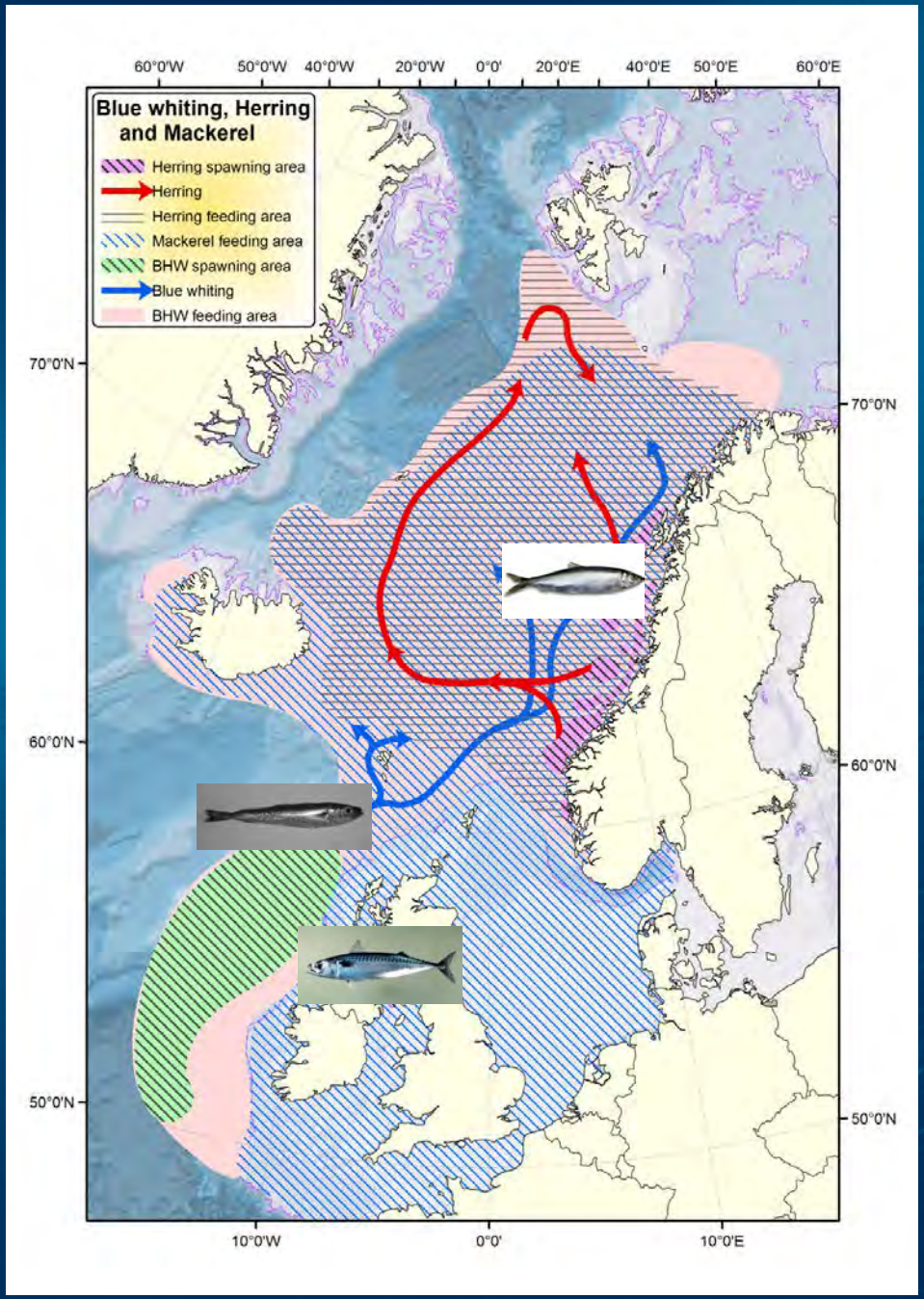
- North East Atlantic Mackerel
- Blue whiting
- Norwegian spring-spawning herring

Three pelagic stocks in the North-East Atlantic

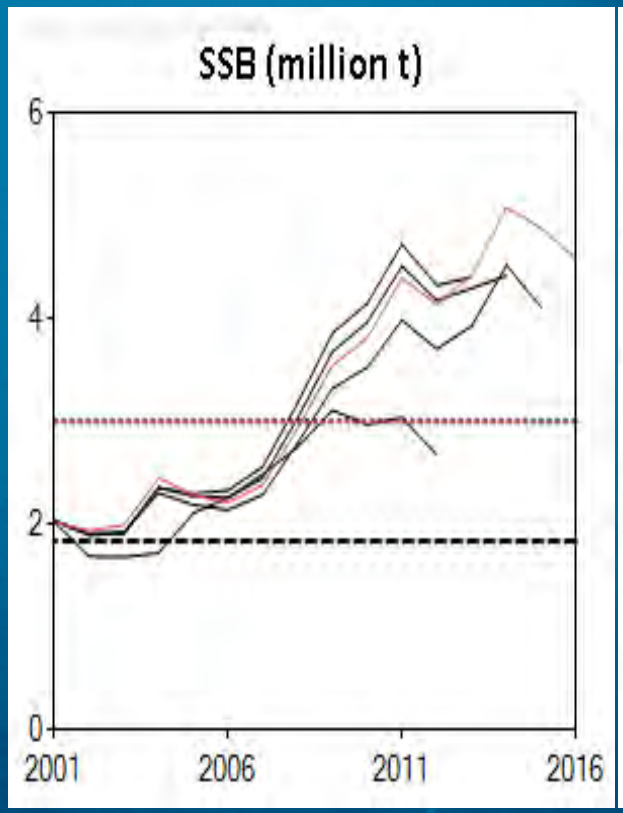
Mackerel
SSB: ~ 5.2 mill t
Going ?

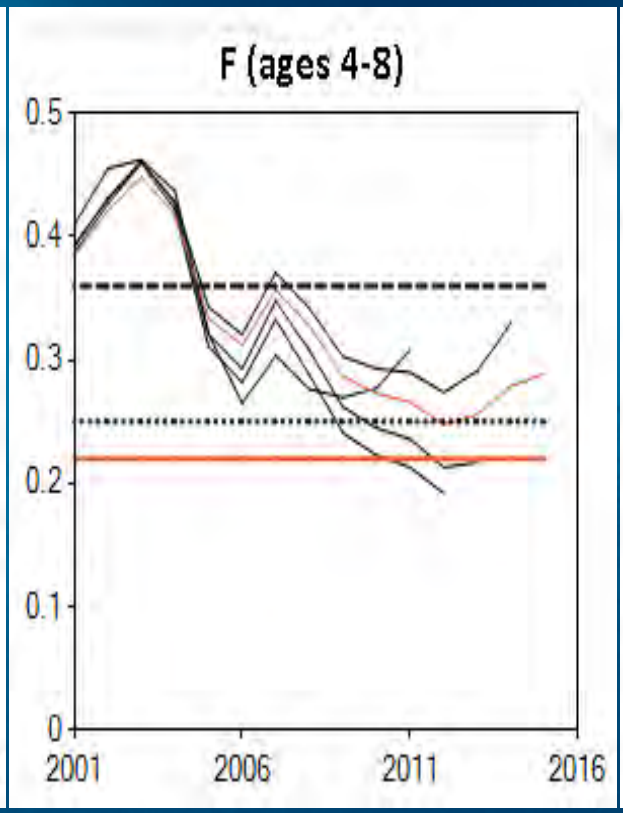
Blue whiting
SSB: ~ 4.9 mill t
Increasing

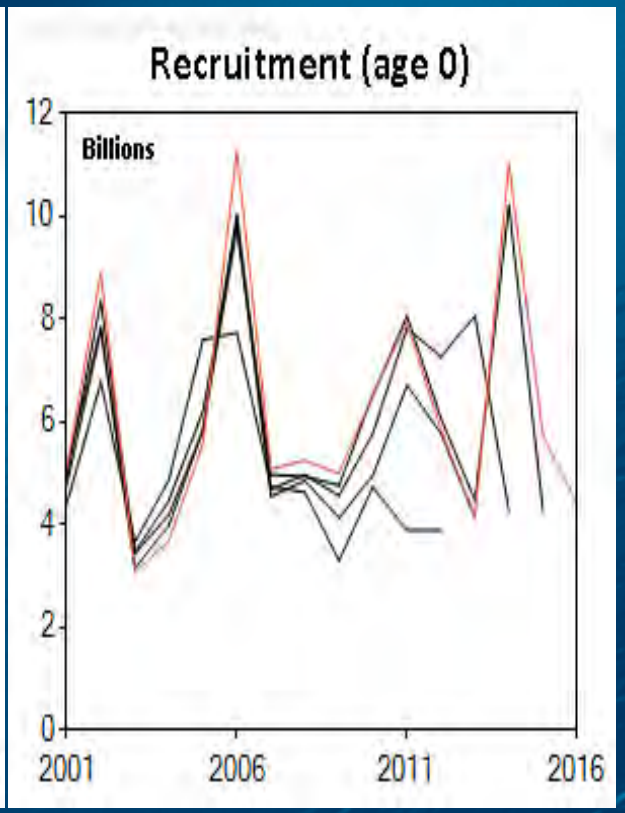
Herring
SSB: ~ 5.3 mill t
Decreasing



Retrospective plot for assessment of NEA mackerel 2016



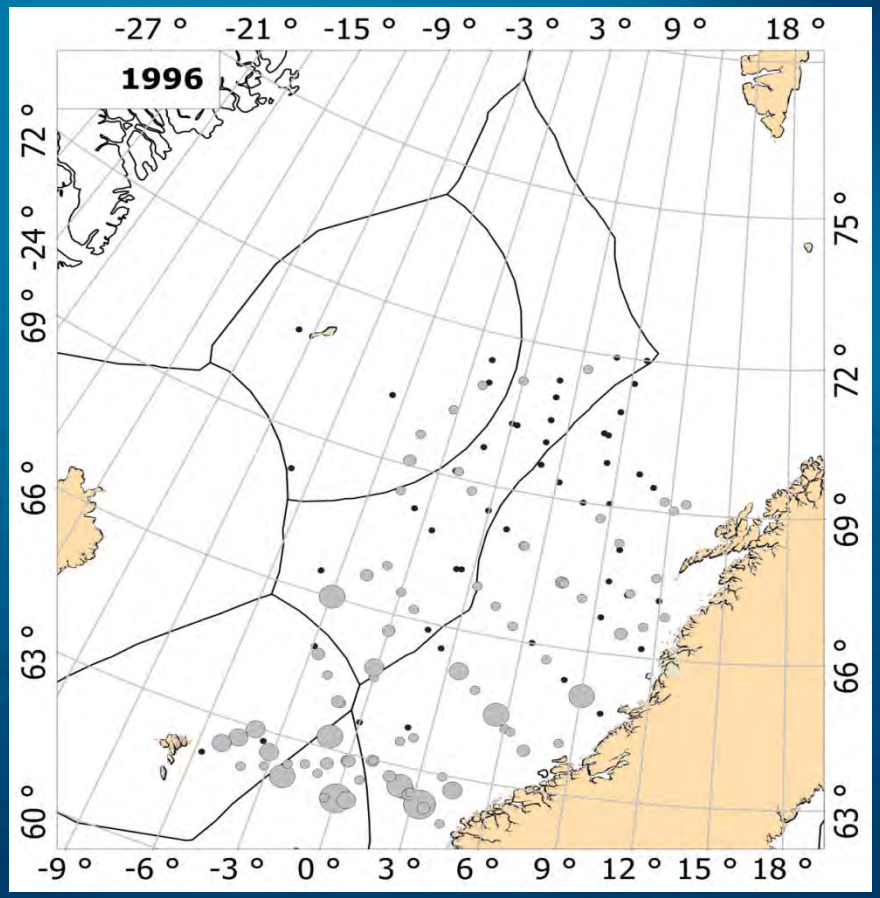


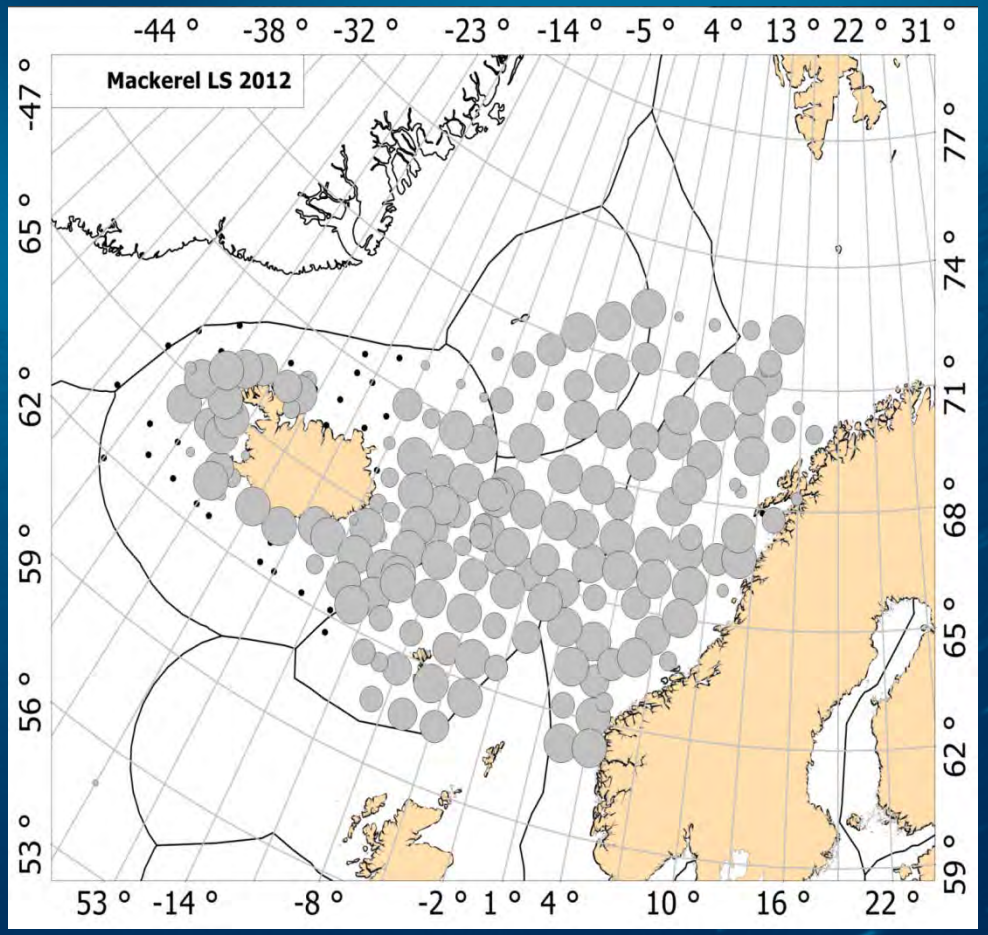


Not very consistent, but a very difficult stock to assess

Mackerel in NE Atlantic

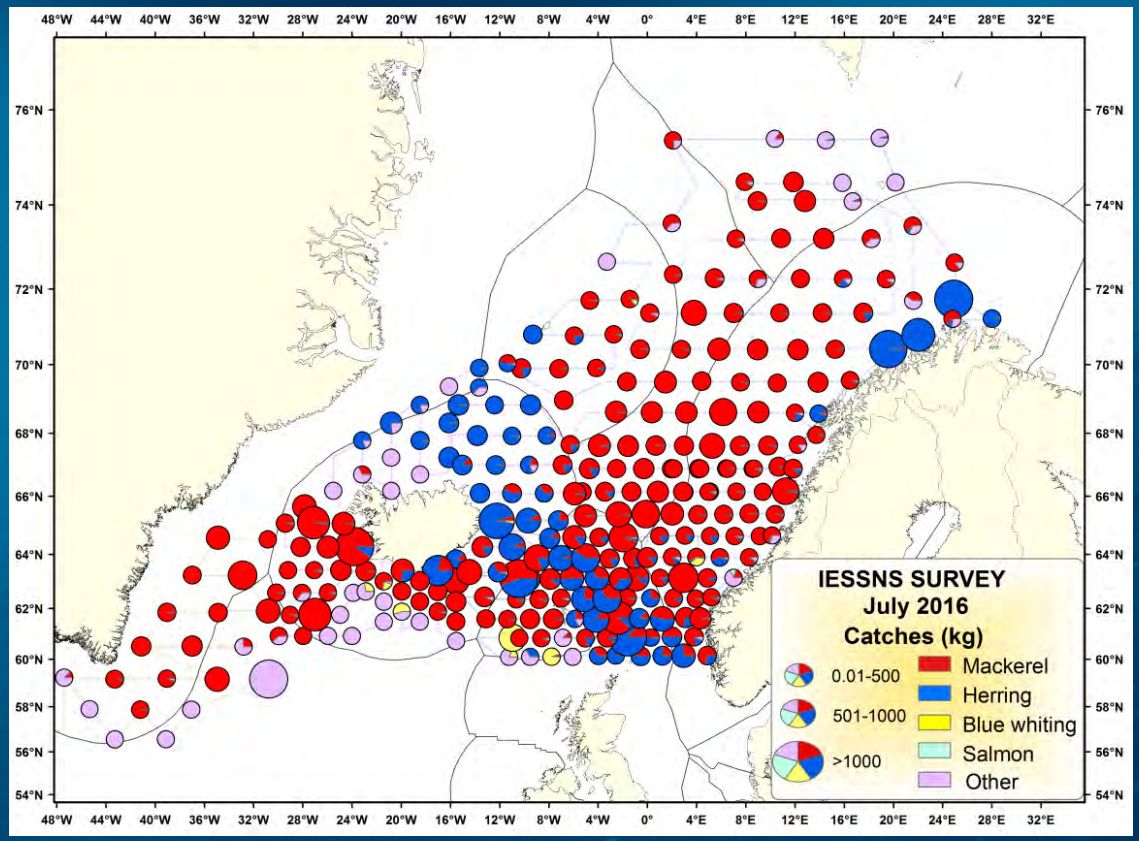
Change in geographical distribution of mackerel, 1996 - 2012





Swept area survey for mackerel, 2016

Mackerel
Herring
Blue whiting
Salmon



Main challenges for mackerel

- Large geographical distribution
- Many countries harvest the stock, - unreliable catch statistics
- Disagreement in abundance estimation methodology – uncomplete coverage

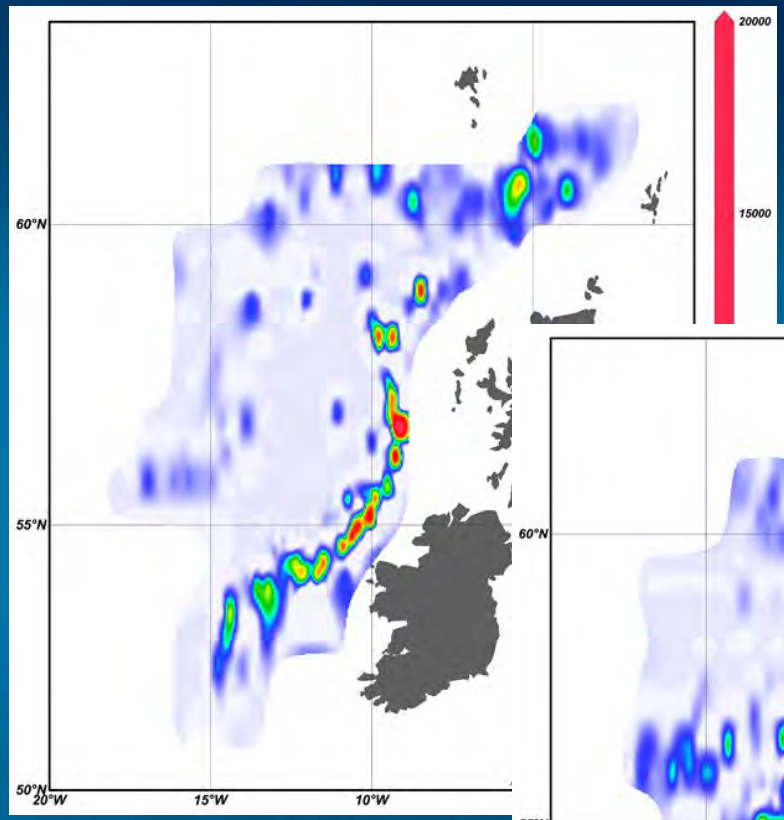
➢ Egg survey

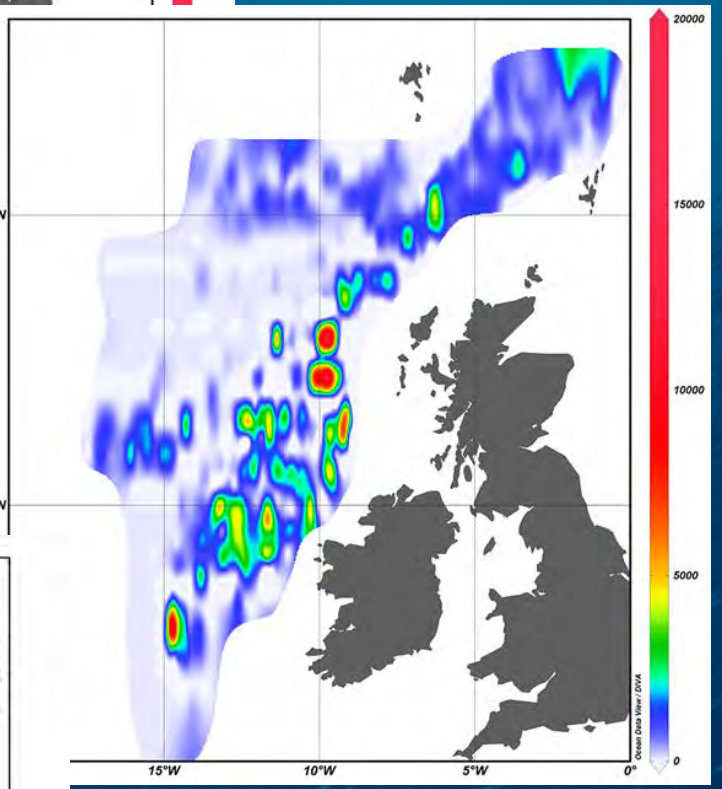
➢ Trawl survey in the Norwegian sea

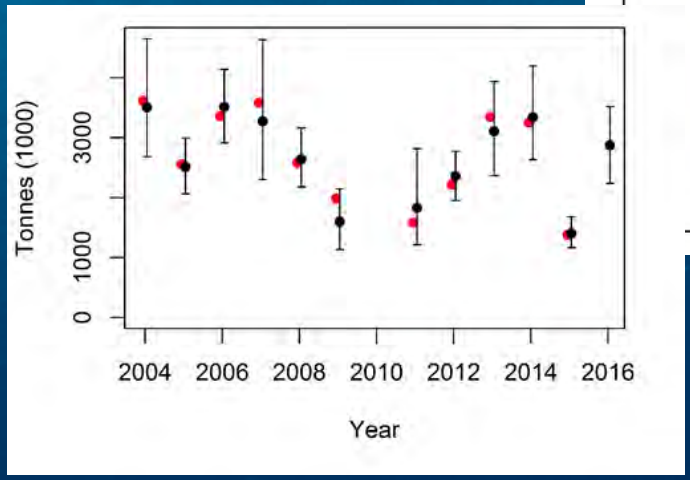
Blue whiting in NE Atlantic

Acoustic abundance estimates on spawning grounds

High concentrations in small areas



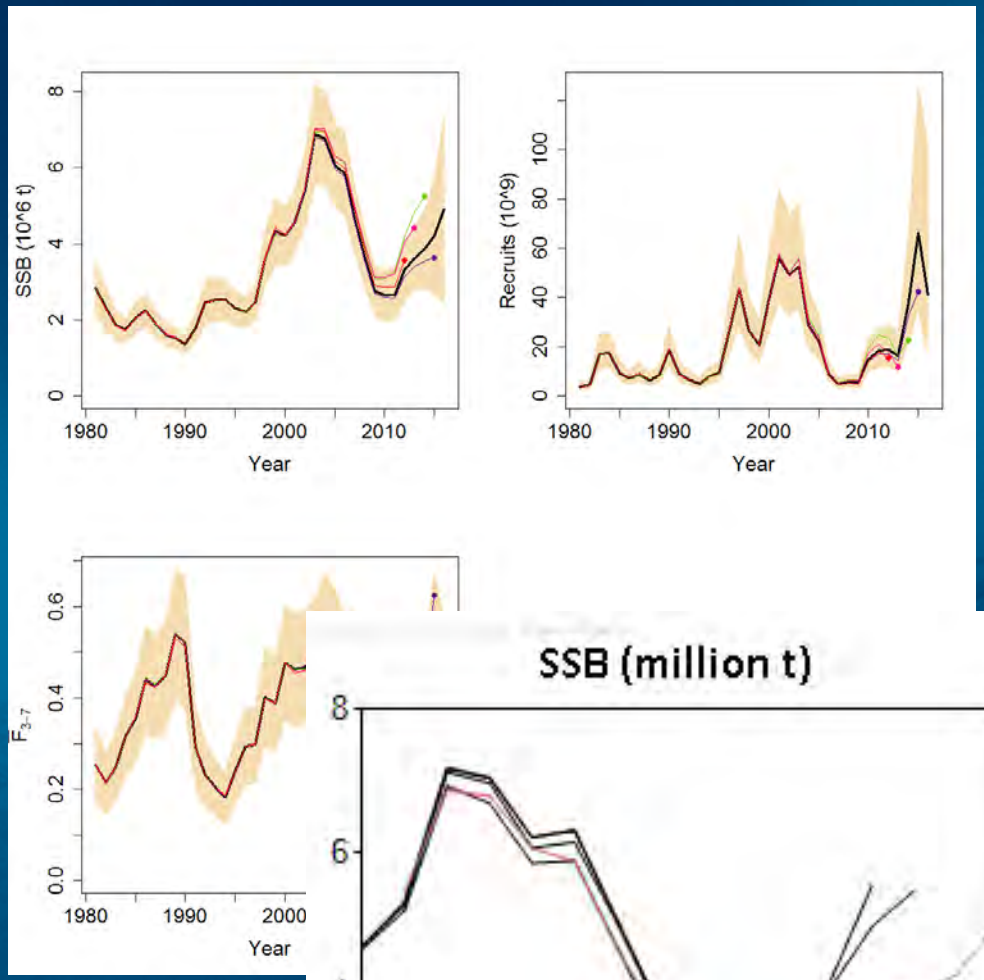




Blue whiting, retrospective runs

Only one acoustic abundance index

Small area of distribution when monitored

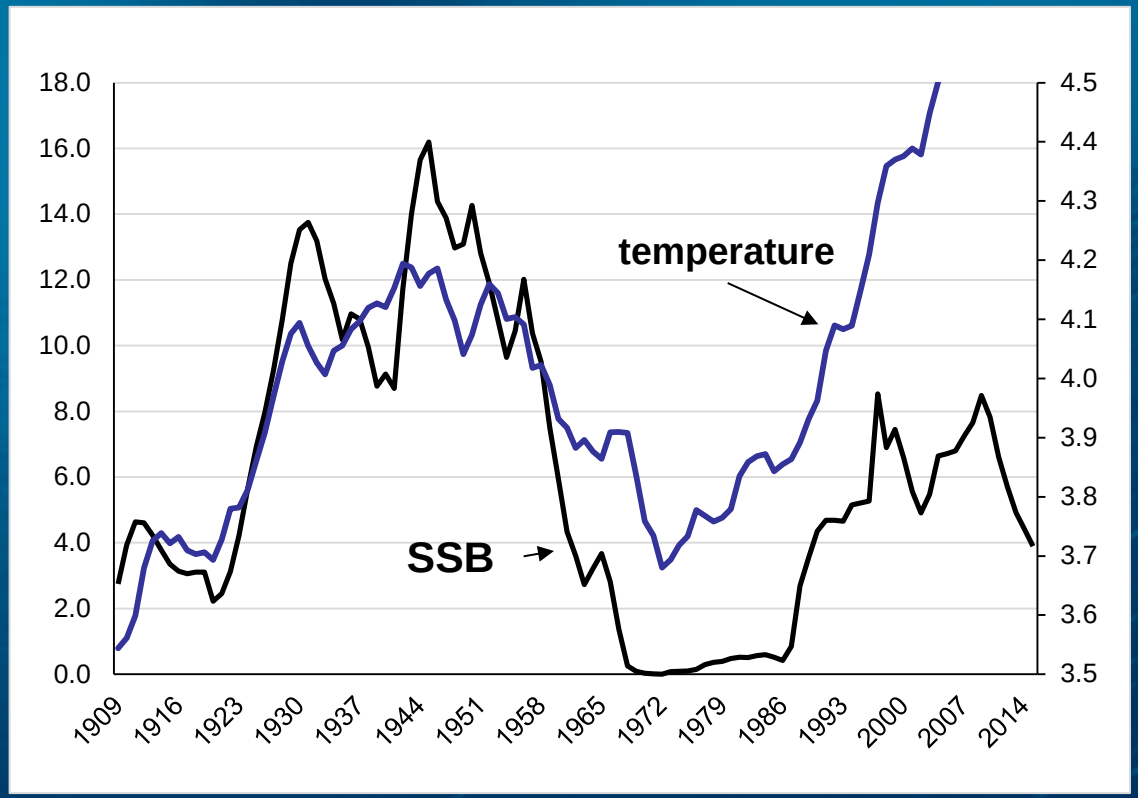


Norwegian spring-spawning herring

Long term variability in SSB

Variability in:

- Abundance
- Recruitment
- Geographical distribution



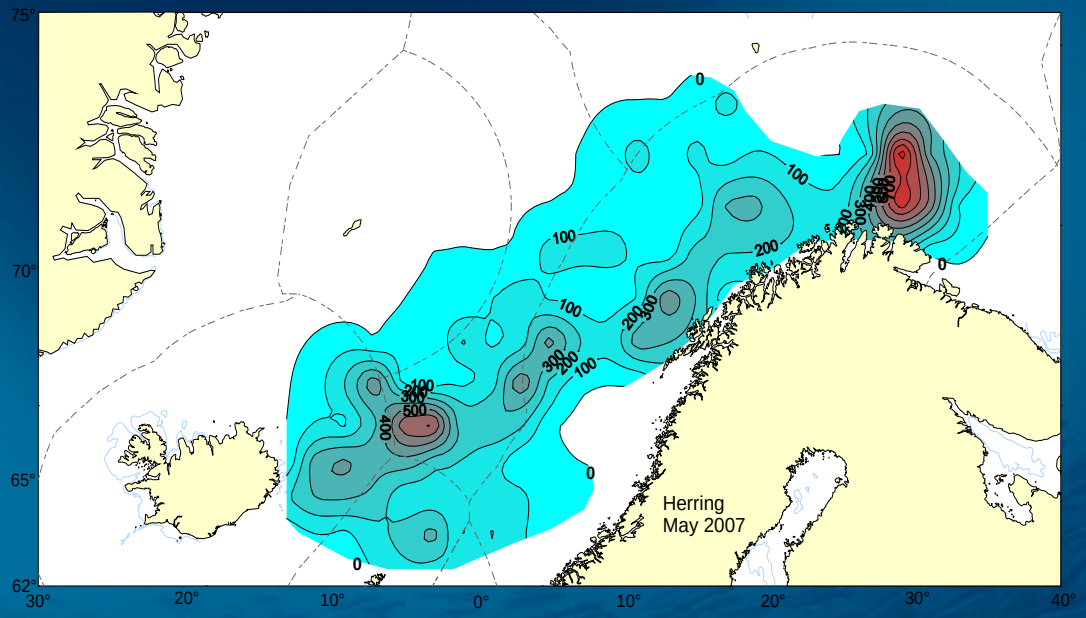
Toresen and Østvedt, Fish and Fisheries, 2000, 1

Norwegian spring-spawners

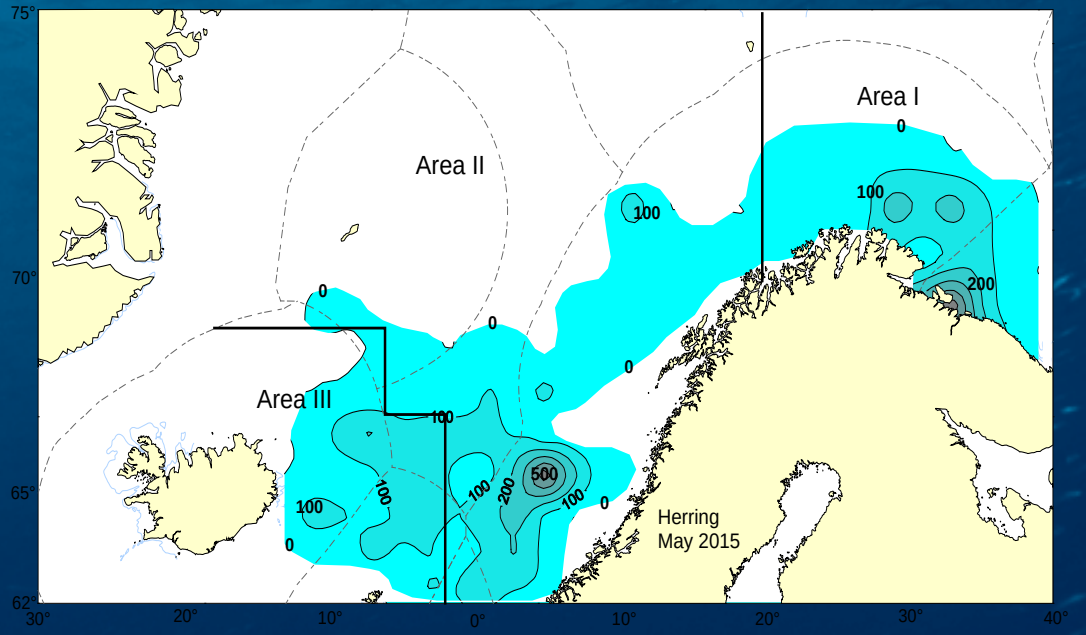
- Oceanic distribution
- Young herring in the Barents Sea
- Feeding in the Norwegian Sea
- Spawning at the coast

Challenging «catching» the whole stock in surveys

2007

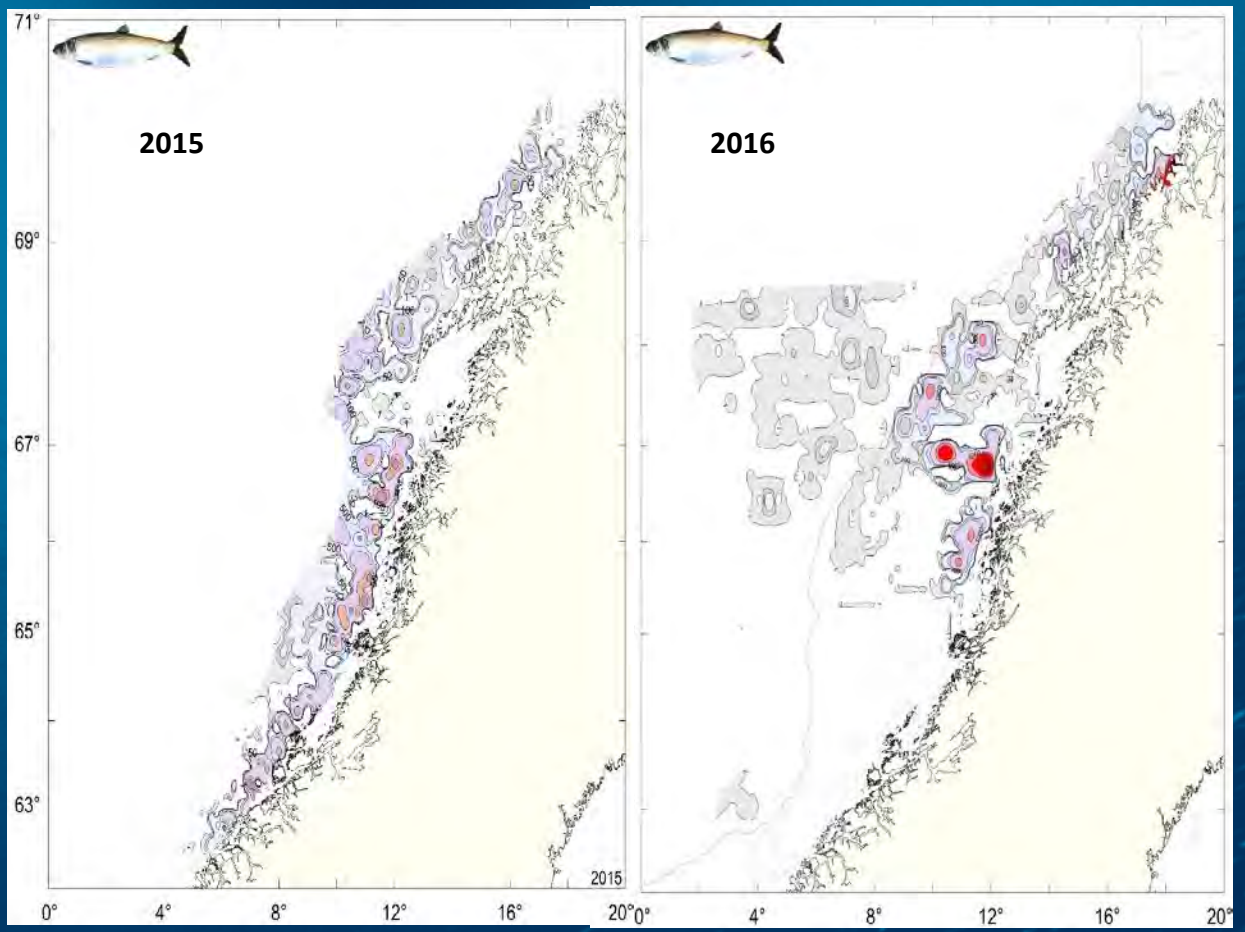


2015



Distribution during the survey on spawning grounds (2015-2016)

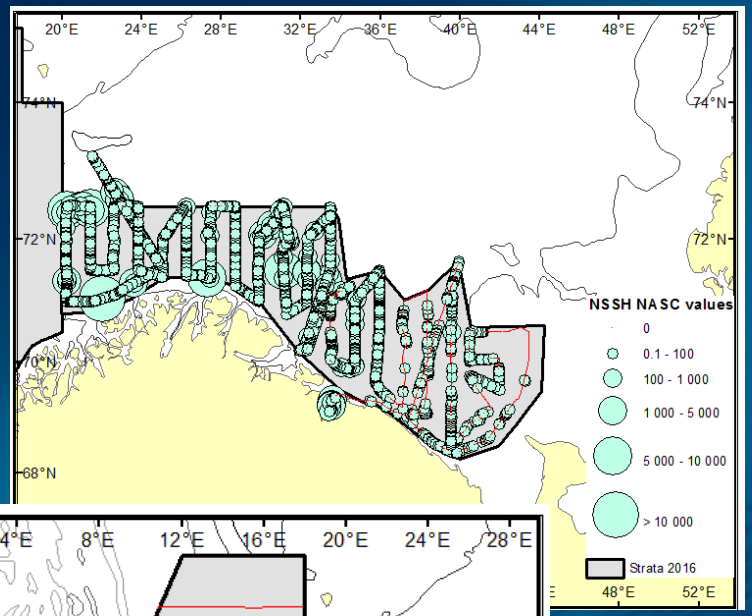
- High density concentrations increase uncertainty
- Dynamic behaviour on the spawning grounds

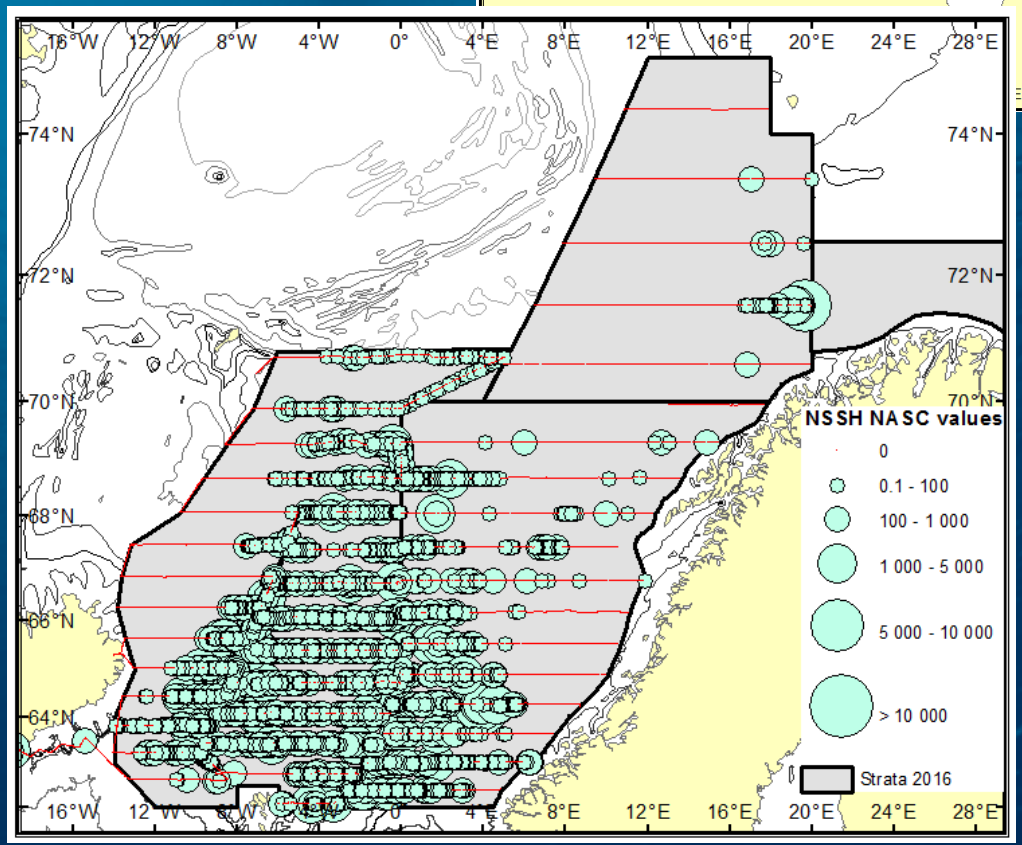


The May/June survey in 2015

Abundance estimate procedures, - StoX

with estimates of variance by boot-strapping of transects and trawl-stations

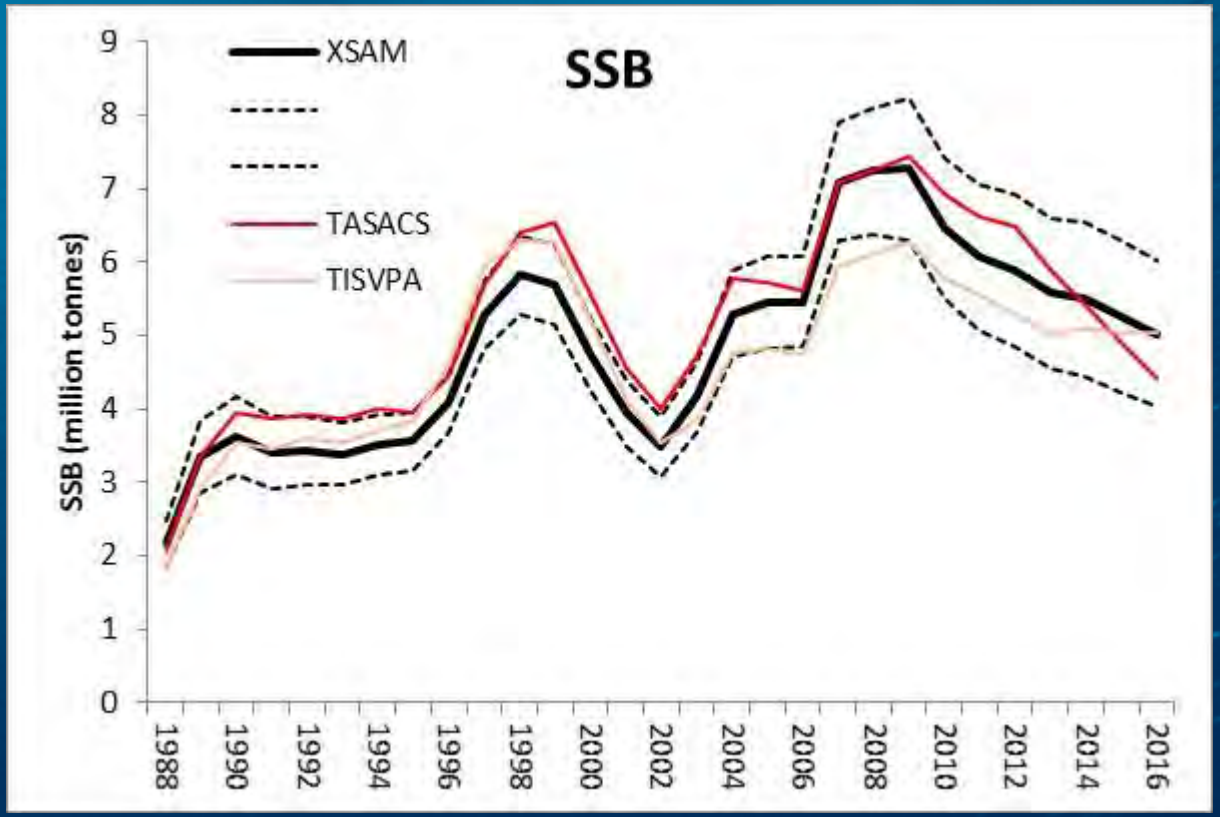




Comparing different assessment methods handling uncertainty in different ways

Tell the story quite similar

XSAM use data with estimates of uncertainty, - also in catch data

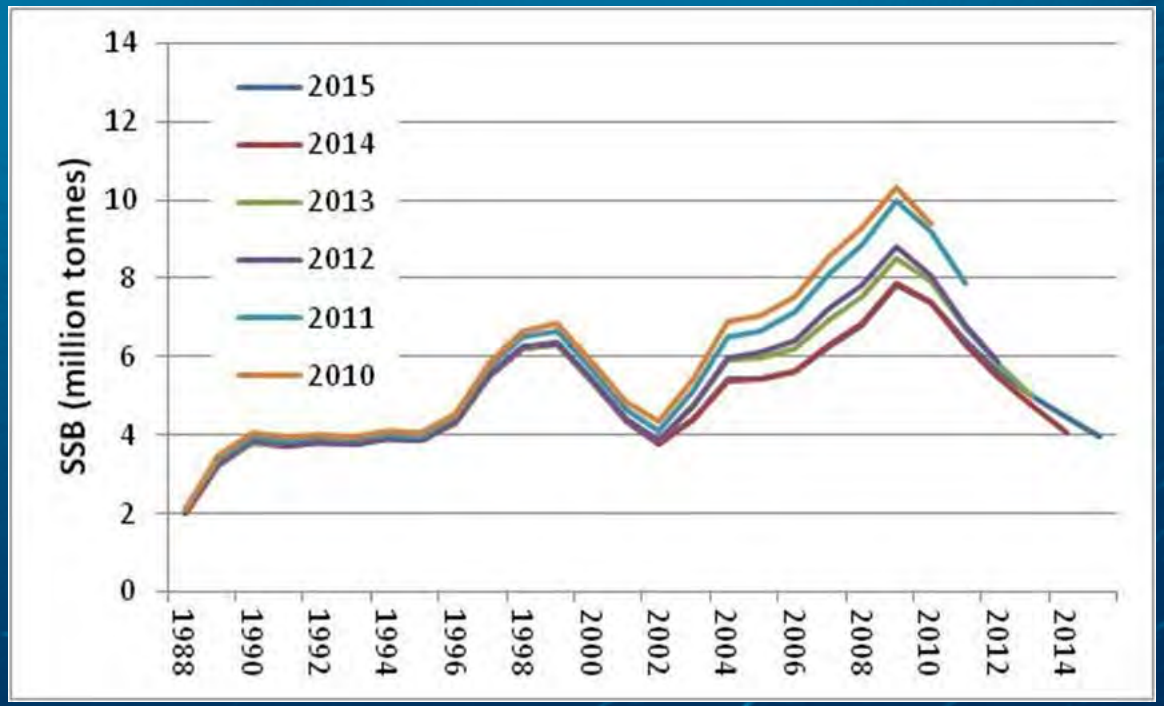


Retrospective plot for Norwegian spring-spawning herring, 2015

Not so bad, but a tendency of a downword revision

Overestimating the young?

Underestimating mortality?



These were data rich, - what about data poor examples?

There are many, - especially in temperate and tropical waters

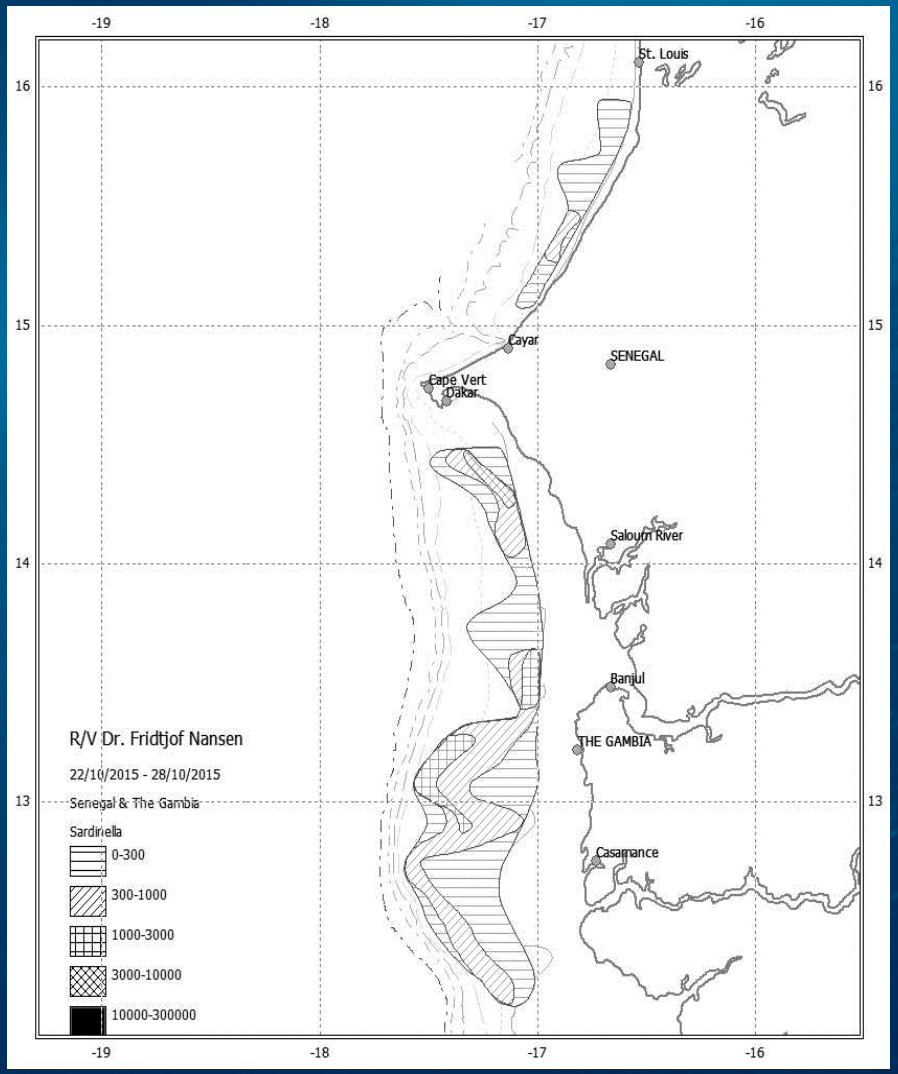
Sardinella off NV Africa

Challenging stock definition

Challenging cohort definition

Acoustic surveys, «Dr Fridtjof Nansen» and «Etaf Deme»

High number of fishing units landing fish at many sites



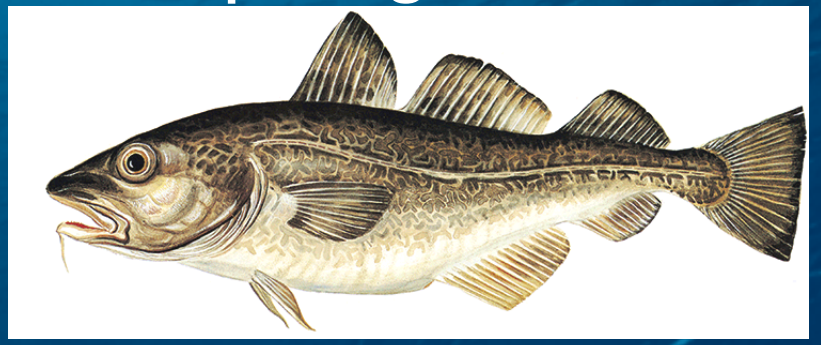
What about environmental data?

- There are few if any examples where ocean temperature data are used directly in assessments

- The relationships are too weak
- The potential use is in the prognosis of recruitment, but our ability to predict environmental development sufficiently is limited

Multispecies interactions

- There are a few examples where information on interaction between pelagic fish and demersal fish contribute to higher quality of assessments of the pelagic fish



- North East Arctic Cod
- Capelin in the Barents Sea

How should we cope?

1. Do basic biological research – for stock definitions and reference points
2. Check data quality before assessments,- internal and external consistency
3. Produce uncertainty estimates for main input data
4. Apply assessment methods that produce diagnostics of input data and results and can handle uncertainty in input data in an objective way
5. If you have poor data another more sophisticated method will probably not save you
6. Address the reasons for retrospective patterns

Thank you!

Photo: T. de Lange Wenneck