ICES ecosystem approach to fisheries management

Ecosystem Dynamics and Optimal Long-term Harvest in the Barents Sea Fisheries
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Poul Degnbol
ICES

Trailer

- Why an ecosystem approach
- Knowledge base for EA – the role of advice
- Advice under complexity and uncertainty
- Implementation principles
- How to get there
- Conclusions

Why an ecosystem approach?

International guidance - WSSD

WSSD Implementation Plan (UN 2002) - actions are required at all levels to

- '*Encourage the application by 2010 of the ecosystem approach, noting the Reykjavik Declaration on Responsible Fisheries in the Marine Ecosystem and decision 5/6 of the Conference of Parties to the Convention on Biological Diversity;'*

International guidance - CBD

Decision 5/6 (Convention on Biological Diversity 2000) - an ecosystem approach is

- '*a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Thus, the application of the ecosystem approach will help to reach the three objectives of the Convention: conservation; sustainable use; and the fair and equitable sharing of the benefits arising out of the utilisation of generic resources.' And 'It recognises that humans, with their cultural diversity, are an integral component of many ecosystems.*'

EA objectives

- Sustainable development – a long term use perspective
  - Conservation
  - Sustainable use
    - Utility value – provide long term societal benefits
    - Requires that productivity of marine resources are maintained
  - Fair and equitable access to benefits
- Humans are integrated components of ecosystems

Knowledge base for an ecosystem approach

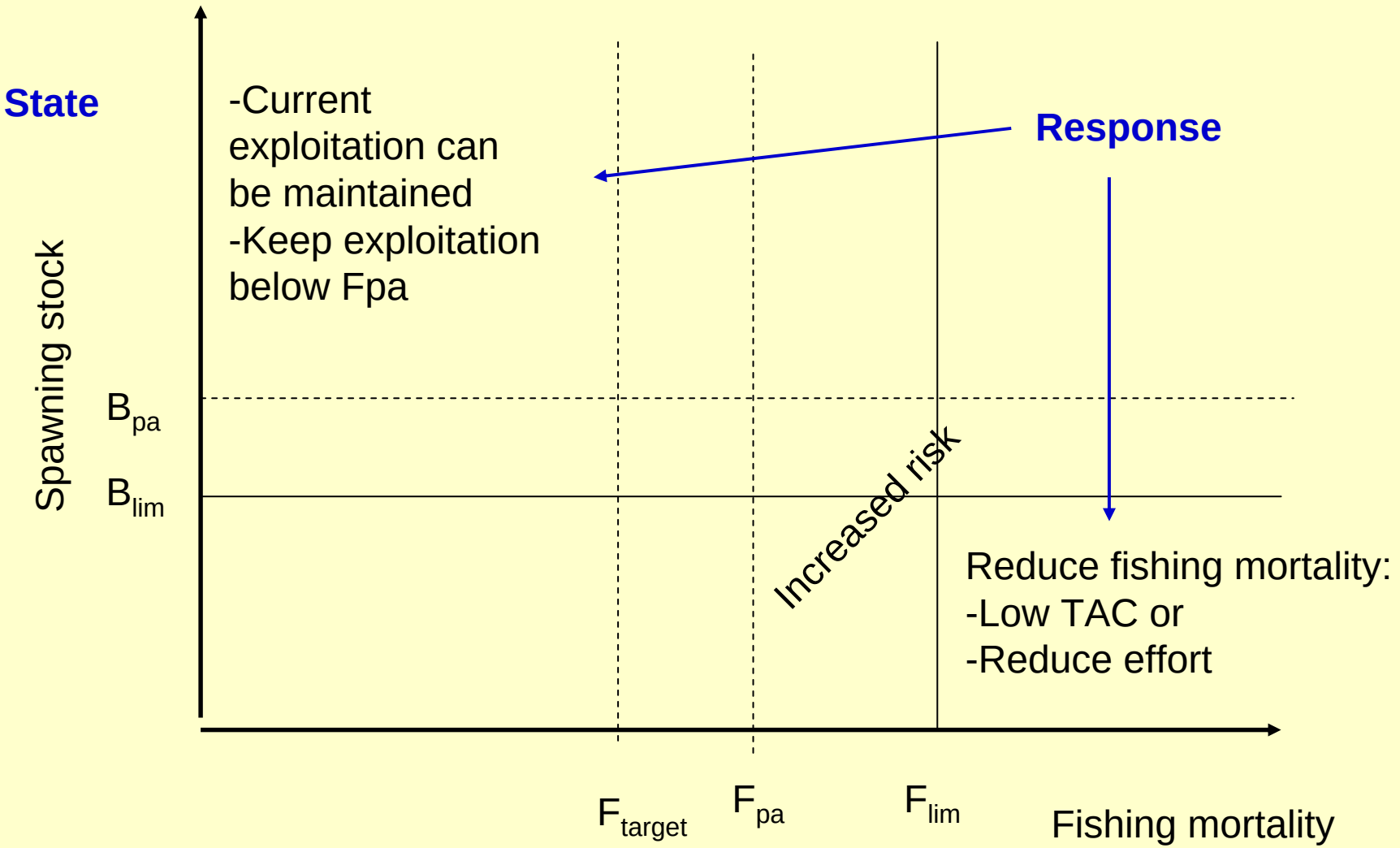
Potentially complex task

- Ecosystem Advisory Panel to the US Congress (1999):
  - the ability to predict ecosystem behaviour is limited
  - ecosystems have real thresholds and limits which, when exceeded, can effect major system restructuring
  - once thresholds and limits have been exceeded, changes can be irreversible
  - diversity is important to ecosystem functioning, that multiple scales interact within and among ecosystems
  - components of ecosystems are linked
  - ecosystem boundaries are open
  - ecosystems change with time

EA decision signposts - fisheries

- Indicators – signposts for decisions
- Limit points
  - Relates to conservation
    - reproductive capacity
    - ecosystem services
      - food
      - predation
      - diversity
- Target points
  - Relates to societal benefits

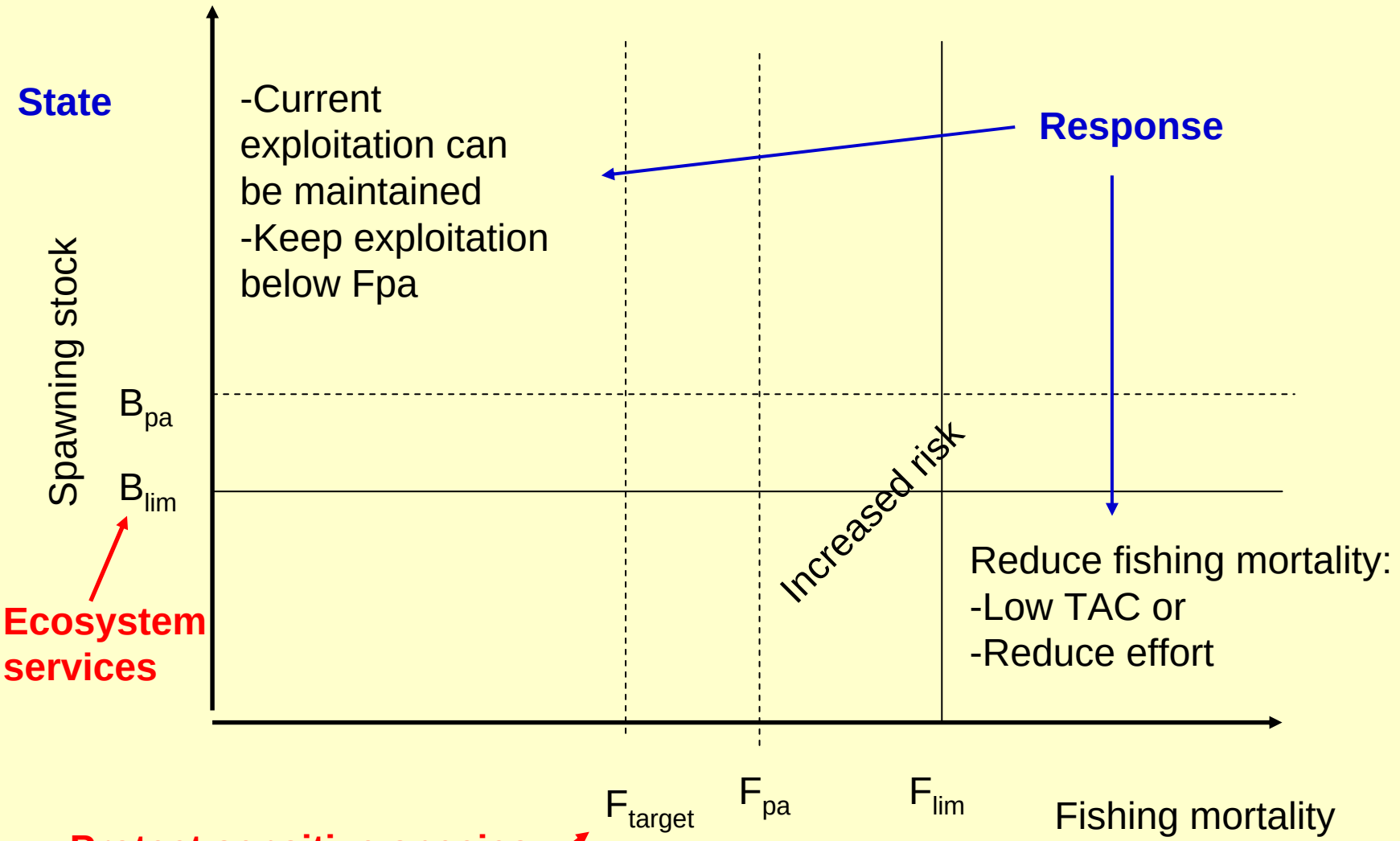
Indicators EA – single stock



EA indicators for a single stock

- When considering the lower biomass limit, consider ecosystem services from the stock
  - Food
  - Predation
  - Biodiversity
- When considering target fishing mortality or Fpa consider
  - Protection of sensitive habitats (gear impact)
  - Protection of sensitive species (by-catch)

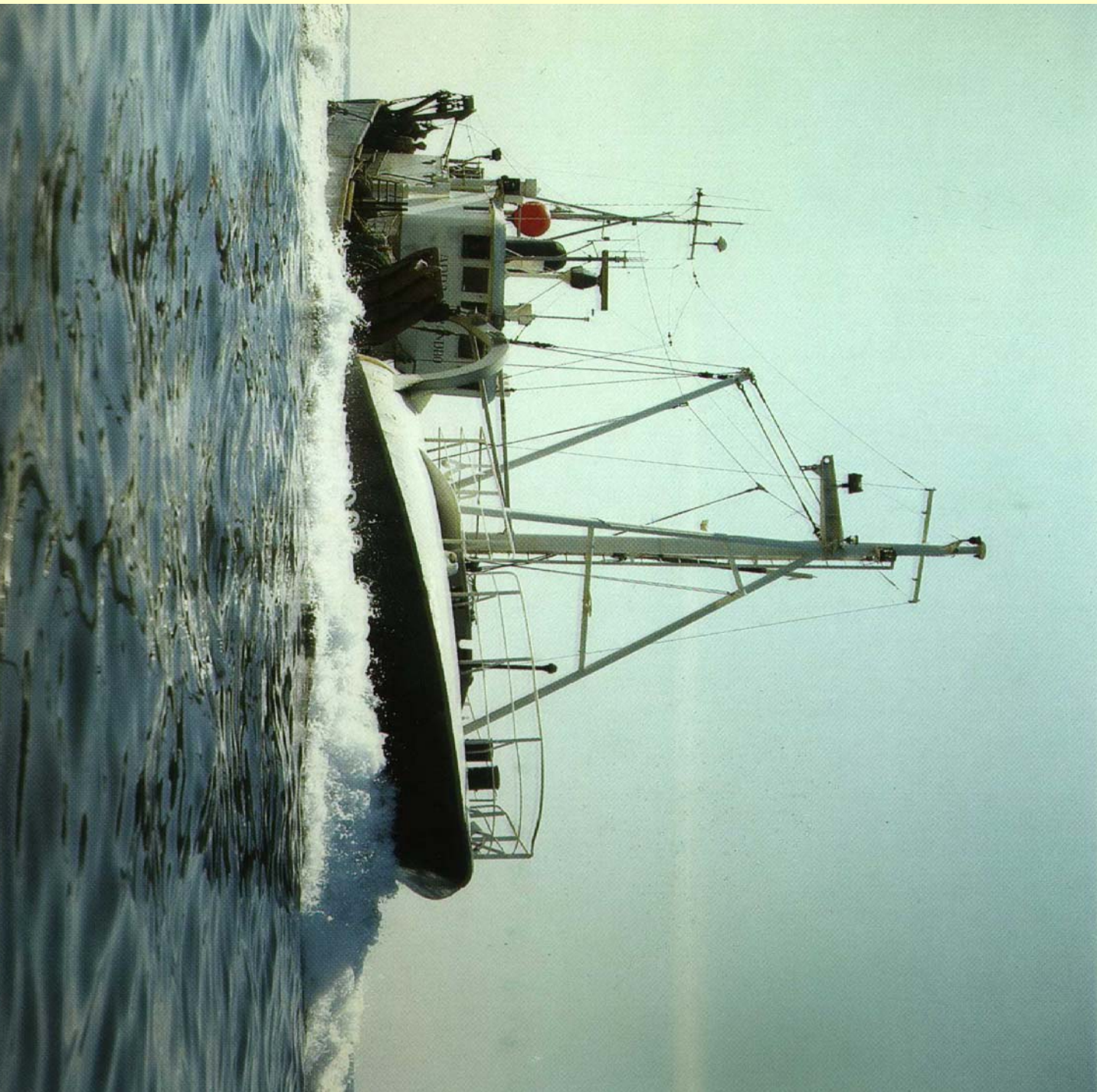
Indicators EA – single stock



Indicators – overall ecosystem health

- Quantitative indicators not yet developed
  - EcoQO's
  - Trophic or size structure indicators
  - Diversity indicators
  - Sensitive species indicators
- Response is long term
  - Not usefull for tactical decisions
- Not clear link between management action and response
- Absolute reference points can not be established a priori – but direction of action may be known

Advice under complexity



Uncertainty in EA knowledge

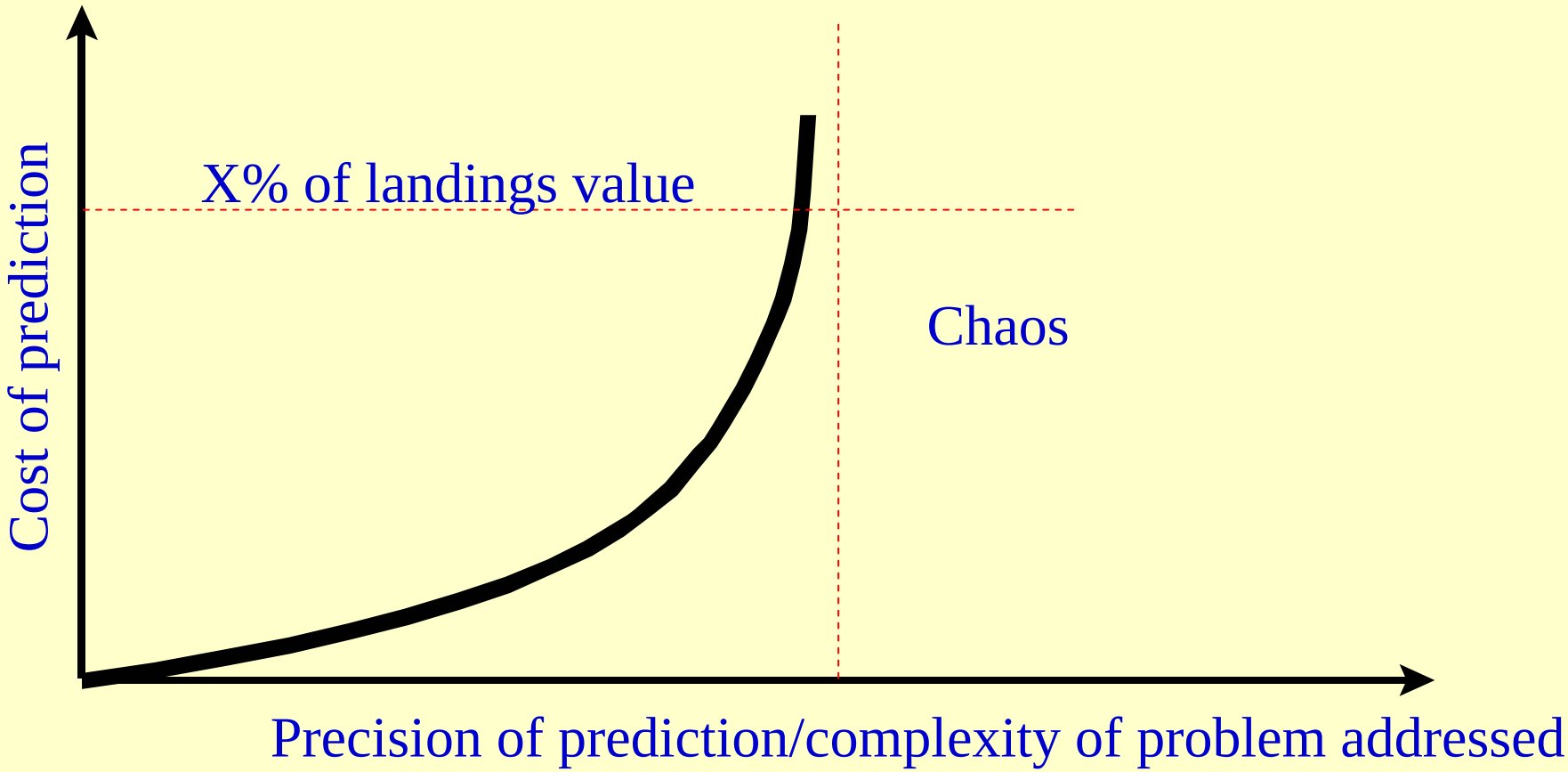
- General uncertainty in knowledge basis for advice
  - Data uncertainty
  - Model uncertainty
  - Implementation uncertainty
  - Uncertainty about future state of nature
- For most EA indicators - uncertainty about causality from management action to outcome, long response time
- Precautionary approach applies – incomplete knowledge implies precautionary use

Why don’t we just make precise estimates of the present state and precise forecasts of outcomes?

The economics of advice production

- The costs to collect data and make analysis increases with
  - the complexity of the system (such as total ecosystem) and
  - The precision required
- There are ultimate limits to the precision which can be obtained – nature is ultimately chaotic

The cost-complexity trap



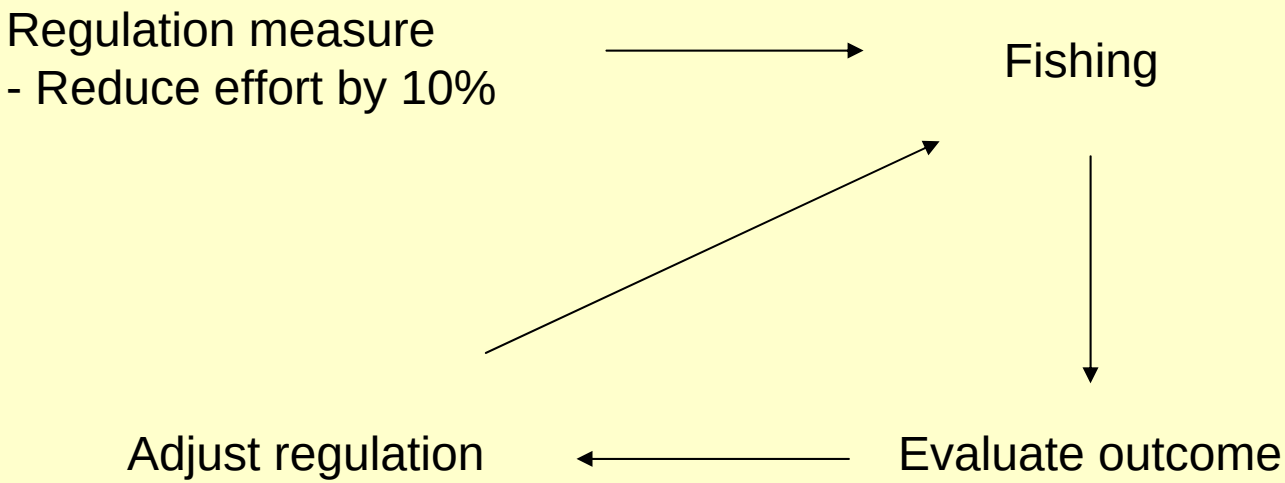
Reduce uncertainty or use robust managent systems?

- There is always considerable uncertainty
- The costs to reduce uncertainty may be high and should be balanced against the value of the resources
- The solution is not to ’remove’ uncertainty but to design management so that it is robust to uncertainty

Predictive - Adaptive balance?

- Uncertainty is as important as central values
- Predict or learn by experience from implementation
- Passive adaptivity: predict and correct through next years prediction
  - Requires that relevant reference points can be estimated, that indicators respond to management measures in the short term and that predictions make sense technically and operationally
- Active adaptivity: explore a range of exploitation ranges and adapt
  - Absolute reference points cannot be established a priori but direction may be known
  - Ecosystem effects of fishing – response not precisely known
  - Stocks for which dynamics is poorly known – incl fisheries and trophic interactions
  - Regime shifts

Adaptive management



- Accept that there is large uncertainty
- Learn by experience from implementation rather than predict
- Small steps, monitor outcomes, adjust
- Long term perspective

Scientific advice for EA

- For single stock advice
  - Consider ecosysetm services when establishing lowest acceptable biomass (Blim)
  - Consider impacts on sensitive habitats and sensitive species when establishing target fishing mortality
- Ecosystem health
  - Develop indicators and identify direction for action
- Contribute to learning
  - Adaptive approach
  - Dialogue with clients and stakeholders

Implementation principles

FAO guidelines

FAO (2003) recommends in its guidelines that fisheries management under EAF should respect the following principles:

- fisheries should be managed to limit their impact on the ecosystem to the extent possible;
- ecological relationships between harvested, dependent and associated species should be maintained;
- management measures should be compatible across the entire distribution of the resource (across jurisdictions and management plans);
- the precautionary approach should be applied because the knowledge on ecosystems is incomplete; and
- governance should ensure both human and ecosystem well-being and equity.

ICES guidelines for marine strategy

The ICES (2005) guidelines propose the following principles:

- Management should be based on a shared Vision and requires stakeholder engagement and participation;
- Planning and management should be integrated, strategic, adaptive, and supported by unambiguous objectives and take a long-term perspective;
- The geographic span of management should reflect ecological characteristics and should enable management of the natural resources of both the marine and terrestrial components of the coastal zone;
- The management objectives should be consistent with the requirement for sustainable development and reflect societal choices. They should address the desired quality status of the structure and dynamic functions of the ecosystem;
- Management should be based upon the precautionary principle, the polluter-pays principle, and the prevention principle. Best Available Technologies (BAT) and Best Environmental Practices (BEP) should be applied;
- Management should be supported by coordinated programmes for monitoring, assessment, implementation, and enforcement and by peer-reviewed scientific research and advice and should make the best use of existing scientific knowledge.

ICES dialogue meeting, Dublin 2004

- Adaptive approach required
- Social balance in measures
- Focus on process rather than measures
  - Collaborative
  - Incremental
- Already partly implemented
- Good data crucial – ref fisheries experience
- To be developed in dialogue with clients and stakeholders

Ecosystem approach

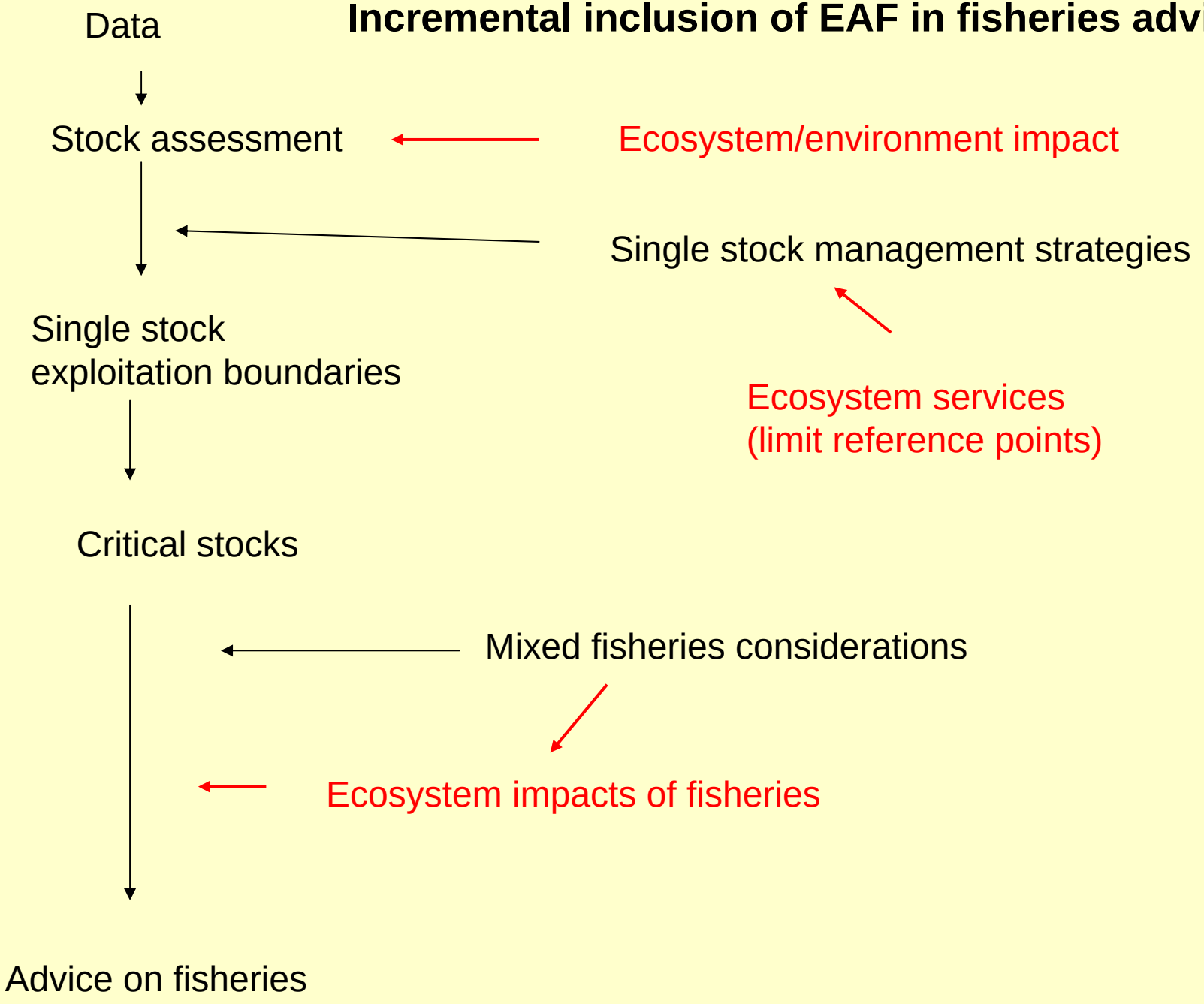
- Balanced, sustainable use that simultaneously addresses
  - Human use including harvest
  - Rebuilding or maintenance of healthy ecosystems
  - Protection of sensitive habitats and species
- Precautionary approach applies
- NOT
  - Designer ecosystems (’ecosystem based management’)
  - Pending full knowledge about systemic effects of fishing

How to get there

The steps

- An incremental approach
  - Include any known fisheries impacts on the ecosystem
  - Include any known environmental drivers on fish stock productivity
  - Proactive search for new relevant knowledge
  - Cooperation between assessment working groups and group to identify drivers and impacts (WGRED)
- Include ’ecosystem health’ considerations in the longer term
  - Overall synthesis of ecosystem health indicators under development (REGNS)
- Dialogue
  - Dialogue with clients and stakeholders
    - Clarify objectives
    - Clarify criteria for indicator/reference point identification
    - Ongoing process
  - modify advisory framework to relate to EAF as it is implemented

Incremental inclusion of EAF in fisheries advice



Ecosystem health indicators

- Synthesis of data across biota – overall health indicators
- Model developed for North Sea by 2007
- Implementation in management decisions?

Changed advice delivery mechanisms

- We need to move from ’Vatican’ model (smoke out of chimney after closed non-transparent process)
- To
- ’Socratic’ model - exploratory, dialogue based search evaluation of options
  - Clarify objectives by presentation of indicators and reference points
  - Clarify performance criteria

Conclusions

Ecosystem approach

- Balanced, sustainable use that simultaneously addresses
  - Human use including harvest
  - Rebuilding or maintenance of healthy ecosystems
  - Protection of sensitive habitats and species
- Incrementally by inclusion of known knowledge about environmental drivers and fisheries impacts
- Through adaptive management
  - Do something
  - Monitor outcomes in relation to objectives
  - Discuss with clients and stakeholders whether they like what they see
  - Adjust
- On basis of knowledge which is transparent regarding its data, methods and own normative basis
- In a dialogue between science advisors, clients and stakeholders

Role of science based advice

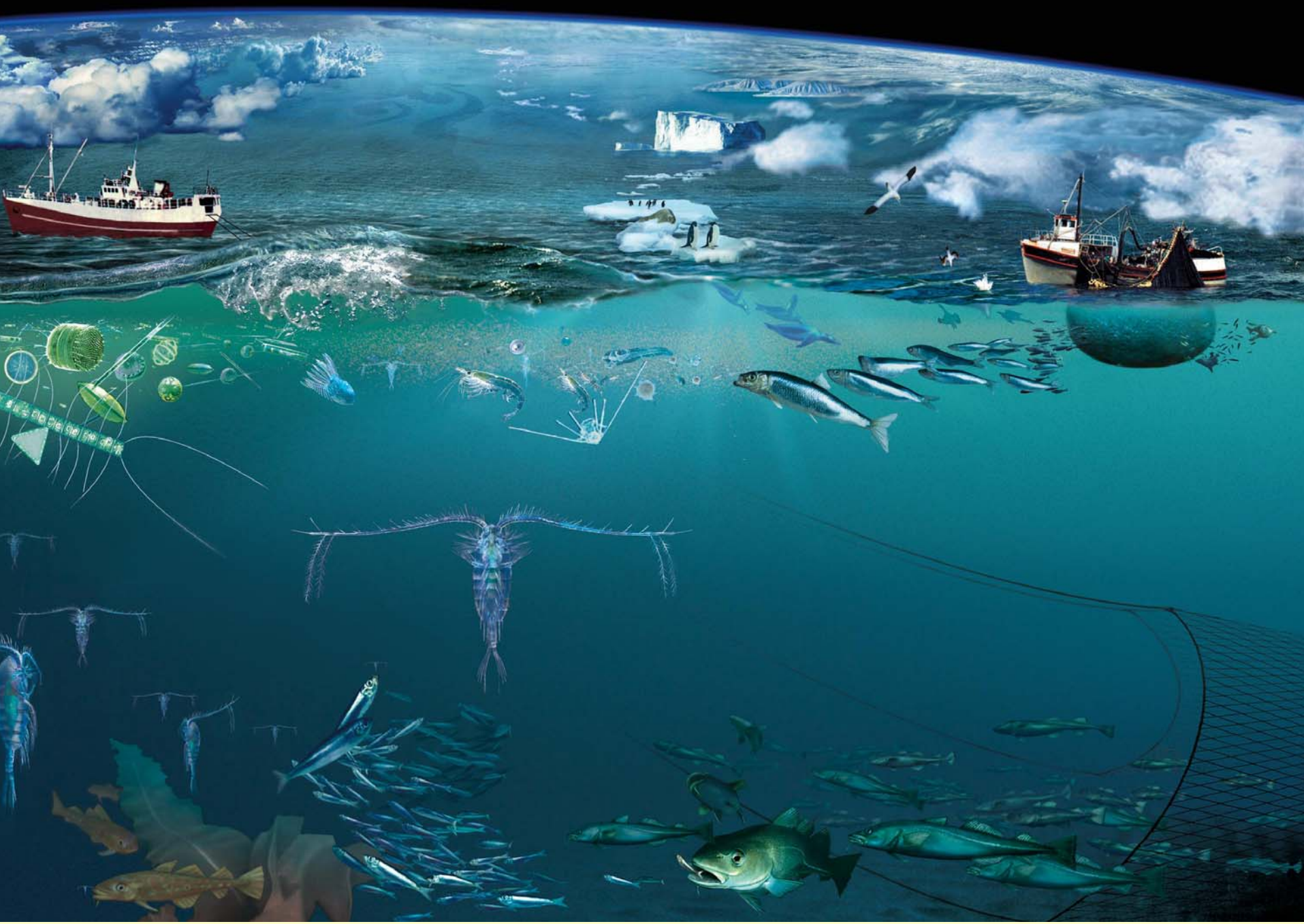
- Dialogue with clients and stakeholders to identify objectives and performance criteria
- Develop framework
  - Incremental inclusion of existing knowledge
  - Ecosystem health indicators and reference points
- Present options and learn
  - Develop options and discuss with clients and stakeholders
  - Monitor outcomes and present
- Modify
  - Indicator framework
  - Delivery mechanisms
- Transparency about
  - Normative basis
  - Data
  - Methods

Conclusions

- Ecosystem based management must be developed in a process and will never be finally defined
- Objectives are up for continuous negotiaion and reflect conflicting interests
- EAF must mainly be adaptive
- Based on transparent knowledge
- Dialogue based

It is not that difficult to begin with

- Main issue in most fisheries as identified from a classical single stock perspective: fishing pressure is way above MSY
- General advice: reduce fishing pressure considerably
- By reducing fishing effort most ecosystem concerns are addressed simultaneously
- When fishing effort is reduced EAF may fine tune further
- But initially there is little difference between what is required from a single-stock and EAF perspective
- Thus:
  - Reduce effort as required from single stock perspective
  - Supplement with specific measures to protect sensitive habitats and species where required
  - When this is acheived consider EAF fine tuning



Artist:Glynn Gorick