

The past, present, and future roles of national and international organizations in interdisciplinary marine science

Alan Haynie, ICES

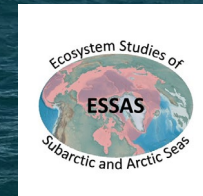
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Across organizations, how can we
can more efficiently collectively
advance interdisciplinary marine
science and better manage the
global marine environment?

Many marine science organizations have embraced transdisciplinary science



An underwater photograph of a coral reef. The scene is dimly lit, with a deep blue background. In the foreground, there are several pieces of coral, some appearing purple and others brown. A fish is visible in the lower left corner, partially obscured by the coral. The overall atmosphere is serene and natural.

The North Pacific Marine Science Organization (PICES) engages scientists in trans-disciplinary multi-national collaborations to further our collective understanding of the North Pacific's natural systems and enhance ecological and social resilience of our coasts and oceans.

PICES Strategic Plan 2016

The Context for Tradeoffs: U.S. National Standards

- 1. Optimum Yield**
- 2. Scientific Information**
- 3. Management Units**
- 4. Allocations**
- 5. Efficiency**
- 6. Variations and Contingencies**
- 7. Costs and Benefits**
- 8. Communities**
- 9. Bycatch**
- 10. Safety of Life at Sea**

U.S. marine fisheries are scientifically monitored, regionally managed, and legally enforced under a number of requirements, including ten national standards.

The National Standards are principles that must be followed in any fishery management plan (FMP) to ensure sustainable and responsible fishery management.

As mandated by the Magnuson-Stevens Fishery Conservation and Management Act, NOAA Fisheries has developed guidelines for each National Standard.

When reviewing FMPs, FMP amendments, and regulations, the Secretary of Commerce must ensure that they are consistent with the National Standard guidelines.

US Economics/Social Sciences & Balancing National Standards

1. ...prevent overfishing while achieving, on a continuing basis, the **optimum** yield
4. ...ensure **fair** distribution of resources
5. ... consider **efficiency** in the utilization of fishery resources; except that no such measure shall have **economic allocation** as its sole purpose.
7. ...**minimize costs** and avoid unnecessary duplication.
8. ...take into account the **importance** of fishery resources to fishing **communities**
9. ...to the extent practicable, **minimize** bycatch.

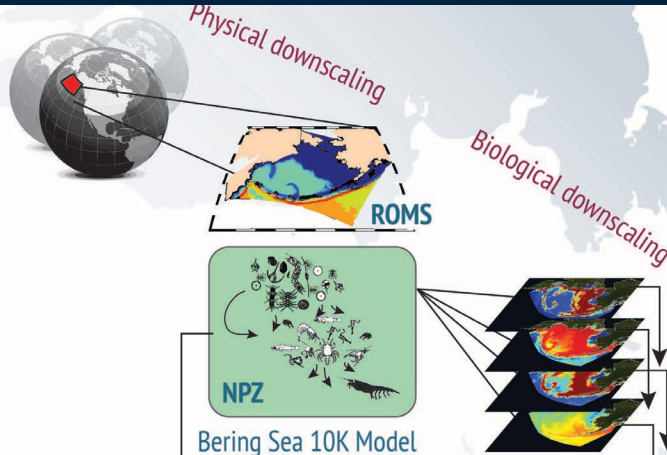
The Alaska Climate Integrated Modeling (ACLIM) Project

Global Climate

- ECHO-G
- MIROC3.2 med res.
- CGCM3-t47
- CCSM4-NCAR-PO
- MIROCESM-C-PO
- GFDL-ESM2M*-PO
- GFDL-ESM2M*-PON

Projection Scenarios (x3)

- AR4 A1B
- AR5 RCP 4.5
- AR5 RCP 8.5



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- Kirstin Holsman (AFSC, REEM/REFM)
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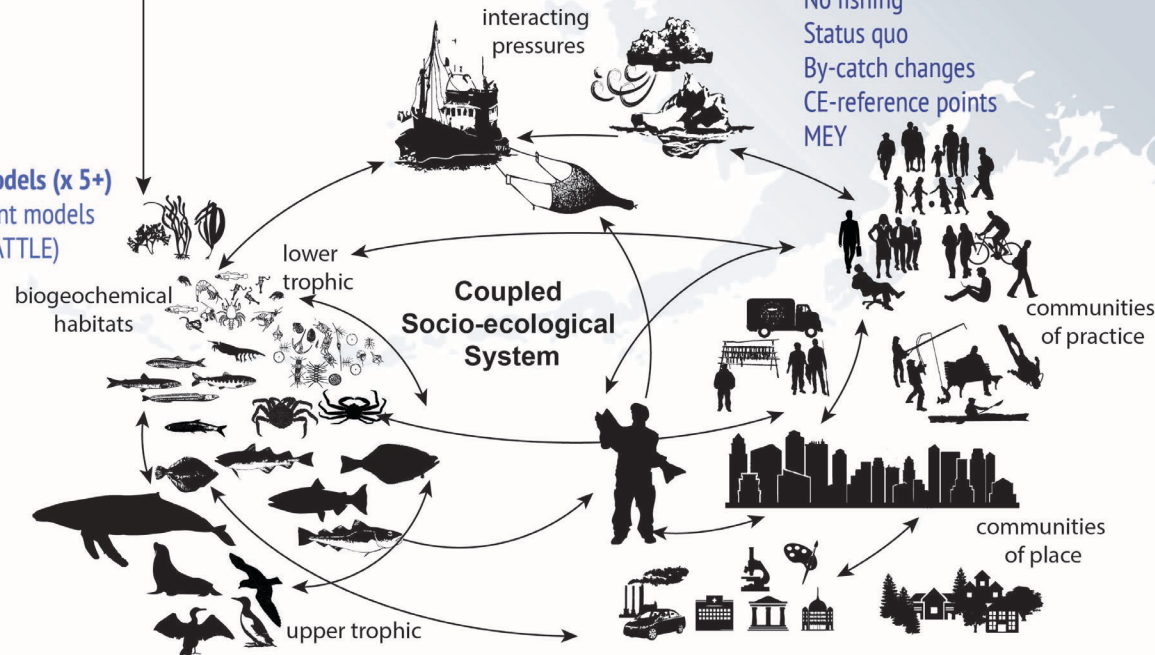
FATE: Fisheries & the Environment
SAAM: Stock Assessment Analytical Methods
S&T: Climate Regimes & Ecosystem Productivity

Socio-economic / harvest scenarios (x 5+)

- No fishing
- Status quo
- By-catch changes
- CE-reference points
- MEY

Climate Enhanced Biological models (x 5+)

- CE- single species assessment models
- CE- multispecies model (CEATTLE)
- CE - Size spectrum model
- CE- Ecopath with Ecosim
- End-to-End model (FEAST)





ICES and PICES have fully embraced human dimensions work

ICES Human Dimensions Steering Group

Leading social sciences and humanities related expert groups at ICES.

*Chair: Dr. Nathalie Steins,
the Netherlands*

PICES Human Dimensions Committee

...to promote and coordinate interdisciplinary research...

*Chair: Dr. Mitsutaku Makino,
Japan*

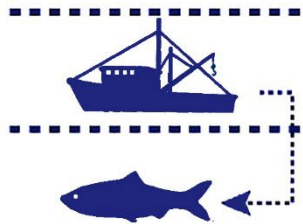
ICES Transition to Human Dimension Steering Group



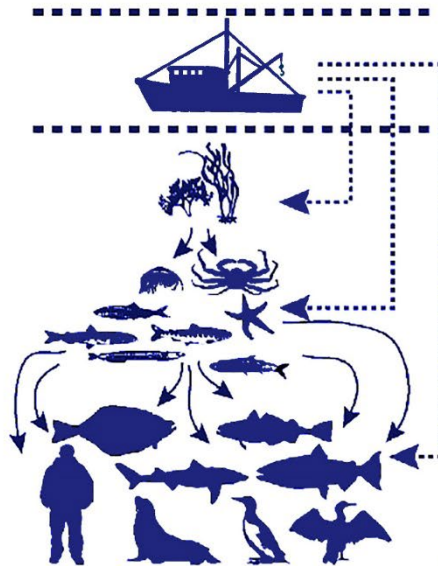
- Get a proper place for social sciences and humanities within ICES
- Centralise demand for social science and humanities expertise
- Institutionalise the links between “human dimension” and other SG, SCICOM & ACOM

Shifting arena for ICES advice & science

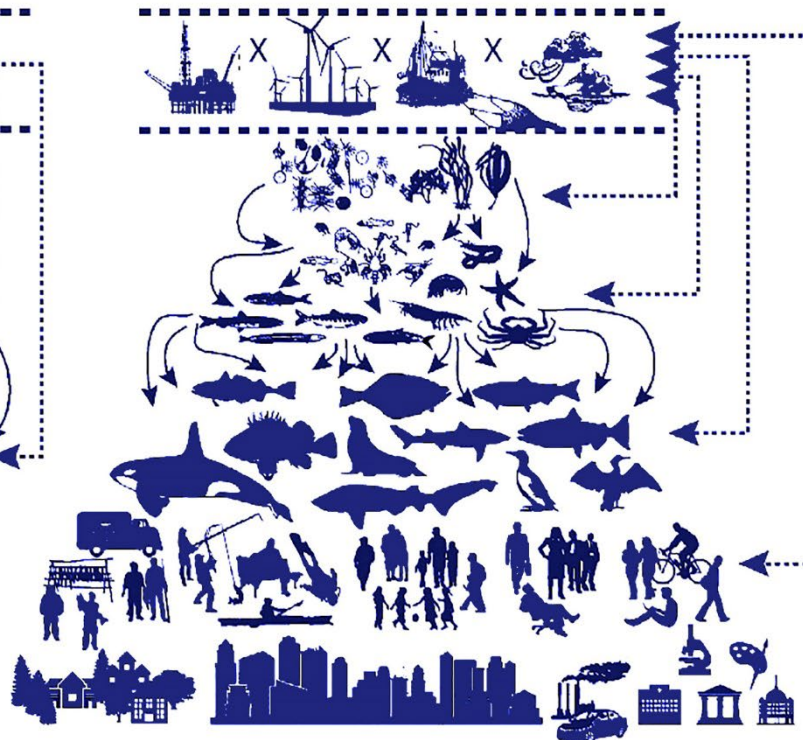
single pressure,
single subject,
direct goods



single pressure,
multiple subjects,
direct goods



multiple pressures,
multiple subjects,
web of goods & services

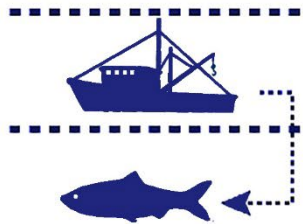


← direct interactions

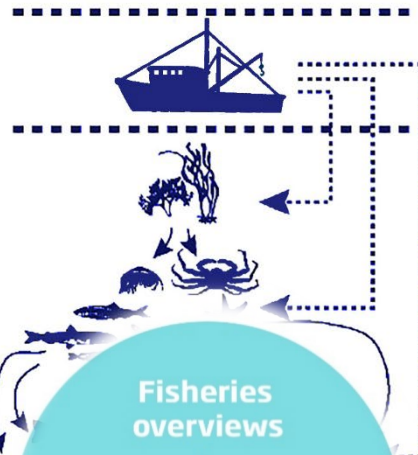
direct + indirect interactions →

Shifting arena for ICES advice & science

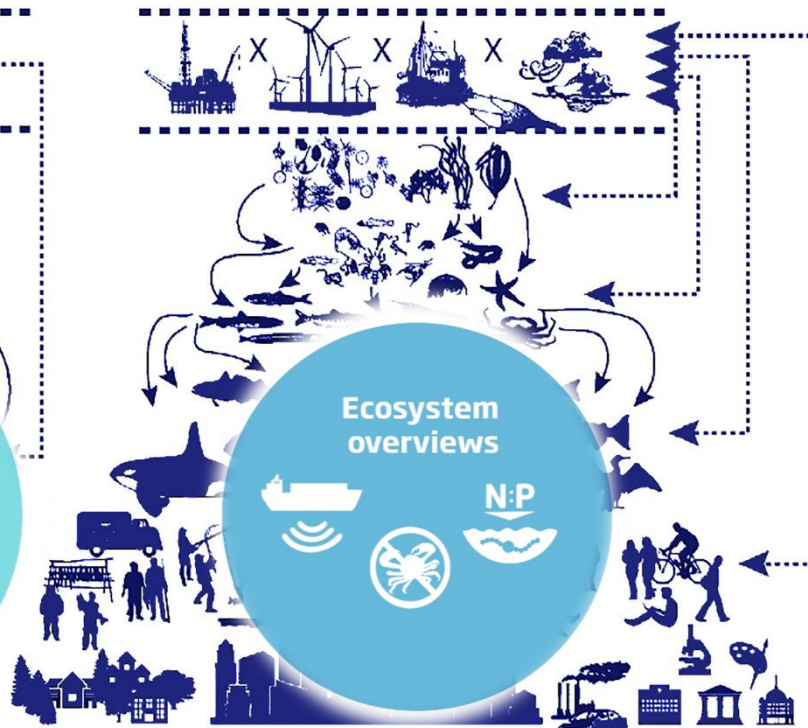
single pressure,
single subject,
direct goods



single pressure,
multiple subjects,
direct goods



multiple pressures,
multiple subjects,
web of goods & services



Aquaculture
overviews



direct interactions

direct + indirect interactions



ICES Overviews and ICES (and ICES/PICES) IEA groups are interdisciplinary – and policy makers are listening

AQUACULTURE OVERVIEW 2022 CELTIC SEAS ECOREGION

Share of total European aquaculture production within the Celtic Seas ecoregion in 2018

- 34% by value
- 21% by volume

Average price changes for some significant cultured taxa in the last decade

- Mussel prices decreased by 49%
- Pacific oyster prices increased by 34%

Aquaculture practices and species cultured within the Celtic Seas ecoregion are varied and consist of a range of both intensive finfish and extensive shellfish production practices.

Policy and legal foundation
Aquaculture production requires licences and is regulated, but aquaculture policy differs between the five countries within the ecoregion.

Recommendations for sustainable aquaculture growth
Promoting innovative production technologies to reduce environmental impacts

- Diversification of existing culture systems
- Application of diverse and innovative de-lousing techniques
- Expansion of seaweed aquaculture
- Diversification of fish culture species
- Development of offshore aquaculture

Main aquaculture species

- Atlantic salmon: >34% total production by volume, largely produced in Scotland
- Shellfish: Dominates in number of licensed sites and enterprises
- Invertebrates and seaweeds: Relatively small production volumes

Primary environment interaction relating to and species

Mainly related to: Shellfish, Atlantic salmon, Invertebrates and seaweeds

Other important: Pelagic species, Demersal species, Elasmobranch species, Deep-sea species

FISHERIES OVERVIEW 2022 BAY OF BISCAY AND IBERIAN COAST

ICES provided advice in 2022 on 73 stocks

- 10 Benthic
- 6 Crustacean
- 20 Demersal
- 26 Elasmobranch
- 11 Pelagic

This ecoregion includes areas of the deeper eastern Atlantic Ocean, as well as coastal areas from Brittany in the north to the Iberian Peninsula and Gulf of Cadiz in the south.

Who is fishing?
7 countries currently have fisheries targeting the ecoregion

Species caught in the ecoregion

- Pelagic species
- Demersal species
- Elasmobranch species
- Deep-sea species

ECOSYSTEM OVERVIEW 2022 GREATER NORTH SEA

Introduction of non-indigenous species

- 53% from shipping mainly through ballast water and hull fouling
- 18% from aquaculture

Fishing continues to be the main activity impacting ecosystem health, despite a decline in fishing effort in recent decades.

Energy production
Oil and gas industries remain one of the main activities impacting the marine ecosystem, primarily through contaminant pressure.

Energy transition
Pressures from oil and gas are expected to decline as pressures from offshore marine renewable energy production are expected to increase.

State of the ecosystem

- Two main seal species — grey seal and harbour seal — have increased in numbers from an all-time low in the 1970s.
- Seabird abundance appears to be declining. Changes in migration patterns, reductions in breeding success, and lower survival are possible causes.
- Most commercial stock sizes are effectively managed at levels consistent with achieving maximum sustainable yield (MSY).
- Invertebrate benthic biomass: Fishing-related physical disturbance of the seabed is the main pressure resulting in an overall decrease in invertebrate biomass.
- Stock species: There is a decrease of 20–30% in fished areas, depending on how heavily the sea is fished.

Environmental and socio-economic context

- Increased fuel prices lead to:
 - Decreased fishing with bottom-towed gears
 - Reduction of the extraction of demersal fish
 - Reduction of the disturbance of seabed habitats
- Shift towards less fuel-intensive fisheries, such as gillnets
- Increased bycatch risk of seabirds and marine mammals
- Longer-term effects from lost and abandoned fishing gear
- Climate change: An increase in sea surface temperature in the southern North Sea of between 1 and 2 degrees compared to the 1951–1980 average temperature. This has changed the spatial distribution of several fish and plankton species within the ecoregion. This trend is likely to continue.
- Eutrophication has reduced due to the introduction of measures to reduce nutrient input from rivers.
- Contributions of small-scale coastal fisheries:
 - 10% of value landed
 - 11% Revenue
 - 18% Full-time employment
- Seabed litter is widespread and increasing. The most common items are plastic sheets, synthetic ropes, monofilament fishing lines, and plastic bags.

ICES/PICES/PAME WORKING GROUP ON INTEGRATED ECOSYSTEM ASSESSMENT (IEA) FOR THE CENTRAL ARCTIC OCEAN (IWGICA; outcomes from 2021 meeting)

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ICM 2021

Blue jack mackerel

Horse mackerel

Agelto benthic

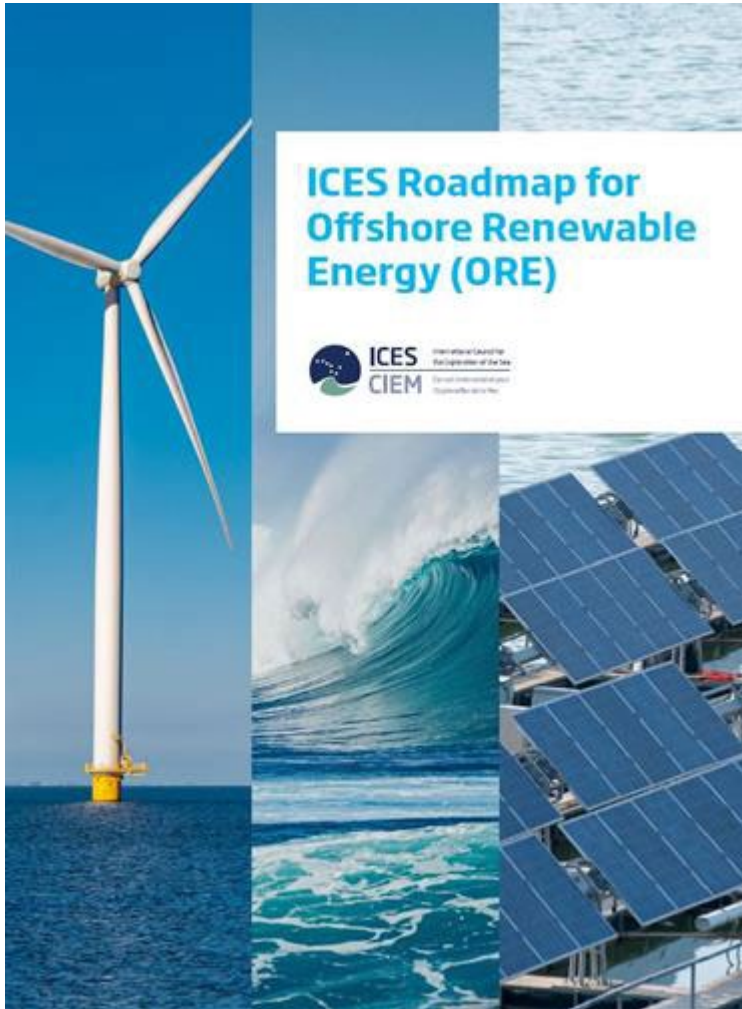
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ICES Stakeholder Engagement Strategy

- Requesters of advice and Expert Groups are asking for more consultations and input
- Observers' expectations of engagement and consultation are increasing
- Essential to get this right to maintain the integrity of the system.



ICES Roadmap for Offshore Renewable Energy (ORE)



- Assessing the **trade-offs** between ORE and other sectors, e.g., fisheries & biodiversity. This topic area will also address **best practice guidelines for marine spatial planning**.
- The **coordination of research programmes and data** to contribute to strategic EIAs.
- The development of **guidelines and standards for monitoring and assessment** in the ORE sector.
- The **impact of ORE developments** on

fishery surveys and fisheries management

Several Key Challenges

- Resources
- Career social scientists throughout marine research institutes
- Repeated conversations and trust between policy makers, managers and scientists
- Consensus on key information to consider

Thank you! Questions?

ありがとうございます!

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CIEM