

How area-based conservation measures in the Barents Sea contribute to ecosystem-based management

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Cambridge Bay, 20 March 2019



Outline

- The ocean environment
- Ecological distinctive features
- Management plans for Norwegian Sea areas
- Consultations with stakeholders
- Valuable and vulnerable areas
- Consequences for the activity in the area

Physical and biological environment

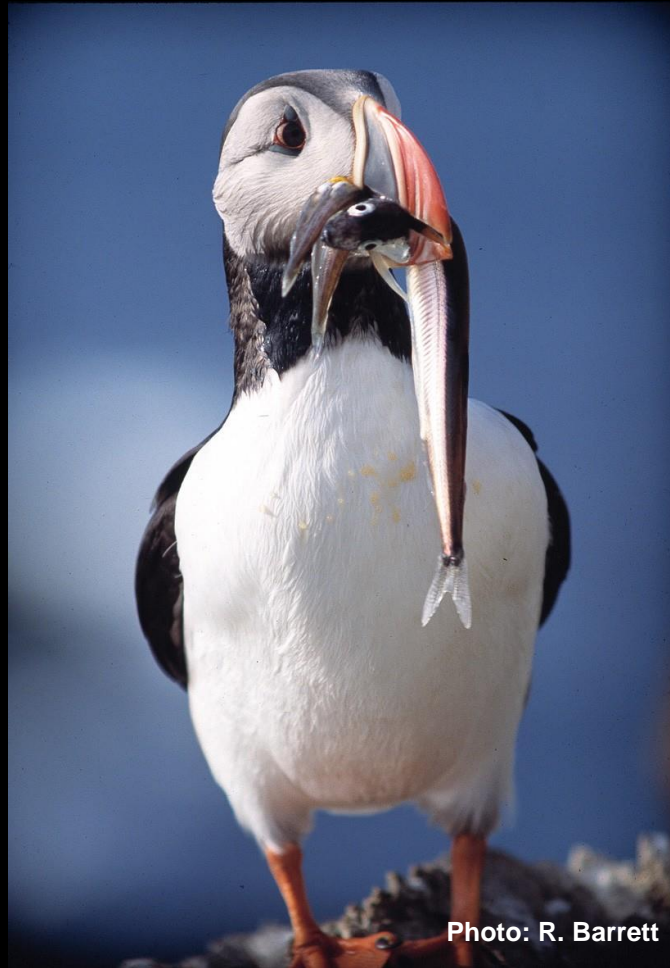


Photo: R. Barrett

The ocean environment

- Ocean currents
- Water masses
- Vertical mixing – stability
- Sea ice
- Ocean floor topography/condition

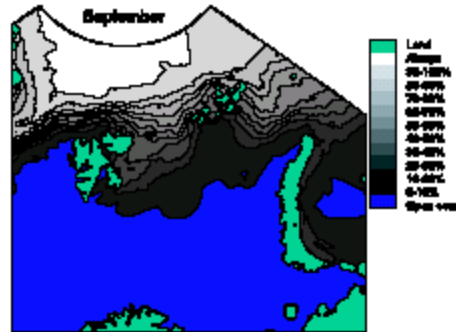
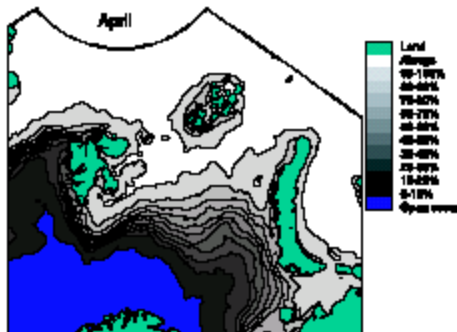
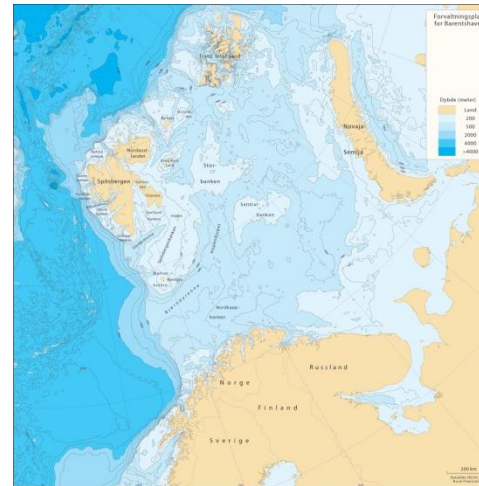


Drifting ice

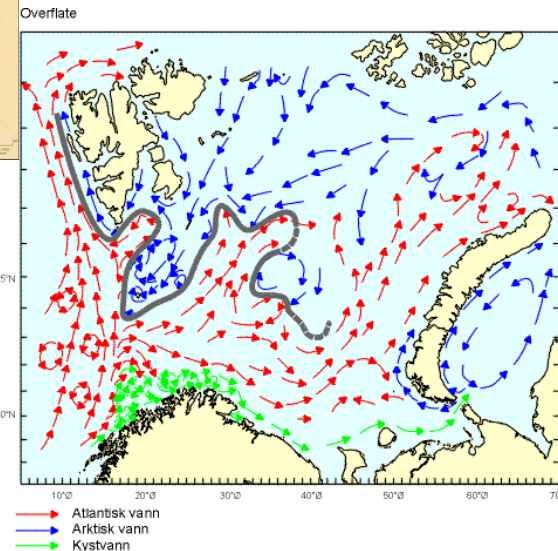
Multi year ice



Pressure ridges



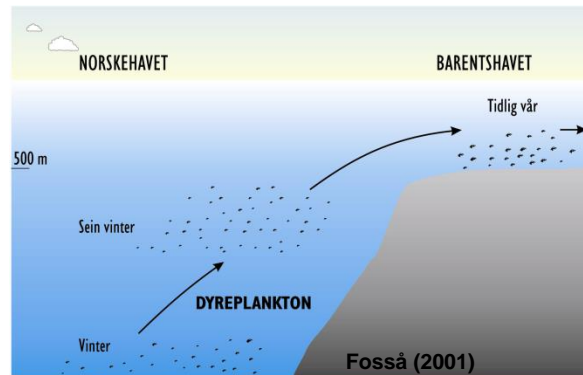
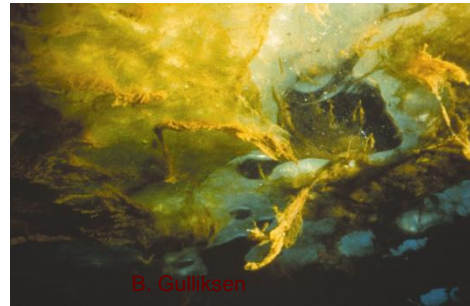
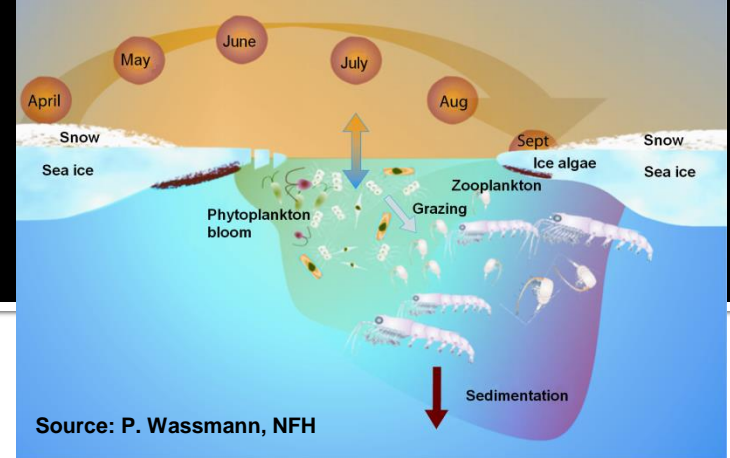
The probability for ice in April and September



Surface currents: Lofoten–Barentshavet

Productive areas

- Bank areas
- The Marginal Ice Zone
- Shelf slopes/brakes
- Glacier fronts
- Polynyas
- + Transport of organisms to the area



"Challenges"



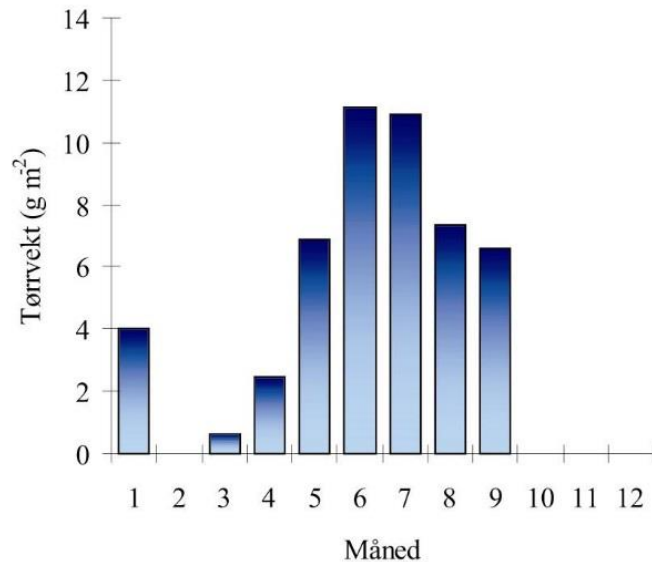
Foto: C.H. von Quillfeldt



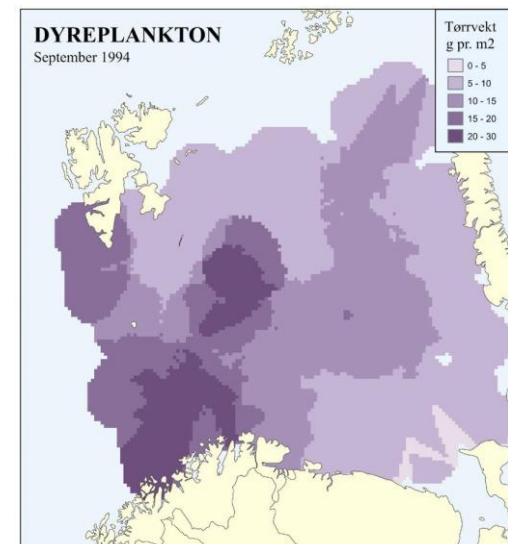
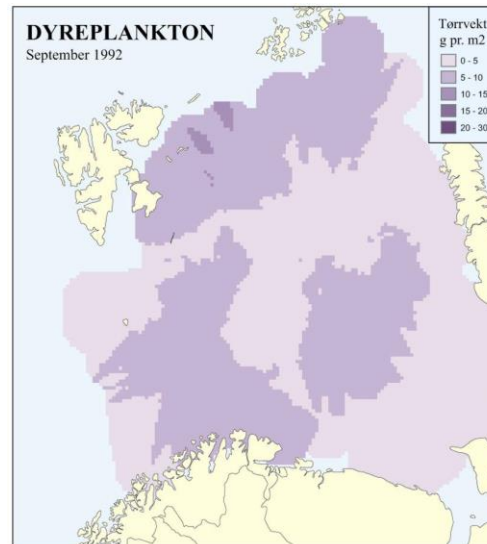
Foto: C.H. von Quillfeldt

Changes throughout a year and between years, e.g. plankton

Zooplankton – biomass

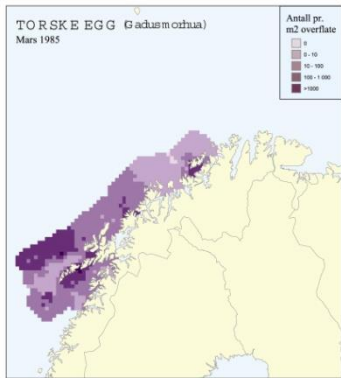


Zooplankton – horizontal distribution

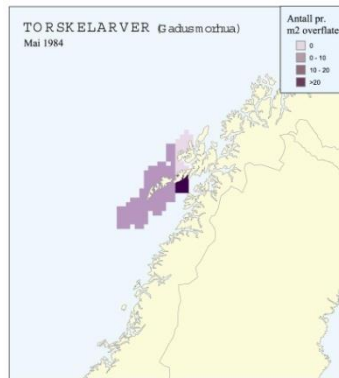


Northeast Arctic cod

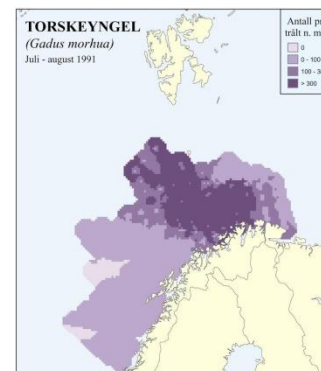
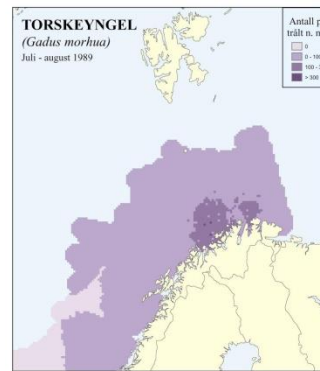
Eggs



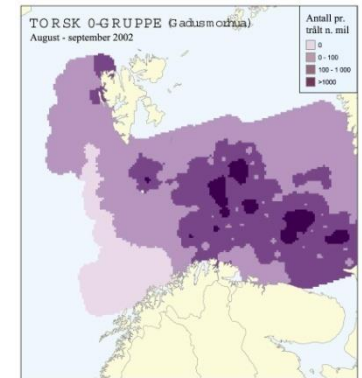
Larvae



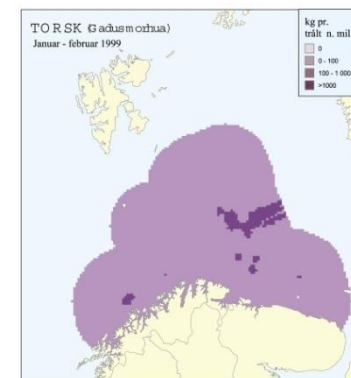
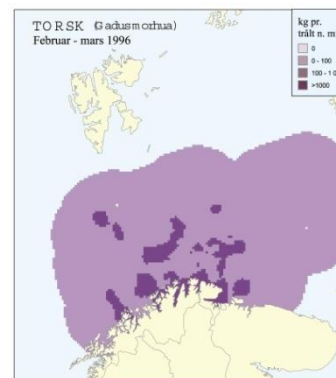
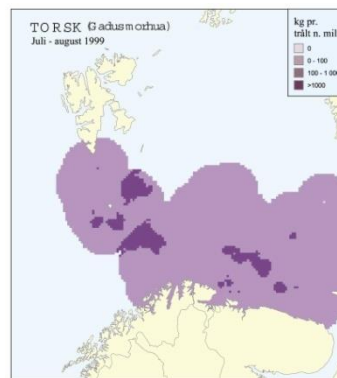
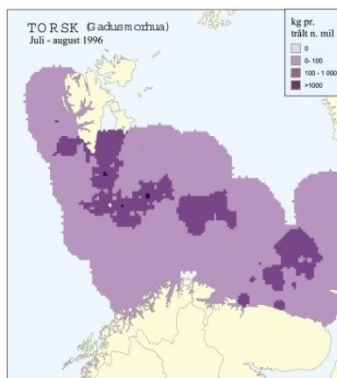
Fry



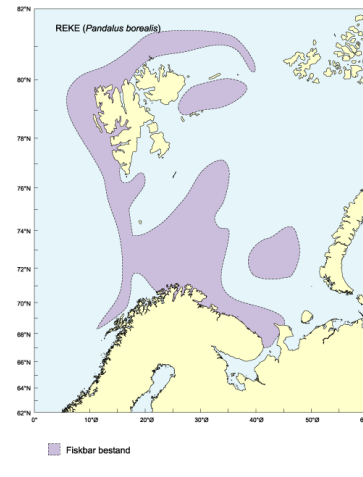
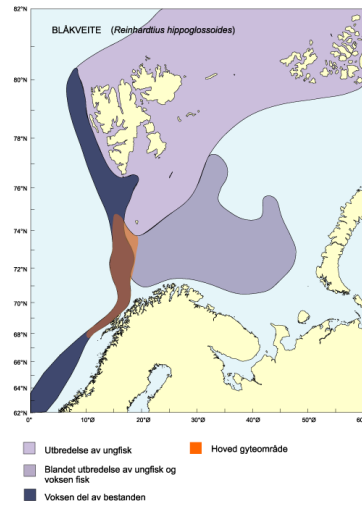
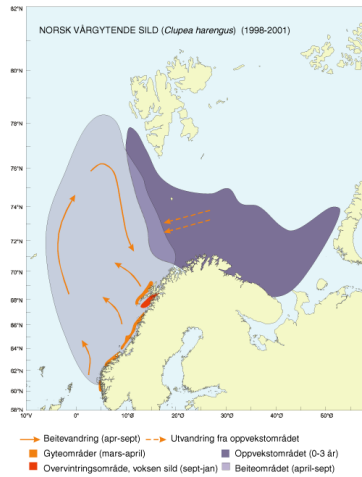
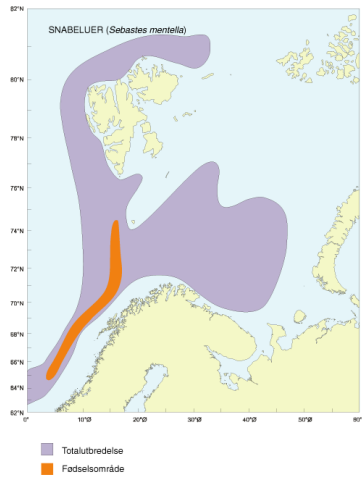
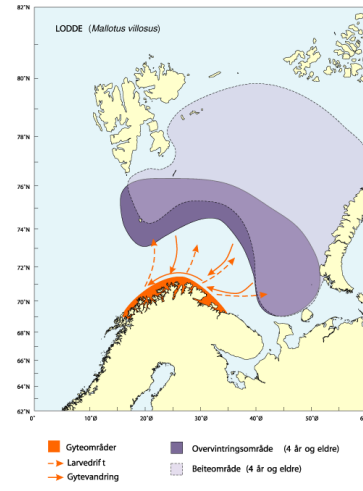
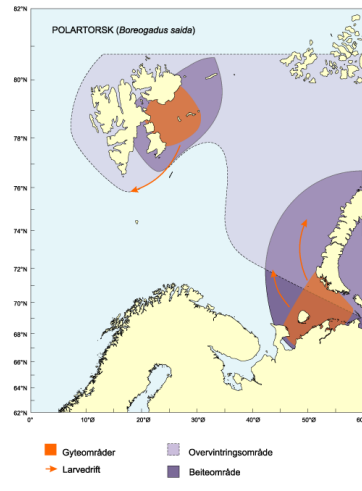
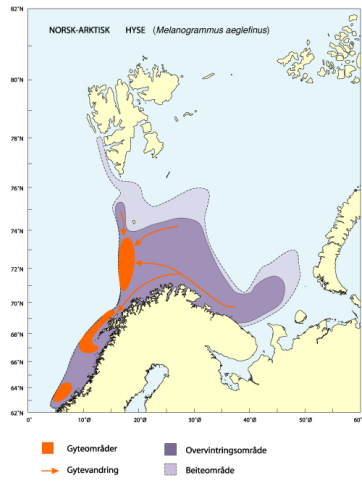
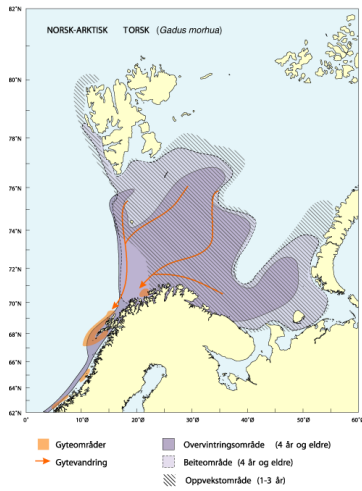
0-group



Adult



The Barents Sea is one of the world's most important fishing areas (total importance)

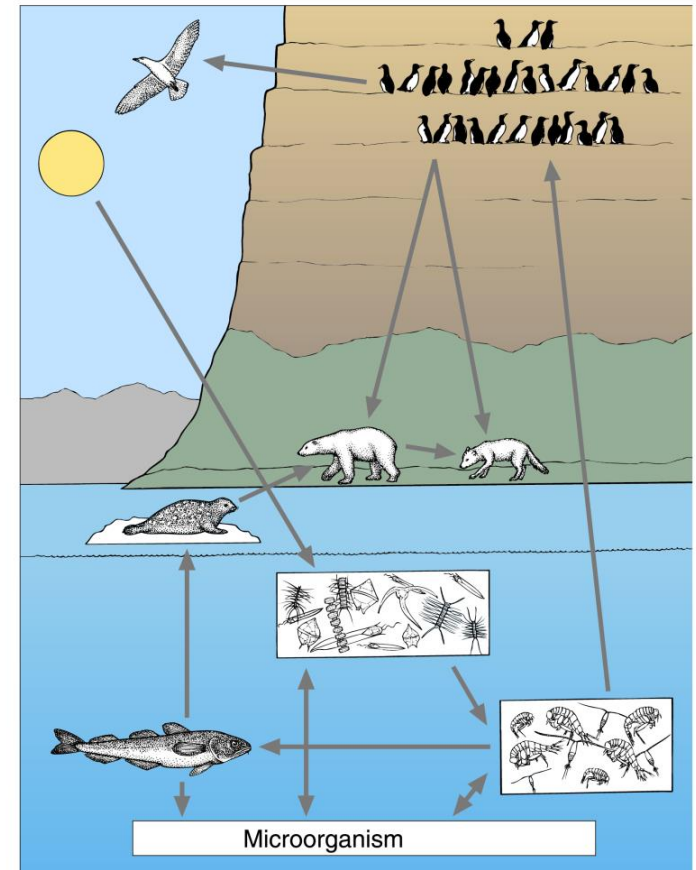


Coupling: sea - land

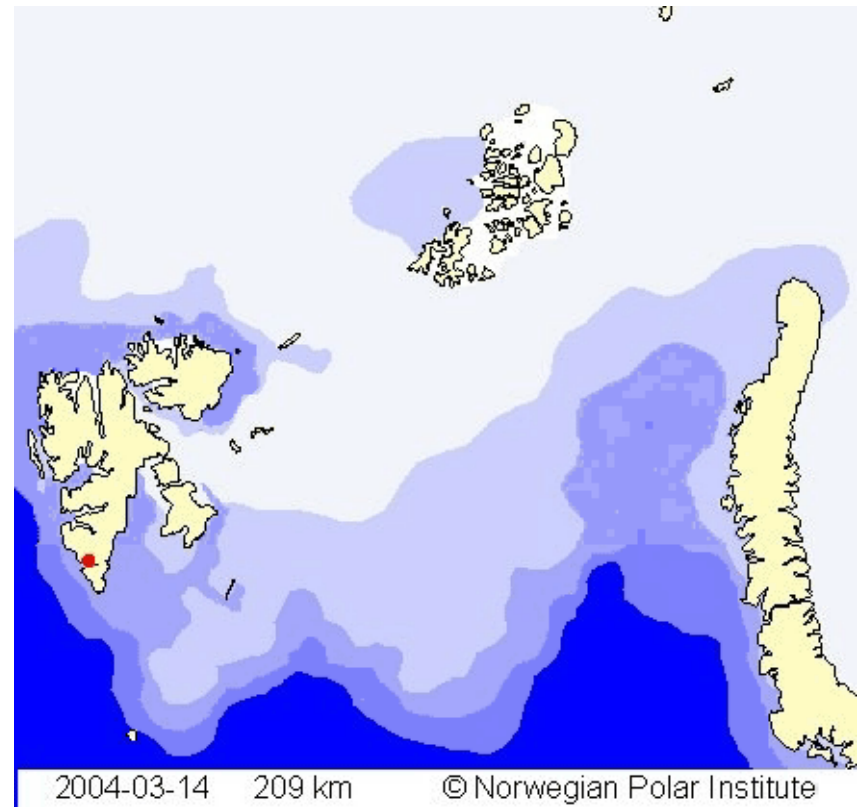
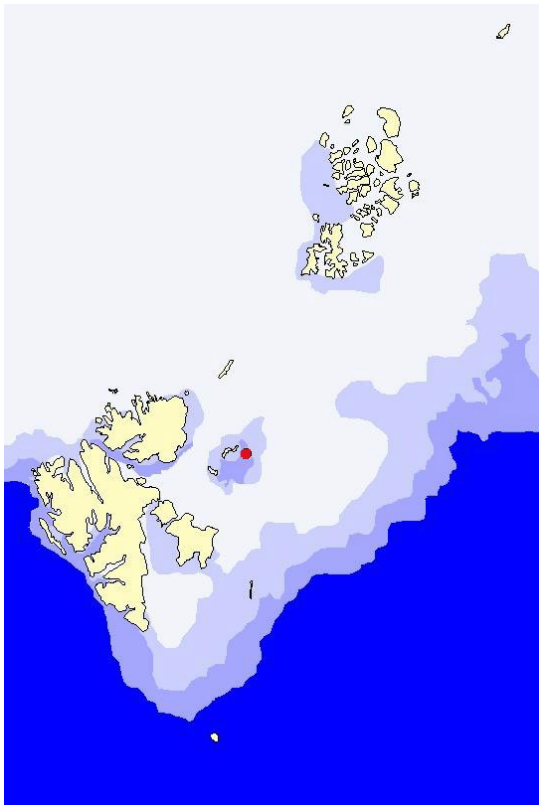


- Transport of energy from sea to land
- Nesting areas (bird cliffs)
 - Nutrient supply from birds to inland waters
 - Bird cliffs:
 - Areas for arctic fox
 - Plant communities with high demands for nutrients
 - Geese

- Haul out sites
- Den areas



Some polar bears have small and/or large distribution areas



Migration



Source: Strøm et al. (2010)

Activity + other impact factors



B. Frantzen



B. Frantzen

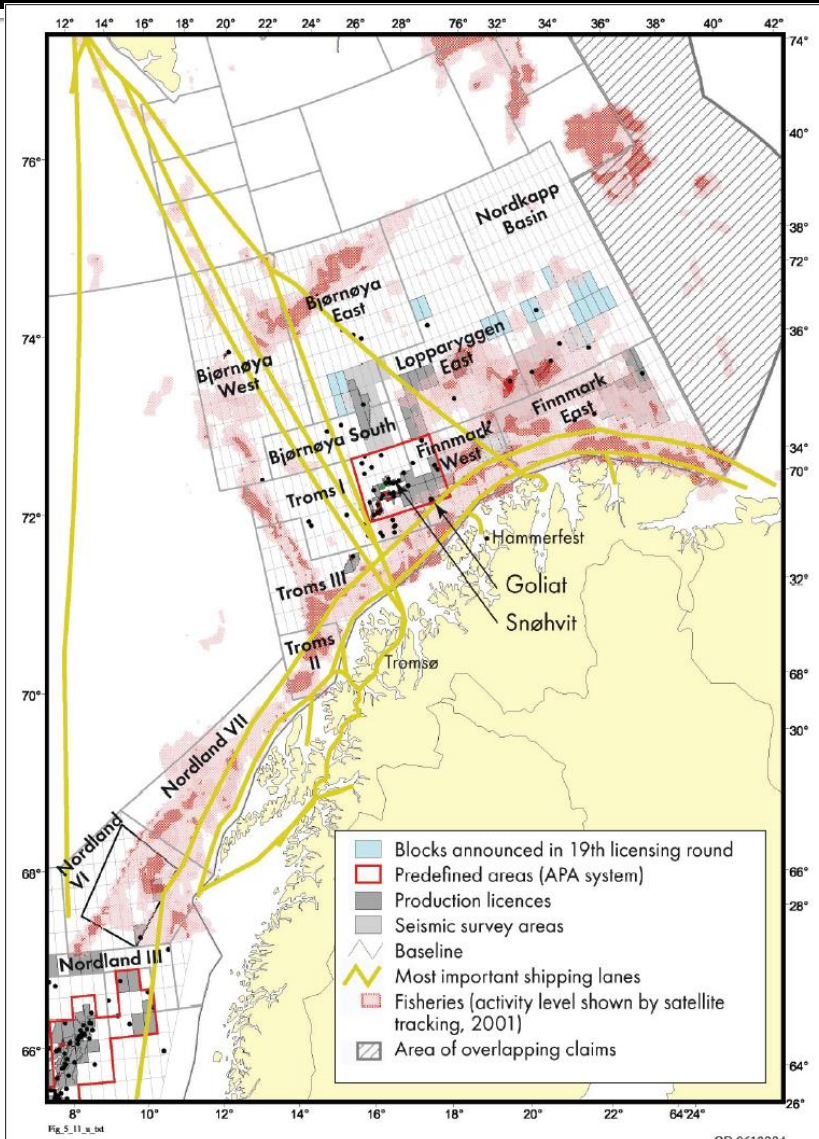


B. Gulliksen



J.-A. Røyset

Overall pressures in the Barents Sea-Lofoten area

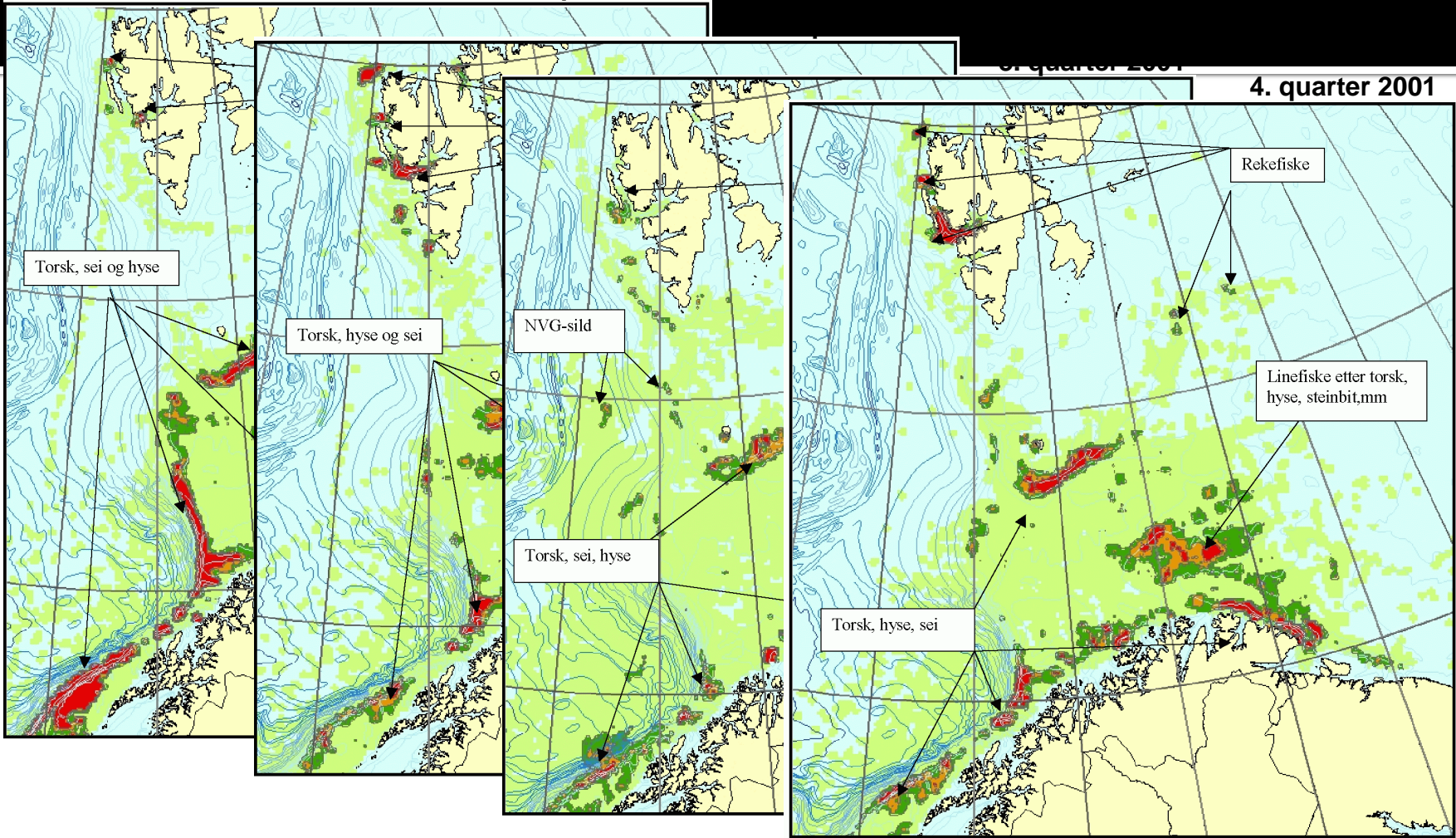


The state of the environment in the management plan area is ultimately dependent on the overall pressures and impacts of all the different activities that take place both within and outside this area.

The fishery activity

3. kvartal 2001

4. kvartal 2001



The management plan for the Barents Sea



Clione limacina

Photo: B. Gulliksen

Need for more comprehensive, ecosystem-based management

The purpose of the **Integrated Management Plans** is to provide a framework for the **sustainable use** of natural resources and goods derived from an area and at the same time maintain the structure, functioning and productivity of the ecosystems of the area.

Evaluate conflicting interest



Make guidelines for activities

Help achieve consensus about the management

Identify gaps in knowledge

Setting the levels for acceptable influence by human

Make guidelines for monitoring

Norwegian management plans

- Integrated Management plan for the Barents Sea and Lofoten (2006):

Updated in 2011 (and then part of it, 2015)

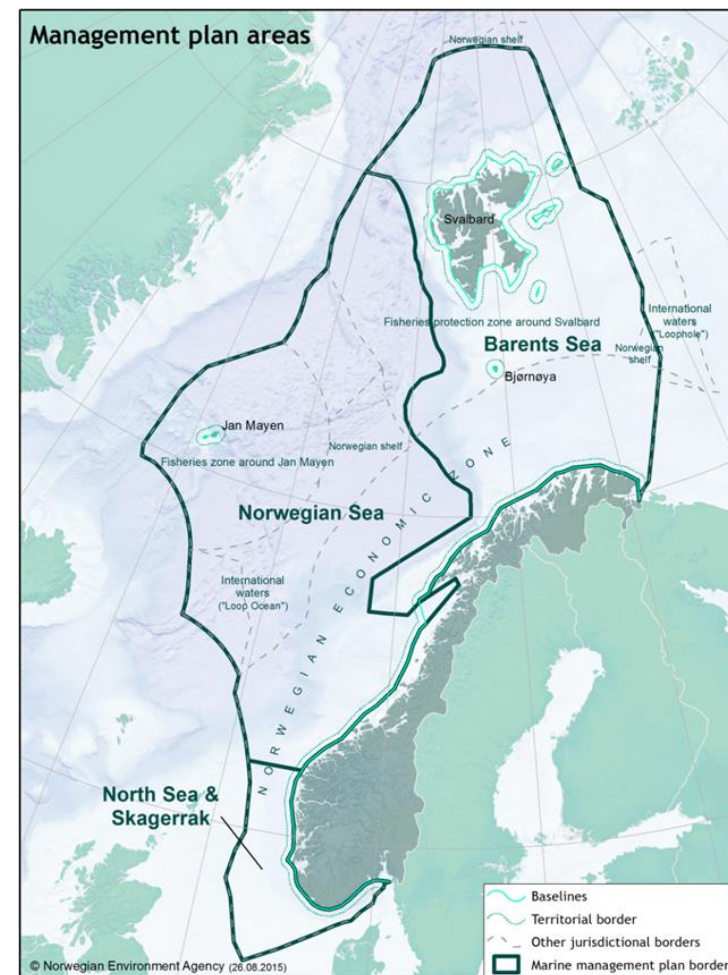
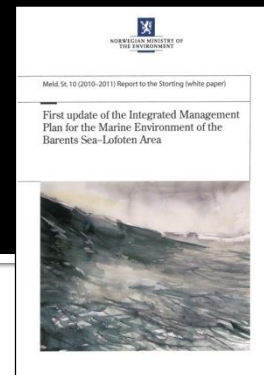
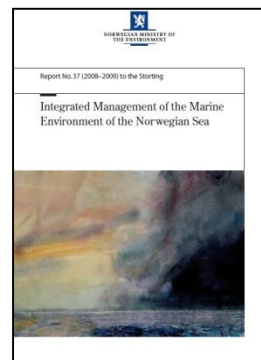
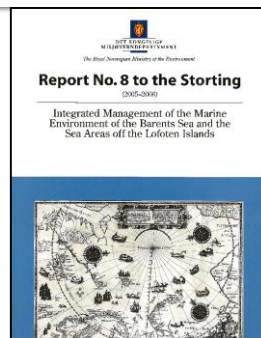
Revision 2020

- Integrated Management plan for the Norwegian Sea (2009):

Updated in 2017, next update 2020

- Integrated Management plan for the North Sea – Skagerrak (2013)

Update 2020



The ecosystem approach

■ The ocean environment

- Ocean current
- Water masses
- Sea ice
- Ocean floor topography/condition

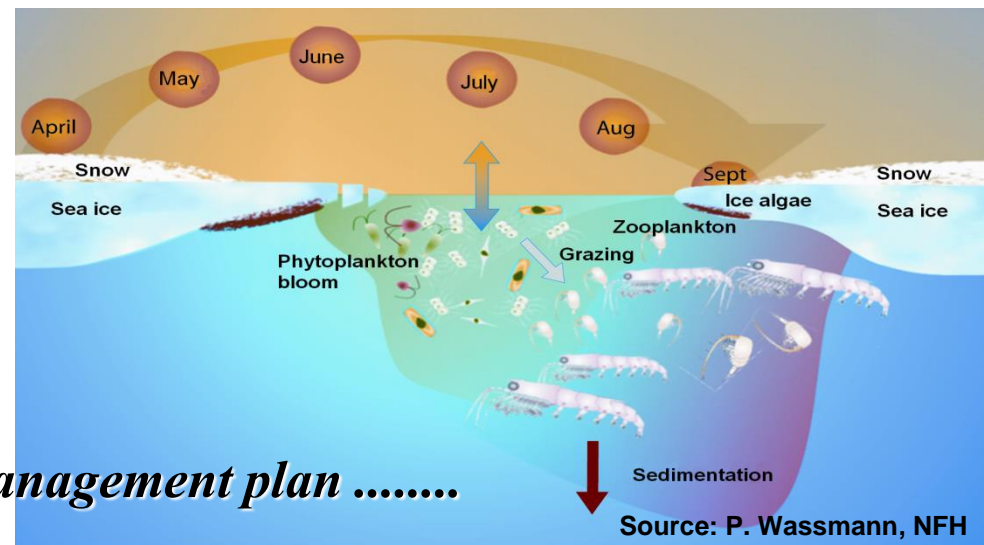
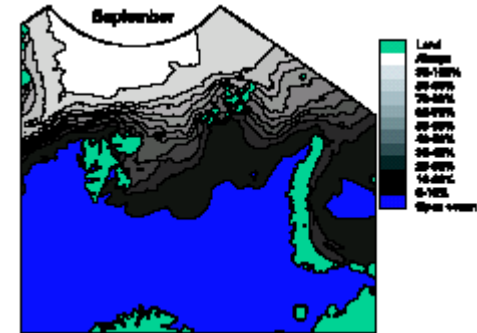
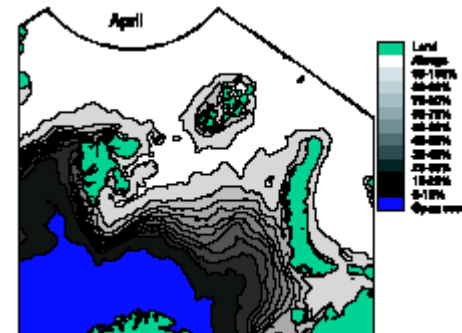
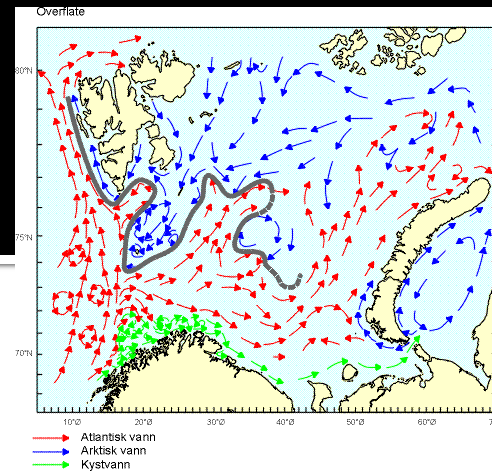
■ Biology

- Productive areas
- Dynamics/Processes
- Transport of organisms to the area
- Migration in/out

■ Activities and impact factors

- Climate
- Ocean acidification
- Pollution
- Fisheries
- Petroleum
- Shipping
- Introduced species

... have to be considered together in a management plan



Source: P. Wassmann, NFH

Class Asteroidea



Crossaster papposus

Class Scyphozoa



Halicystus auricola

Class Malacostraca



Amphipod



Paramphithoe hystrix

Class Anthozoa



Class Gastropoda



Clione limacina

Other groups

Class Osteichthyes



Gymnelus retrodorsalis



Arctic lump sucker
(*Eumicrotremus spinosus*)



Hormanthia nodosa

Class Demospongia



Haliciona sp.

Class Ophiuroidea

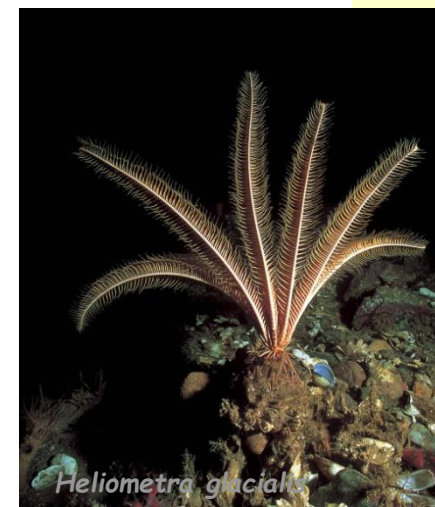


Ophiura sp., *Ophiocten* sp.



Gorgonocephalus sp.

Class Crinoidea



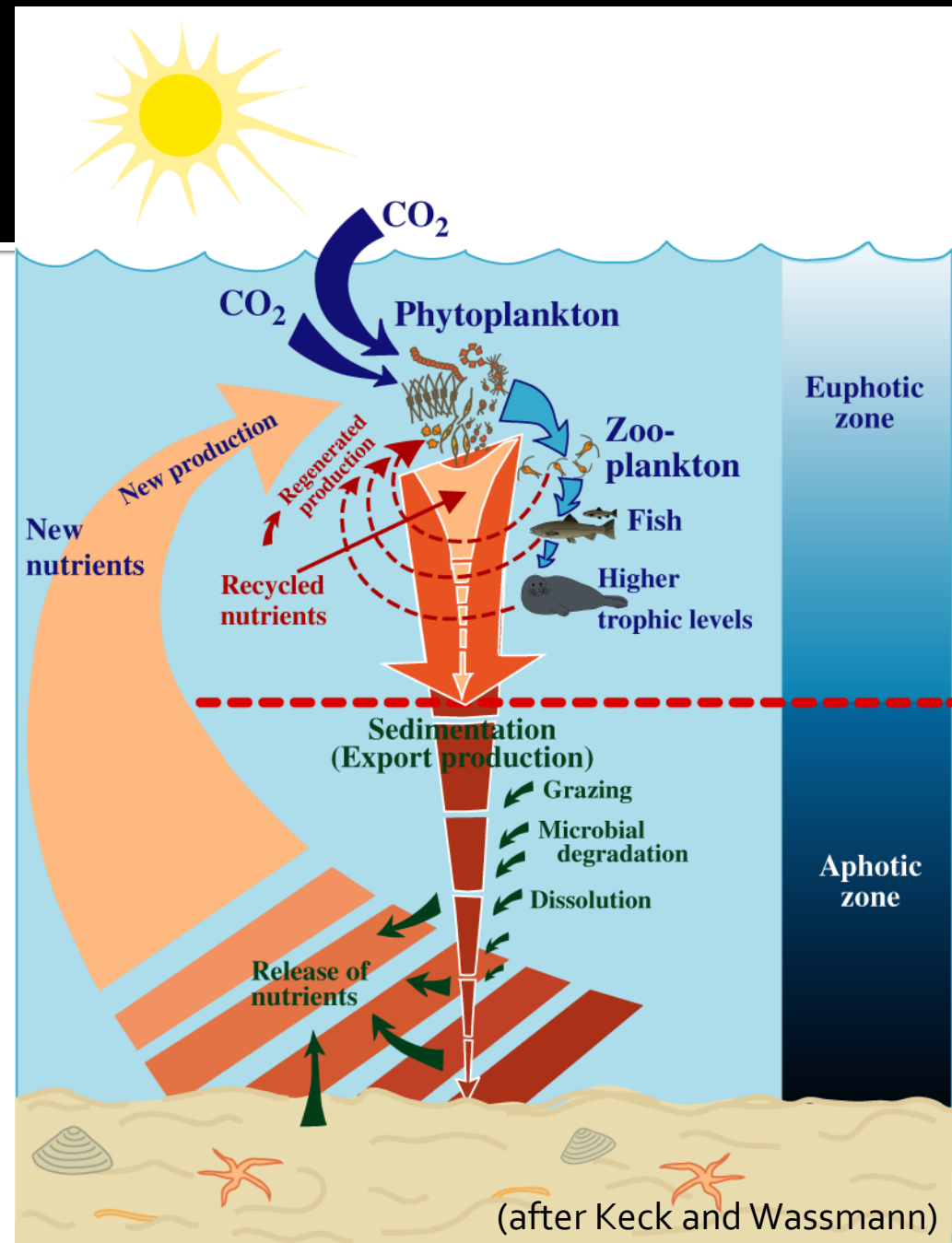
Heliopecten glacialis



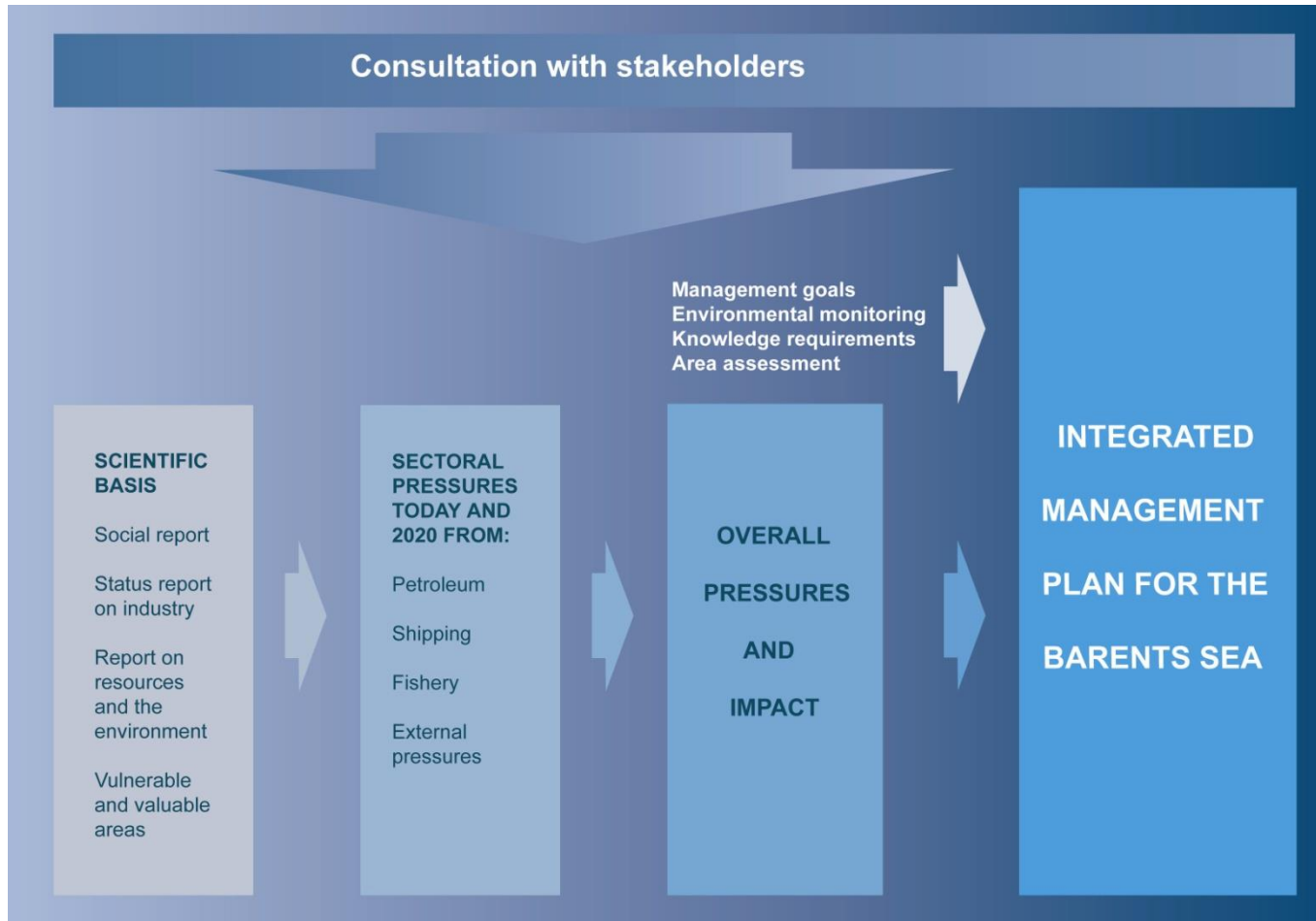
Family Axinellidae

Photos: B. Gulliksen & E. Svensen

Conceptual view on interactions and processes in Arctic marine ecosystems



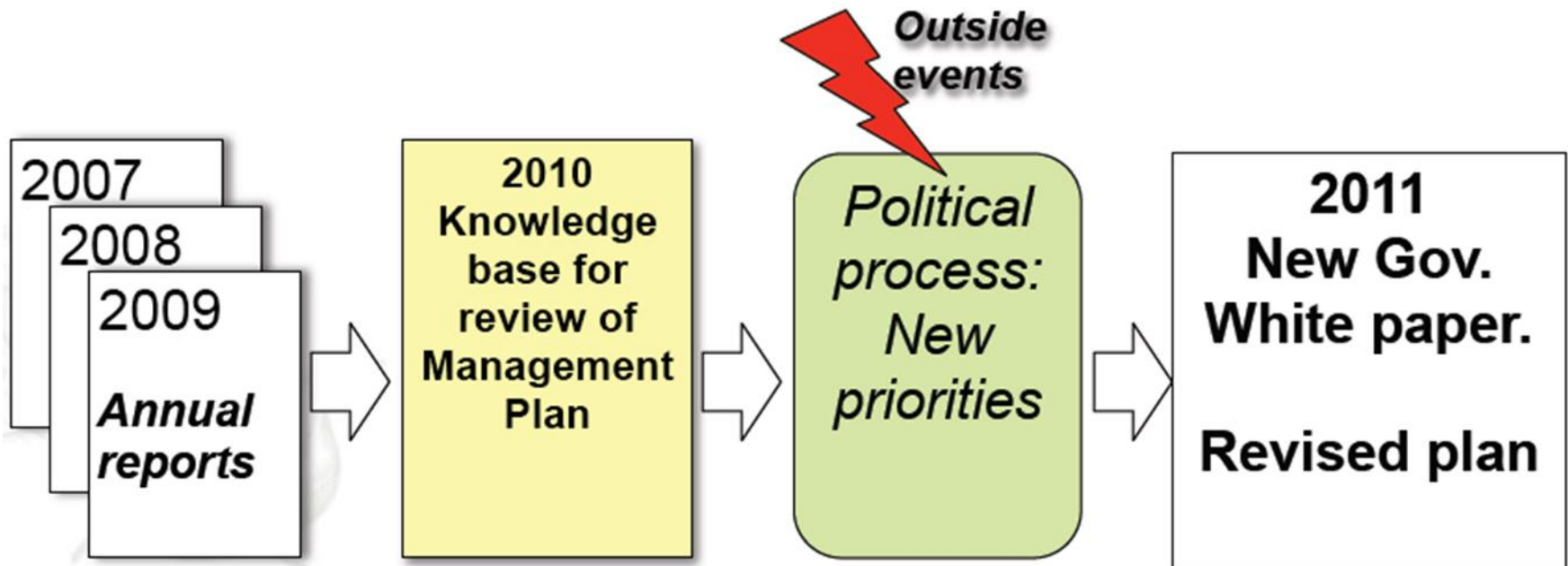
The different steps of the Integrated Management Process



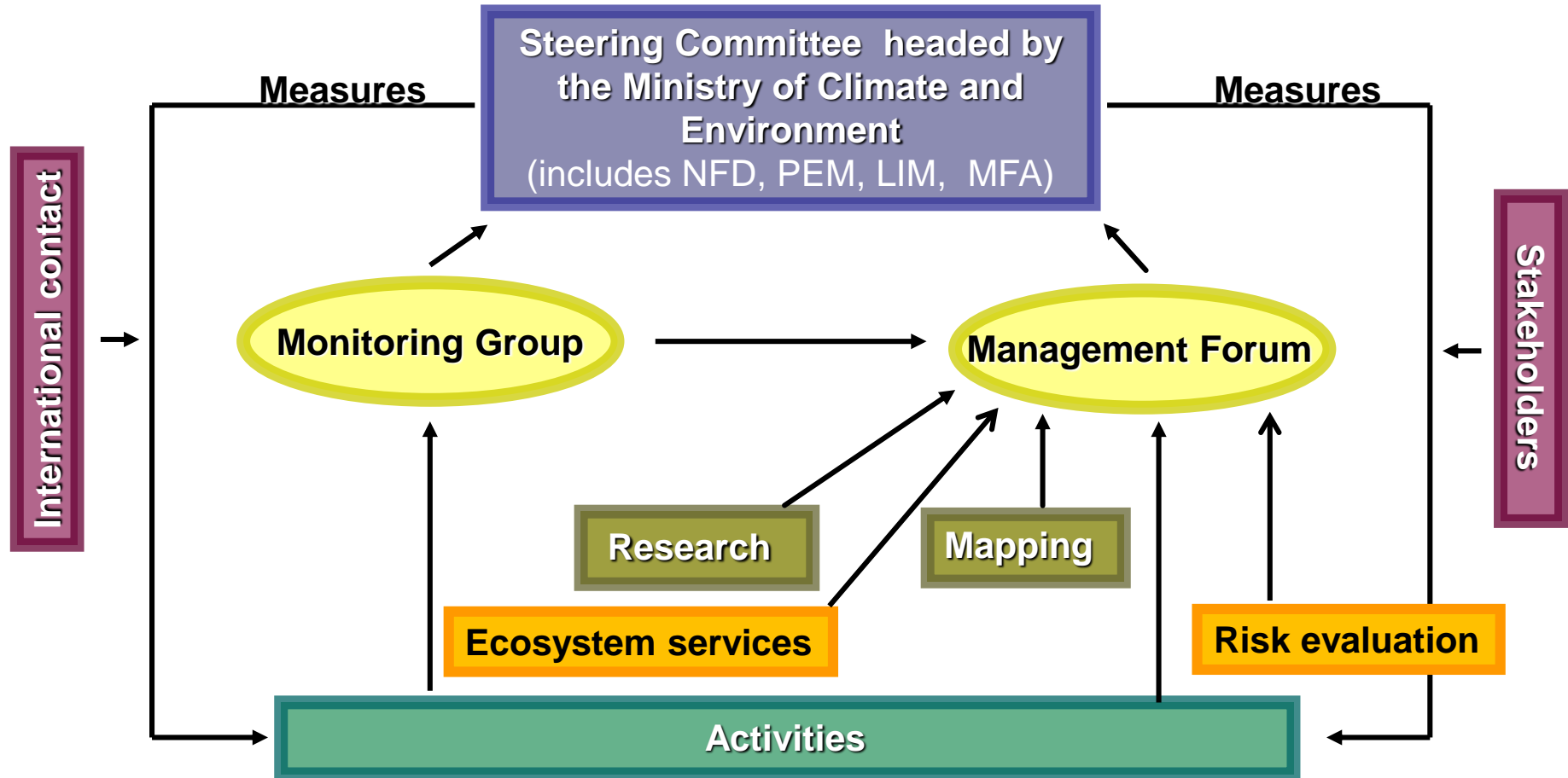
Update and revision

The Integrated Management Plan is to be updated on a regular basis.
First update: spring 2011.

A complete revision of the whole management plan within 2020.



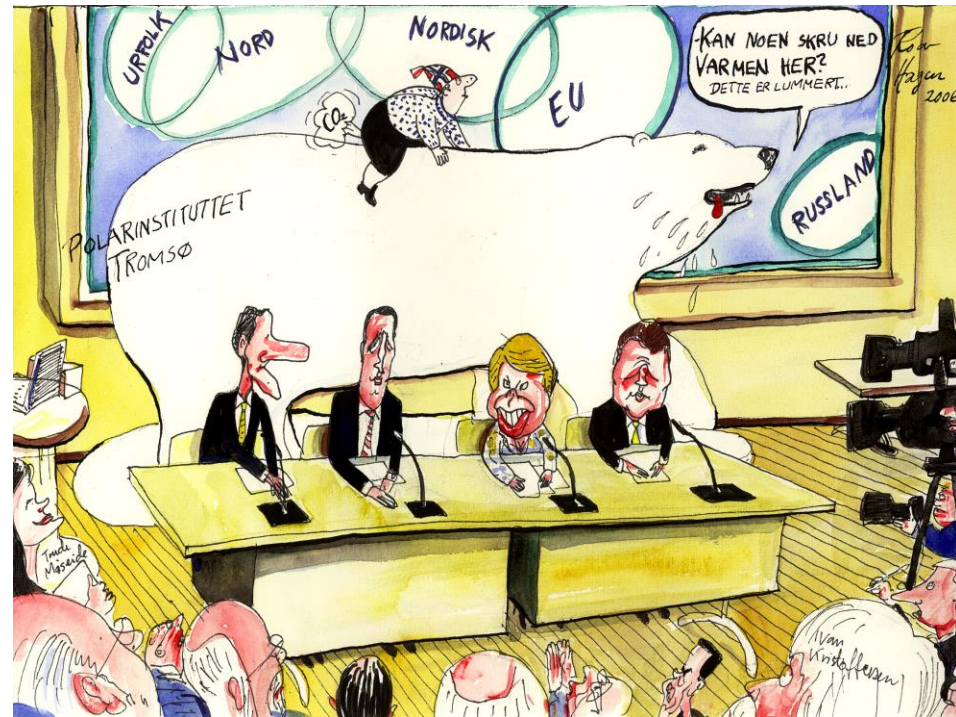
The elements of the system for implementing the management plan



The different groups have a broad membership, with representatives from the relevant public institutions with responsibility for and expertise in the various sectors, but will also draw on expertise from other sources as necessary.

Consultation with stakeholders

- Meetings before updates
- Seminars on specific topics
- Meetings between single stakeholders and the permanent working groups
- Written feedback on scientific material/reports being produced
- Conference when the scientific background material for updates/revision has been delivered to the Steering Group



Integrated Management Plan implementation

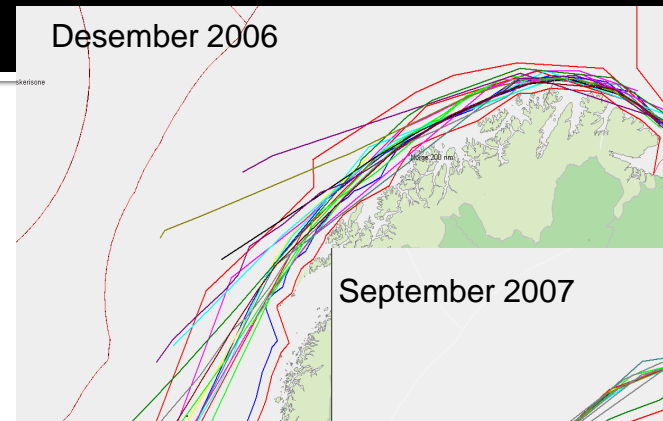
Management by areas

Protected areas

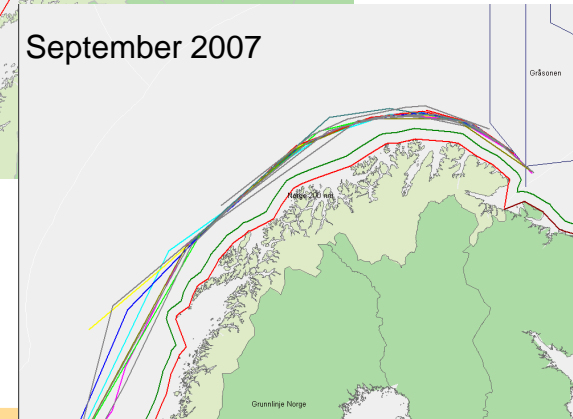
Framework for petroleum activities

Establish mandatory lanes for shipping

Other geographical regulations



September 2007



Guidelines for activity

Time limitation

Volume limitation

Equipment restrictions

Other demands upon technology

Other management areas

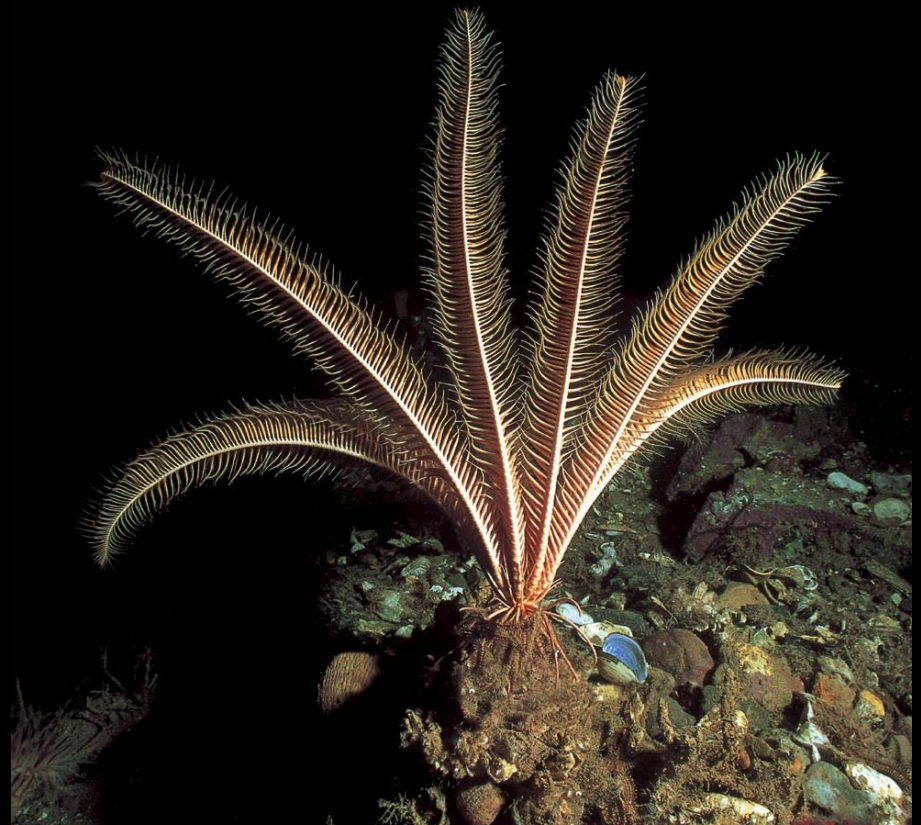
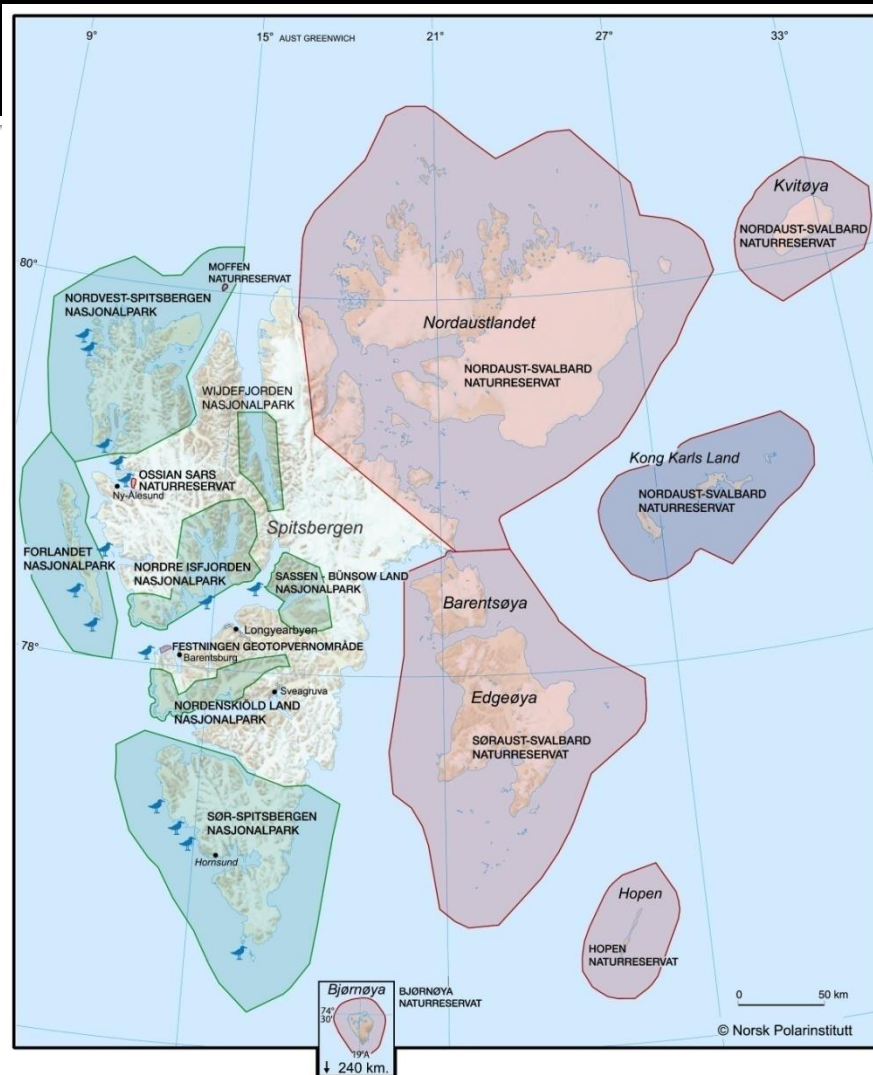


Photo: B. Gulliksen & E. Svensen (2004)

Protected areas in Svalbard

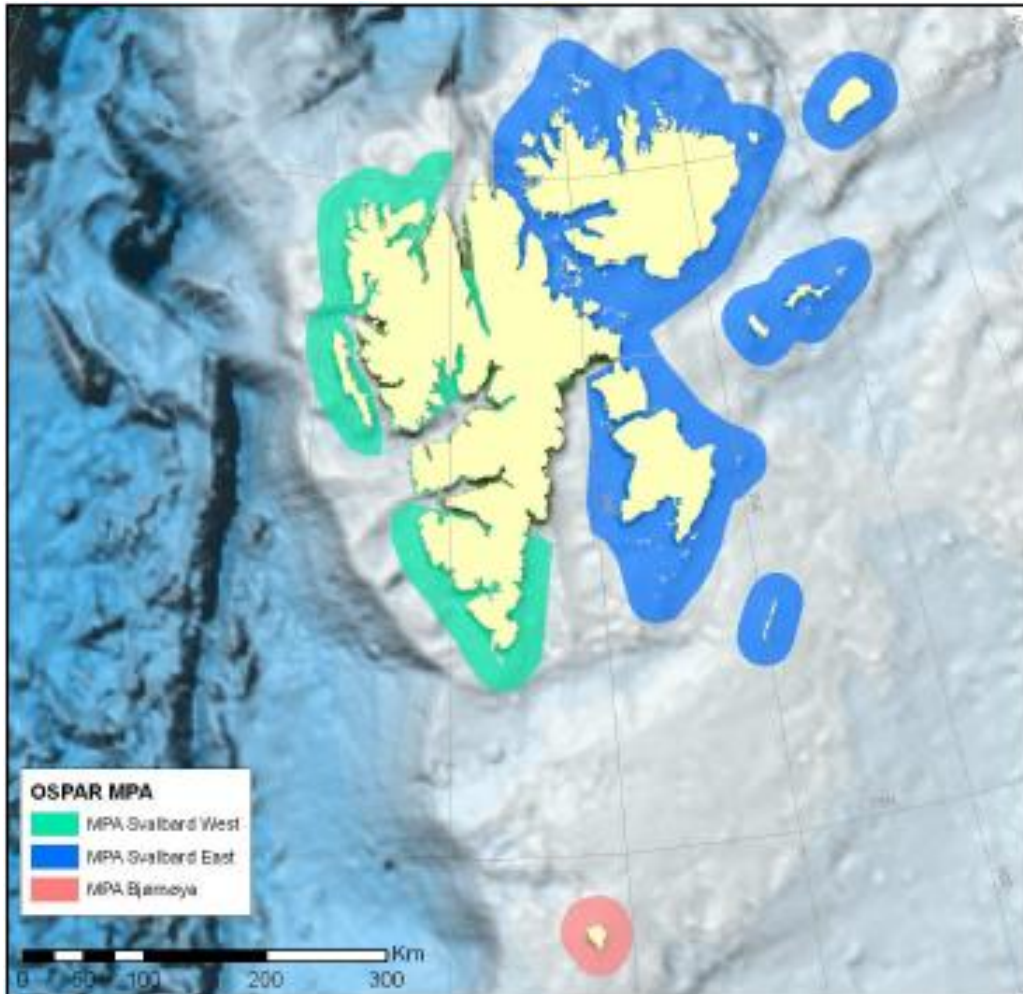


Protected areas cover 65 % of Svalbard, either as national park or as nature reserve.

The protection is stretching out to the territorial boundary (12 nautical miles) thereby including large marine areas of very different quality.

- NATURRESERVAT / NATURE RESERVE
- NASJONALPARK / NATIONAL PARK
- GEOTOPVERNOMRÅDE / PROTECTED GEOTOP
- FUGLERESERVAT / BIRD SANCTUARY

OSPAR Marine Protected Area (Svalbard, Norway)

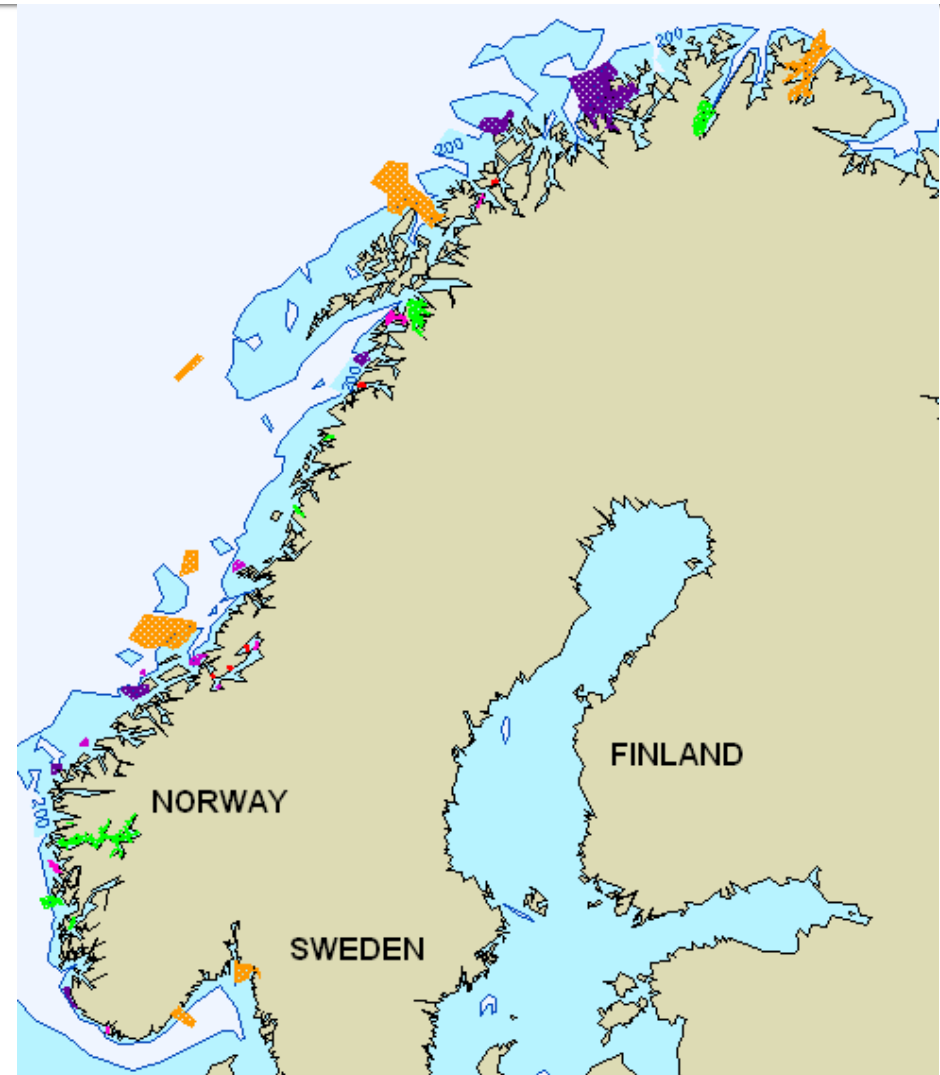


Selection criteria

- Threatened and/or declining species and habitat
- Important species and habitats
- Ecological significance
- High natural biological diversity
- Representativity
- Sensitivity
- Naturalness

Development of national plan for MPAs

- Analysis: distribution of plants and animals along the coast (4000 benthic species)
- 3 biogeographic regions
 - Skagerrak in the south
 - Norwegian west coast
 - Finnmark in the north
- 6 categories of areas
 - 1. Landlocked fjords 2. High-current areas, limited water exchange through a narrow passage/channel 3. Shallow-water areas 4. Fjords 5. Open coastal areas 6. Transects coast /ocean and continental shelf areas)
- Areas from all the 6 categories in each region selected
- National goal: Protect a representative selection of nature types, habitats and landscapes



Source: Egil Roll/www.milodir.no

Valuable areas (background - management plan)



Photo: C.H. von Quillfeldt

Criteria

- Representativity
- Biodiversity
- Production
- Coupling: marine – terrestrial
- Naturalness
- Uniqueness and/or rarity
- Economic importance
- Social importance
- Scientific importance
- Educational value
- Accessibility
- International or national significance

Tabell 21. Utvalgsriterier for vurdering av marine natur- og kulturverdier brukt i MABA. Omarbeidet etter Theisen (1997), Gabrielsen et al. (1997), DN (1998), Theisen & Brude (1998), Hop et al. (1998), Kalleher (1999). Eksemplene som er nevnt under de ulike delkriteriene er ikke fullstendig. * Er forklart nærmere på neste side.

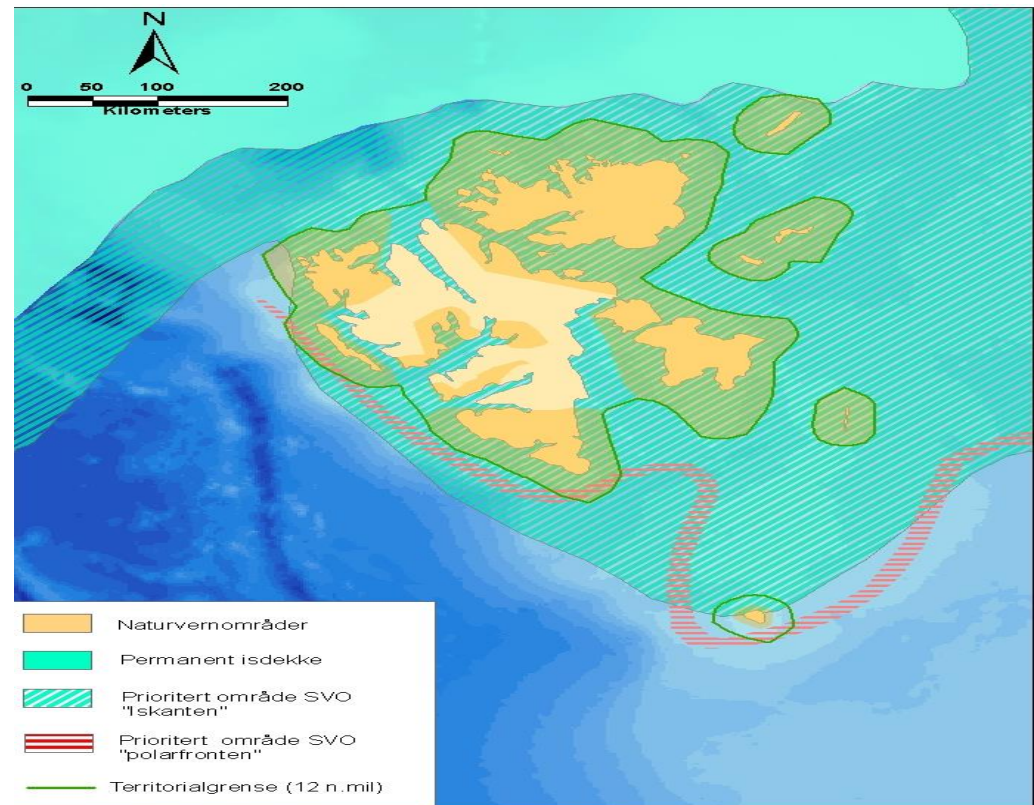
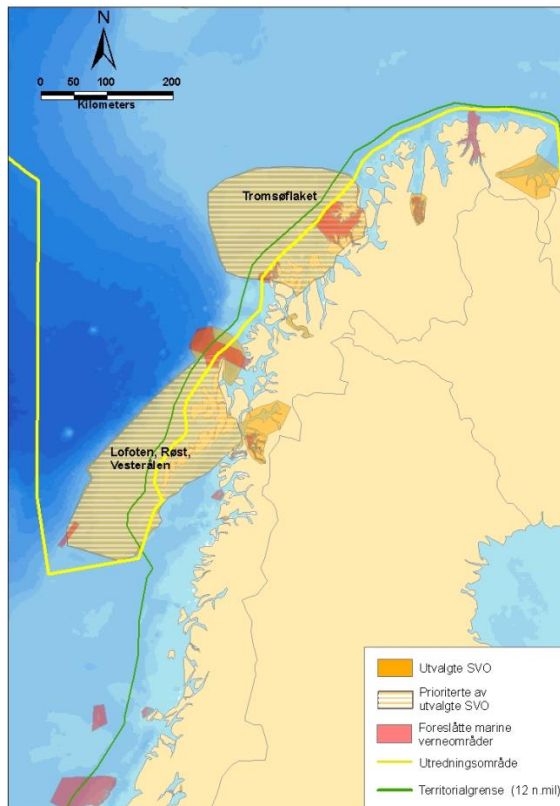
Utvalgsriterier	Delkriterier	Detaljer	Noen eksempler	
Overordnet kriterium	Viktighet for representasjon av alle biogeografiske soner, naturtyper, habitater, arter og kulturminner i analyseområdet	Sikre representasjon som er typisk	Vanlig forekommende Unikt område, representativt for regionen Områder som har bevart sin opprinnelige karakter	Iskanten Polynyaer Fuglekolonier Issturingsområde
		Sikre representasjon som er særegen	Sjeldne naturkvaliteter Områder med innhold truet av menneskelig virksomhet Spesielt betydningsfulle arter	Områder nær bosetninger Områder med stor turistaktivitet Områder med fis erikativiteter
		Sikre representasjon innenfor et større nettverk	Cirkumpolart i Arktis Nord-sør gradient	
Uttyllende kriterier	Viktighet for biologisk mangfold	Spesielt stort biologisk mangfold (diversitet)	Økosystemnivå Artsnivå Genetisk nivå	«Hot-spots»
		Leveområder for spesielle arter/bestander	Endemiske arter Sårbare, sjeldne, truede arter * Økologiske indikatorarter * Nøkkelarter * Paraplyarter * Flaggskip * Bestander med nasjonal eller internasjonal verneverdi	Øyer/fuglefjell Strandsonen Drivisen Åpent hav
		Spesielle naturtyper og habitater	Sjeldne Truede Sårbare	Isolerte øyer
	Viktighet for biologisk produksjon	Grenseområder	Yttergrense for en eller flere arters utbredelse	Polarfronten
		Stor biologisk produksjon	Høy primærproduksjon Høy sekundærproduksjon	Oppvellings- og frontområder Iskantsonen Permanent isfrie områder i drivisbeltet
	Uttyllende kriterier	Kobling mellom marint og terrestrisk miljø	Store konsentrasjoner av arter eller individer	Reproduksjonsområder Oppvekstområder Nærings-, hvile- og myteområder Kaste- og hårfellingsområder Trekk- og vandringsruter
Grad av påvirkning fra marine organismer på terrestrisk miljø			Vegetasjon ved fuglefjell Næringsressurs	Fuglefjell
Uberørthet		Grad av menneskeskapt påvirkning	Tekniske inngrep/areallbruk Beskatning (fis ø/fangst) Forurensning	Bentiske områder Åpent hav Områder nær bosetninger
		Særegenhet og/eller sjeldenhet	Naturverdier Kulturminneverdier	Særegne/Sjeldne naturtyper Særegne og sjeldne kulturminner
Økonomisk betydning		Turisme	Områder med opplevelsesverdi	Enkelte strandlokalteter Fuglefjell
		Fiske/fangst	Reproduksjonsområder Oppvekstområder Nærings-, hvile-, myteområder	Bentiske områder Kystområder Åpent hav
Sosial betydning		Verdi for lokale/internasjonale samfunn	Historisk verdi Estetisk verdi Verdi for rekreasjon	Kystområdene Kulturminner
		Vitenskapelig verdi	Spesielt vitenskapelig interessante områder/arter/økosystem	Biologiske- Geofysiske- Geologiske forekomster og fenomener Kulturminner
Pedagogisk verdi		Referanseområder Kildeverdi	Forskning Overvåkning	Et vidt spekter av områder
		Typelokaliteter	Biologiske Geologiske Økologiske	Et vidt spekter av områder
Tilgjengelighet	Illustrering av sammenhenger	Økologiske Naturfenomener Kulturminner og naturmiljø	Et vidt spekter av områder	
	Vitenskapelig aktivitet Pedagogisk aktivitet Turisme/friluftsliv			
Internasjonal og/eller nasjonal verdi	Eksisterende forpliktelser	Ulike avtaler/forpliktelser Internasjonale konvensjoner	Et vidt spekter av områder	
	Potensiale for å bli innlemmet i et nasjonalt/internasjonalt system	Ulike nettverk verneområder målestasjoner forskningsprogram Internasjonal/nasjonal verneverdi	Et vidt spekter av områder	

Selected valuable areas

- **Oceanographically/topographically special areas**
 - Fronts
 - Strong currents
 - Fjords
 - Retention areas
 - Tidal zone
- **Important areas for life history**
 - Spawn/birth/breeding grounds
 - Drifting paths/migrating routes
 - Feeding grounds
 - Wintering grounds
 - Moulting areas
- **Other criteria**
 - Key areas for **endangered** or **vulnerable** species
 - or **species** for which Norway has a **special responsibility**
 - or **habitats** for **internationally** or **nationally populations** of certain species all year round or at specific times of the year
- **Protected areas**
 - Suggested marine protected areas along the Norwegian coast
 - Existing protected areas in Svalbard
- **Cultural monuments**

Particularly valuable areas in the Barents Sea

18 valuable areas of which four (Lofoten/Røstbanken/Vesterålen, Tromsøflaket, the Polar Front and the Marginal Ice Zone) are particularly valuable areas for **biological production** and **biological diversity**. Negative pressures will in some cases affect a great deal of a population or a great deal of the ecosystem.



Vulnerable areas (background - management plan)



Photo: H. Strøm

Vulnerability

Assessing vulnerability

- **Type of impact and duration**
- **An area is usually not equally vulnerable all year round**
- **All species in an area will not be equally vulnerably towards a specific environmental pressure**
- **Differentiating between natural and human-induced pressures on the environment is difficult**

Vulnerability can be measured at individual, population, community and ecosystem level.

Vulnerability cont.

■ High concentrations of organisms

- Number of individuals within an area - influence on the vulnerability
 - High production – grazing areas
 - Breeding colonies
 - Haul out sites



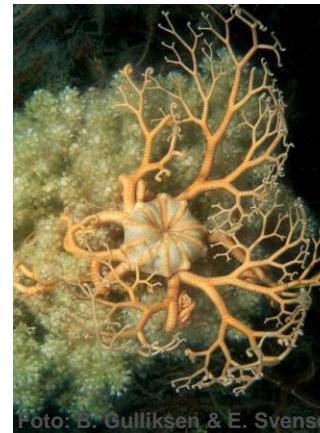
■ Behavior or population dynamics

- Species being able to escape unfavorable conditions will be least affected
- Time spent at sea for feeding or moulting



■ Sessile/motile animals

- Sessile animals – particularly vulnerable with respect to climate change, pollution, certain types of fishing operations



■ Insulation

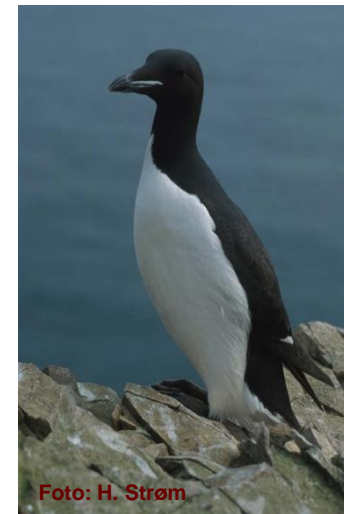
- Feathers and fur - more vulnerable to oil spills than whales and adult fish – amount of blubber

■ Diet

- The diet variability and degree of specialization

■ Key species

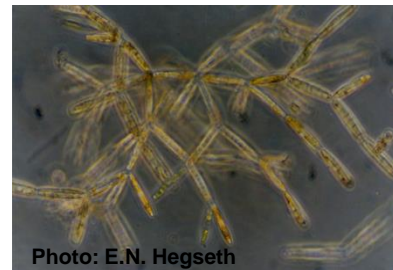
- Particular important role in the ecosystem
- Seriously affected – may affect the whole ecosystem



Vulnerability cont.



- **Age**
 - An organism's vulnerability varies in accordance with age
 - Generally, the young stages of an organism's lifecycle will be especially vulnerable
 - immune, neural, enzyme systems are developed
- **Life history**
 - How long they live
 - When they sexually mature
 - Reproductive rate
- **Migration**
 - Whole life or migrate in and out of the area
- **Border of distribution**
 - Often more vulnerable near its border of distribution
- **Peculiar species composition and/or particularly high species diversity**
- **IUCN Red List species.**
 - Essentially a forecast of the risk of species becoming extinct in Norway.



Particularly vulnerable areas

Barents Sea: An evaluation of environmental values and vulnerability with respect to the most important impacts of fisheries, shipping and petroleum activity, resulted in a list of **16 vulnerable areas/types of areas**, of which **seven** were regarded as **particularly vulnerable**.

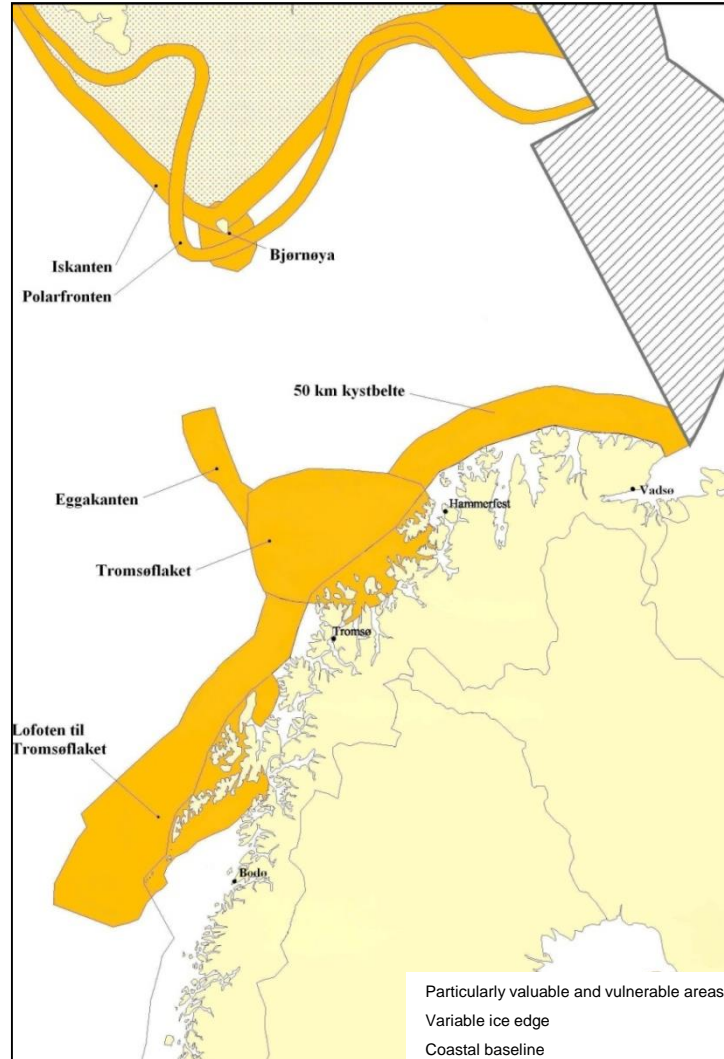


- Particularly valuable areas
- Spawning and egg grounds for fish
- Larva grounds for fish
- Breeding, feeding, moulting and wintering grounds

Particularly valuable and vulnerable areas in the management plan



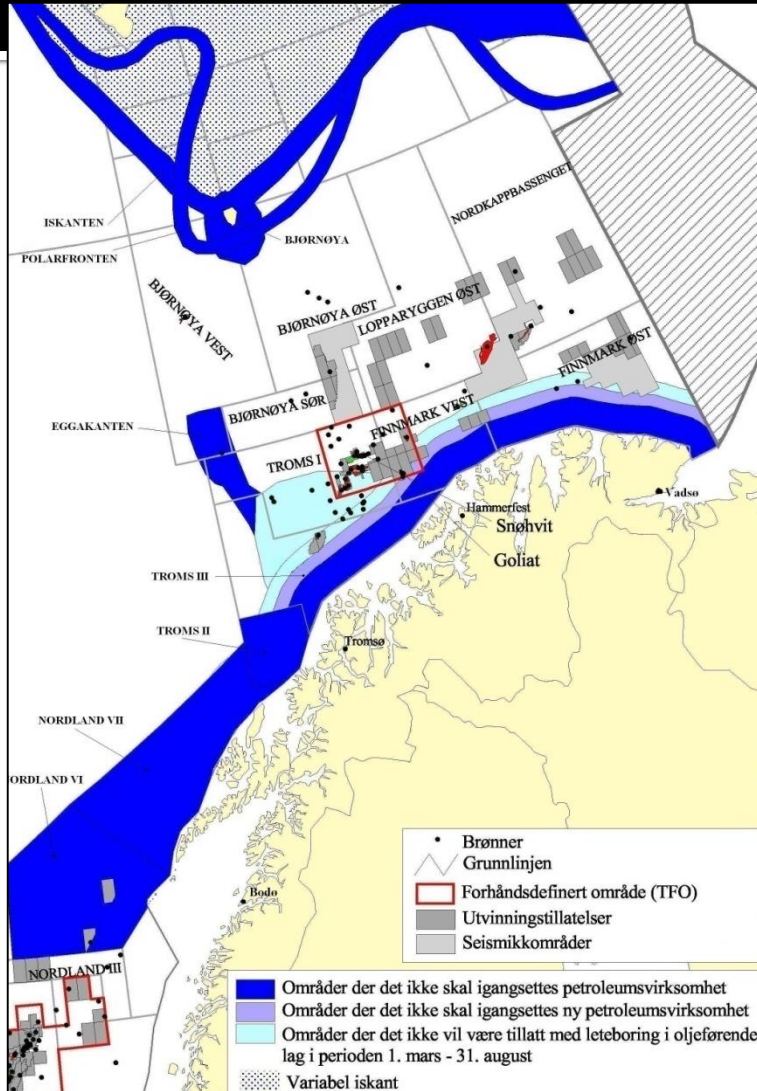
Particularly valuable and vulnerable areas that require special attention (in the Management Plan/White Paper)



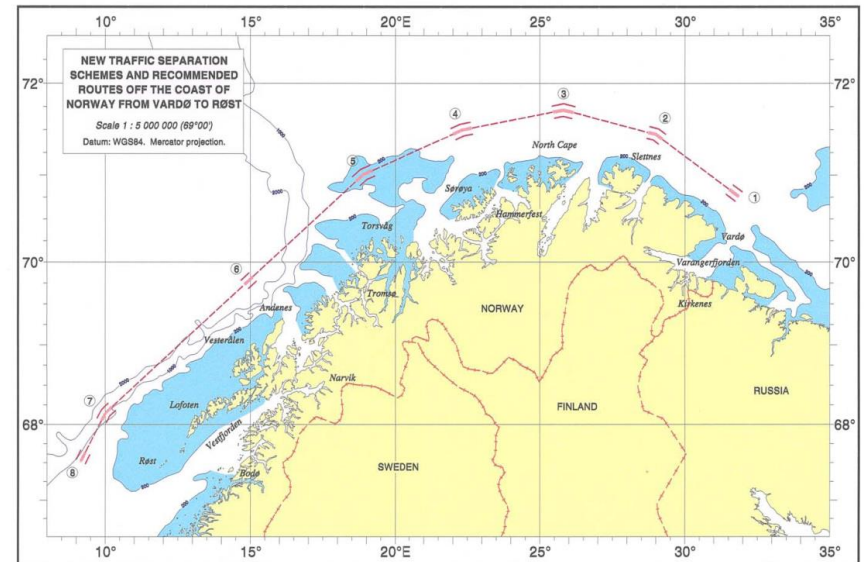
The most important criteria for selecting the areas were:

- whether it supports **high production** and **high concentration** of species
- whether it includes a large proportion of **endangered** or **vulnerable** habitats
- whether it is a **key area** for species for which Norway has a special responsibility or for endangered or vulnerable species
- whether it supports **internationally** or **nationally** important populations of certain species all year round or at specific times of the year

Area based management



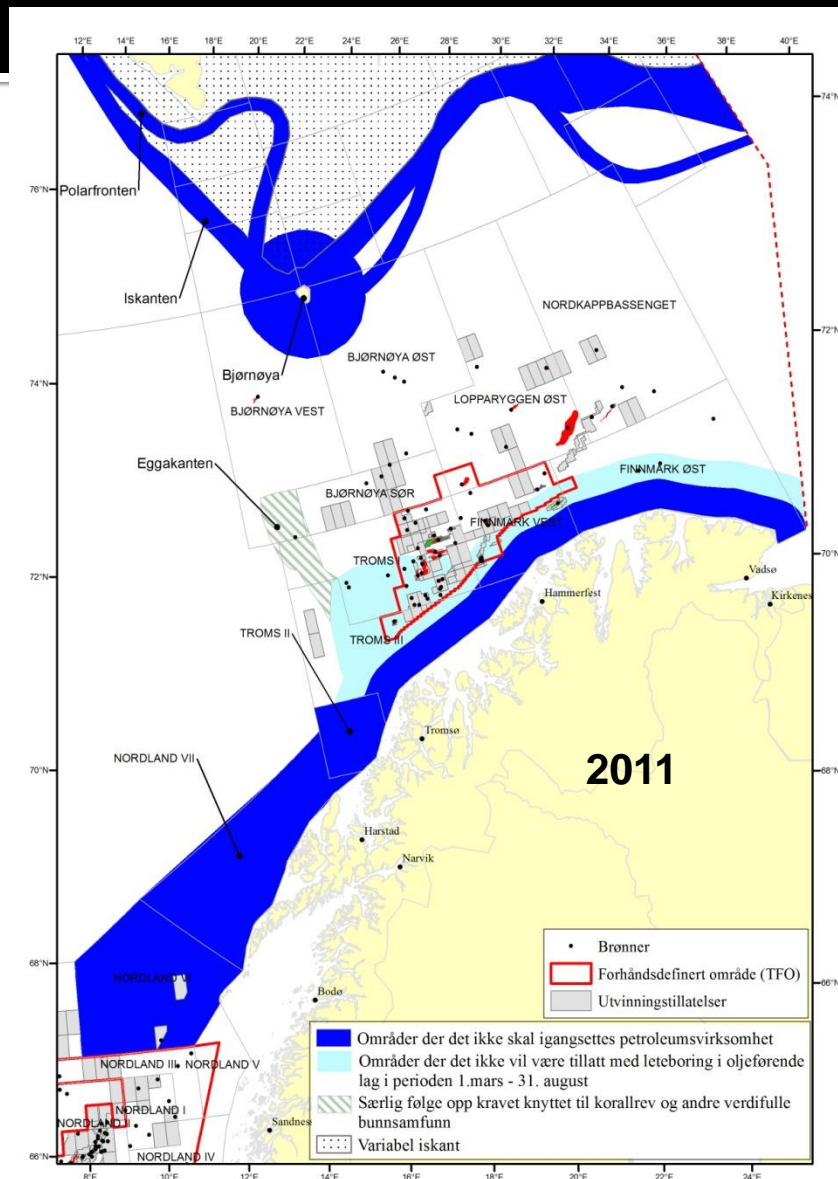
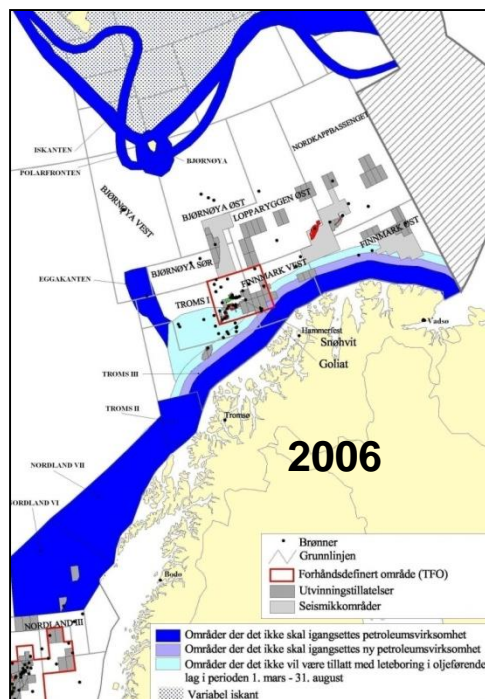
Framework for petroleum activities



Mandatory routing and traffic separation scheme outside territorial waters between Vardø and Røst.

Framework for petroleum activities - Result of revision

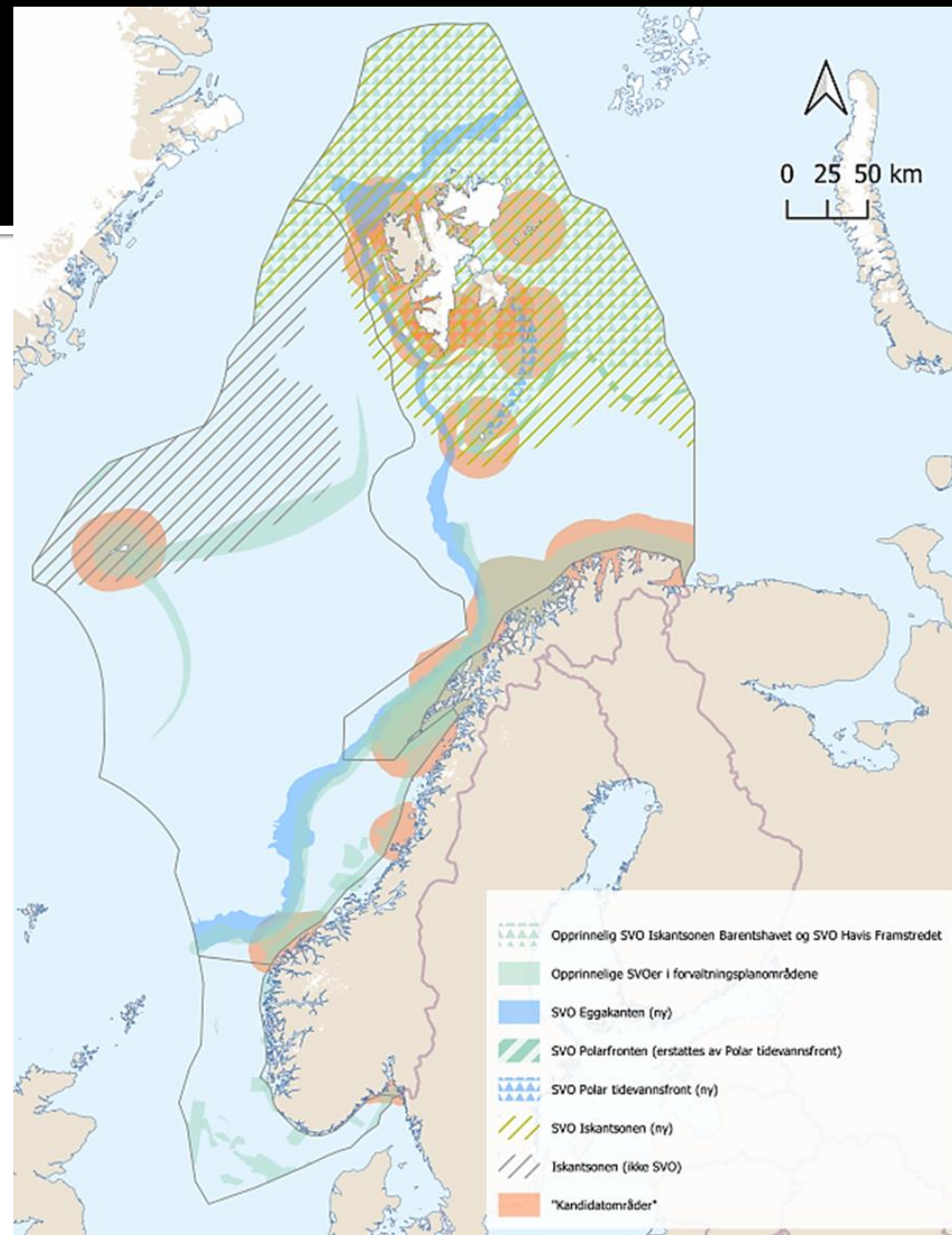
- More areas for petroleum activity, but not in the Lofoten area
- Revisions of environmental regulations
- More science



Report on valuable and vulnerable areas 2019

- Marginal sea ice- two options
 - Maximal sea ice distribution
 - 30 % frequency of sea ice
- Polar tidal front (instead of the Polar front area)
- Continental shelf break and slope from Stadt to north of Svalbard (instead of shelf brake in parts of the area)
- Candidate areas based on important areas for seabirds
 - Consequences for the size of existing areas?

Final result in the management plans in 2020????



Before and after the management plans

From	To	Barents Sea plan
Individual species	Ecosystems	Barents Sea as ecosystem
Small scale	Multiple scales	Barents Sea – sub areas, concrete spots
Short time frame	Long time frame	Scenario 2020
Sector management	Integrated management	Combined assessment of impact of oil and gas activities, shipping and fisheries
Management and research divided	Knowledge based management	Knowledge gaps identified, monitoring needs identified, priorities set based on management needs
Sector measures	Cross sector cost-benefit analysis	Optimal risk management across sectors

Thank you for your attention!



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Photo: C.H. von Quillfeldt