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# Social-Ecological Timelines and climate change narratives in Finnmark fjord fisheries

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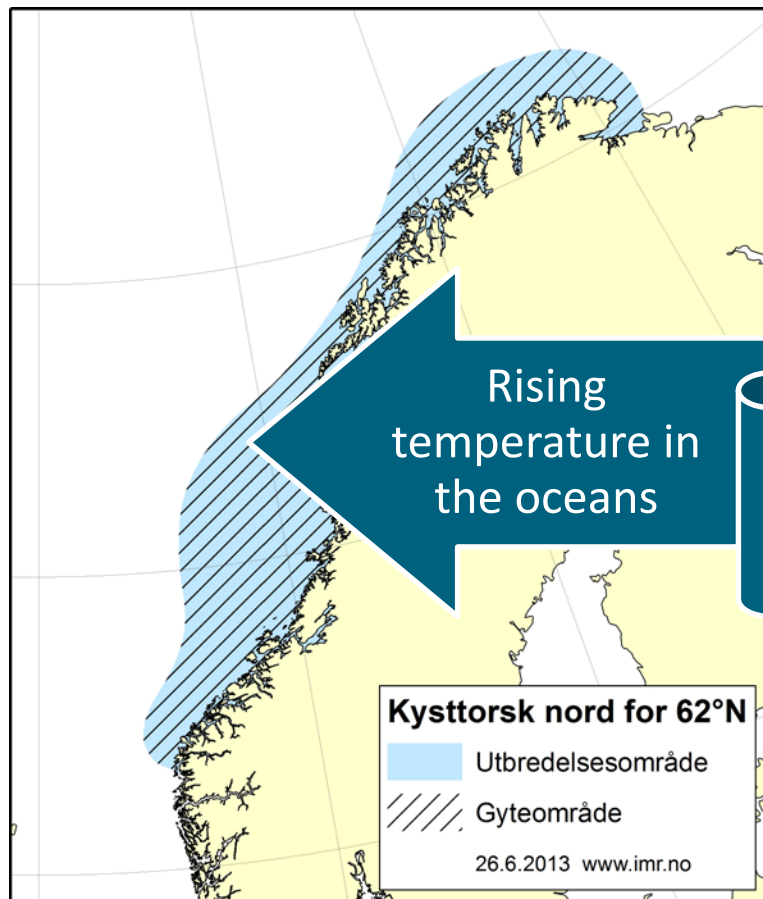
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*Time series analysis in environmental science and applications to climate change  
Tromsø, 8-11 November 2016*



# Climate change and human impacts— what can explain the disappearance of resources from indigenous coastal communities?



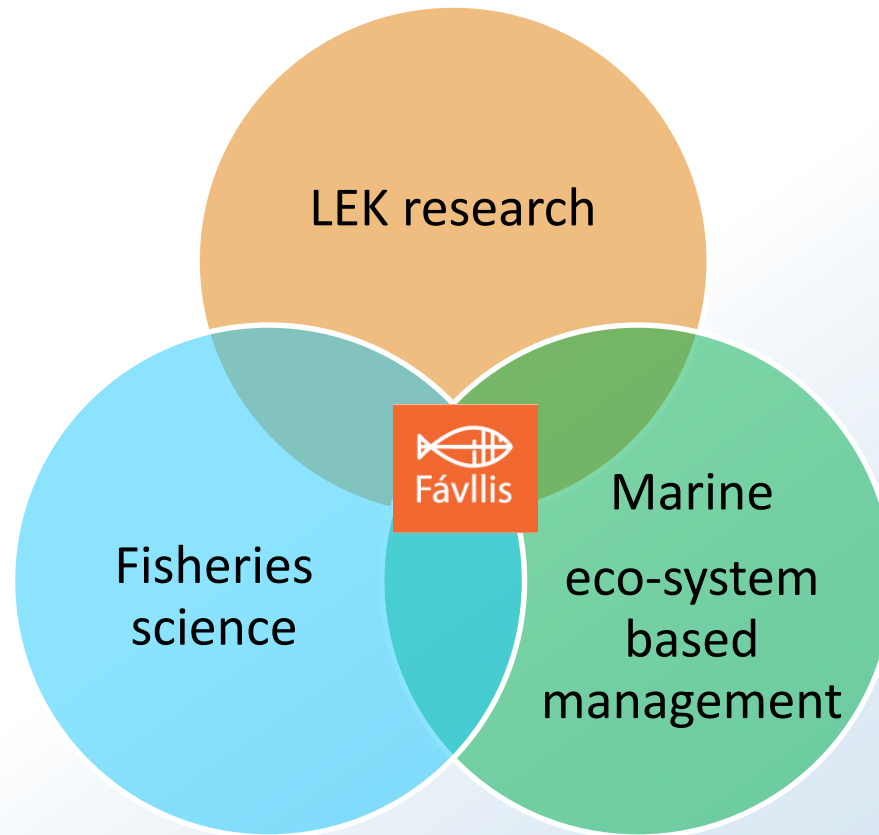
**Anthropogenic impacts (overfishing)**



• Picture: Jannie Staffanson, Saami Council, at COP 22 in Marrakech, November 8th

# Fávllis project: Integrating local ecological knowledge (LEK) with marine science and management

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# Ecological and social change impacts on local communities (1990→)

- Broderstad and Eythórsson (2014): Resilient communities? Collapse and recovery of a social-ecological system in Arctic Norway
- Large-scale ecological changes in Finnmark fjords
  - Collapse and recovery of fish stocks
  - Invasive species
- Large-scale social changes
  - IVQ-system 1990
  - Active fisheries policy

Fig. 2. Registered fishers in Unjárga and Porsárgu, 1985-2012, main and secondary occupation. Source: Directorate of Fisheries (2014).

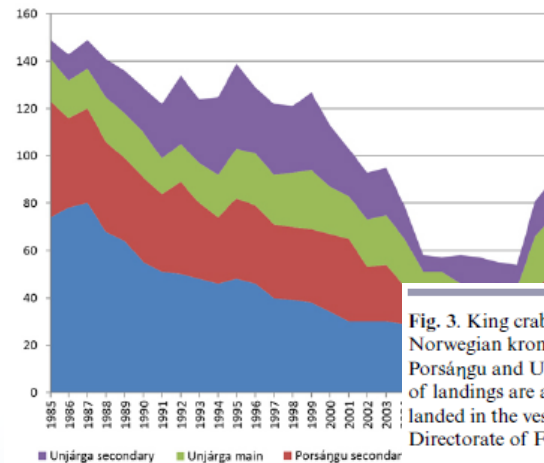
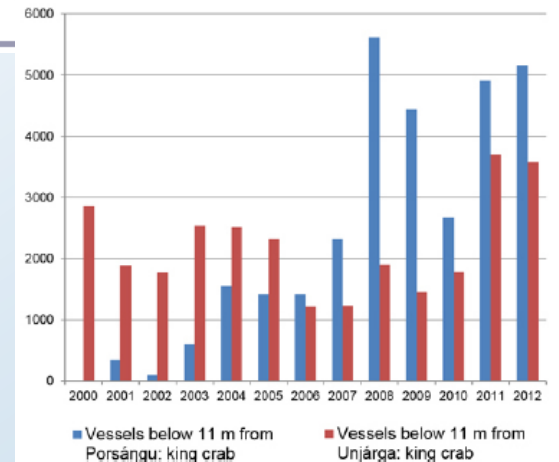


Fig. 3. King crab (*Paralithodes camtschaticus*) catch (in 1000 Norwegian kroner) landed by vessels below 11 m from Porsárgu and Unjárga, in the period 2000-2012. Municipalities of landings are all over Finnmark, but most of the catch is landed in the vessels' home municipality or close by. Source: Directorate of Fisheries (2014).

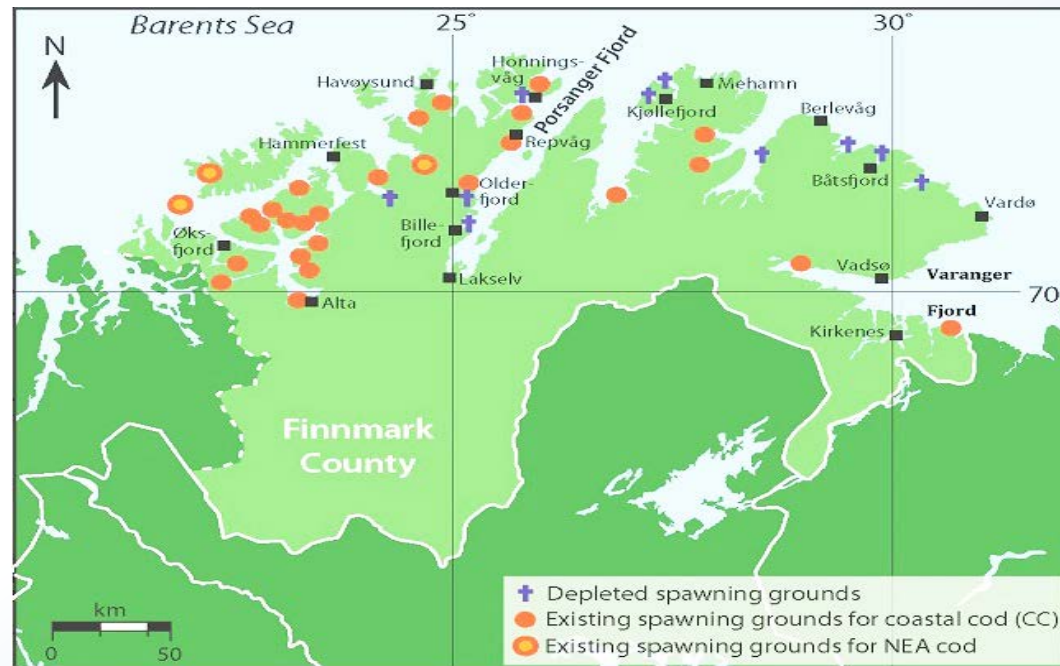


# Case area: Porsanger fjord

## Partner: Coastal Sami Resource Centre

## Institute of Marine Research

**Fig. 1.** Porsáŋgu and Várjat vuotna are two of the major fjord areas in Finnmark County. The map shows spawning grounds for Northeast Arctic cod (*Gadus morhua*), coastal cod, and depleted spawning grounds for coastal cod, based on interviews with 70 fishers in 1996, by social scientist Anita Maurstad and marine biologist Jan H. Sundet (Maurstad and Sundet 1998).



# The Fávllis LEK research method

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“Experience-based knowledge, continually derived from fishing practices within a community of fishers in the same area. LEK, as we understand the term, emphasizes the spatial aspect of knowledge about the environment in a resource user’s (and in this case particularly fishers’) vicinity, without discrimination between traditional knowledge and contemporary knowledge derived from fishers’ continuous interaction with a changing marine environment”

(Eythórsson and Brattland 2012)



# Social-Ecological Timelines (SET)

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- A tool for documenting and visualising social-ecological change at small spatial scales.
- Experiences from the Fávllis network for Sami fisheries research
- Example of marine socio-ecological timeline (SET)
- What is the potential contribution of SET to other climate change time series?



# Method: Grounded theory using Nvivo qualitative analysis software

The screenshot displays the Nvivo software interface. On the left, an interview transcript is visible with several lines highlighted in yellow. On the right, a 'Select Project Items' dialog box is open, showing a tree view of project nodes and a table of selected items.

**Interview Transcript:**

S: Kan du sette en A der?

H: En A? Og så kanskje jeg må gjøre sånn her (Markerer på kart)? For her var også et lite... og kan egentlig gå helt ut dit. Det her fisket der, tror jeg.

S: Hvis du bare tar og lager sånn krollstrek der.

H: Jeg kan heller gjøre sånn her. Slik at det.... Det her kalte man for Råigaadjastråvdnji. Og det betydde noe det også. Det betydde at...råvnnjis...da var du akkurat i strømmen her og fisket etter enten småsei eller torsk. Det var vel kanskje sjelden at storsei gikk hit inn. Men hit kunne storsei faktisk komme. Og her. Lenger inn vet jeg ikke, da er man liksom utenfor mitt område. Men her har jeg sjøl vært som guttunge med og fått storsei. Fylt båten og rodd til Kolvik for å levere.

S: Er den plassen der, hadde dere navn på den?

H: Eartejåtkågåddi. Ved siden av Eartejåtkå betyr det.

S: Kan du merke den av så kan du ...

H: Men, jeg vil ikke gå innpå det her. Jeg vil holde meg her borte, for her er jeg mer fortrolig. Det der er nesten bare sånne si desprang når jeg nevner det. Det vil jeg ikke gå inn på nærmere. Men akkurat det området her. Det var et yndet flyndre-felt. Men det var litt begrenset. Slik at akkurat utenfor huset her, der måtte vi stoppe med å sette flyndregarn. For da kom vi inn på ruggelbotn bortover her. Det var min lærdom av min far. Men de beste flyndrene var faktisk når vi var utover her, helt på kanten her. For at der var det store, fete fisker.

S: Hvis du tar og skraverer der, det flyndrefeltet.. Det står en A der.

**Select Project Items Dialog:**

Automatically select subfolders:  Automatically select hierarchy:

Name	Nickname	Created	Modified
Places		07.07.2010 12:00	07.07.2010 12:00
Species		21.06.2010 14:40	19.10.2010 15:25
Birds - Sjøfugl		09.07.2010 11:37	13.01.2011 11:14
Bottom Fauna		01.09.2010 10:38	17.11.2010 16:16
Capelin - Lodde		22.06.2010 13:35	27.01.2011 10:16
Charr - Røye		22.06.2010 14:00	17.03.2011 13:01
Coalfish - Sei		21.06.2010 14:47	17.03.2011 13:46
Cod - Torsk		21.06.2010 14:41	17.03.2011 13:47
Coastal cod		01.09.2010 10:30	15.03.2011 10:38
Fjord cod		01.09.2010 10:30	27.01.2011 14:21
Ocean cod		01.09.2010 10:30	17.11.2010 15:57

Buttons: Filter, Clear Filter, Select All, Clear, OK, Cancel



# Main findings in the Fávllis material

Table 3: Topics mentioned by most of the informants

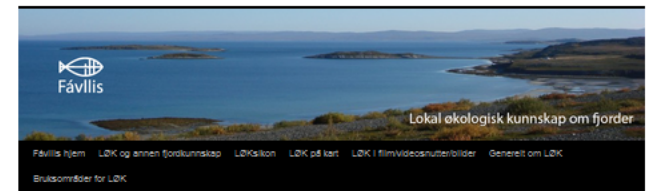
Gear (passive, active)	Information about traditions
Fishing boats (small, large)	The ecological cycle (seasonal changes)
Customary and current use (fishing practices)	Ecosystem (species behavior, movement and interaction, general ecological changes)
Dating of own participation in fishing	Fish disappearance
Personal observations (stories)	Overfishing (or not)
Conveyed observations	Community (various topics)
Subsistence fishing	Commercial fishing, profitability and markets
Value statements (social, legal, economic and ecological)	Local perceptions on the management systems (quotas, etc.) and on legislation
Reflections about research projects/researchers	General reflections about the past

Table 4: Topics talked about by many of the informants

Changes and adaptations in equipment use	Empirical observations about the fjord
Professional fishing (full-time)	Pollution/acidification
Social processes like kinship and economic relationships	Local participation in fishery management and politics
Emotional impact	Impact on local economy, local markets
Sense of justice	Farming
Factors related to identity and ethnicity	Usage of places in the fjord (leading lines, etc.)
Usage of places in the fjord (spatial)	Interplay between sea landscape, fish and gear types
Factors related to language and language connected to resource utilization	Reflections on the future of settlement and fishing

# Socio-Ecological Narratives

- Narratives on ecological change constructed from interviews with local ecological knowledge (LEK) experts
- “Bottom-up” approach
- Design in collaboration with local partners
- Significant components that make up Social Ecological Timelines



## Narrativ om sel

Selen i Porsangerfjorden



(Foto: Sigvald Persen)

Selen er en fjordboer som har hatt tilhold i Porsangerfjorden i lang tid. Det er for det meste snakk om tre typer sel i fjorden, de mer eller mindre bofaste havtene, steinkobbene og ringselen (kystsel). Men også grunlandsselen søker til fjordene iblant. Hvis du ber en fisker i Porsangerfjorden om å nevne en spesiell hendelse som har hatt stor betydning for økologiske endringer i fjorden, vil svaret ofte være "selinvasjonen på slutten av 1980-tallet". Da kom det en stor mengde grunlandssel til fjorden. Dette bidro til dårlig fiske over flere år, noe mange mener hadde store konsekvenser for lokalbefolkningen.

Selen har på godt og vondt hatt stor betydning for befolkningen i Porsanger oppgjennom historien. I tidligere tider har selen vært en viktig ressurs for de som levde langs fjorden. Jakt på sel var en viktig kilde til mat, og skinn og spekk var gode handelsvarer og råmaterialer til håndverk. Fra tiden rundt andre verdenskrig og utover har bruken av selen som ressurs avtatt.

I løpet av den siste halvdel av 1900-tallet har det skjedd mange store endringer i fjorden, som også har påvirket oppfatninger av selen og dens rolle i fjorden som økosystem og som ressurs for befolkningen. Den gjengse oppfatningen gir inntrykk av at selen har gått fra å være oppfattet som et velkomment nyttedyr til å anses som et plagsomt skadedyr. Etter hvert som det har blitt mindre fisk i fjorden, konkurrerer fjordfiskerne og selen om den samme, minskende ressurstilgangen. Selen skaper dessuten problemer for fiskerne gjennom blant annet skader på utstyr og forringelse av kvaliteten på fangsten, både ved at den spiser av fisk som har gått i garn, og at kveise sprer seg fra sel til fisk. Selen anses også som medskyldig i endringene i fjordens økosystem og nedgangen i fiskebestandene; det hevdes at den skremmer fisken ned på dypere vann, og at økningen i selbestanden fører til at en rekke fiskebestander blir beitet ned, noe som bidrar til å ødelegge den økologiske balansen i fjorden.

Selen ble på sett og vis en katalysator for store endringer i næringsgrunnlaget i fjorden. Bestanden av steinkobbe og havert i fjorden har holdt seg høy i tiden etter den såkalte selinvasjonen, og det har vært stor uenighet mellom lokalbefolkning, forskere og forvaltere om antallet sel i fjorden og fredningsbestemmelser. Det er stor frustrasjon knyttet til forvaltningen av sel i fjordene, og for mange sees den på som en plage og et hinder for fisket. Det kan virke som at mye av lokalbefolkningens frustrasjon og mistro til sentrale myndigheter kommer til syne i konfliktene rundt selen. Selv om mange mener at selen en av hovedårsakene til dagens ressurssituasjon (i tillegg til overbeskatning i nære og fjerne farvann over lang tid) er det flere som har sympati for selen, og viser til at den også trenger mat. Man mener at også sel hører til i fjorden, men at bestandene nå er blitt for store i forhold til næringsgrunnlaget (i hovedsak fisk).

Lokalbefolkningen er ikke i tvil om at selen er tilpassningsdyktig og endrer adferd for å skaffe seg fisk. Kanskje ser den mangesidige fjordfiskeren litt av seg selv i selen?

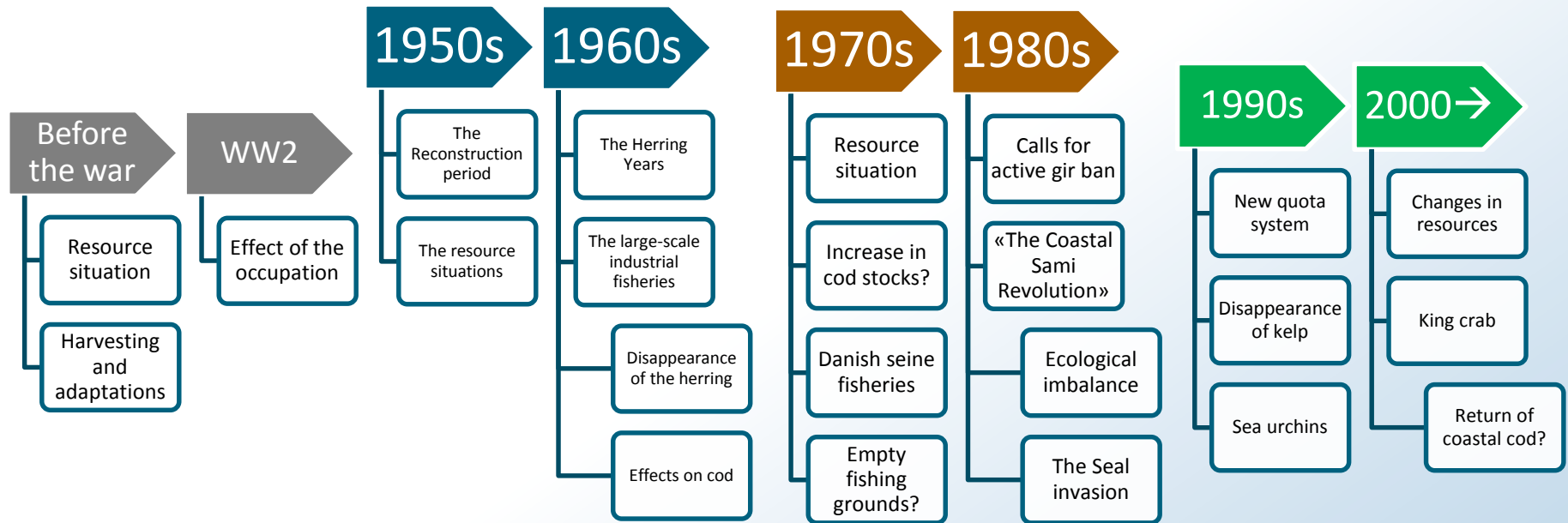
Til tross for at mange har et anstrengt forhold til selen er det helt klart at den er viktig del av den tradisjonelle fjordkulturen, som fremkommer av blant annet Sjøsamisk kompetansesenter sitt prosjekt om [selen som ressurs for sjøsamisk kultur](#) (lenke nederst på denne sida).

[Klikk her for å finne narrativet i kartet.](#)

[Lenker til annet materiale om sel](#)

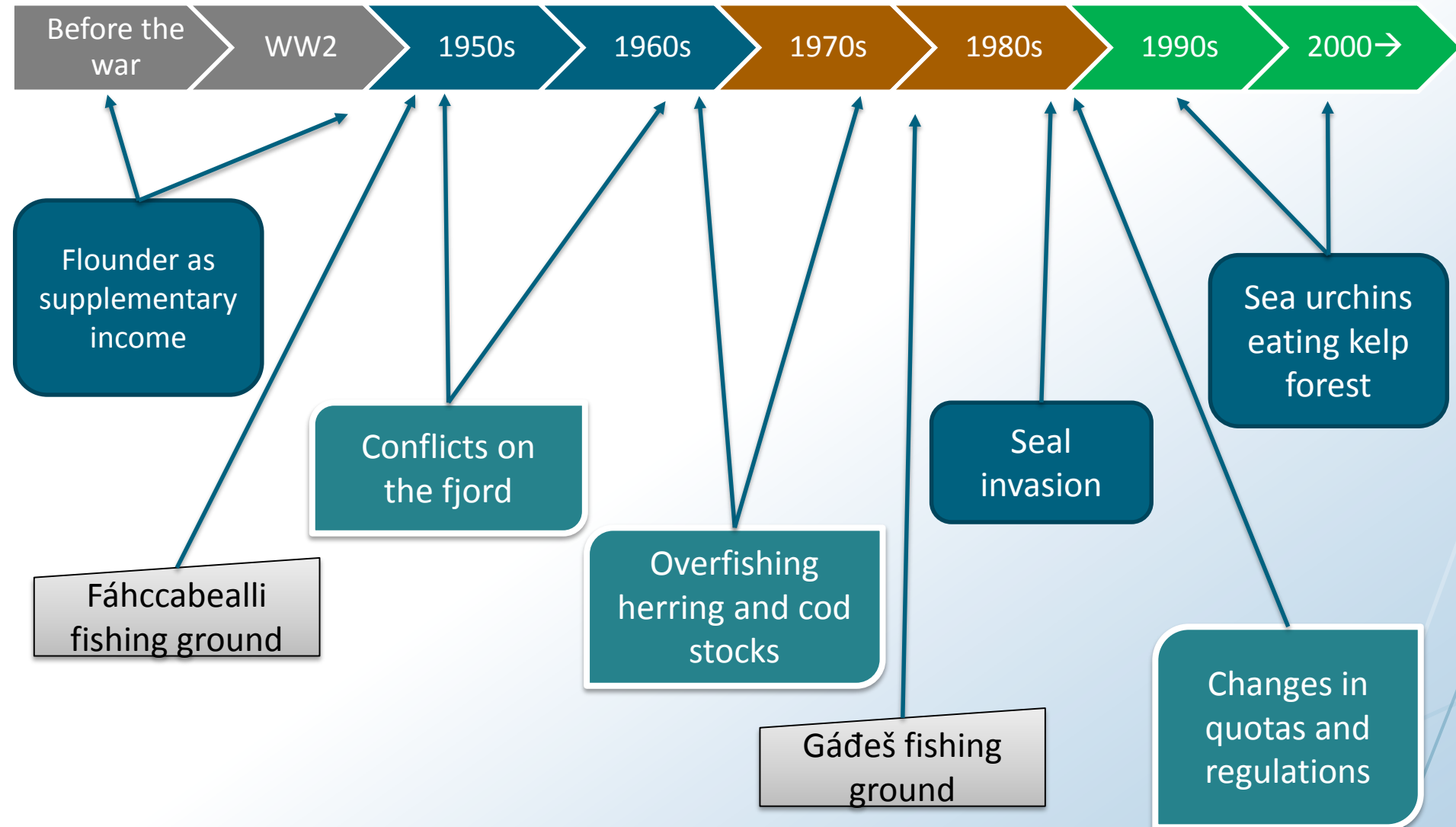
# Social-Ecological Timelines

Organized according to *time constitutive events*



# The Social Ecological Timeline of Porsanger

Local knowledge expressed through narratives, placed on timeline

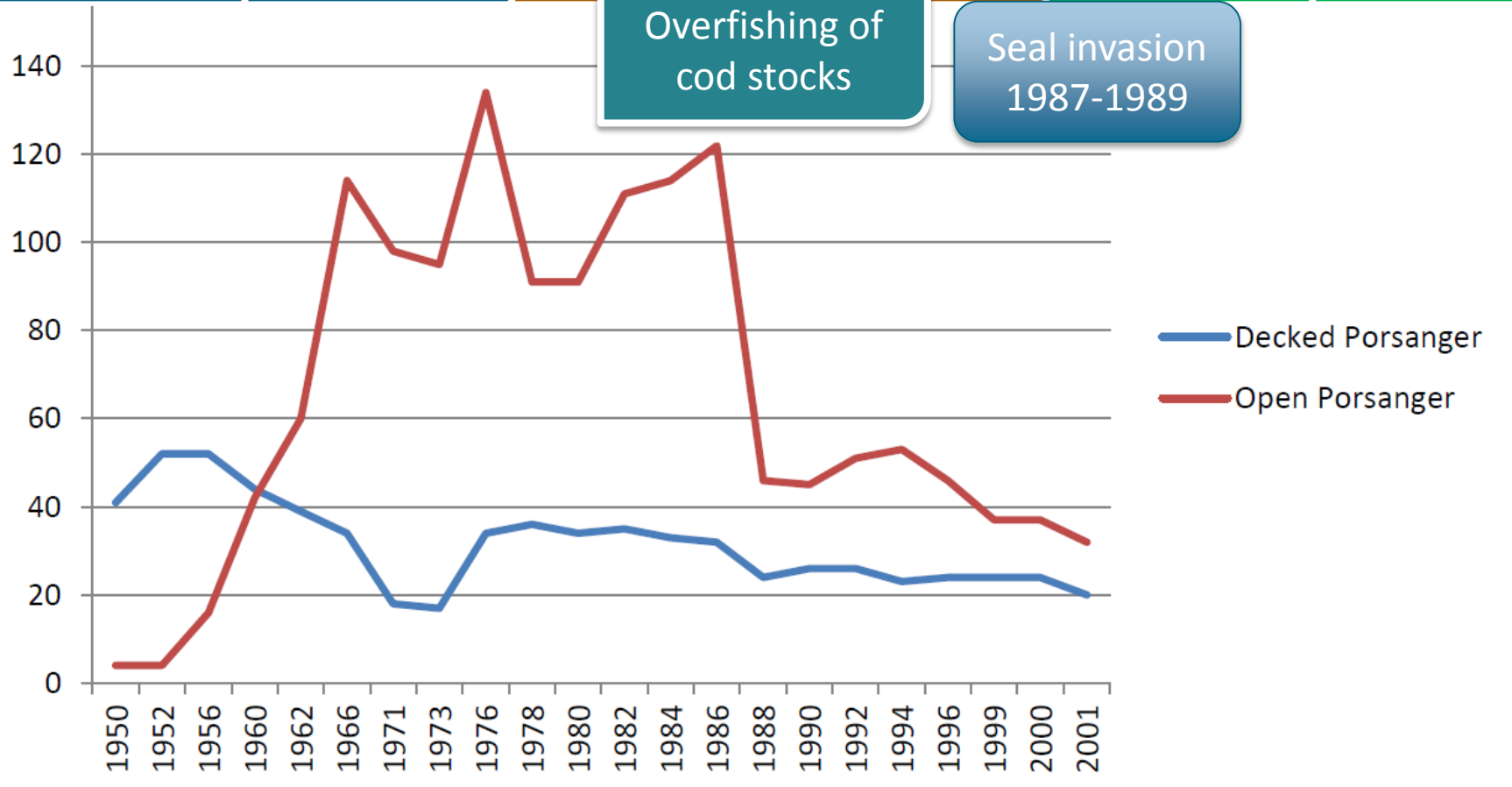
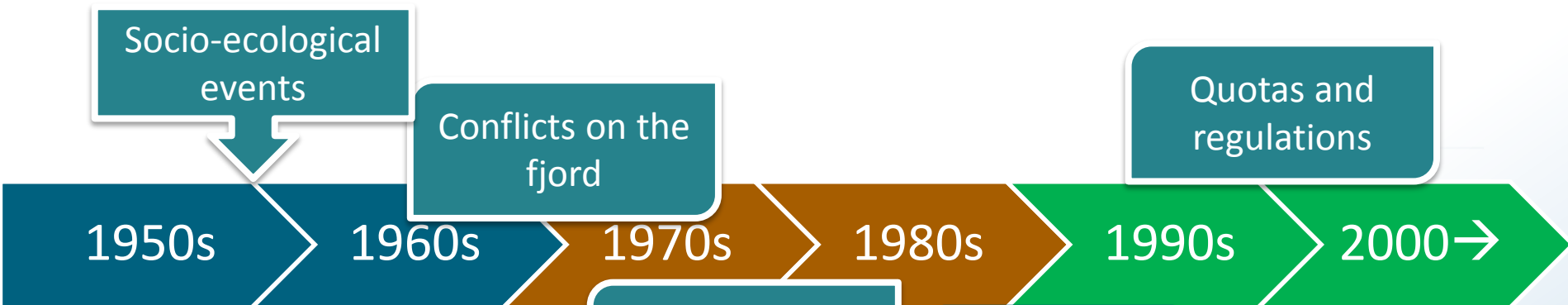


# The cod timeline

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- “We started to see in the 1970s that the fisheries started to go down, and then around 76-77 and first in the 1980s it was completely down. The amount was there, but it was only small fish. And then you had after the mesh size increased, a few meagre years, but there were some years before it started to go up again. So it has varied very from year to year, but these last years it has been very bad, it is not the same catches considering the gear type we have today”.
- 1950- 1970: Technological investments in small vessels: better gill nets, better and cheaper motors and echo sounders. Spatial expansion to deeper waters, fishing larger cod, intensification of fjord fishery. Competition from Danish seiners.
- 1970 – 1990: The cod stocks in the innermost part of the fjord depleted and overall decreasing catches. Changing mesh sizes and intensification of fishery on abundant fishing grounds to catch more fish. Seal invasions 1987- 1989 and collapse in local cod stocks middle part of fjord.
- 1990 – 2000: IVQ system introduced, reduction of overall catches and number of fishers from the mid-1990s. Spatial expansion to other fishing areas for the remaining fishers.
- 2000 - : King crab fishery increasingly takes over as the main commercial species

# Porsanger Social Ecological Timeline - Cod





# Constructing Socio-Ecological Time-series

Čorreočkka	Ránobákti	Uha Jeahkkir
Stuera Jeahkkir	Seaibbetvárru	Ráksavárru
Norske Seaibbetvárru		
Start Forrige 11 Neste Side»		

M-KS Kistrand.

Forstoktes nommar	Amendepide	Uppdrags	Langde	Breidd	Djúpde	St. koma	M. s. l. n	Öskv. l. n	Öskv. l. n
1 Mr. Ulfge	f.k	T 46	26	11.25	5.5	—	Sabb	30	30
2 Mr. Perik	f.k	T 46	26.0	6.5	3.5	—	Sabb	30	30
3 Mr. Mikkelstøl	f.k	T 46	24.9	7.5	4.0	—	Rapp	149	5
4 Mr. Sigval	f.k	T 44	26.0	12.0	6.0	—	Rapp	39	4
5 Ms. Ula	f.k	T 46	21.8	6.4	3.2	—	Sabb	39	4
6 Ms. Måsen	f.k	T 41	24.9	8.5	4.0	—	Sabb	14	12
7 Ms. Brødre	f.k	T 46	26.0	10.0	6.0	—	Rapp	14	9
8 Mr. Sna	f.k	T 46	26.0	7.0	3.5	—	Sabb	47	8

F-KS. Kistrand merkedistrikt.

5 Mr. Långoy	f.k	T 24	24.9	11.0	5.0	—	Wich	25	5
10 Ms. Indre	f.k	T 46	26.0	8.5	3.9	—	Sabb	46	5
11 Ms. Enighet	f.k	T 46	26.0	10.5	4.5	—	Brun	39	13
12 Ms. Støtt	f.k	T 46	26.0	6.0	3.0	—	Sabb	56	5
13 Ms. Håda	f.k	T 46	26.0	7.0	3.5	—	Sabb	47	5
14 Ms. Alaa	f.k	T 46	21.8	6.2	3.2	—	Sabb	41	5
15 Ms. Kamestam	f.k	T 24	24.9	8.5	3.5	—	Vold	35	7
16 Ms. Sandhol	f.k	T 46	26.0	8.0	4.0	—	J. grei	15	7
17 Ms. Rensulation	f.k	T 47	26.0	7.5	3.5	—	Reid	49	5
18 Ms. Nøyen	f.k	T 46	26.0	7.5	3.6	—	Sabb	46	5
19 Ms. Harald	f.k	T 41	24.9	7.0	4.0	—	Pepp	32	6
20 Ms. Tingsv	f.k	T 46	26.0	12.0	6.0	—	Uta	35	15
21 Ms. Nordkyn	f.k	T 46	26.0	9.0	5.0	—	Sabb	45	7
22 Ms. Liv	f.k	T 46	26.0	9.0	5.0	—	Rein	48	7
23 Ms. Liv	f.k	T 46	26.0	7.0	4.0	—	Wich	12	5
24 Ms. Samfjord	f.k	T 46	26.0	8.0	4.5	—	Sabb	45	5
25 Ms. Sandøy	f.k	T 46	26.0	10.0	5.0	—	Brun	31	12
26 Ms. Tve	f.k	T 46	26.0	10.0	4.1	—	Uta	37	10
27 Mr. Sandvik	f.k	T 46	26.0	8.0	5.0	—	Rein	47	7
28 Ms. Råken	f.k	T 46	26.0	8.0	4.5	—	Uta	35	11
29 Ms. Nøyen	f.k	T 46	26.0	9.0	4.0	—	Uta	38	12
30 Mr. Torang	f.k	T 46	26.0	8.0	4.0	—	Stoch	16	5
31 Ms. Liv	f.k	T 46	24.1	8.1	3.8	—	Sabb	45	5
32 Ms. Alken	f.k	T 46	26.0	11.0	6.0	—	Brun	38	10
33 Ms. Solbrø	f.k	T 46	26.0	7.0	4.0	—	Rein	48	8
34 Mr. Iden	f.k	T 46	26.0	8.0	4.0	—	Rein	48	7
35 Mr. Noy	f.k	T 46	26.0	9.0	3.5	—	Rein	48	12
36 Ms. Vind	f.k	T 46	24.1	8.1	3.2	—	Rein	48	6
37 Mr. Lafta	f.k	T 46	26.0	11.0	8.1	—	Bolin	7	23
38 Mr. Eni	f.k	T 46	26.0	7.0	3.5	—	Sabb	45	5
39 Ms. Sonni	f.k	T 46	26.0	8.0	4.5	—	Sabb	45	5
40 Mr. Brys	f.k	T 46	26.0	9.0	5.0	—	Rein	48	13
41 Ms. Lakse	f.k	T 46	24.9	8.0	3.6	—	Sabb	39	3
42 Ms. Alaa	f.k	T 46	26.0	8.0	3.0	—	Sabb	46	3
43 Ms. Noyen	f.k	T 46	26.0	8.0	3.0	—	Sabb	39	3
44 Ms. Glem	f.k	T 46	24.9	7.0	3.0	—	Sabb	36	4
45 Ms. Peron	f.k	T 46	26.0	9.0	4.0	—	Wich	27	10

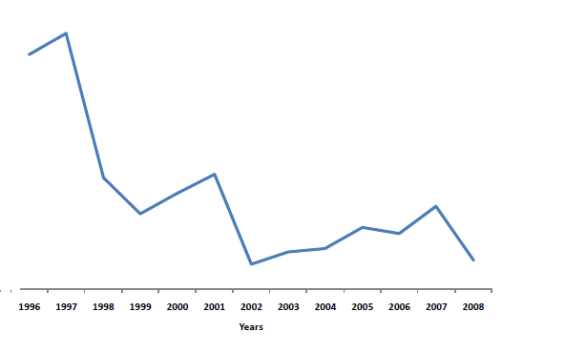
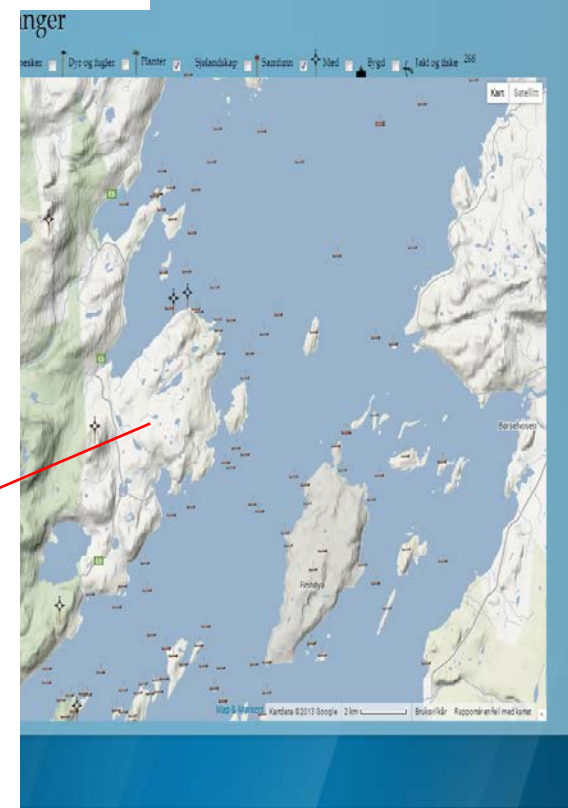
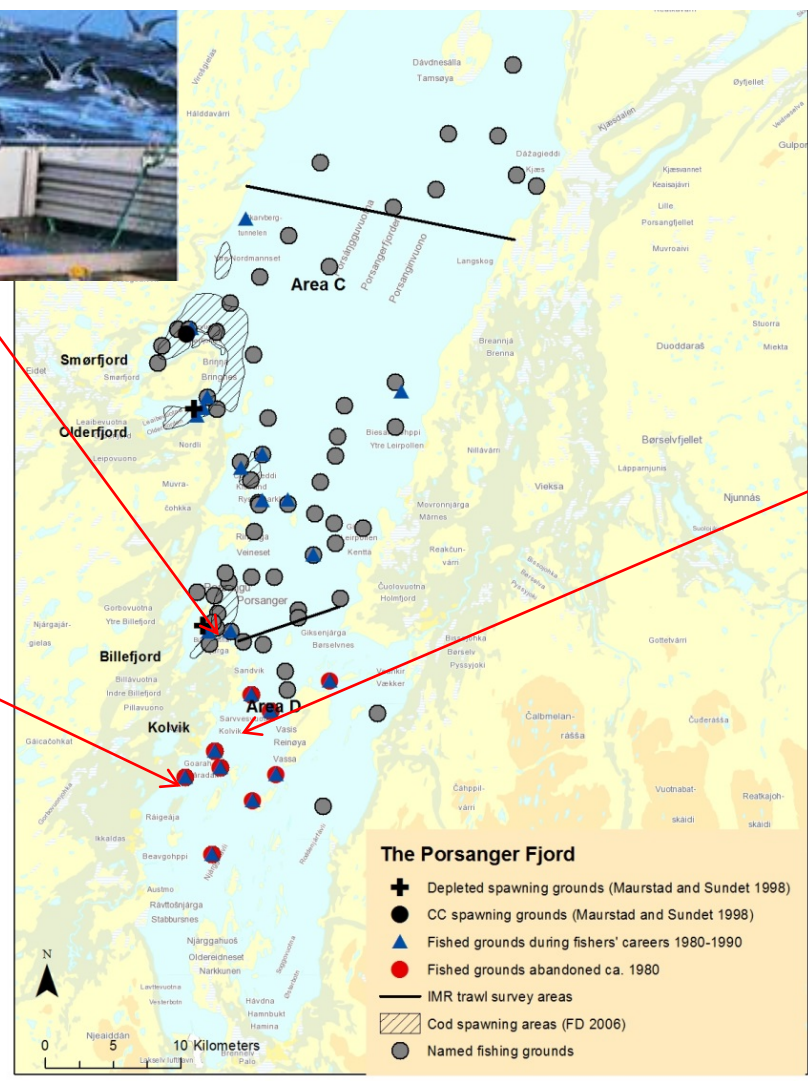
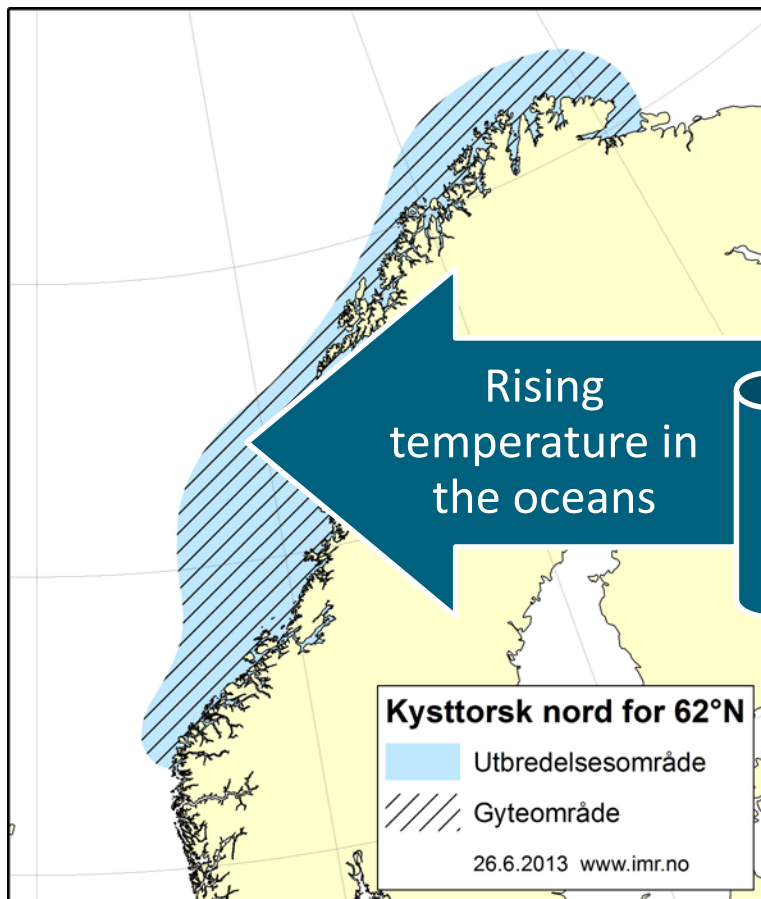


Figure 22. Estimated cod biomass (kg) 1996-2008 in Porsanger Fjord from IMR acoustic surveys (4)

# A need for social-ecological knowledge to explain social-ecological change



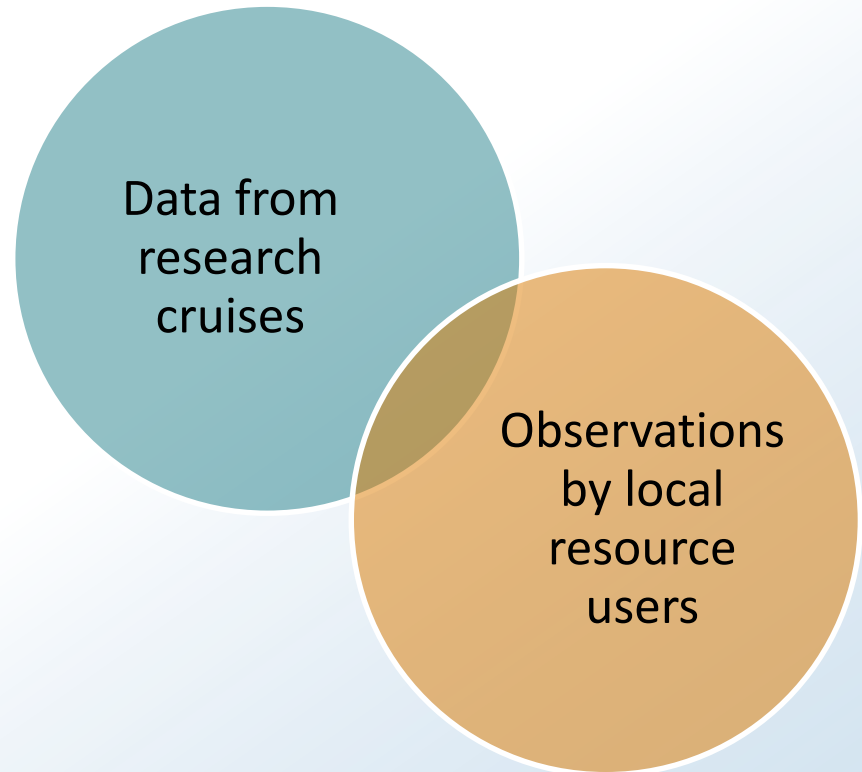
- Picture: Jannie Staffanson, Saami Council, at COP 22 in Marrakech, November 8th



# Challenge: Lack of overlap between data sets

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- The experience-based knowledge of local fishers is spatially limited to their harvesting space.
- Fishers can recollect long-term trends and events of ecological change throughout *their fishing career* - longer time perspective on ecological change
- Scientific time series temporally limited
- Larger spatial range



# The challenge of cross-disciplinary collaboration: Ships passing in the night?

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## New Challenges to Research on Local Ecological Knowledge: Cross-Disciplinarity and Partnership

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*Norwegian Institute for Cultural Heritage Research,  
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### Abstract

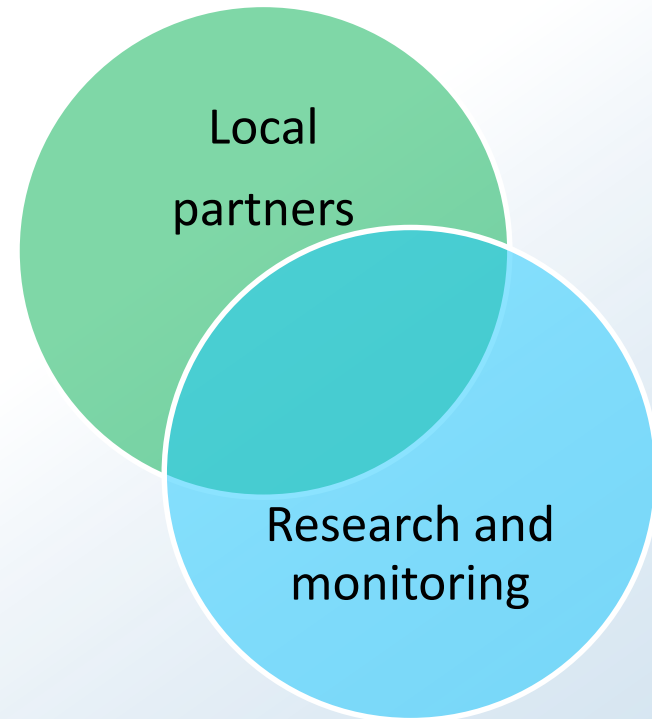
Since the turn of the century, local ecological knowledge (LEK) has been recognized not only as potentially valuable to resource management and science, but increasingly integrated into legislative texts, regulatory structures, and research. Based on experiences from social science and marine science projects on LEK in Porsanger Fjord in Finnmark, we reflect on challenges and limitations of LEK research and cross-disciplinary collaboration. Our reflections lead us to question the different ways in which local ecology is understood and researched by different disciplines. With changing attitudes and perspectives that cast LEK as knowledge that can be integrated with science, the question of how different disciplines integrate LEK and use it in their research is emerging as a problematic issue. Our argument is that ship with community-based institutions is crucial for the accountability and legitimacy of LEK research, and for facilitating dialogue and coproduction of knowledge by scientists and local resource-users.



# Summing up: Challenges and recommendations

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- Lack of local time series in general, lack of cross-disciplinary collaboration
- Partnership: Between disciplines and local community partners.
- Integrating local observer networks/citizen science in research designs
- Social-Ecological Timelines as a tool for climate research partnerships



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