

Transparency and Social Acceptance of Aquaculture

The Norwegian Sustainability-in-Aquaculture Web-portal
Torshavn, 20 October 2023



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Senior scientist, PhD

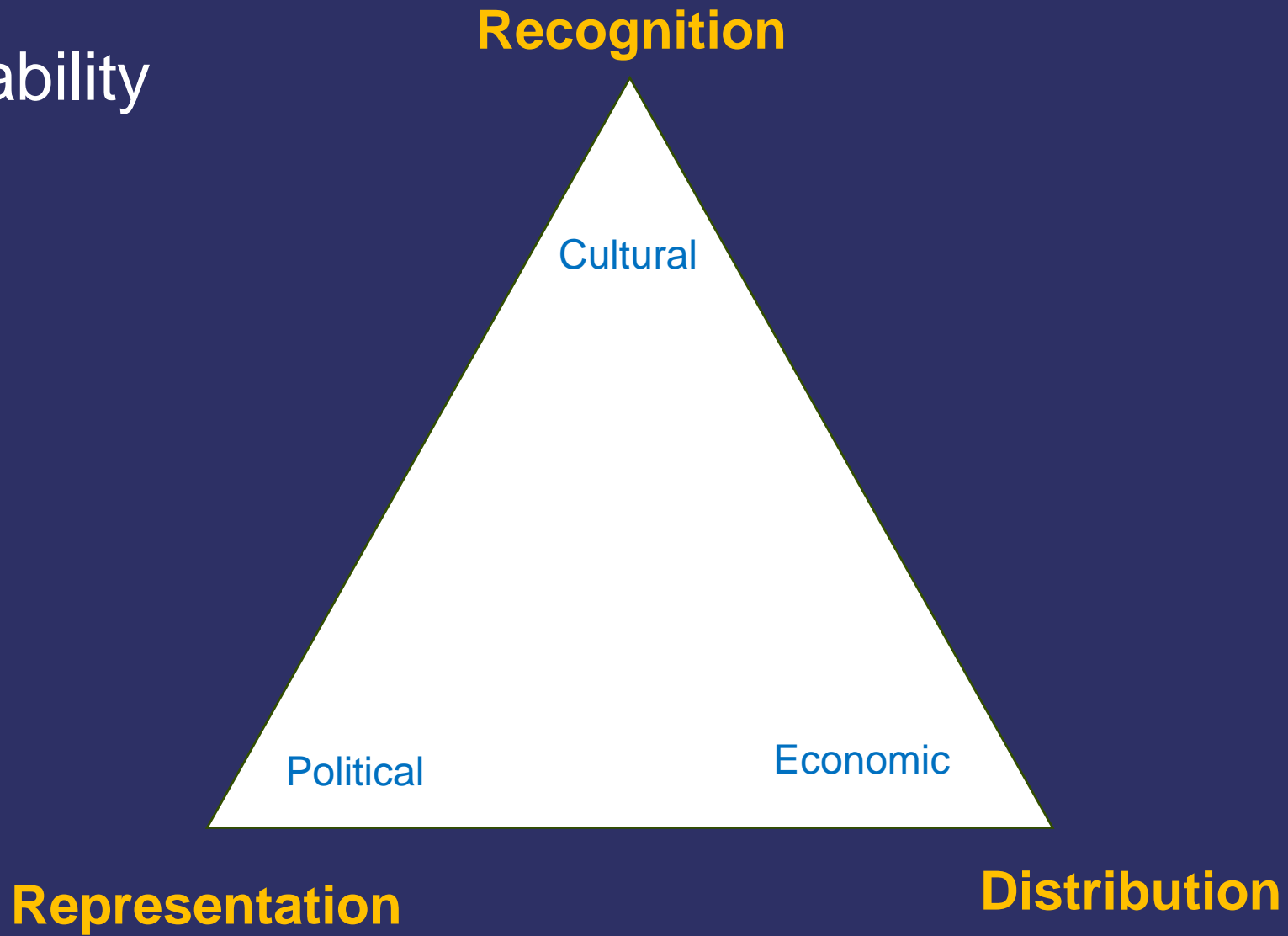
Aquaculture (in Norway)



O. Dahl, Nofima



Salmar



Social acceptance

- **Social license to operate - SLO**

- SLO «definition»:
 - Ongoing acceptance or approval of operations by local stakeholders affected by it and stakeholders who can affect its profitability

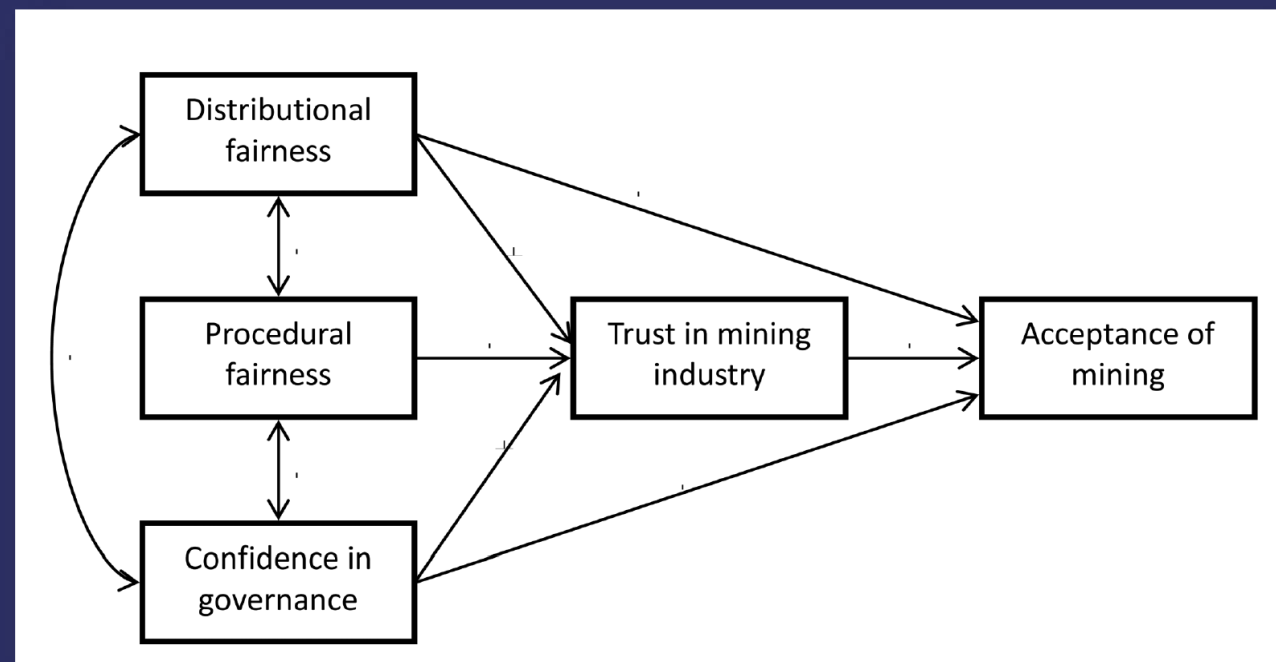
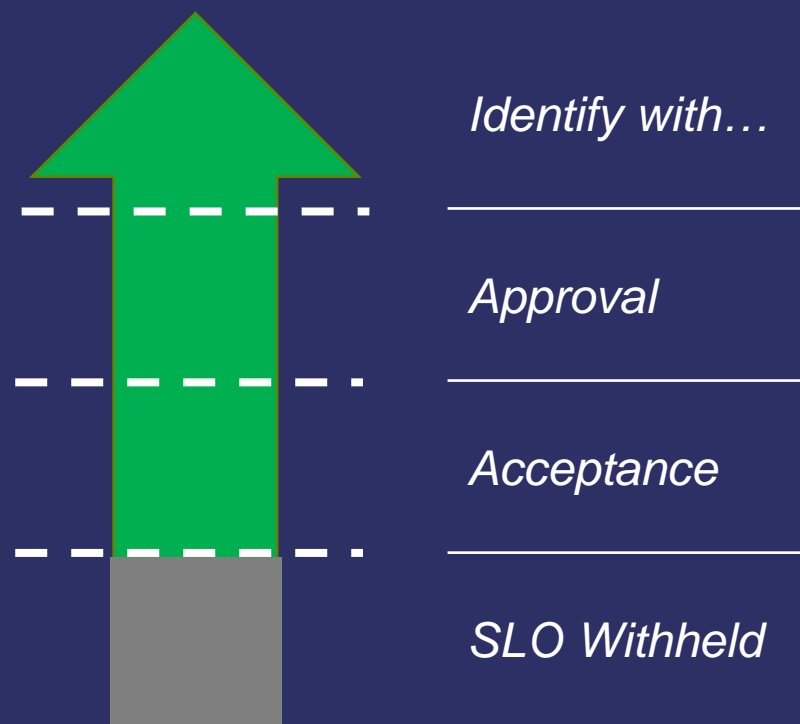
Moffat et al 2015, Forestry

- **Does SLO matter?**



Social license to operate – SLO levels

- Measure SLO-levels – and factors that affect it?

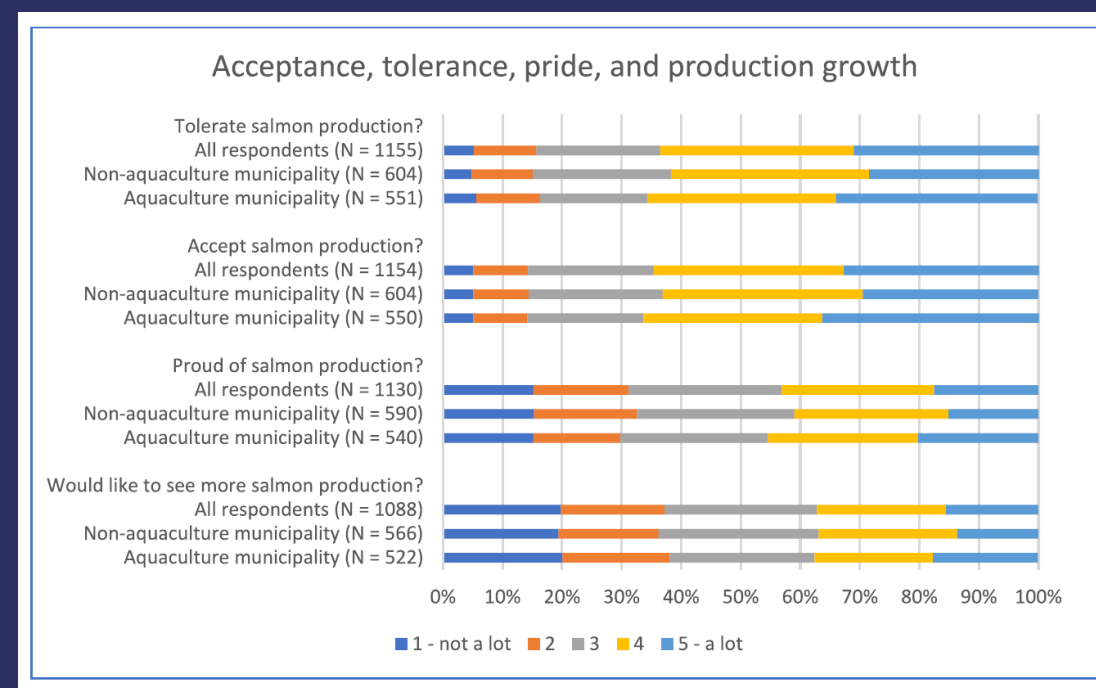


Social acceptance for Norwegian aquaculture?

- National survey (SOLIC-project). 2020. n=1155.

	-	+
Tolerate?	15 %	62 %
Accept?	15 %	62 %
Proud of?	30 %	41 %
Want more?	37 %	38 %

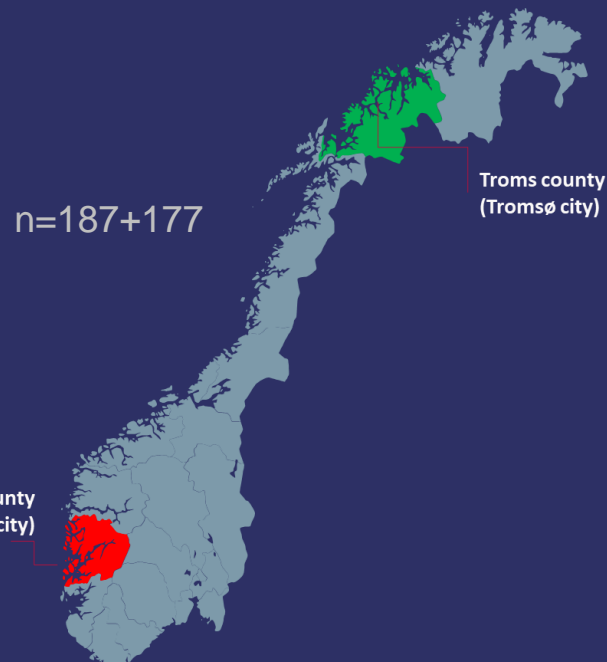
- Only small differences between those from municipalities with / without aquaculture
(But see also Misund et al 2023, *Marine Resource Economics*)



Olsen et al 2023, *Aquaculture*.

What factors affect SLO-levels for Norwegian aquaculture?

- SOLIC-survey 2020
- Hordaland and Troms counties
- Extra «local» questions



Factors affecting SLO-levels:

1. Environmental sustainability (0.23)
2. Industry behaves in accordance with the interests of society (0.21)
3. Gender (-0.20) (= females lower acceptance)
4. Trust in industry (0.19)
5. Confidence in the authorities' governance of the industry (0.15)
6. Just allocation of benefits locally (0.14)

Factors in orange

can be affected by industry or authorities

Room for action to try to alter...

- Impacts
- Behaviour
- Misconceptions


Eriksen & Mikkelsen, *under review*.

Homepage | Sustainability in aquaculture | barentswatch.no/havbruk/

SUSTAINABILITY IN AQUACULTURE English


What impact does Norwegian aquaculture have on the environment, the economy and society?

This website presents facts about the environmental, economic and societal sustainability of Norwegian aquaculture.




Environment

How does the aquaculture industry affect the environment?



Economy

What are the production and economy of the aquaculture industry like?



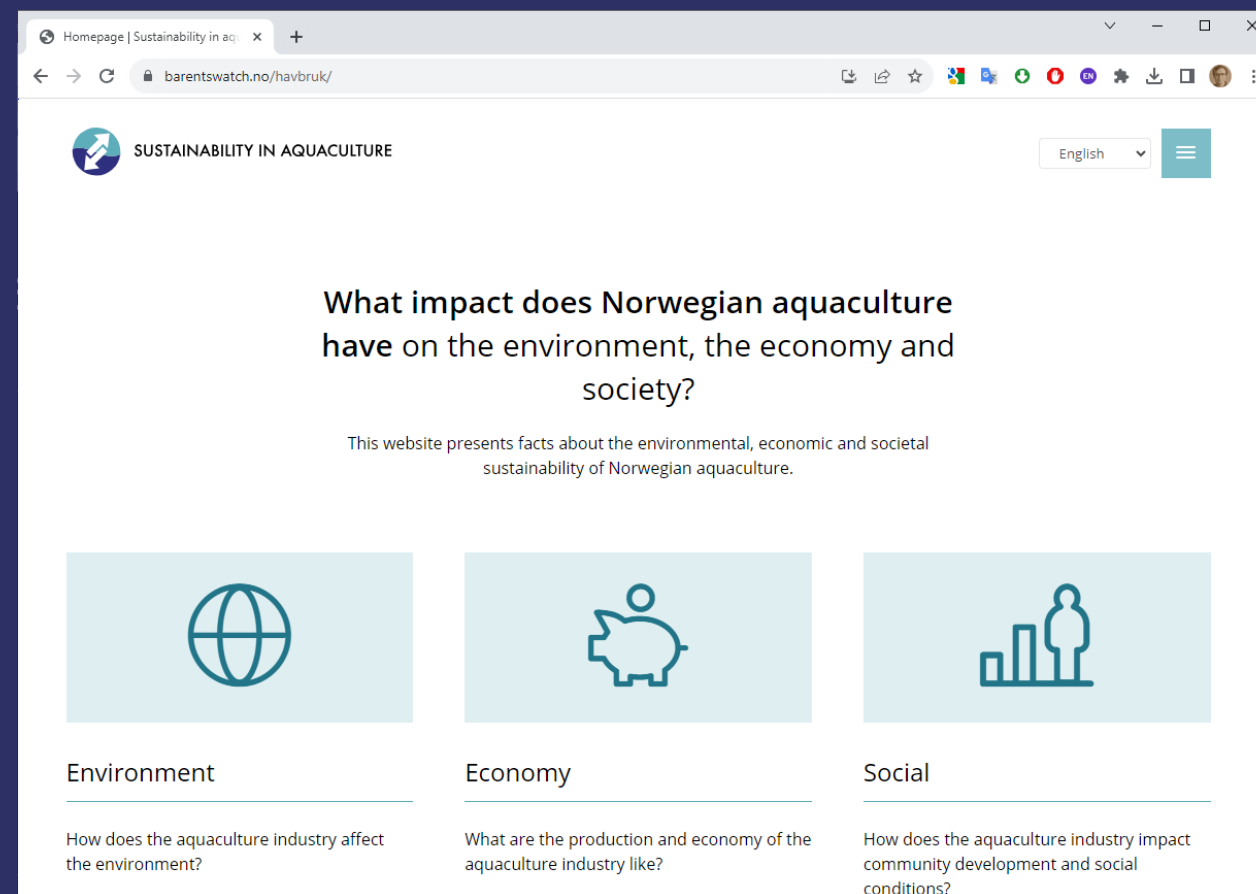
Social

How does the aquaculture industry impact community development and social conditions?

Sustainability-in-Aquaculture web-portal

- Aims:
- More fact-based public debate
- Cover all three sustainability dimensions
- Trustworthy
- Wide target group

- Data only from public authorities or research
- Researchers select and present
- Transparency on sources



www.barentswatch.no/havbruk/



Environment

How does the aquaculture industry affect the environment?

- [Cleaner fish](#)
- [Disease](#)
- [Emissions from fish farming plants](#)
- [Escapes](#)
- [Fish mortality and losses in production](#)
- [Greenhouse gas emissions](#)
- [Impact on wild salmon](#)
- [Sales of pharmaceuticals](#)
- [Salmon lice](#)
- [Utilisation of residual raw materials](#)



Economy

What are the production and economy of the aquaculture industry like?

- [Aquaculture of mussels and kelp and more](#)
- [Costs](#)
- [Feed composition and origin](#)
- [From feed ingredients to produced fish](#)
- [Production of fish species other than salmon and trout](#)
- [Production of salmon, trout and rainbow trout](#)
- [Production permits for algae, molluscs, crustaceans and echinoderms](#)
- [Production permits for salmon and trout](#)
- [Production value](#)
- [Profitability](#)
- [Value added- contribution to GDP](#)



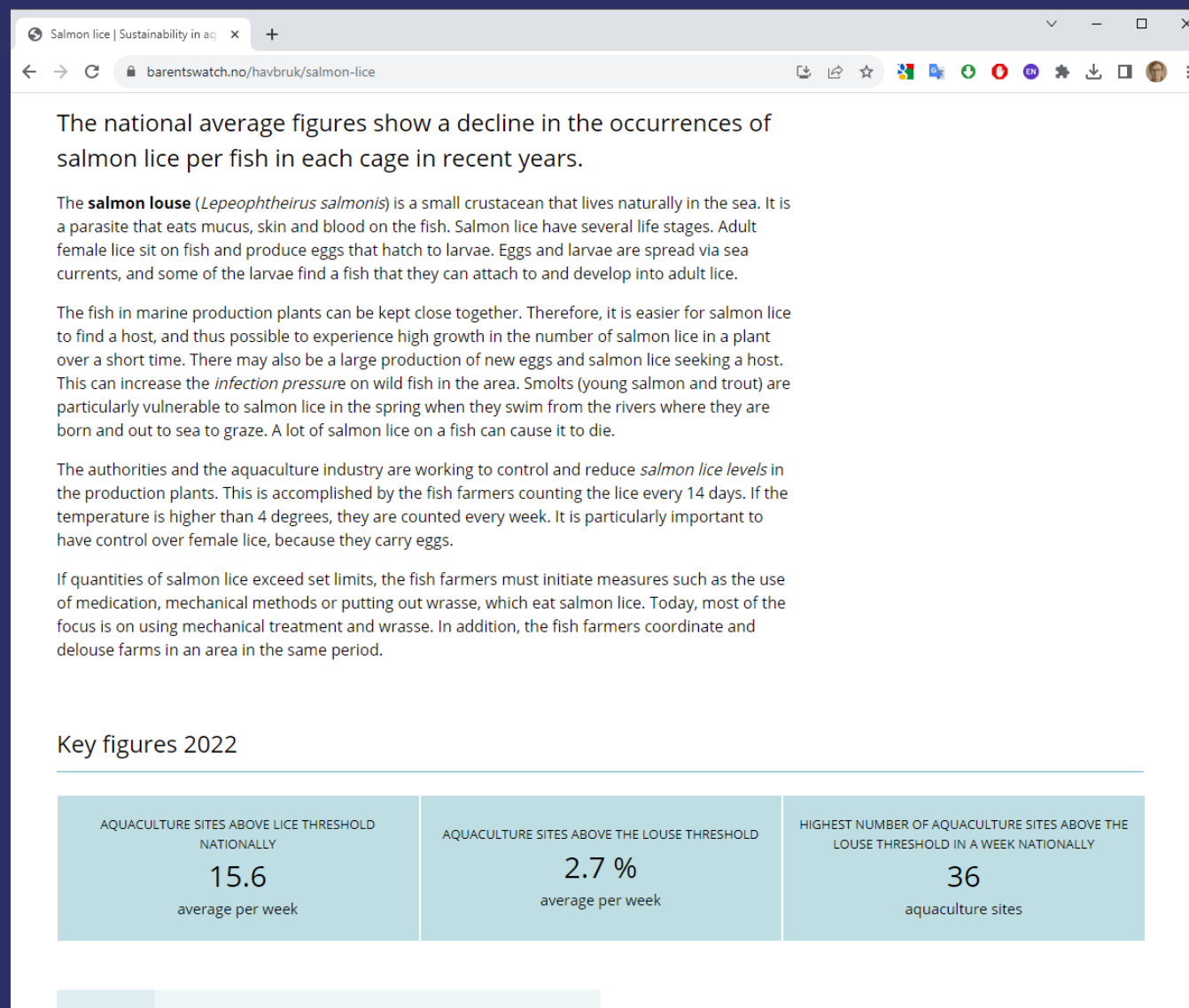
Social

How does the aquaculture industry impact community development and social conditions?

- [Area use](#)
- [Certifications](#)
- [Employment](#)
- [Job absence](#)
- [Nutrients and unwanted substances](#)
- [Occupational injuries](#)
- [Societal contributions, taxes and charges](#)

- 28 theme pages
- Many more indicators

- Introductory text



The national average figures show a decline in the occurrences of salmon lice per fish in each cage in recent years.

The **salmon louse** (*Lepeophtheirus salmonis*) is a small crustacean that lives naturally in the sea. It is a parasite that eats mucus, skin and blood on the fish. Salmon lice have several life stages. Adult female lice sit on fish and produce eggs that hatch to larvae. Eggs and larvae are spread via sea currents, and some of the larvae find a fish that they can attach to and develop into adult lice.

The fish in marine production plants can be kept close together. Therefore, it is easier for salmon lice to find a host, and thus possible to experience high growth in the number of salmon lice in a plant over a short time. There may also be a large production of new eggs and salmon lice seeking a host. This can increase the *infection pressure* on wild fish in the area. Smolts (young salmon and trout) are particularly vulnerable to salmon lice in the spring when they swim from the rivers where they are born and out to sea to graze. A lot of salmon lice on a fish can cause it to die.

The authorities and the aquaculture industry are working to control and reduce *salmon lice levels* in the production plants. This is accomplished by the fish farmers counting the lice every 14 days. If the temperature is higher than 4 degrees, they are counted every week. It is particularly important to have control over female lice, because they carry eggs.

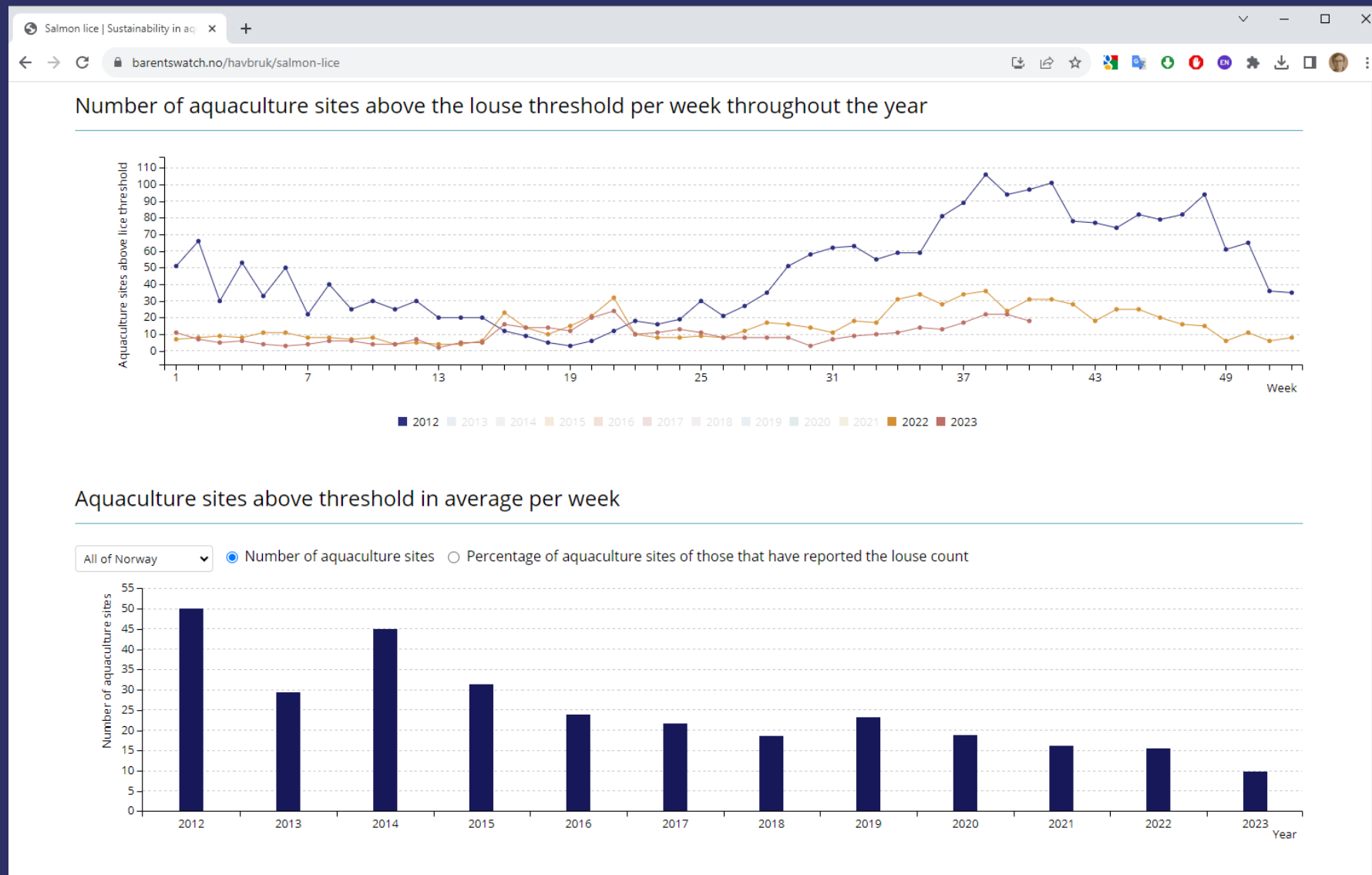
If quantities of salmon lice exceed set limits, the fish farmers must initiate measures such as the use of medication, mechanical methods or putting out wrasse, which eat salmon lice. Today, most of the focus is on using mechanical treatment and wrasse. In addition, the fish farmers coordinate and delouse farms in an area in the same period.

Key figures 2022

<p>AQUACULTURE SITES ABOVE LICE THRESHOLD NATIONALLY</p> <p>15.6</p> <p>average per week</p>	<p>AQUACULTURE SITES ABOVE THE LOUSE THRESHOLD</p> <p>2.7 %</p> <p>average per week</p>	<p>HIGHEST NUMBER OF AQUACULTURE SITES ABOVE THE LOUSE THRESHOLD IN A WEEK NATIONALLY</p> <p>36</p> <p>aquaculture sites</p>
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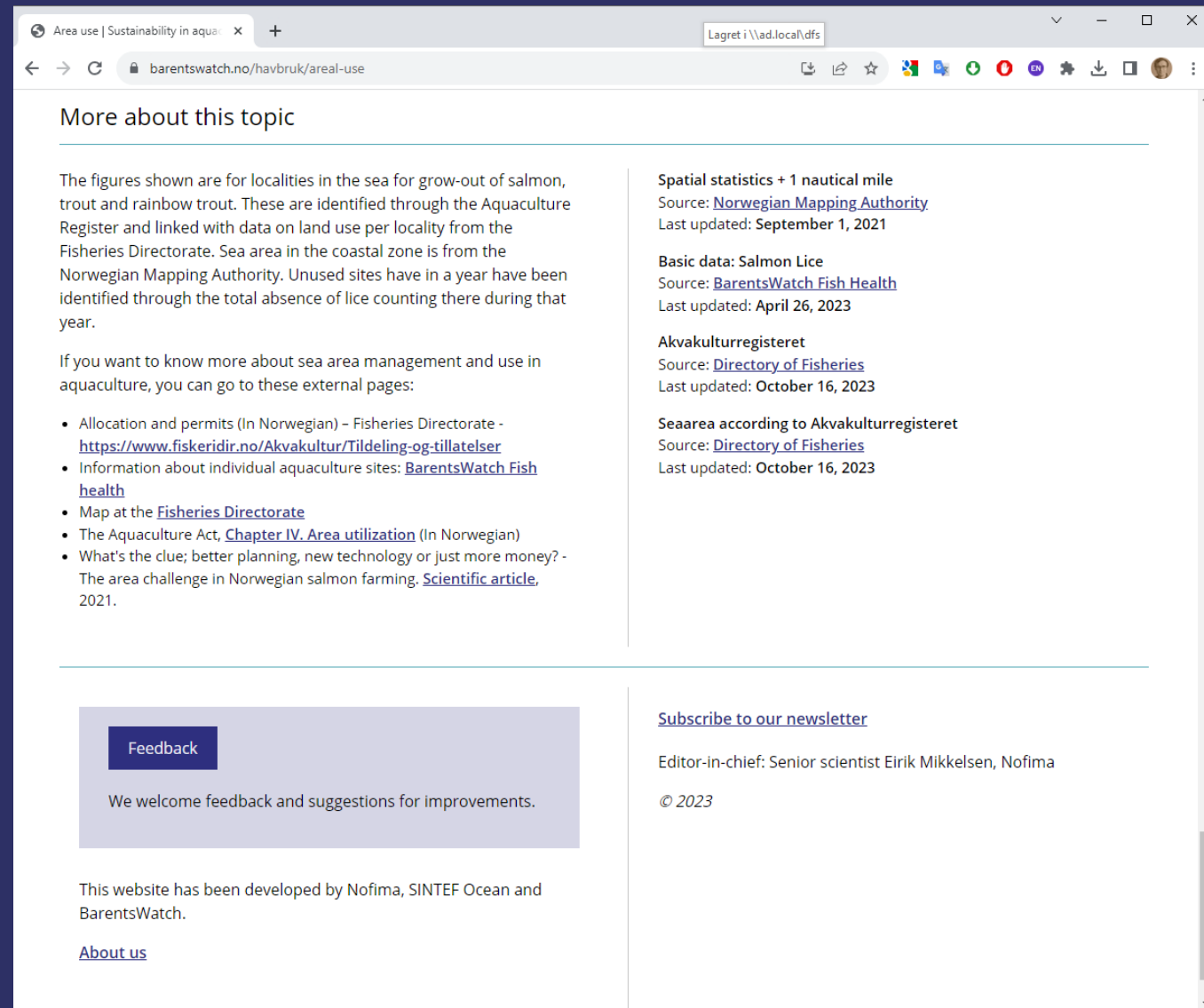
- Key figures

Indicators / time series



- National level
- Counties
- Updates are both automatic and manual
- Daily to annual+
- Depend on data source

- More about this topic
- Data sources
- Portal does not conclude whether aquaculture is sustainable.
- Presents data for people to make their own conclusions.



Area use | Sustainability in aqua

barentswatch.no/havbruk/areal-use

More about this topic

The figures shown are for localities in the sea for grow-out of salmon, trout and rainbow trout. These are identified through the Aquaculture Register and linked with data on land use per locality from the Fisheries Directorate. Sea area in the coastal zone is from the Norwegian Mapping Authority. Unused sites have in a year have been identified through the total absence of lice counting there during that year.

If you want to know more about sea area management and use in aquaculture, you can go to these external pages:

- Allocation and permits (In Norwegian) - Fisheries Directorate - <https://www.fiskeridir.no/Akvakultur/Tildeling-og-tillatelser>
- Information about individual aquaculture sites: [BarentsWatch Fish health](#)
- Map at the [Fisheries Directorate](#)
- The Aquaculture Act, [Chapter IV. Area utilization](#) (In Norwegian)
- What's the clue; better planning, new technology or just more money? - The area challenge in Norwegian salmon farming. [Scientific article](#), 2021.

Spatial statistics + 1 nautical mile
Source: [Norwegian Mapping Authority](#)
Last updated: **September 1, 2021**

Basic data: Salmon Lice
Source: [BarentsWatch Fish Health](#)
Last updated: **April 26, 2023**

Akvakulturregisteret
Source: [Directory of Fisheries](#)
Last updated: **October 16, 2023**

Seaarea according to Akvakulturregisteret
Source: [Directory of Fisheries](#)
Last updated: **October 16, 2023**

[Feedback](#)

We welcome feedback and suggestions for improvements.

This website has been developed by Nofima, SINTEF Ocean and BarentsWatch.

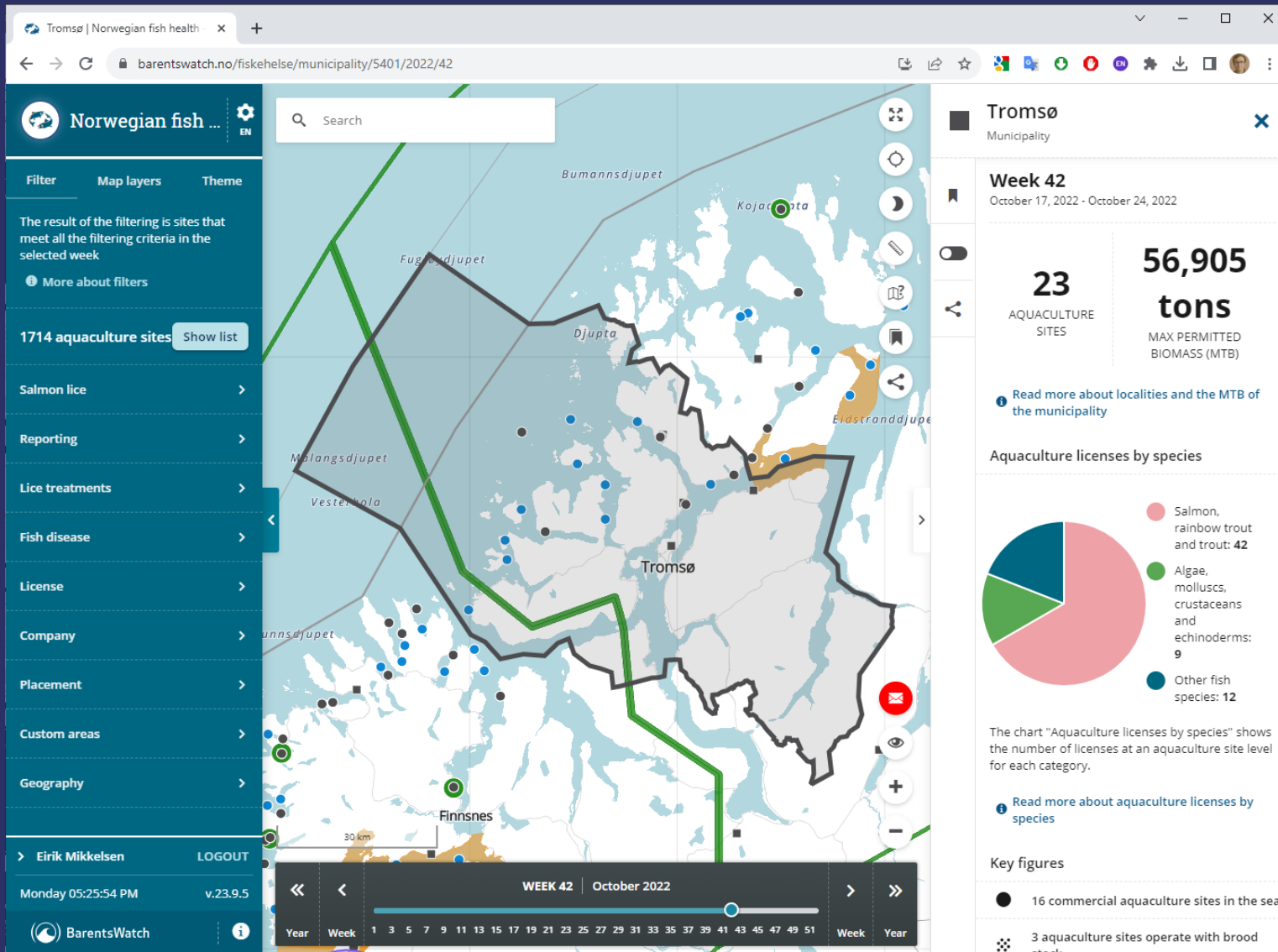
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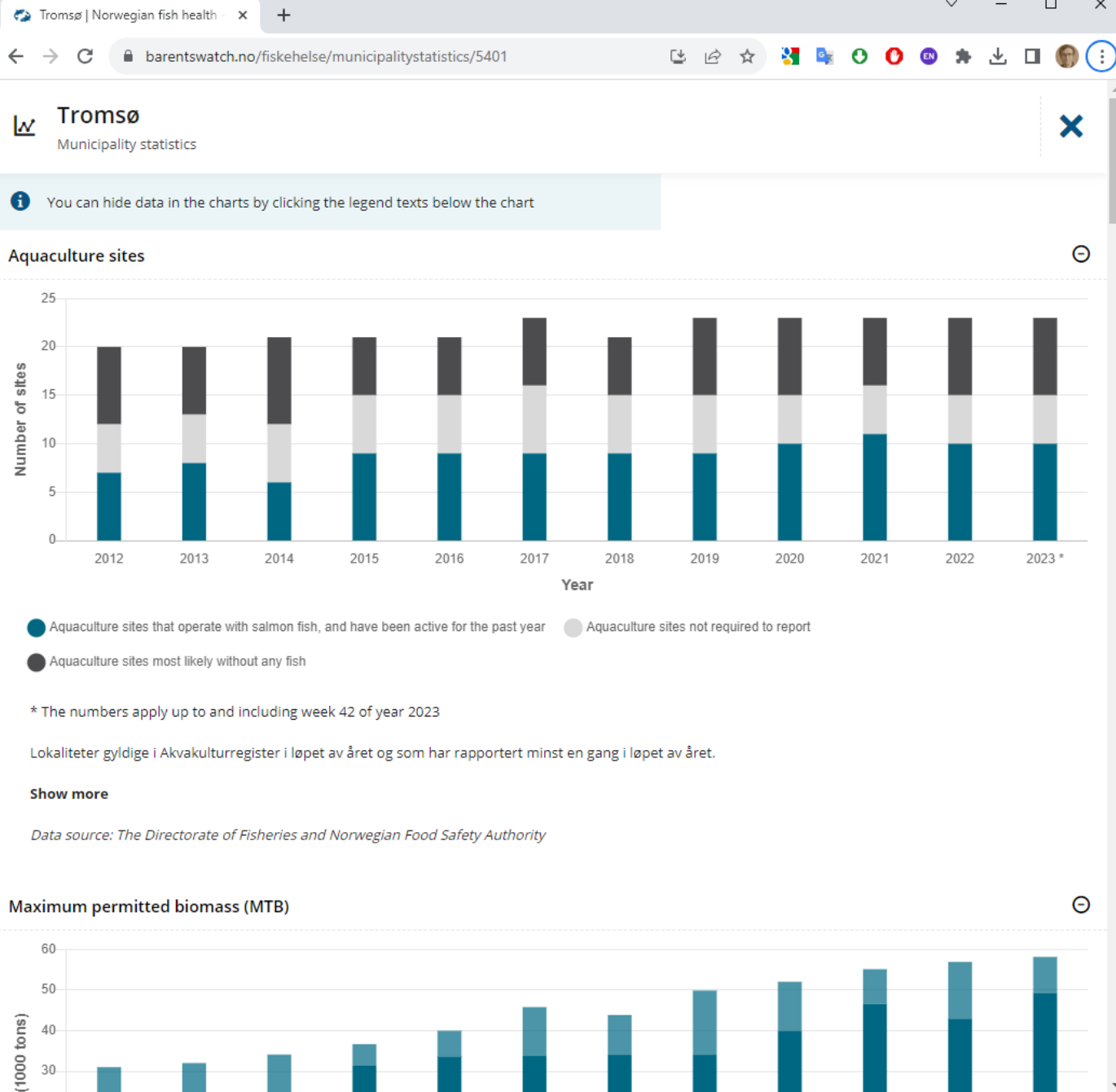
Editor-in-chief: Senior scientist Eirik Mikkelsen, Nofima

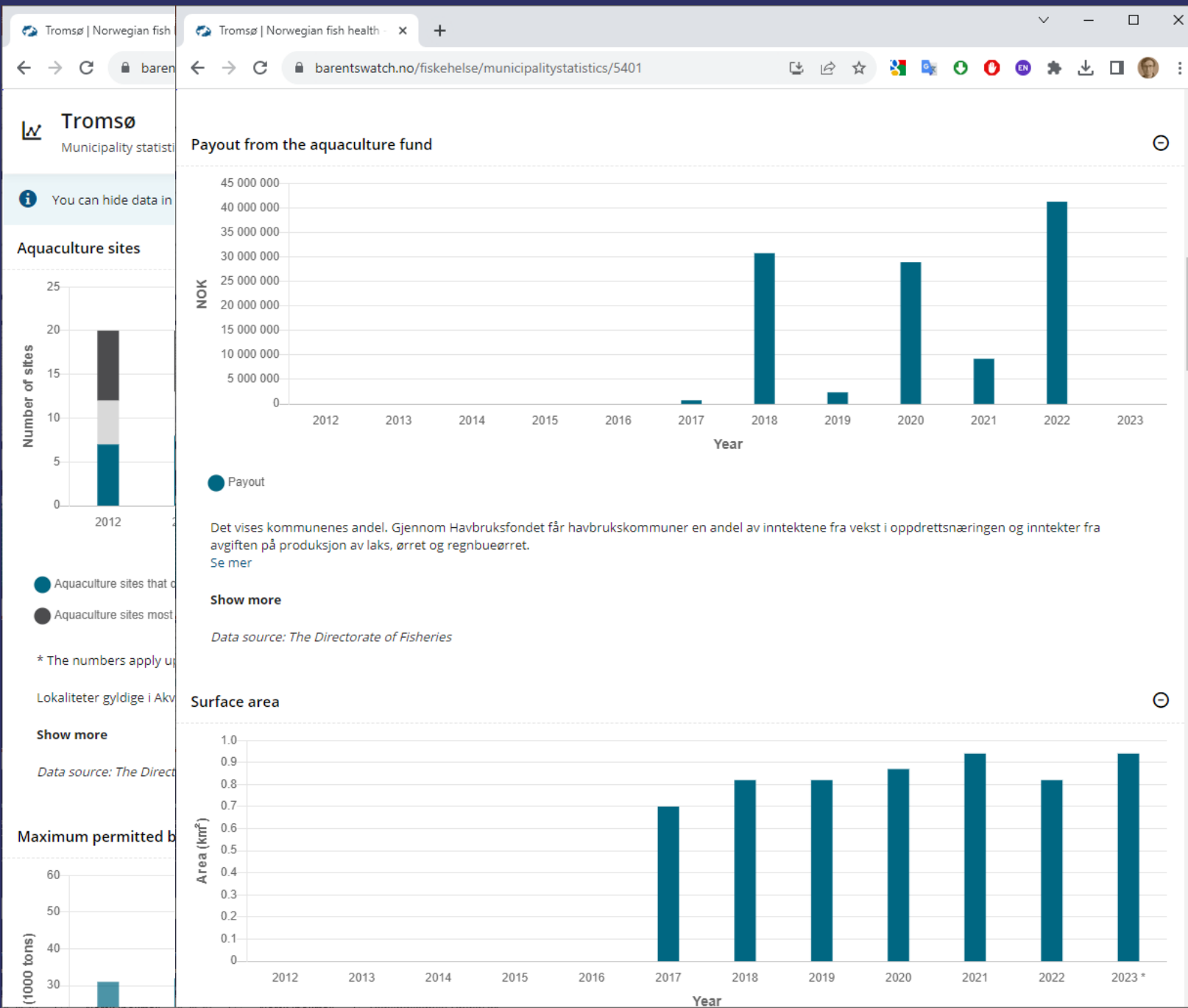
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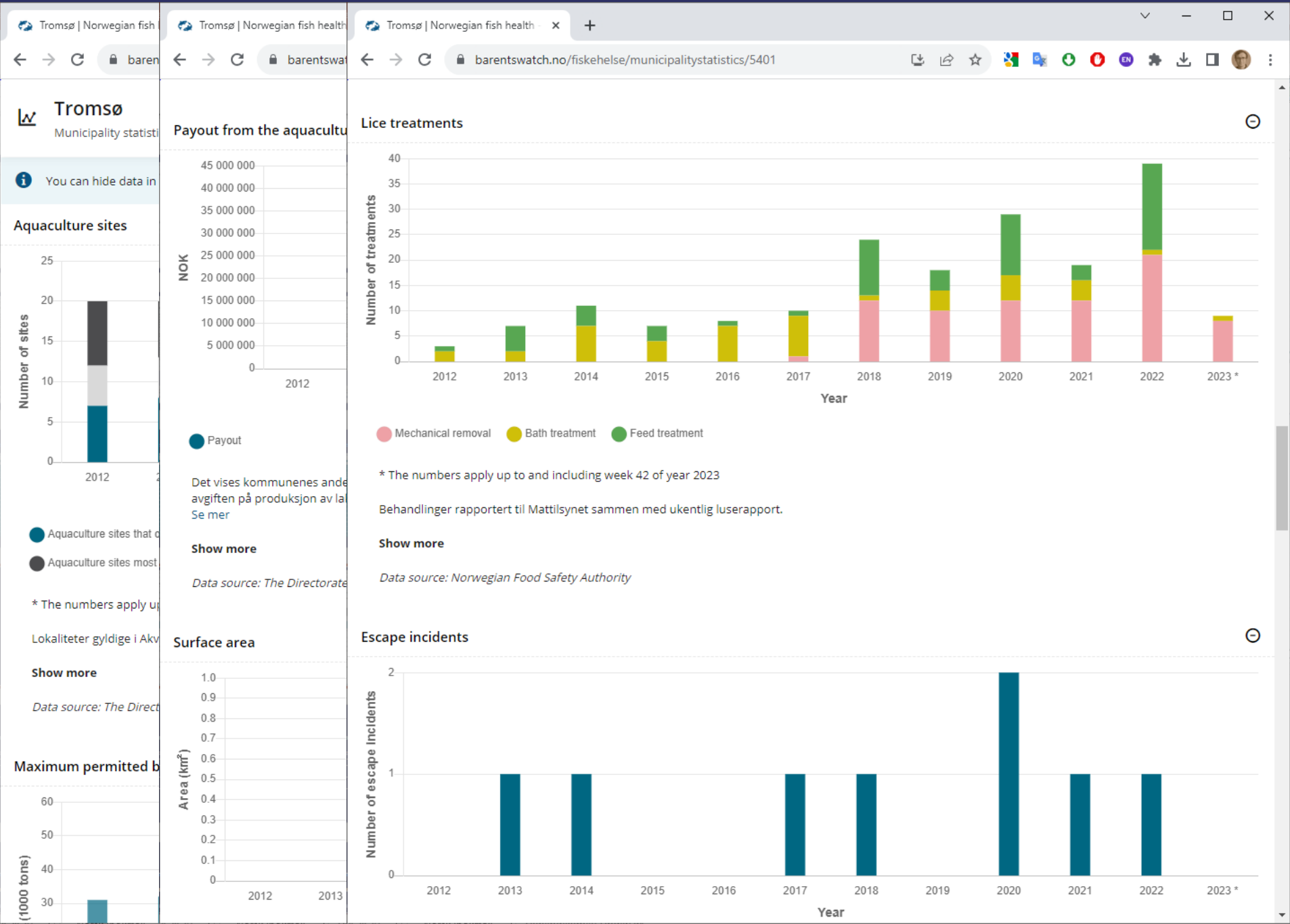
Also municipal-level sustainability indicators available



<https://www.barentswatch.no/fiskehelse/municipality/5401/2022/42>







Tromsø Municipality statistics

You can hide data in

Aquaculture sites

Number of sites

2012

- Aquaculture sites that are active
- Aquaculture sites that are not active
- Aquaculture sites that are closed

* The numbers apply to all municipalities in the county

Lokaliteter gyldige i Akershus

Show more

Data source: The Directorate of Fisheries

Maximum permitted biomass

(1000 tons)

2012

Payout from the aquaculture sector

NOK

2012

● Payout

Det vises kommunenes andel av giften på produksjon av lakse og ørret.

Se mer

Show more

Data source: The Directorate of Fisheries

Surface area

Area (km²)

2012 2013

Lice treatments

Number of treatments

2012

- Mechanical removal

* The numbers apply to all municipalities in the county

Behandlinger rapporterte

Show more

Data source: Norwegian Directorate of Health

Escape incidents

Number of escape incidents

2012 2013

Employment by residence

Employed persons

Year

- Production of on-growing, molluscs, crustaceans and echinoderms in marine and coastal aquaculture
- Production of juvenile in marine and coastal aquaculture
- Marine fish farming services
- Production of on-growing, molluscs, crustaceans and echinoderms in freshwater-based aquaculture
- Production of juvenile in freshwater-based aquaculture
- Freshwater fish farming services
- Fishing, catching and aquaculture, unspecified
- Drying and salting of fish
- Freezing of fish, fish fillets, crustaceans and molluscs
- Canning of fish and fish products
- Slaughtering and other processing and preserving of fish and fish products
- Whaling
- Ocean and coastal water fishing
- Freshwater fishing

Tallene viser sysselsatte personer med bosted i valgt kommune. Data er hentet fra SSB og gjelder 4. kvartal.

For mer statistikk se <https://www.ssb.no/statbank/table/13470>

Show more

Data source: Statistics Norway

Catch in anadromous rivers

Number of fish

2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

Take home messages

- Low social acceptance can limit aquaculture development
- What matters for social acceptance can vary with place and time
- Credible and openly available information can support a fact-based public discussion on aquaculture and increase the industry's social acceptance



Thank you for listening. Questions, comments?

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<https://nofima.com/employee/eirik-mikkelsen/>

Extra slides on Nofima follows

Social license project (SOLIC):

Funded by the



Project lead by



Sustainability portal:

Project partners:



Funded by  FHF

(The Norwegian Seafood Research Fund)

Project #901541 ([link](#))

Also received funding from



- Extra slides



- 397 employees, 165 PhD
- Customers from 32 countries
- 602 projects in 2022

- Three divisions with 13 research departments:
 - Aquaculture,
 - Seafood,
 - Food

Sustainable food for all

Division Aquaculture

- Breeding and genetics
- Fish health
- Nutrition and feed technology
- Production biology





Division Seafood

- Seafood industry
- Marine biotechnology
- Processing technology
- Industrial economics
- Marketing research

Division Food Science

- Innovation, consumer and sensory sciences
- Food and health
- Food safety and quality
- Raw materials and process optimization

