



# Case Study Hardangerfjord including some welfare/disease issues

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# Culture in the Hardangerfjord

## Culture



**National romantics – 1800's**  
**Industry, hydroelectricity- 1900's**  
**National parks 2000's**



## Aquaculture

- New industry, started late 60'es,
- 70 000 mt salmonids
  - To be reduced?
- Cod
  - Financial crisis –recovery?
- Oyster (European)
  - Small, slow-food industry
    - Blue mussel
    - Scallop



# The Hardangerfjord

Bergen

Austevoll

Odda

Rosendal

Stord

Etne

## Aquaculture permits 01.01.2009

- On-growth salmon/trout
- Hatchery-fry salmon/trout
- Broodstock samon/trout
- Marin species
- Shellfish

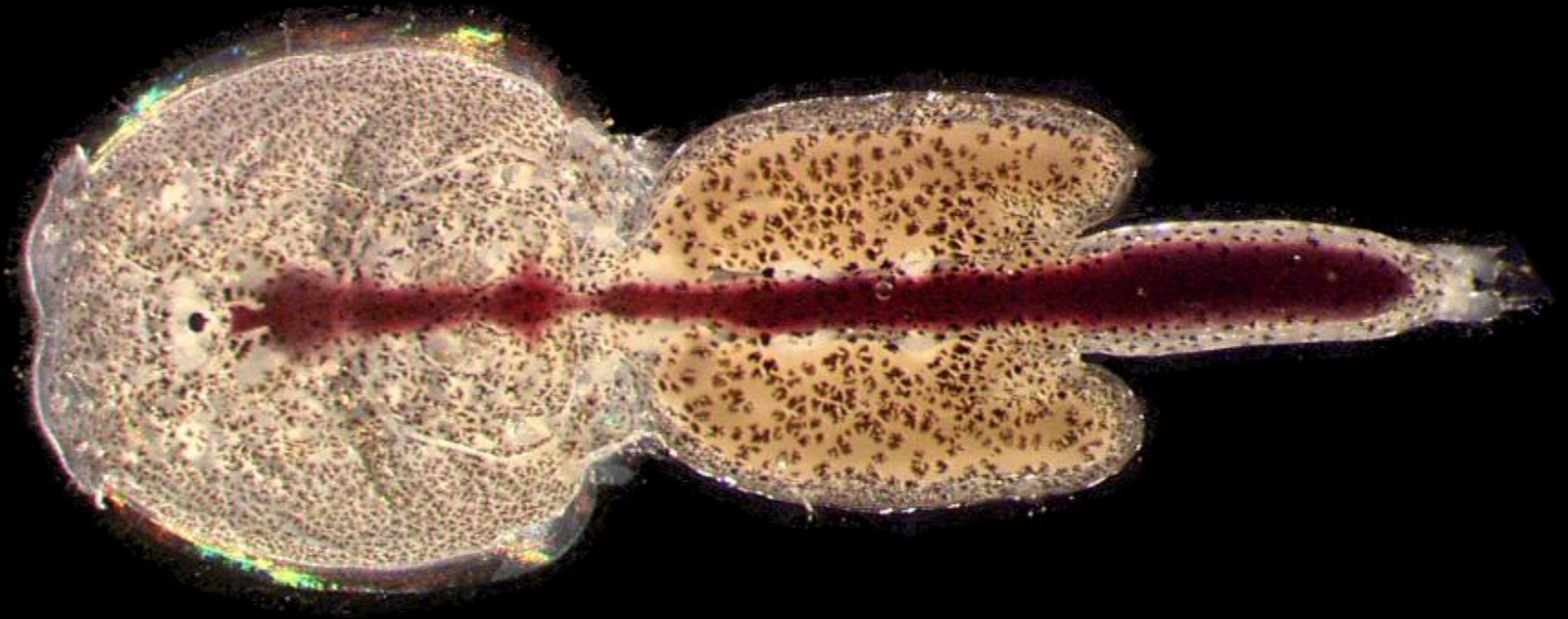
0 5 10 20 Km

# Impact from aquaculture 2011

- Escapees – **RED LIGHT**
  - Wild salmon stocks vulnerable
- Salmon Louse – **RED LIGHT**
  - Affecting wild trout and salmon
- Pharmaceuticals – **Yellow light**
  - Antibacterials: **Green**, Antiparasitics: **RED**
- Eutrophication – **green light**
  - Coastal current from Baltic dominates area
- Other diseases – n.a.

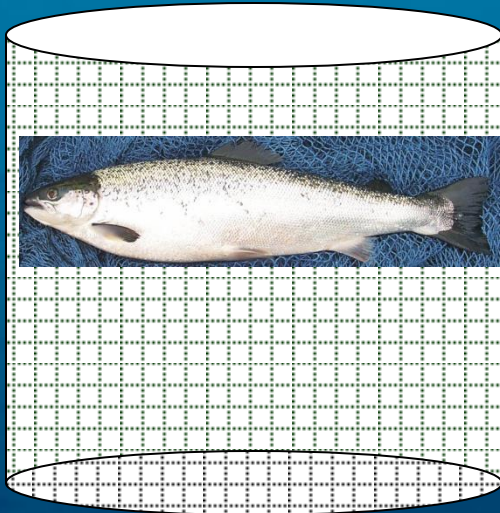


The salmon lice  
*Lepeoptheirus salmonis*



**Salmon/rainbow trout:**  
**n=300 000 000**

**Wild salmon/sea trout**  
**n=1,5-2 000 000**



**0.5 lice/fish** → **150 000 000 lice**

**5 lice/fish**

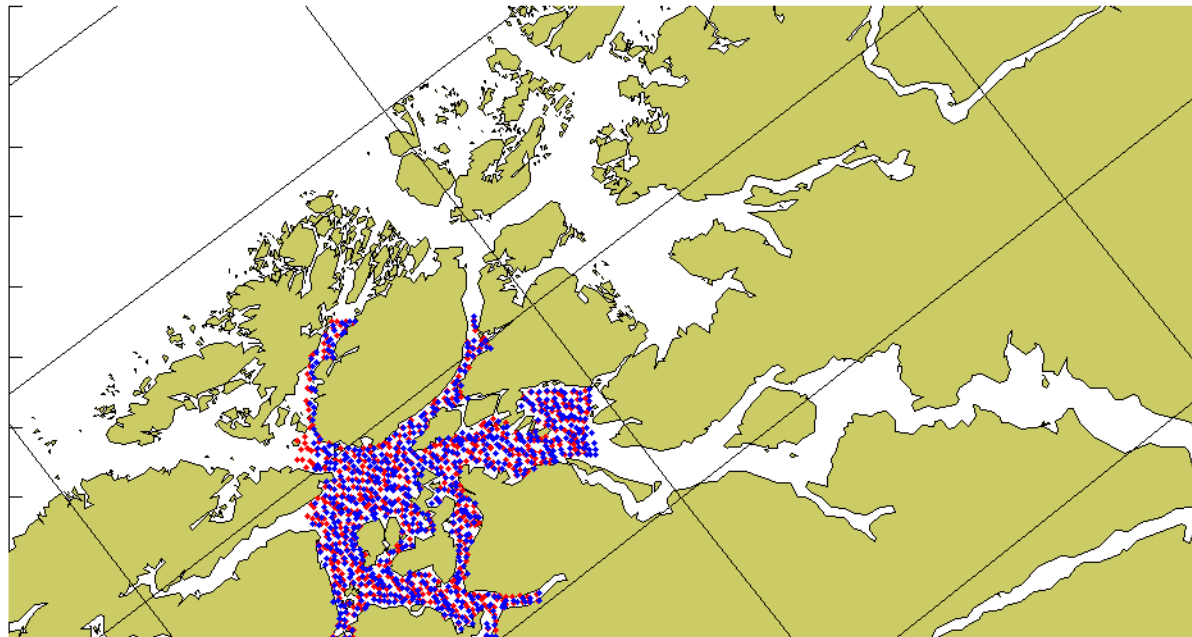
**15-20 000 000 lice**





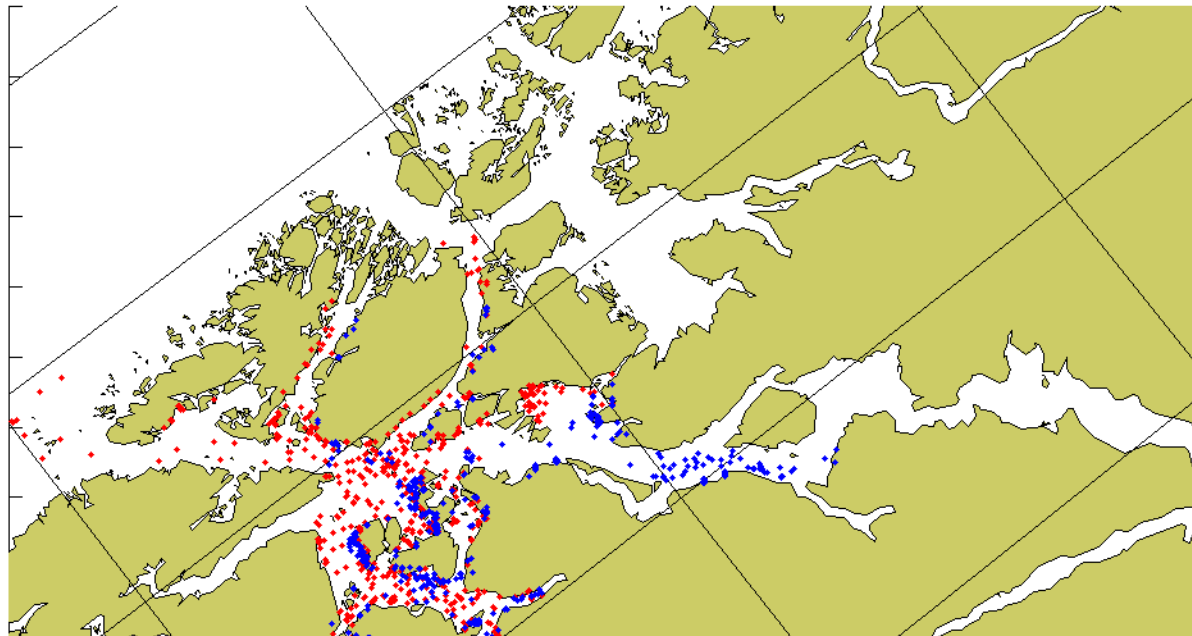
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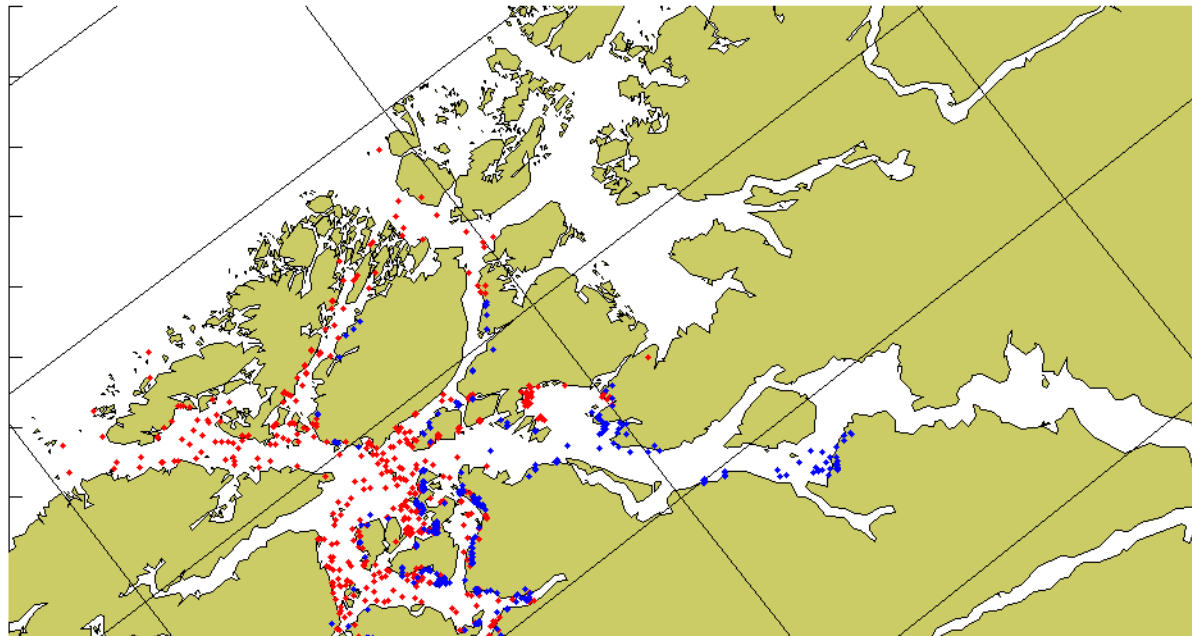
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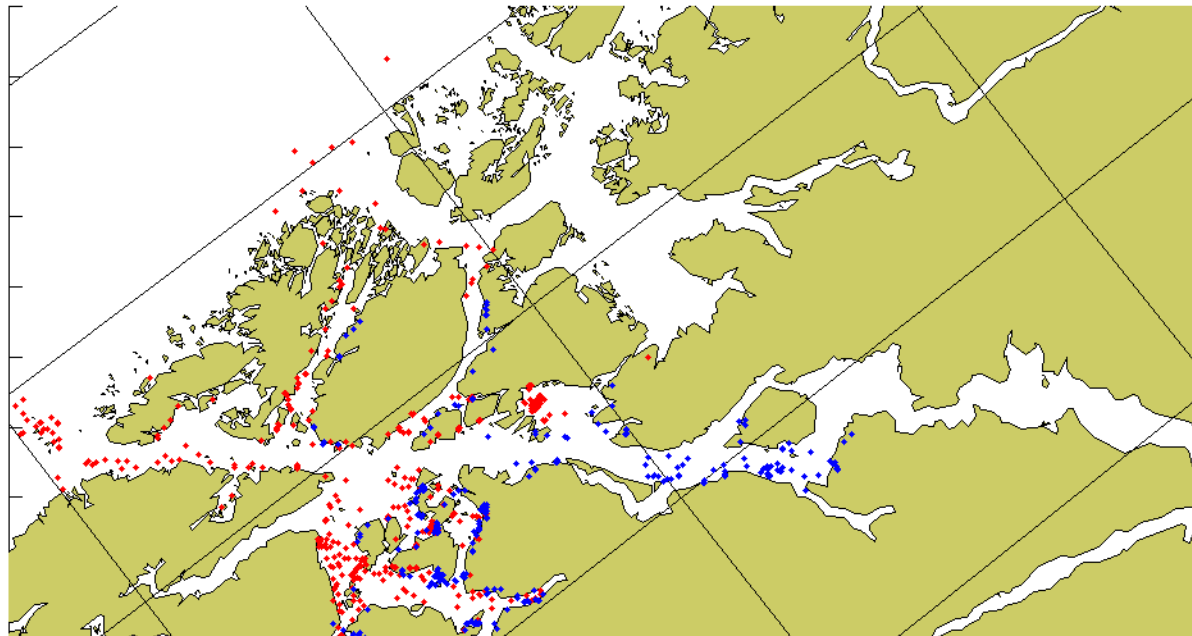
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- 2003

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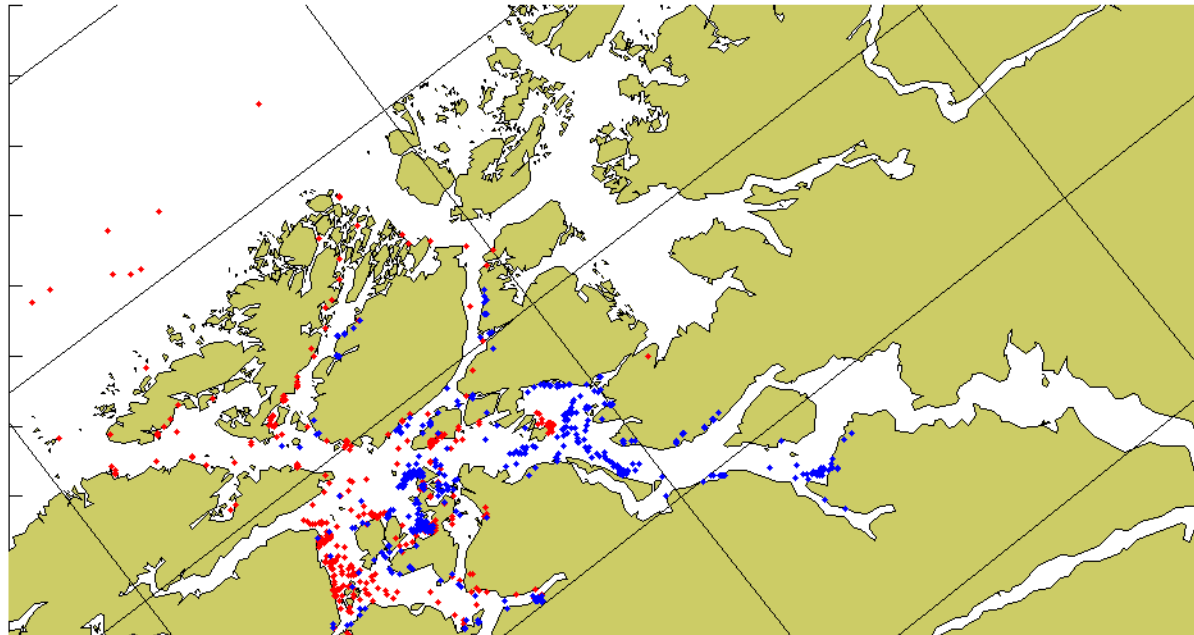
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- 2001
- 2003

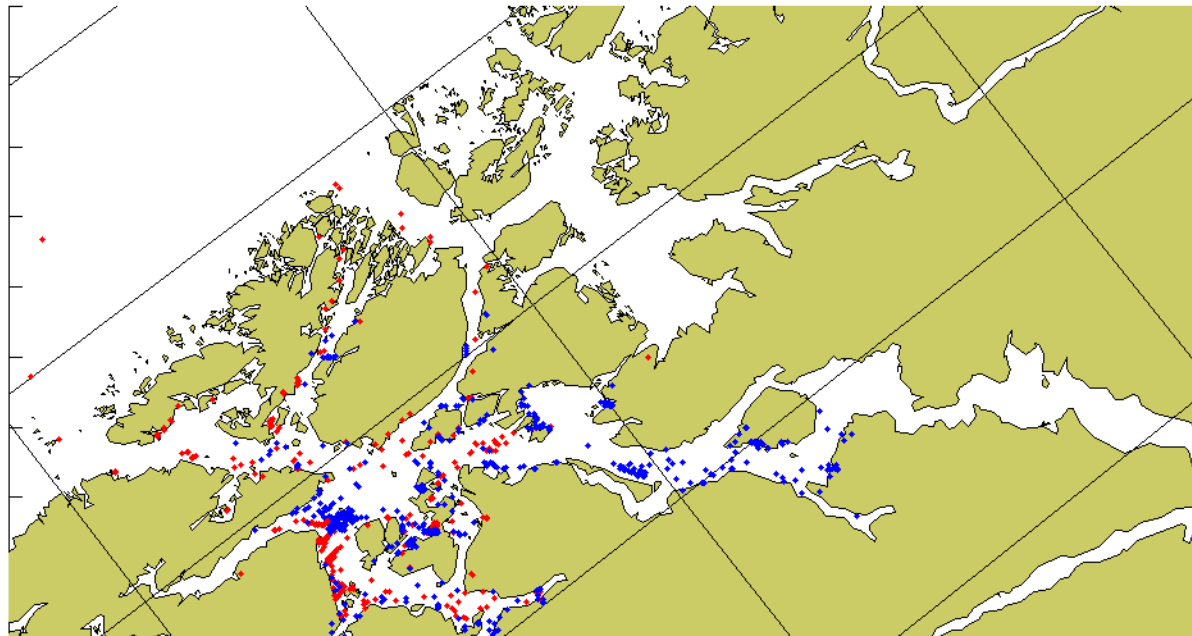
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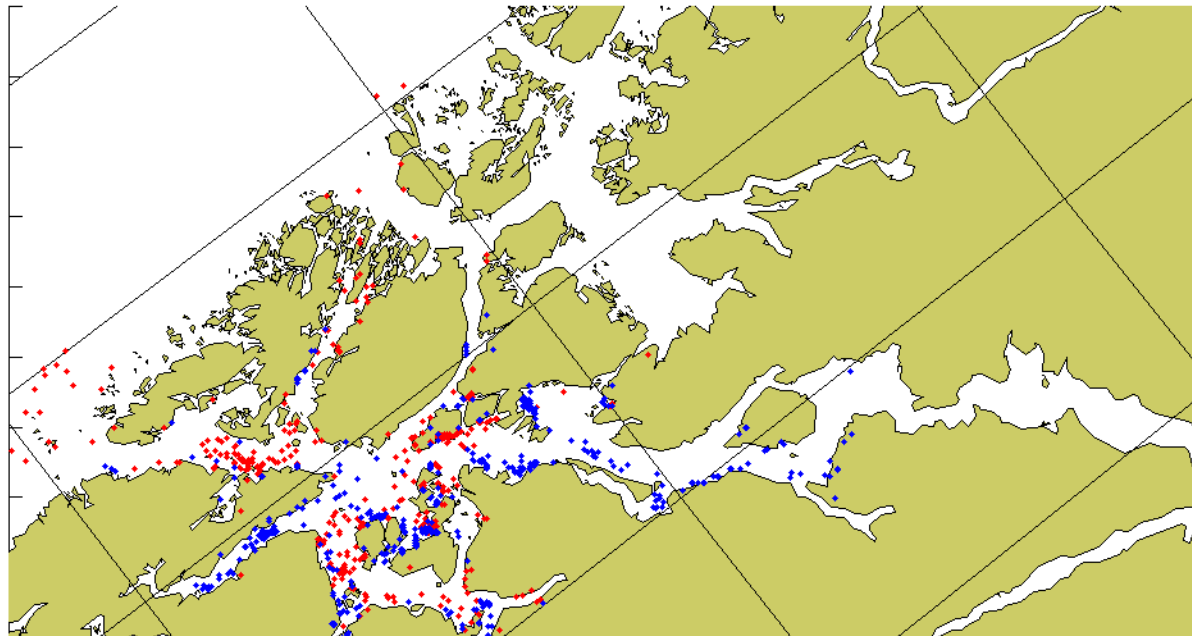
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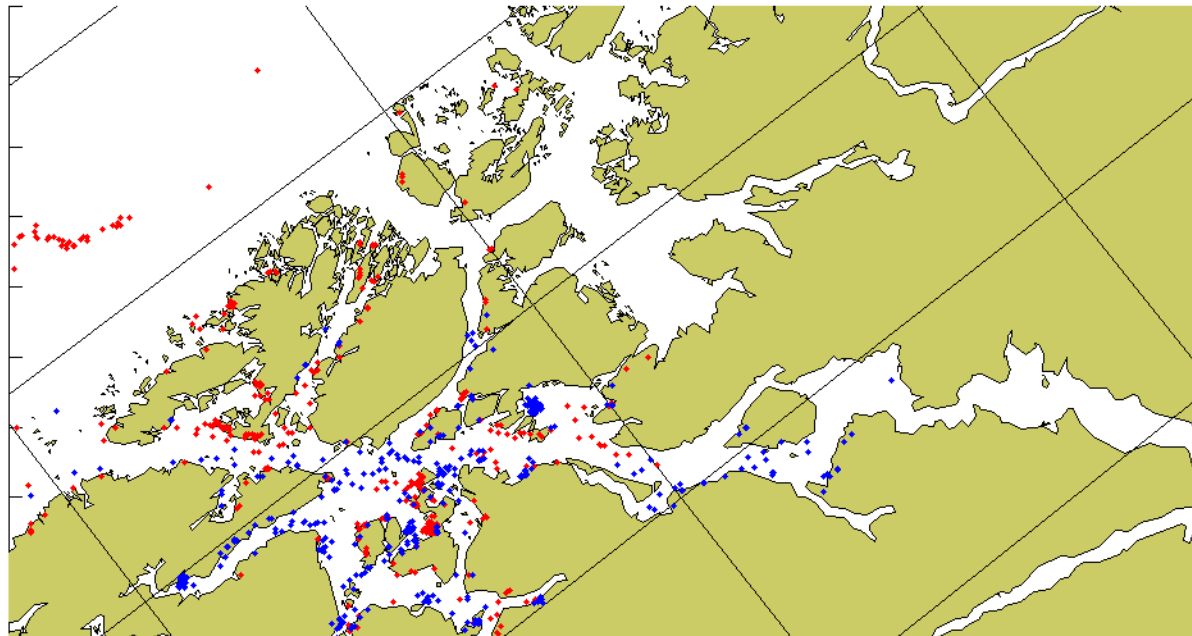
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- 2001
- 2003

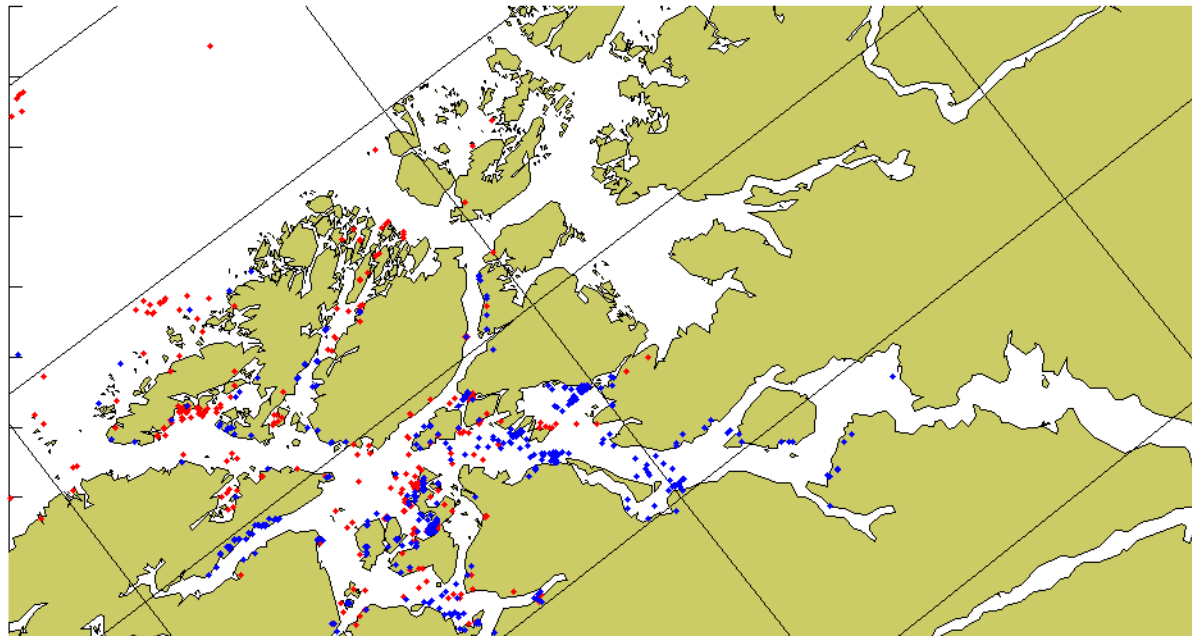
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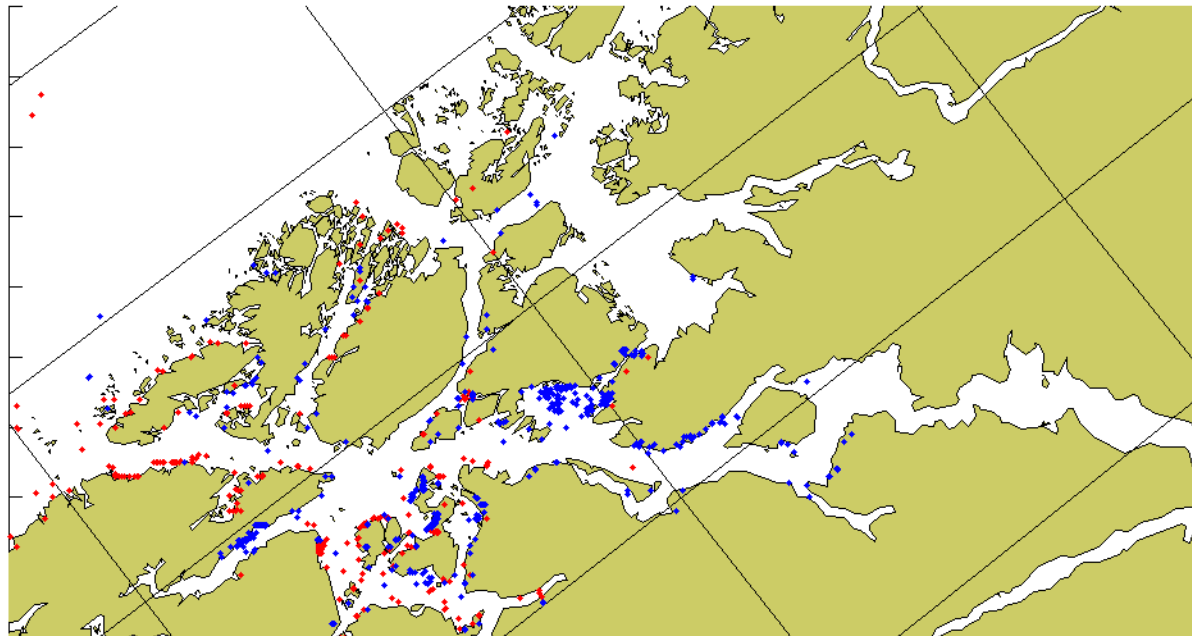
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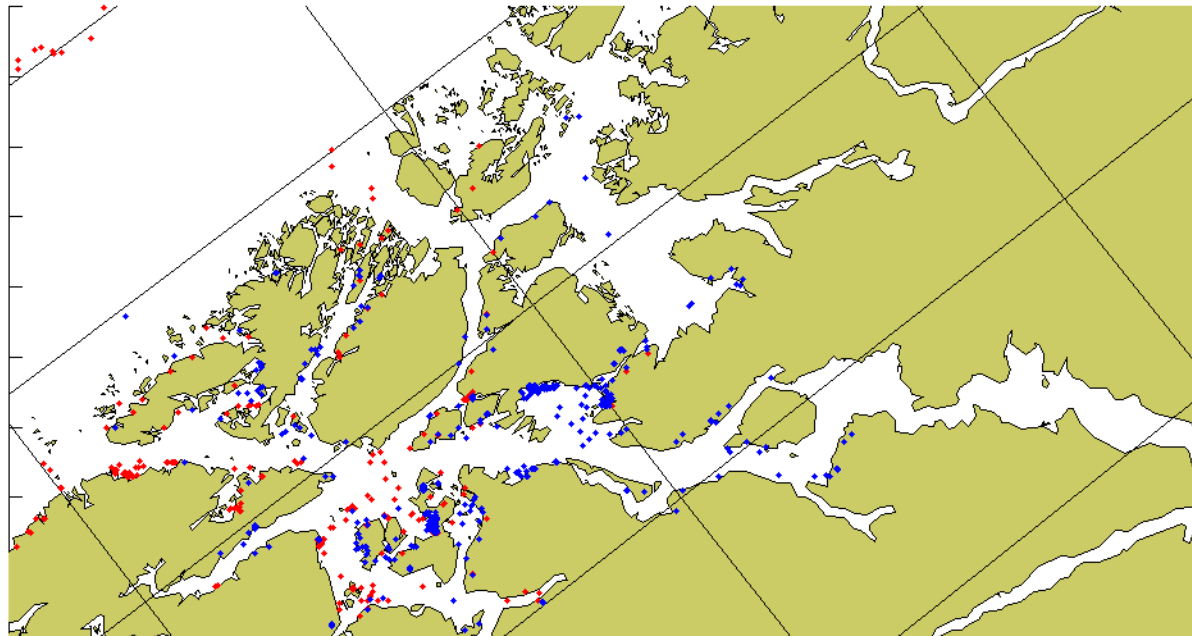
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- 2001
- 2003

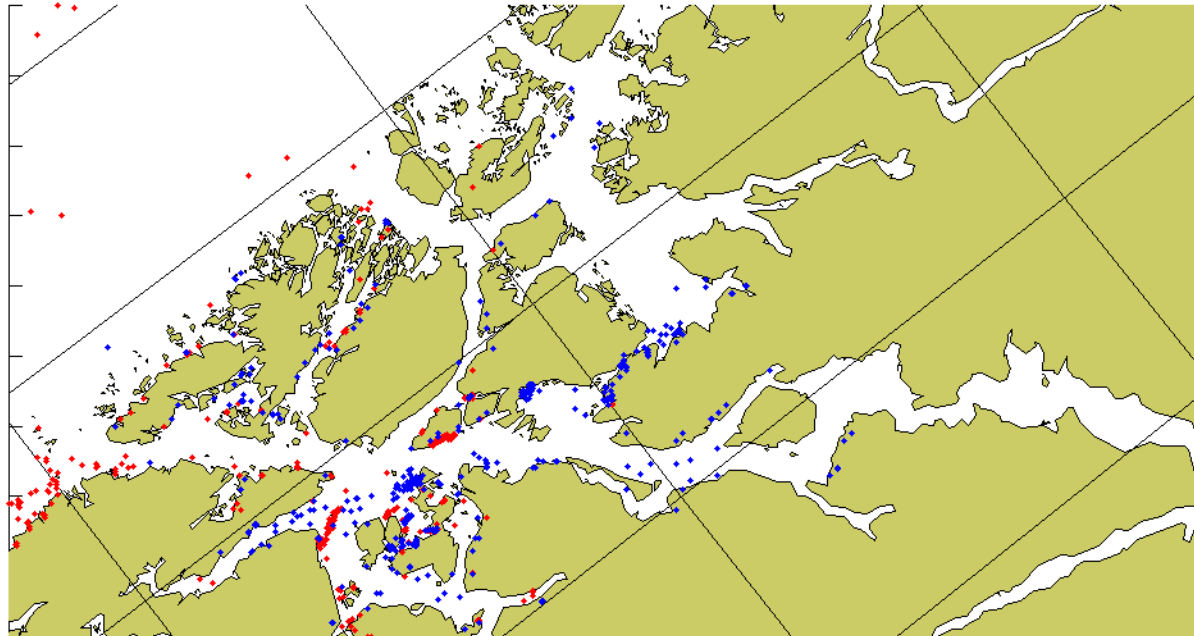
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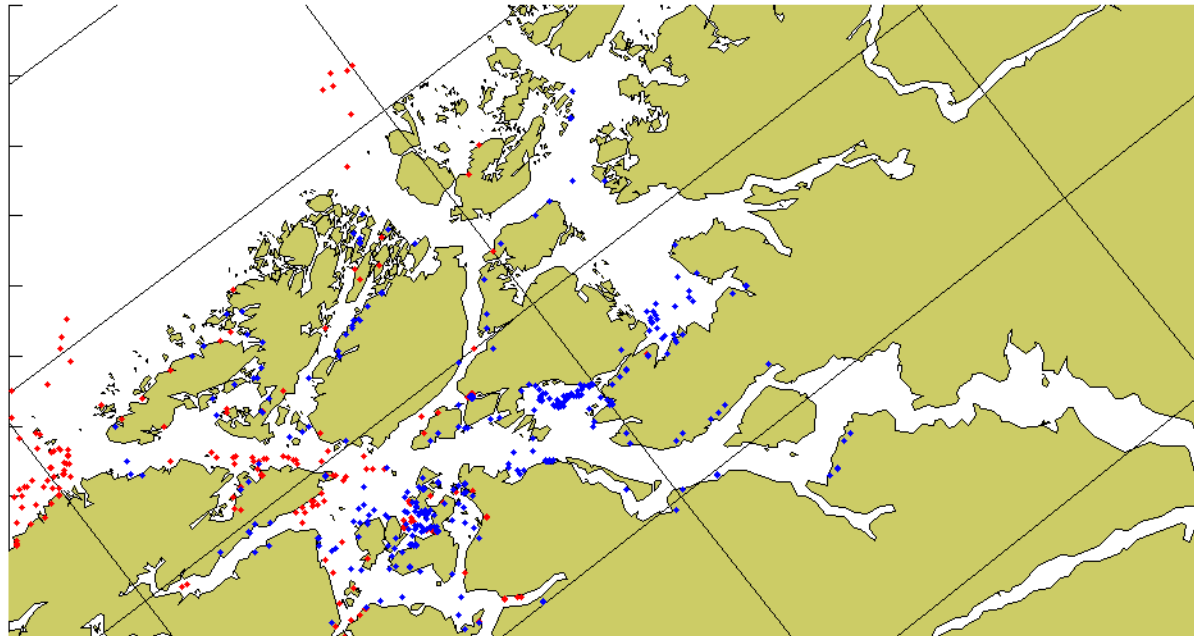
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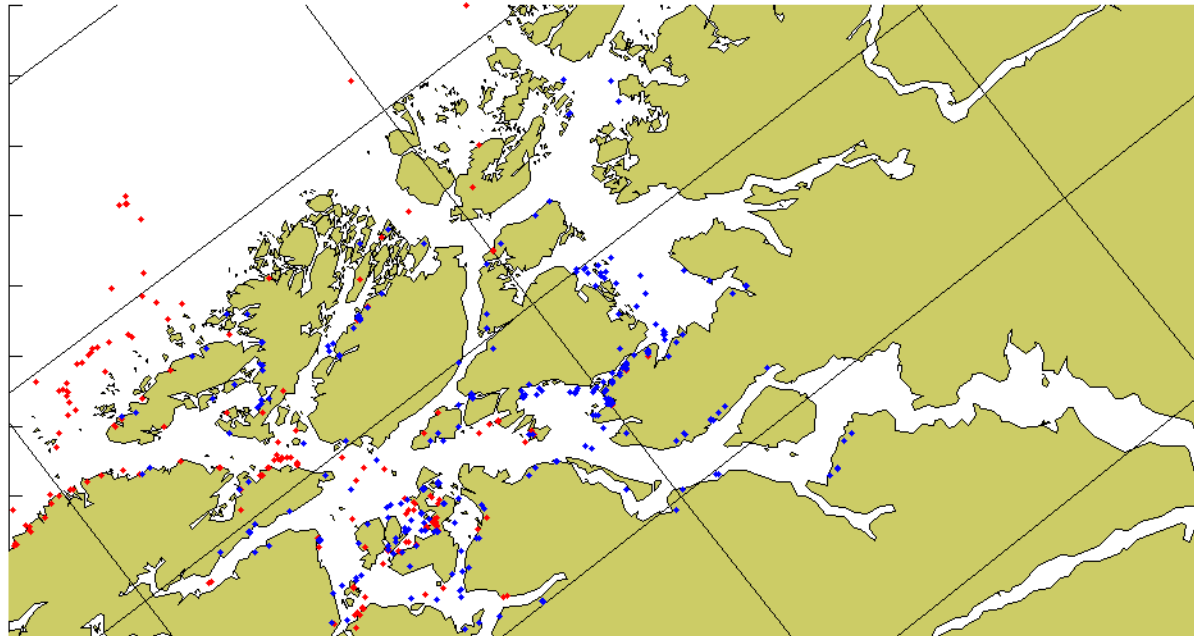
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- 2001
- 2003

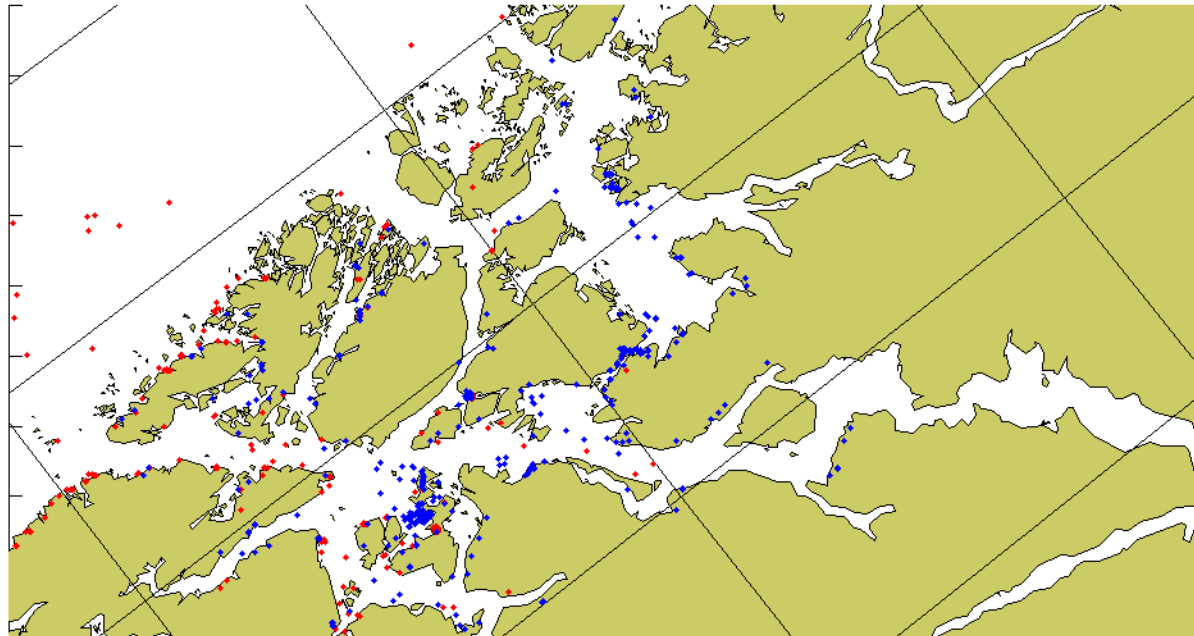
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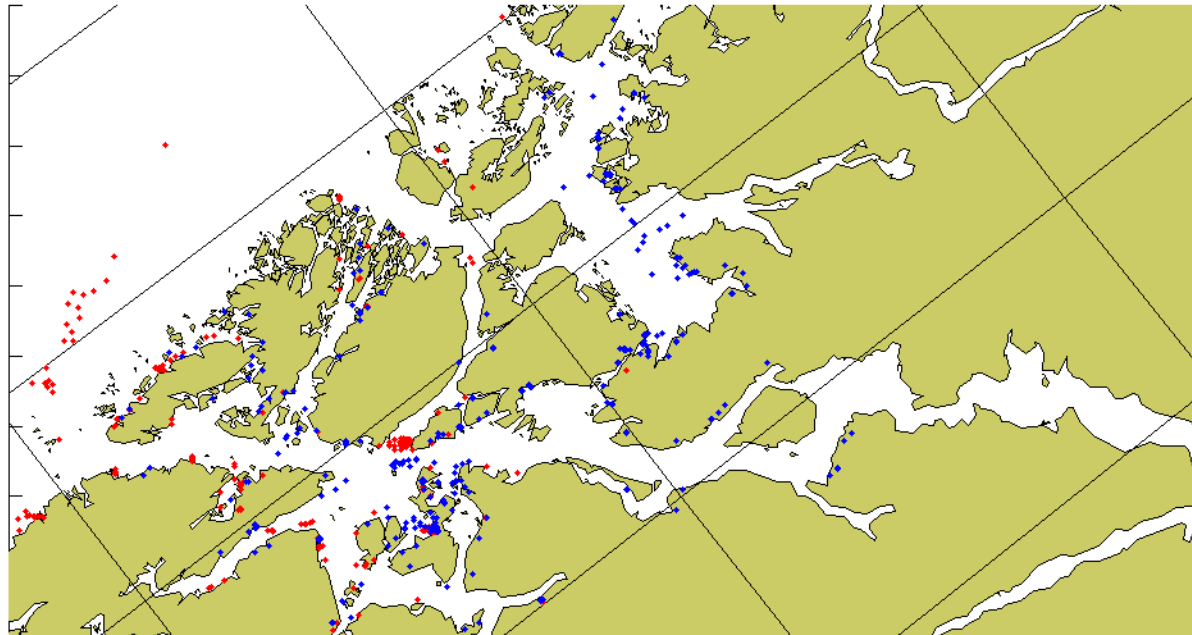
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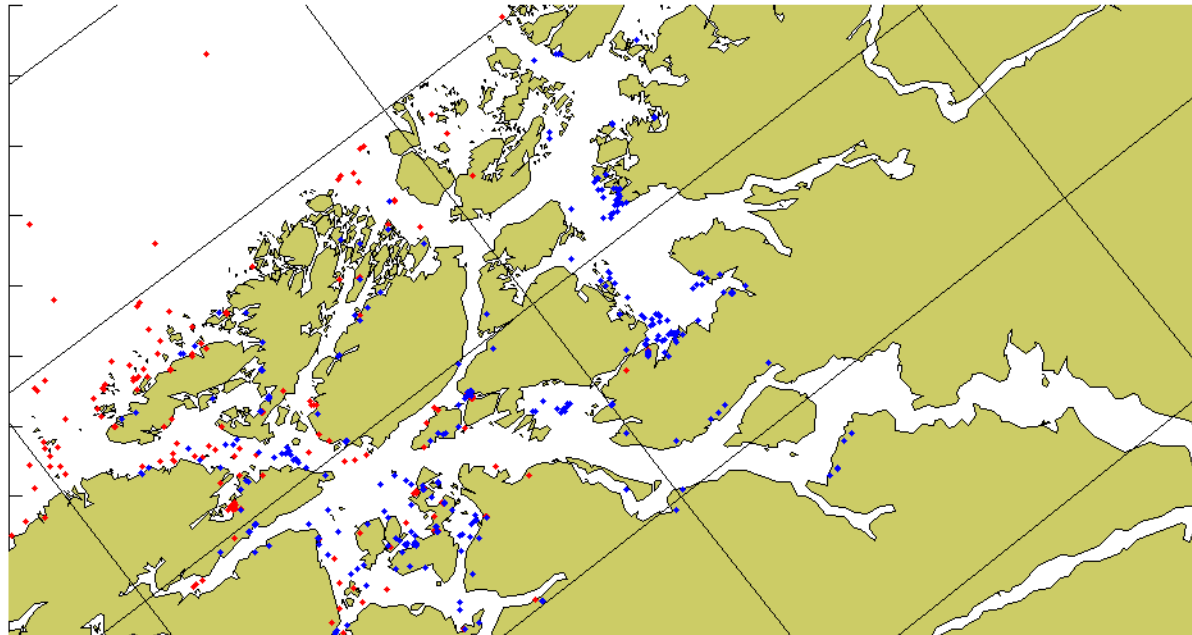
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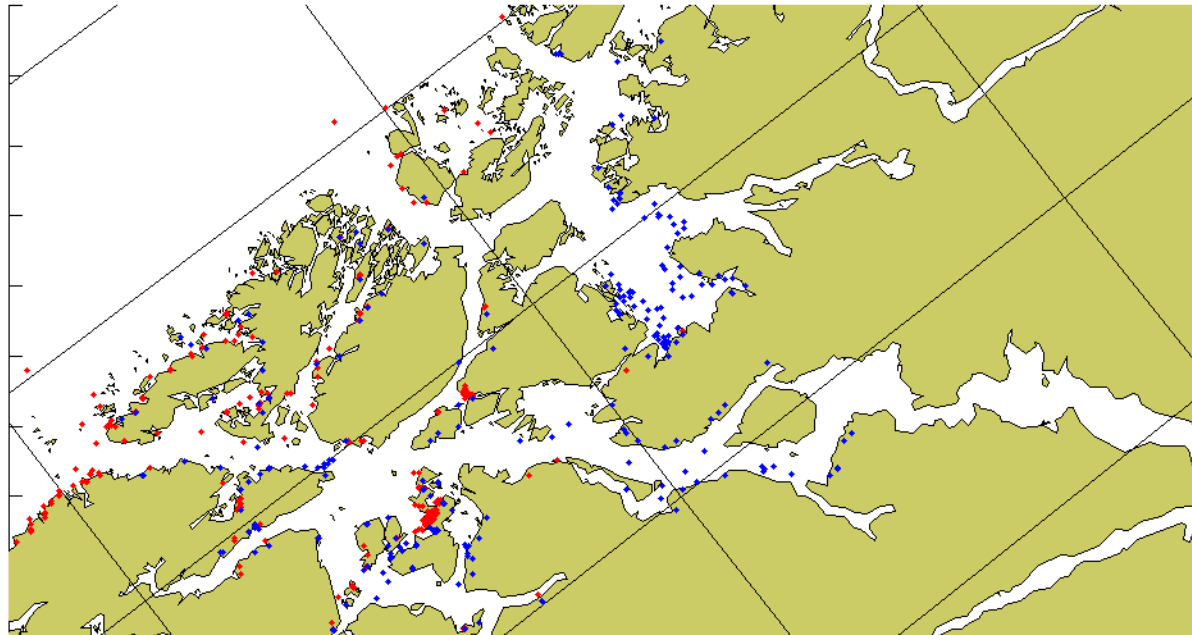
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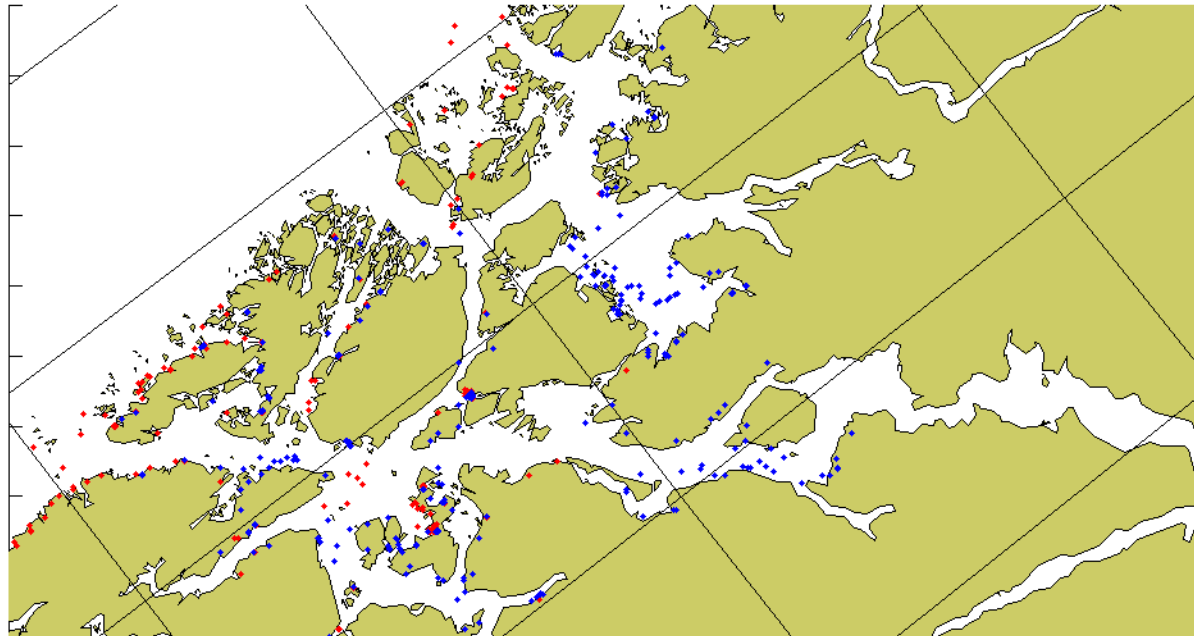
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- 2001
- 2003

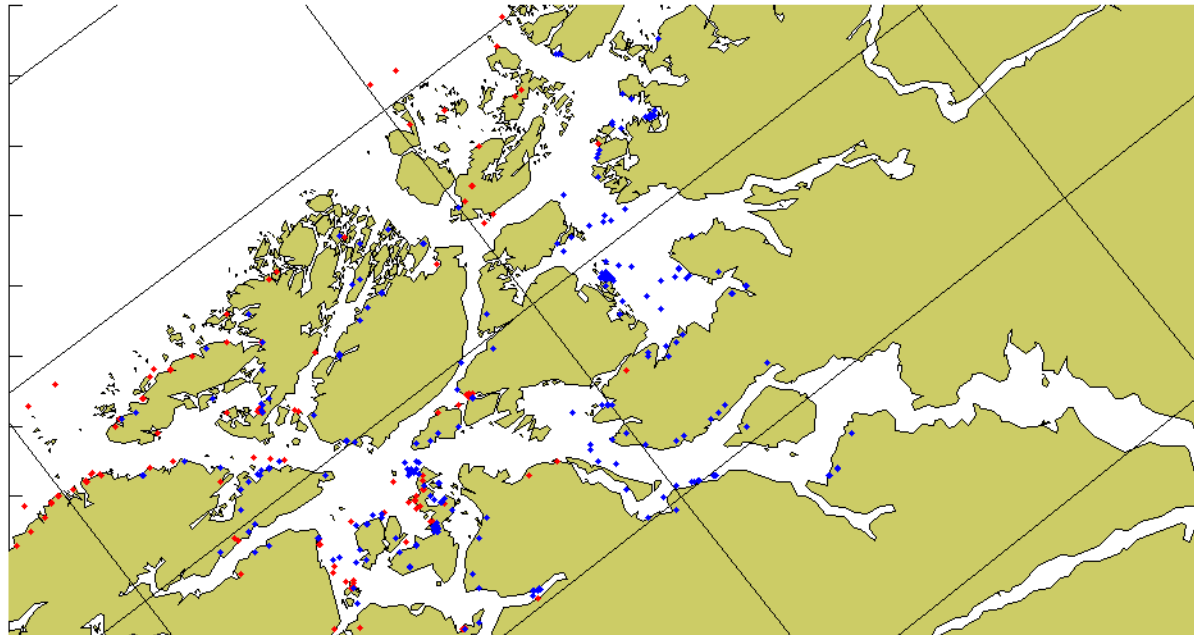
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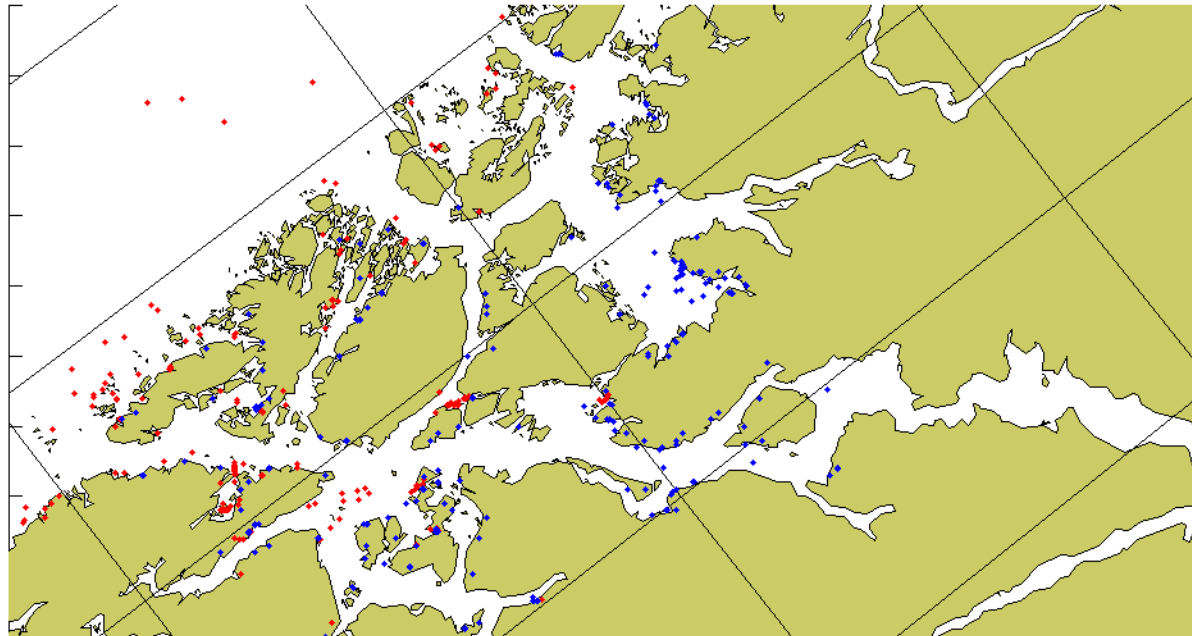
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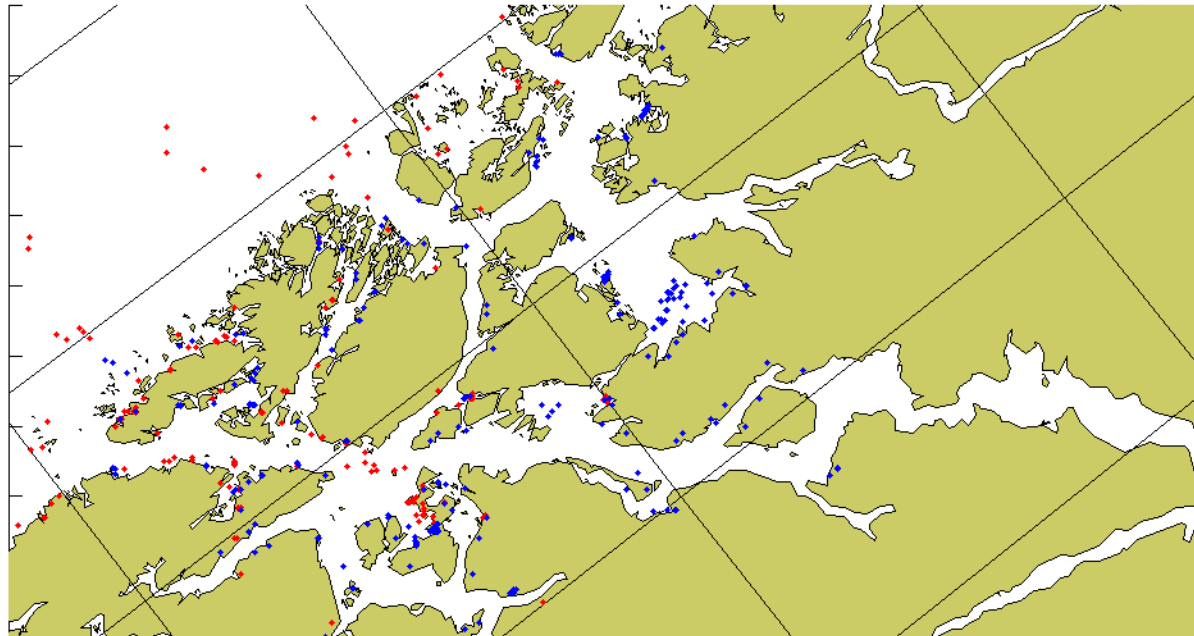
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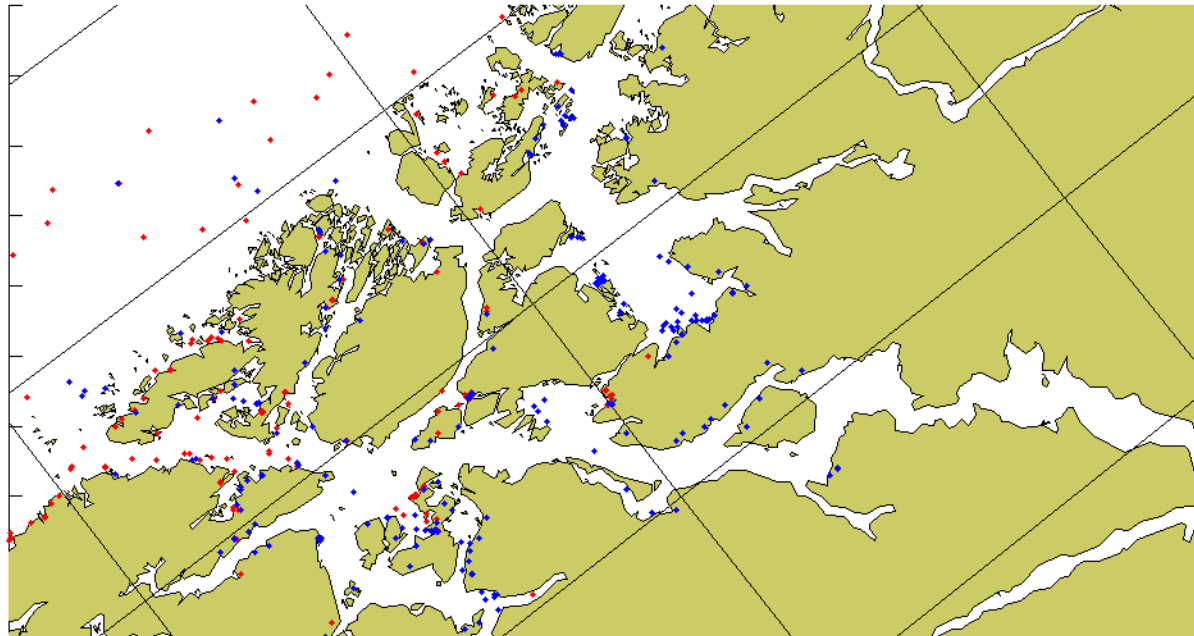
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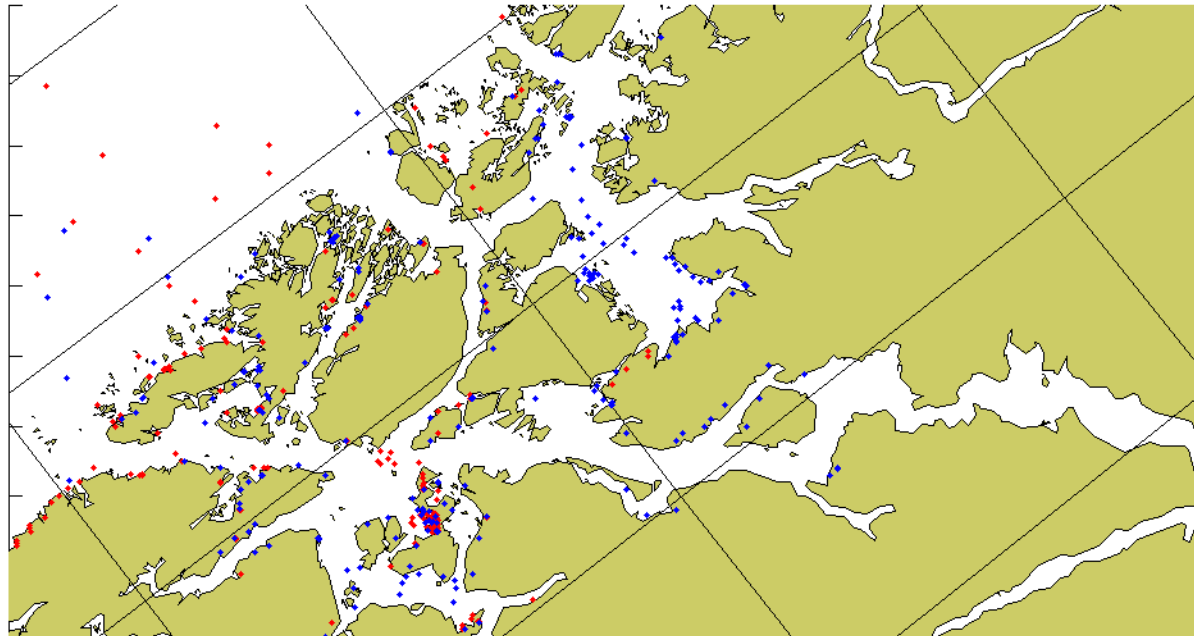
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- 2001
- 2003

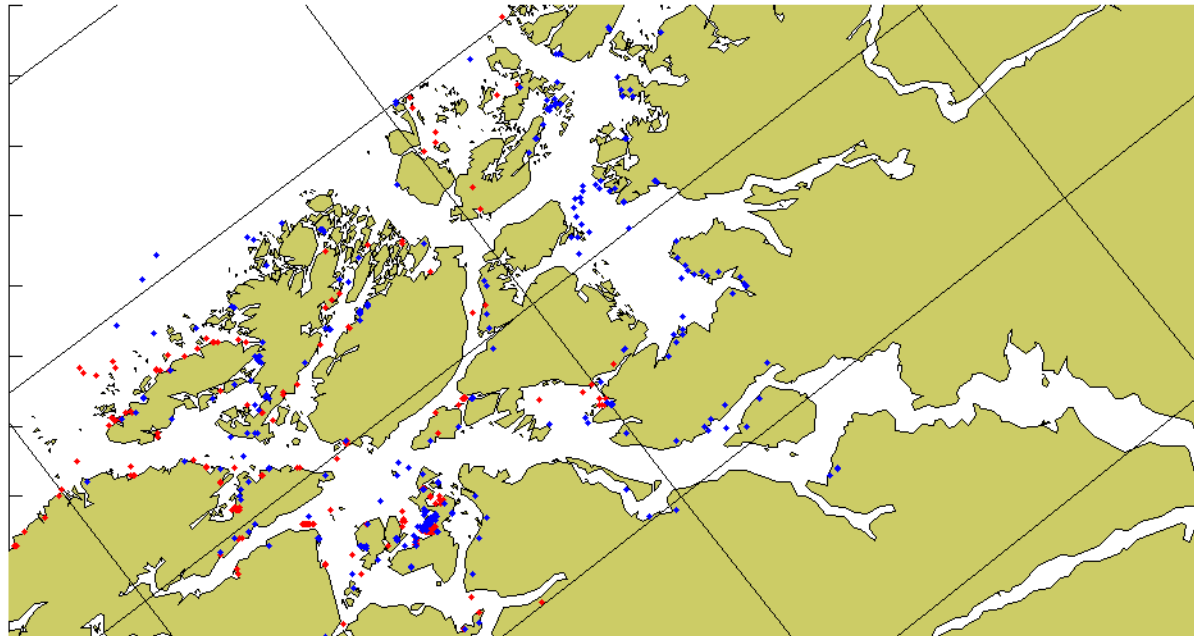
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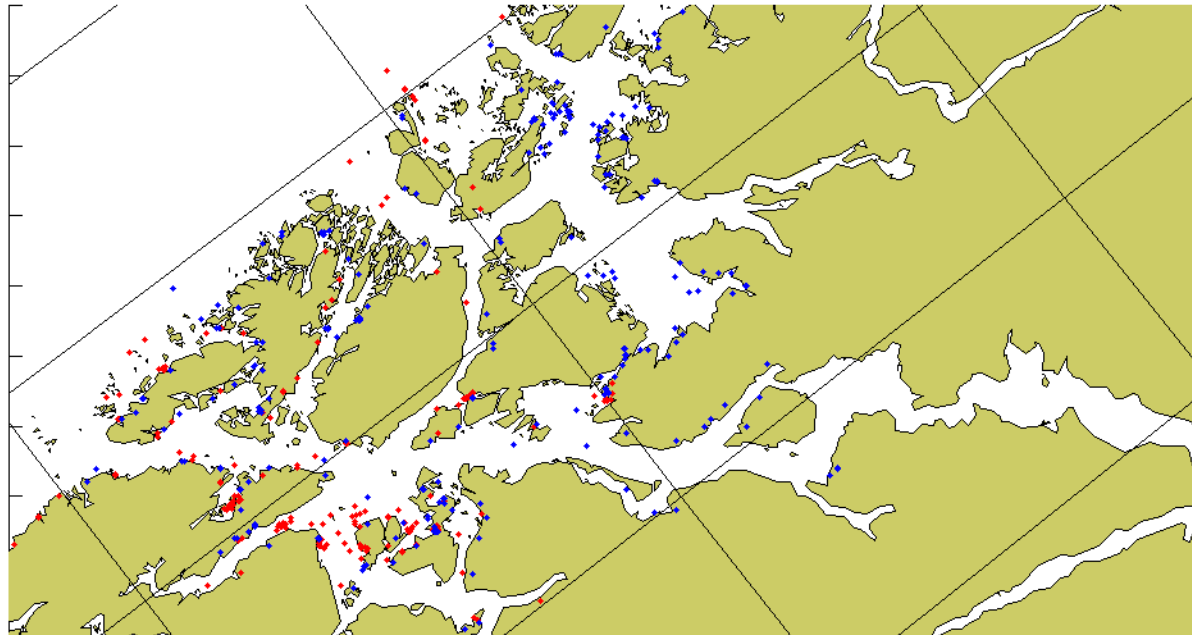
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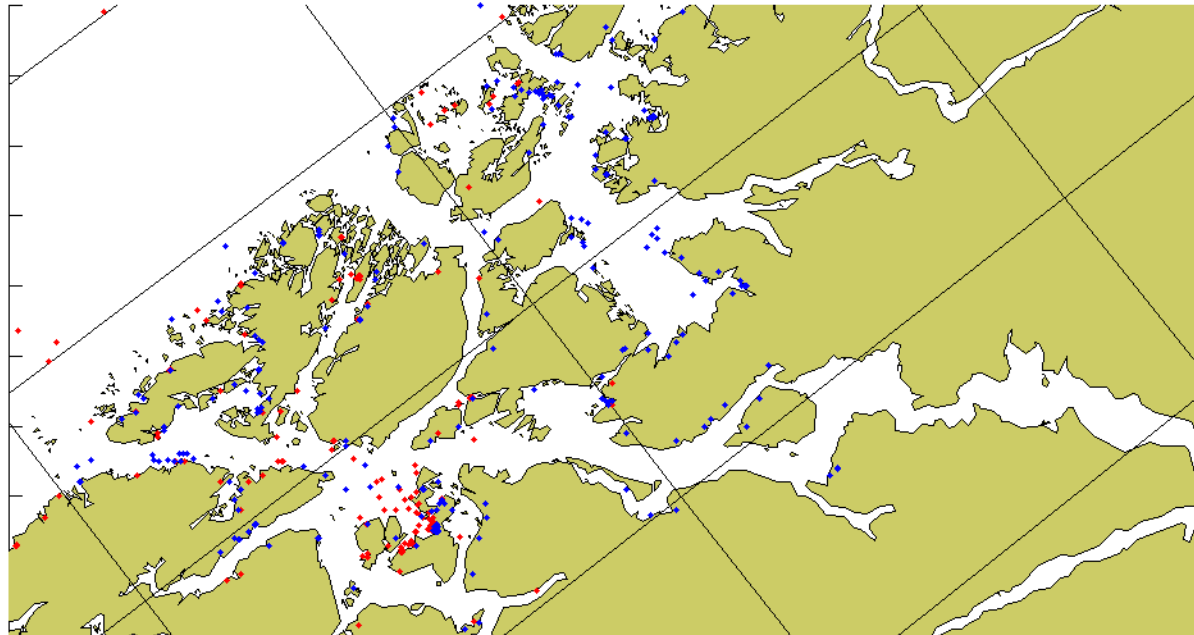
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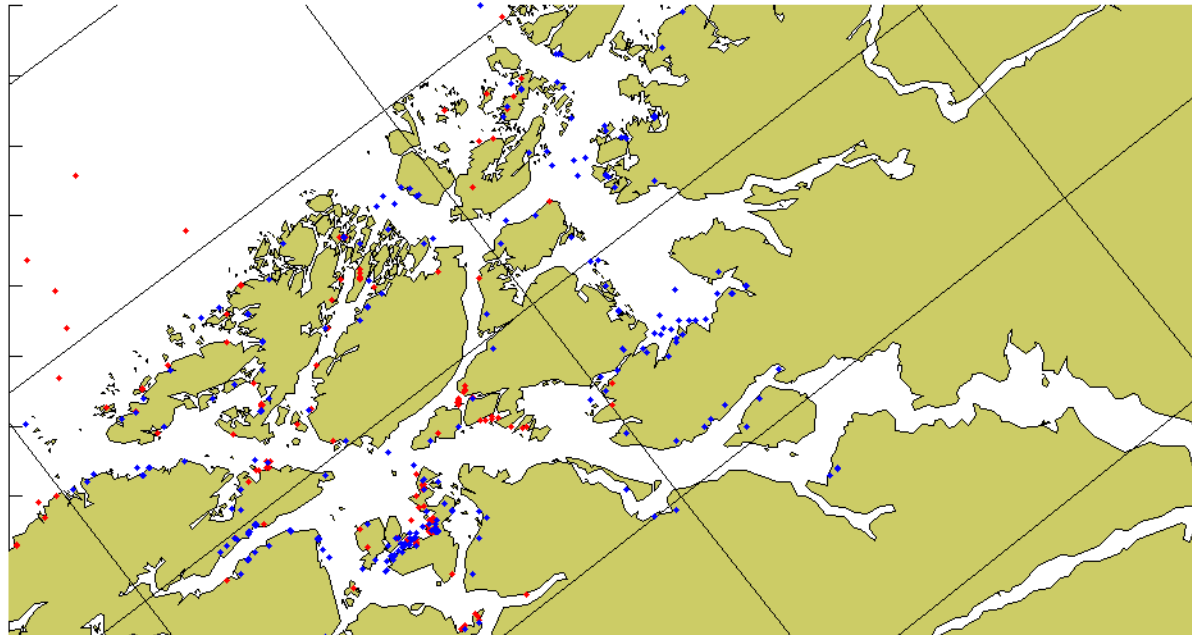
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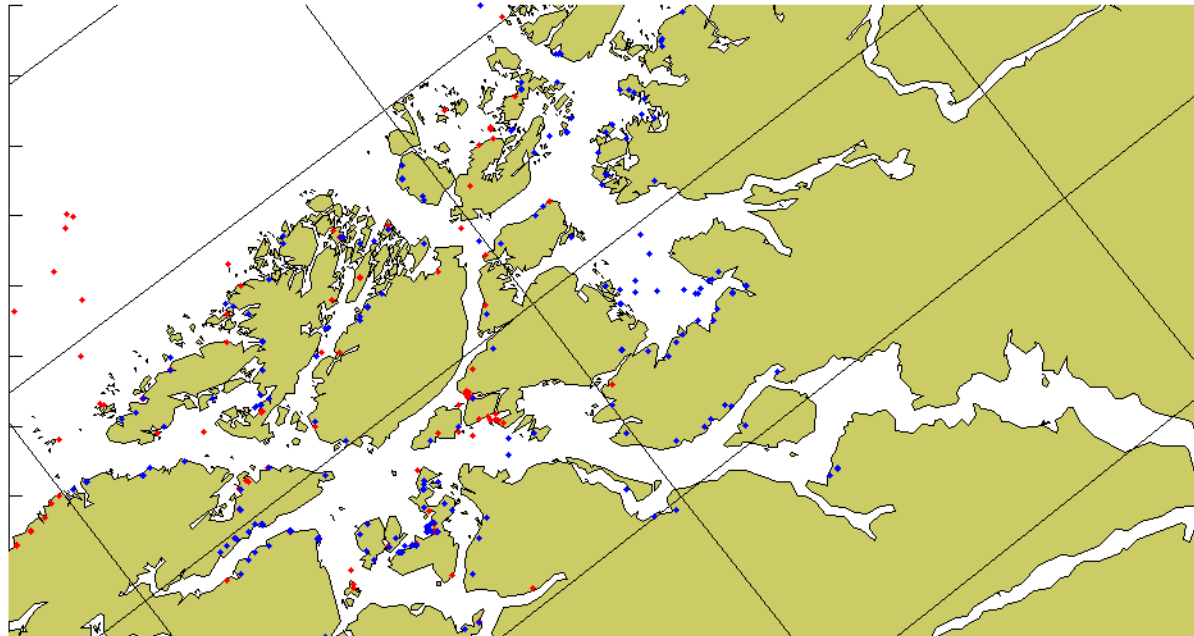
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- 2001
- 2003

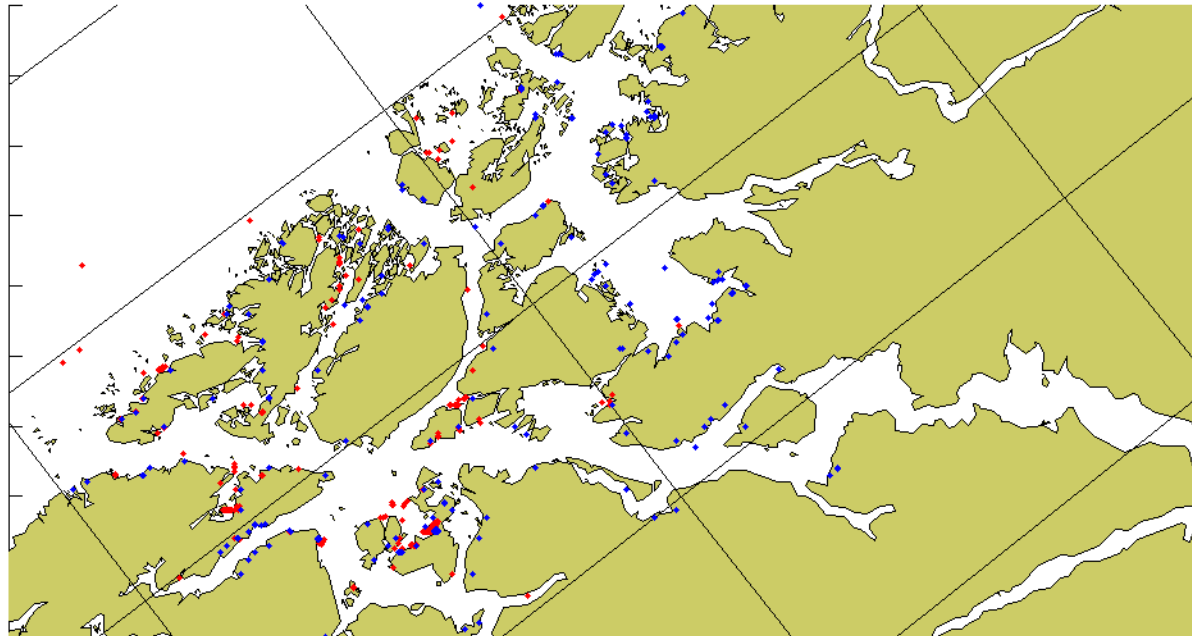
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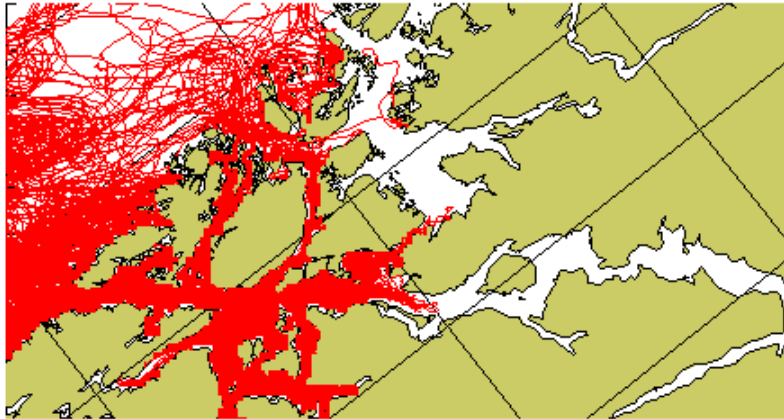


- **2001**
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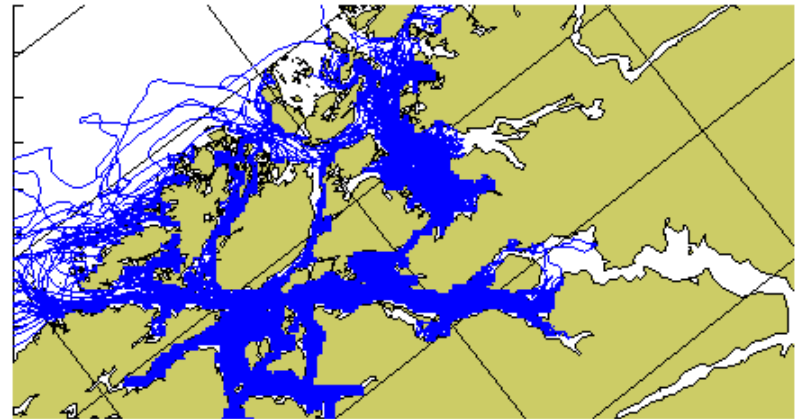
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Trajectories for salmon lice movement from May 10 to June 10, 2001



Trajectories for salmon lice movement from May 10 to June 10, 2003



**2001:**  
**South and out of the fjord**

**2003:**  
**North and into the fjord**



# Hardangerfjord spatial management

- "The Gullestad report – Feb. 4th 2011
- The Hardangerfjord regulation – in prep.



- Zoning?
  - 1 zone? 6 zones?
- Closing of zones
  - Mandatory,
  - temporarily
- Reducing cultured stock
- Closing salmon rivers

