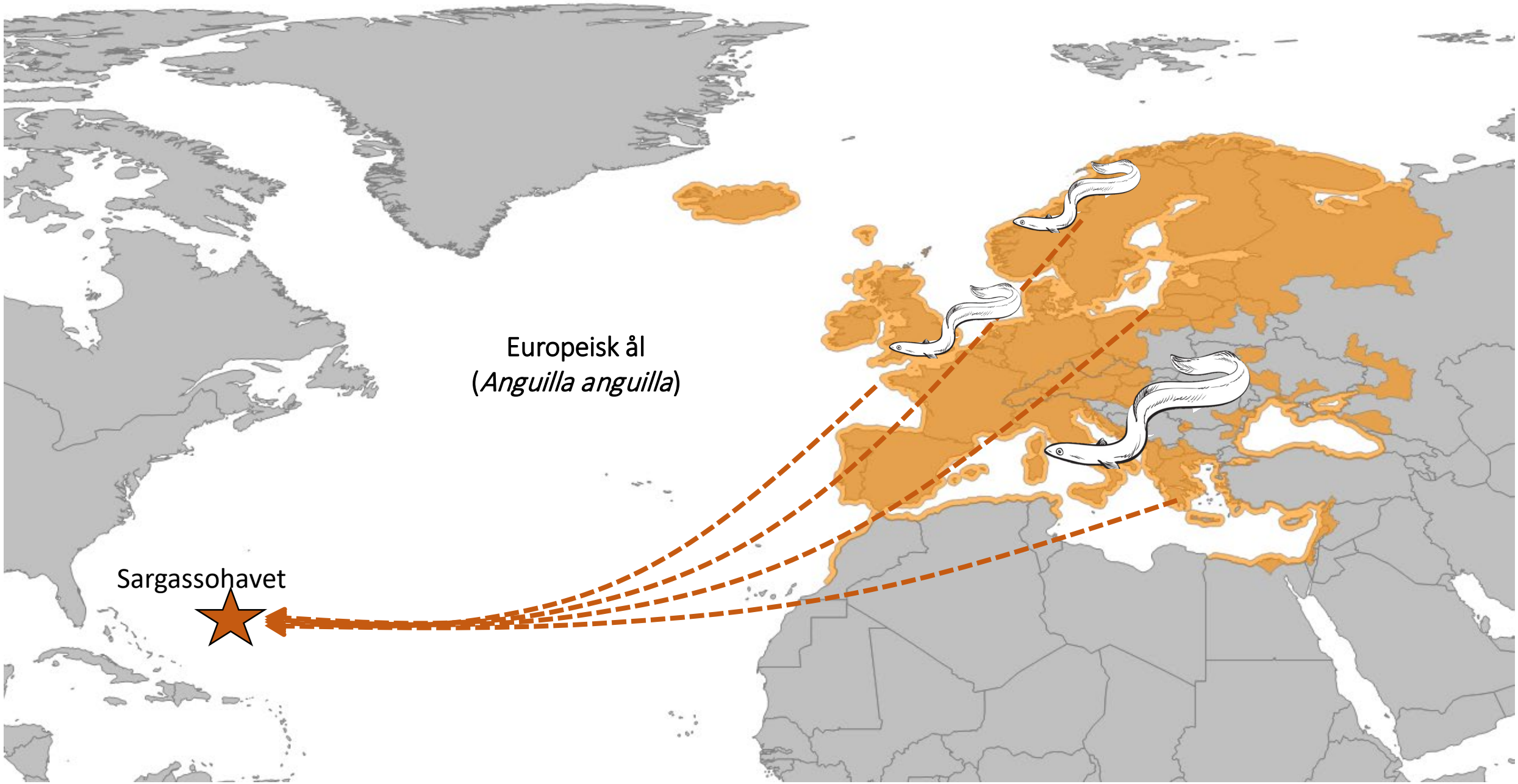
The Research Council of Norway

MAREEL

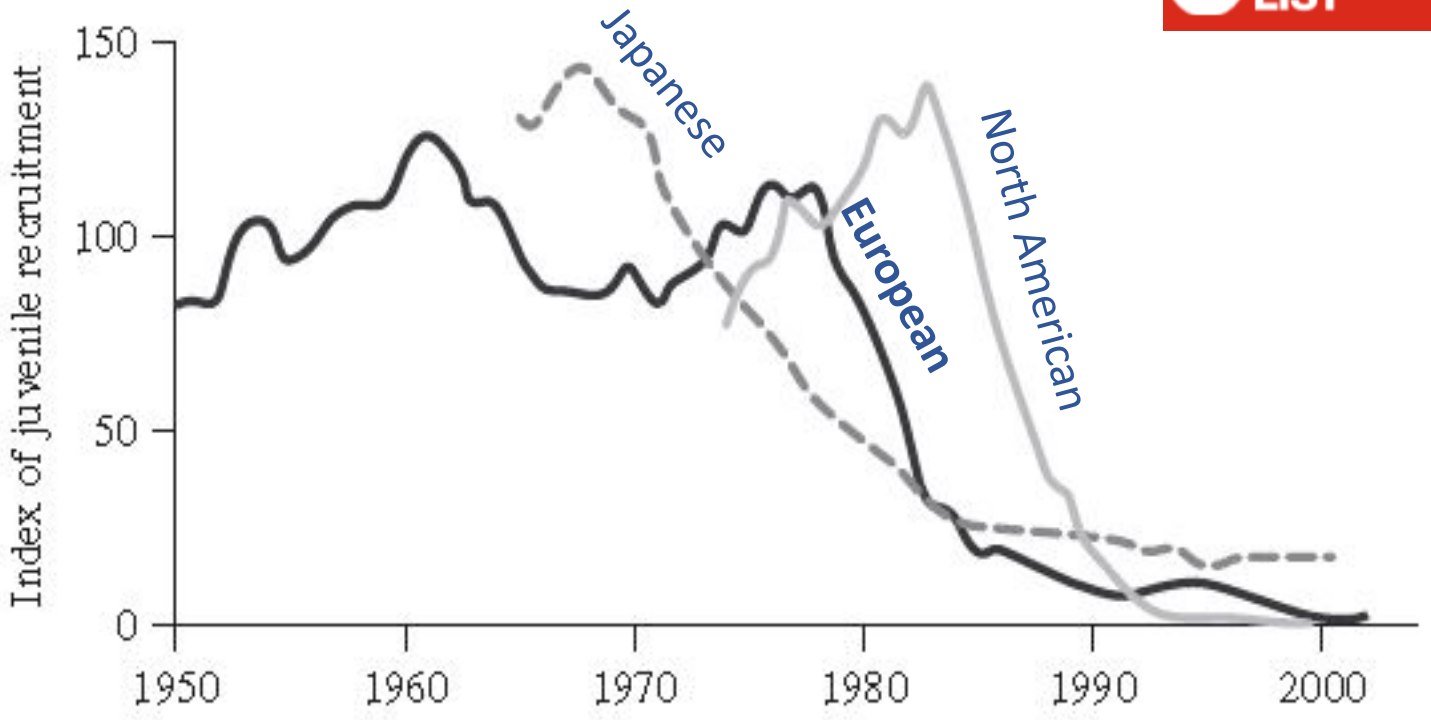
The importance of the marine habitat for the critically endangered European eel

Caroline Durif

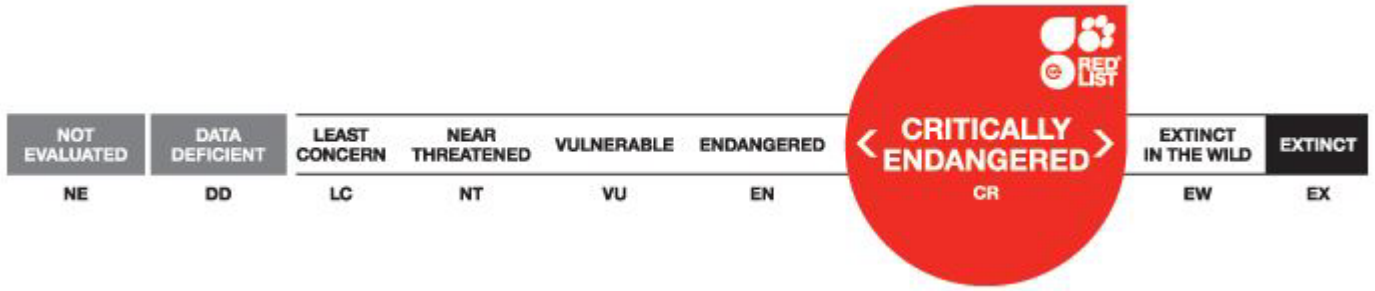
Ål habitater


Europeisk ål
(*Anguilla anguilla*)
Sargassohavet

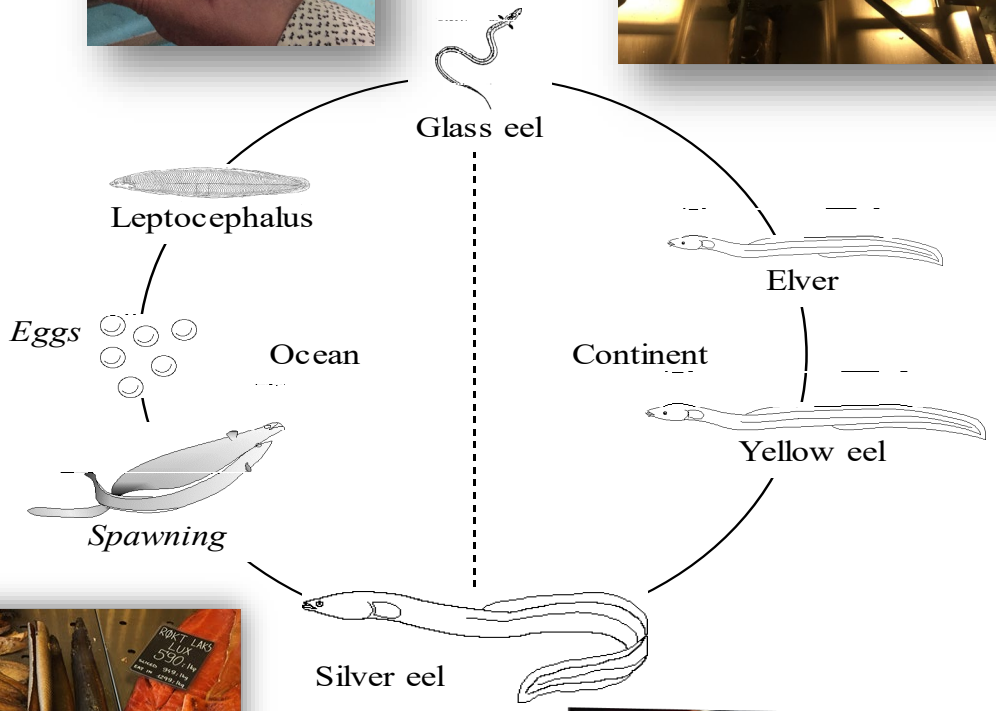
THE IUCN RED LIST
OF THREATENED SPECIES™



2008
2010
2014




ANGULAS
Frescas

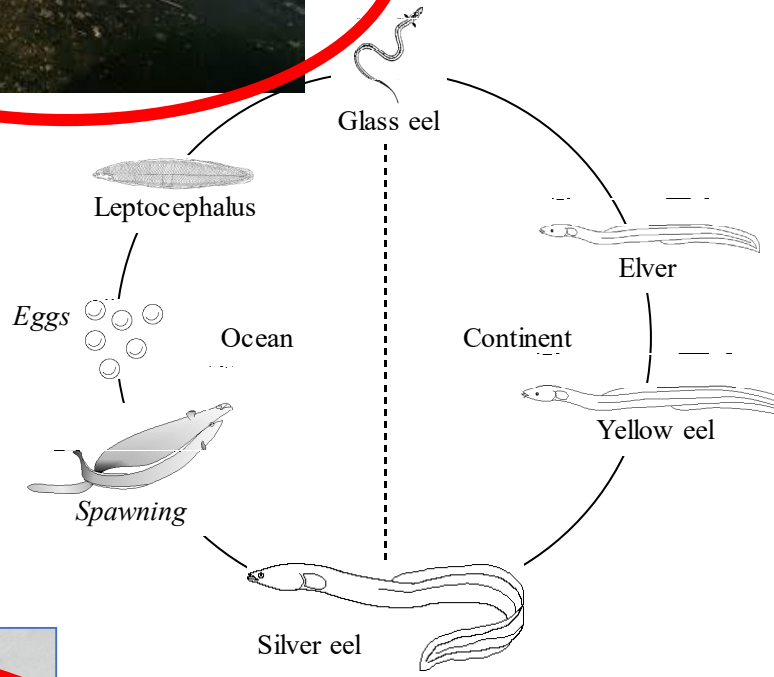

Glass eel
Leptocephalus
Elver
Eggs
Ocean
Continent
Yellow eel
Spawning
Silver eel


AL varmrökt
790

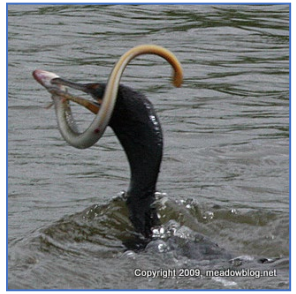

keropok.com

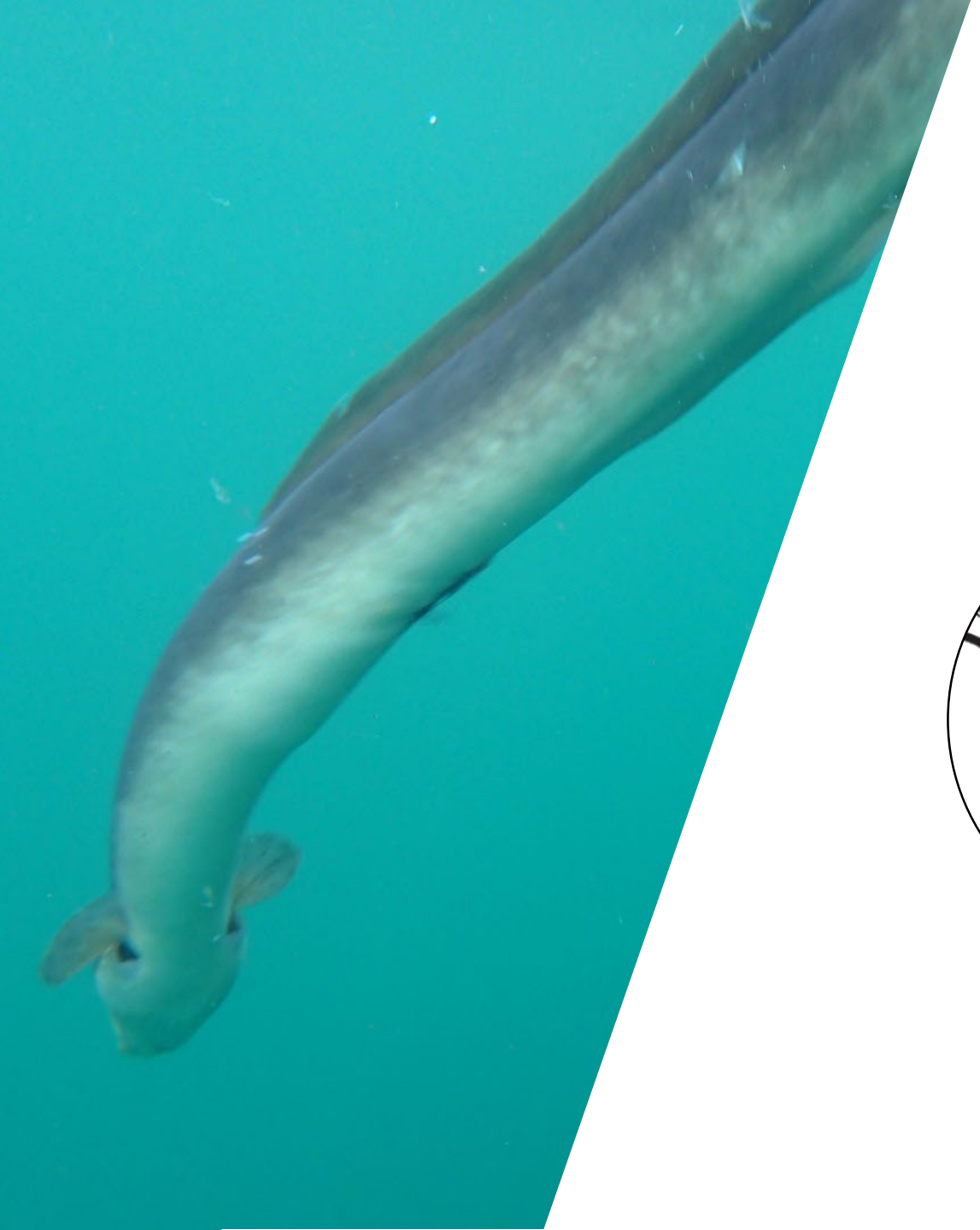

(C)Georges Gagnon 21/01/08


CLIMATE CHANGE

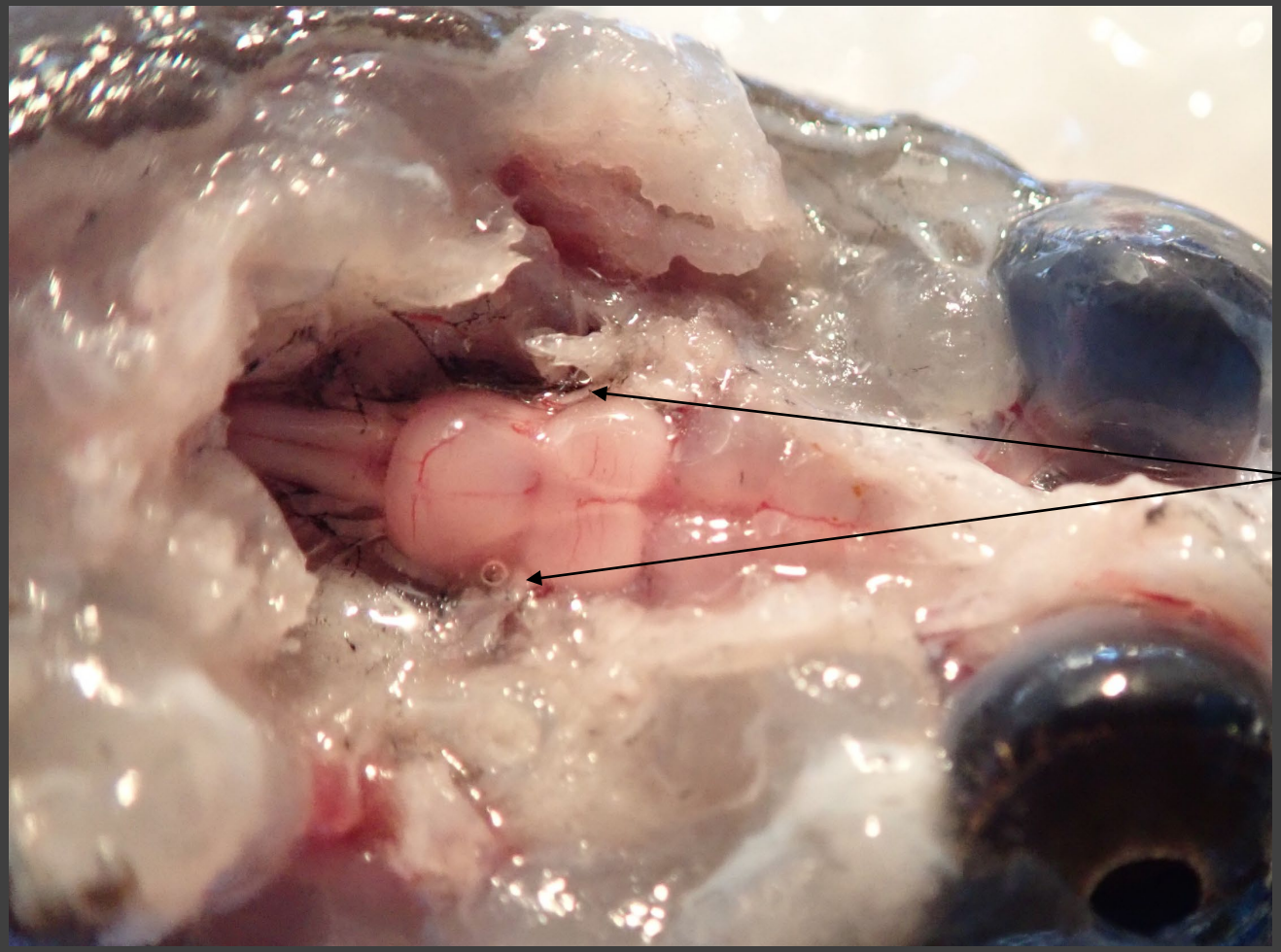

Glass eel
Leptocephalus
Elver
Eggs
Ocean
Continent
Yellow eel
Spawning
Silver eel


(Photo: Kr

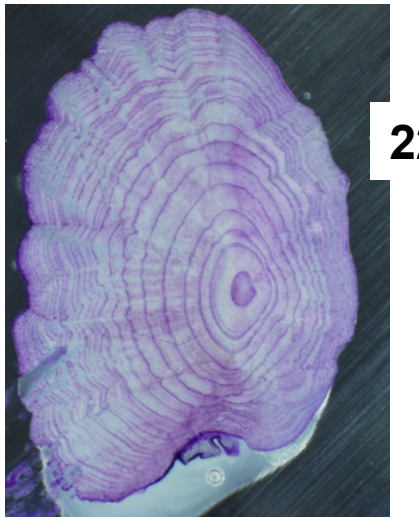

Copyright 2009, meadowblog.net



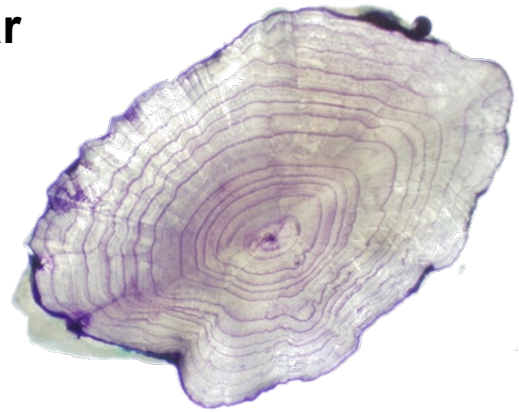
Hvorfor vandrer ål inn i ferskvann?



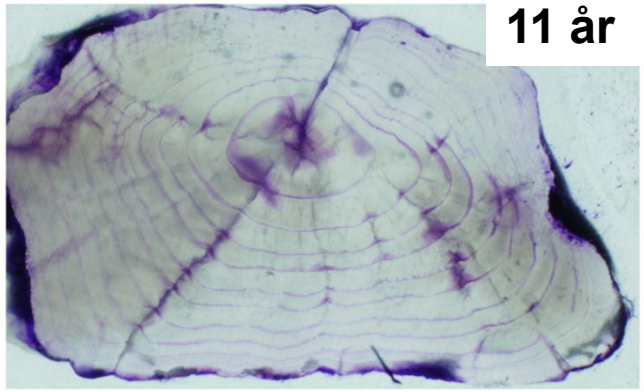
Otolitt



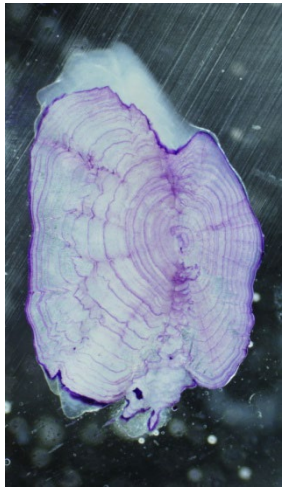
22 år



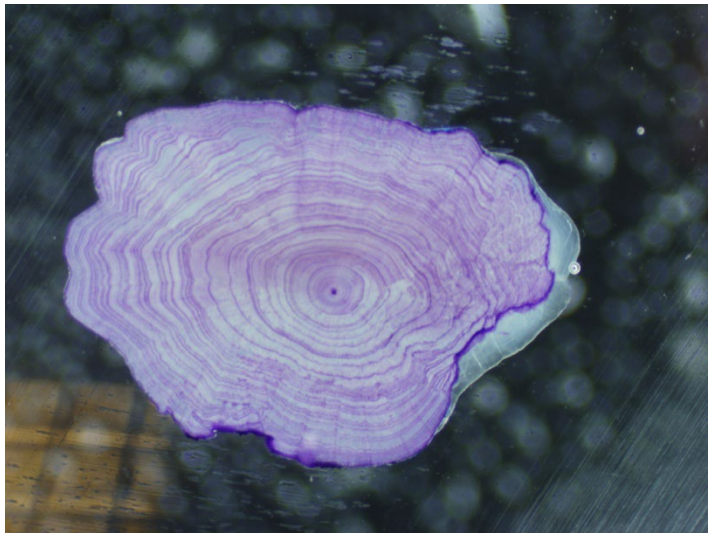
12 år



11 år

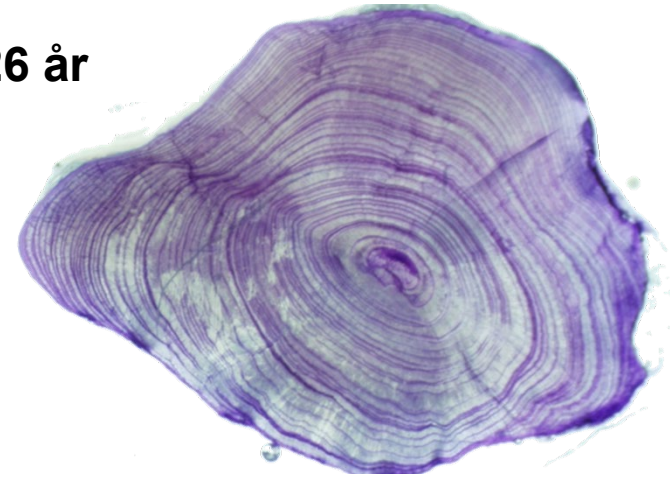


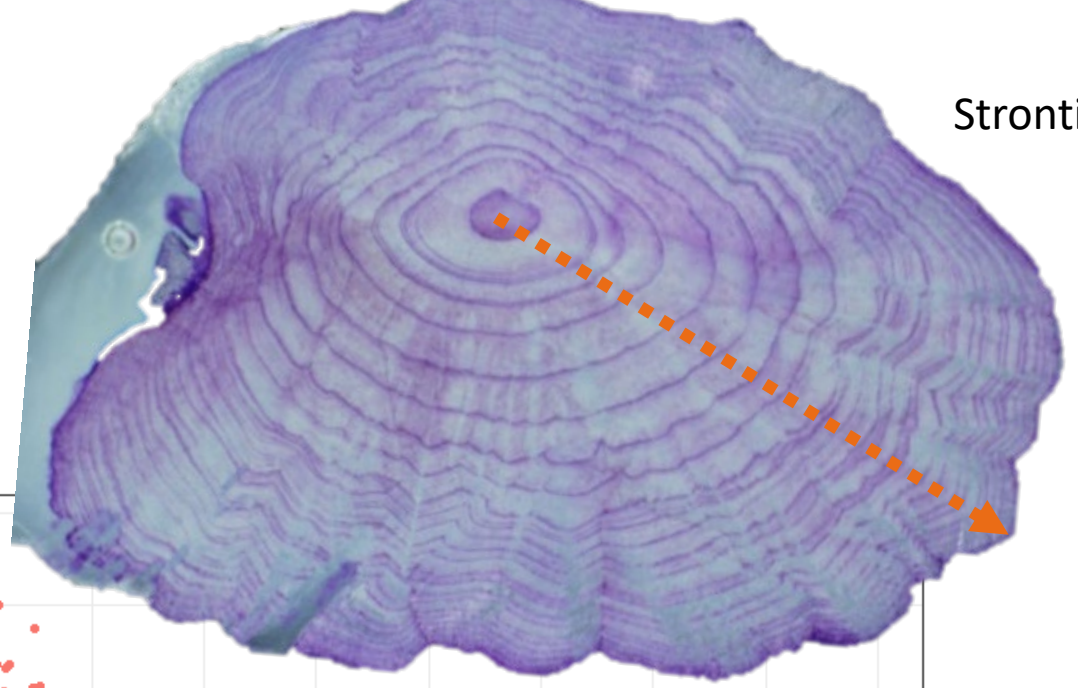
18 år



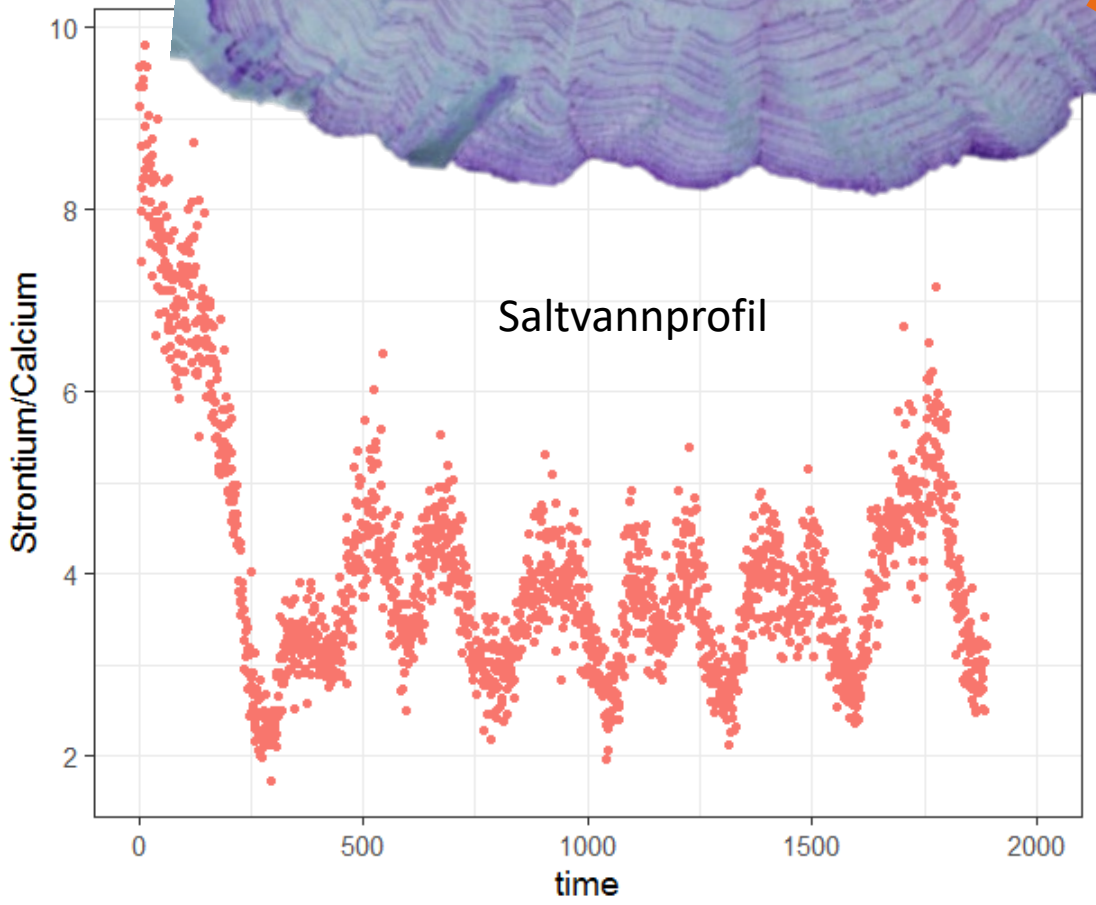
23 år

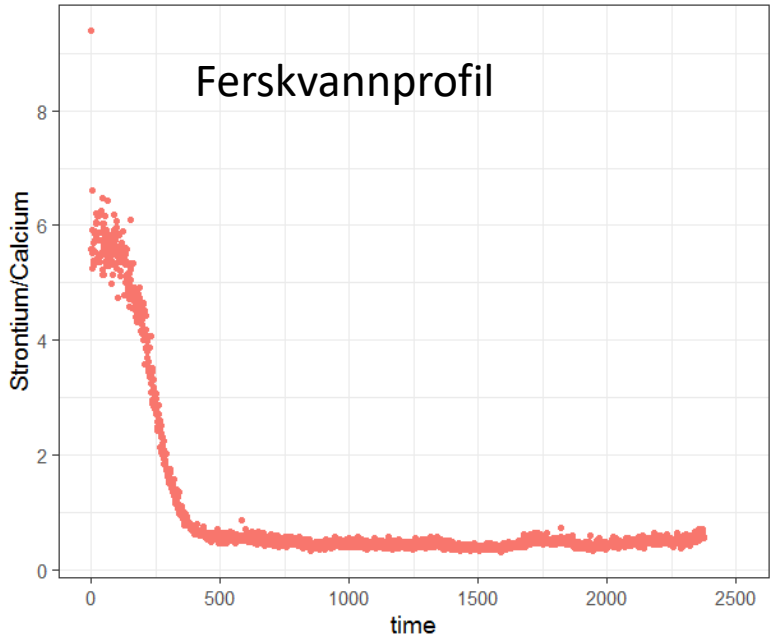
26 år

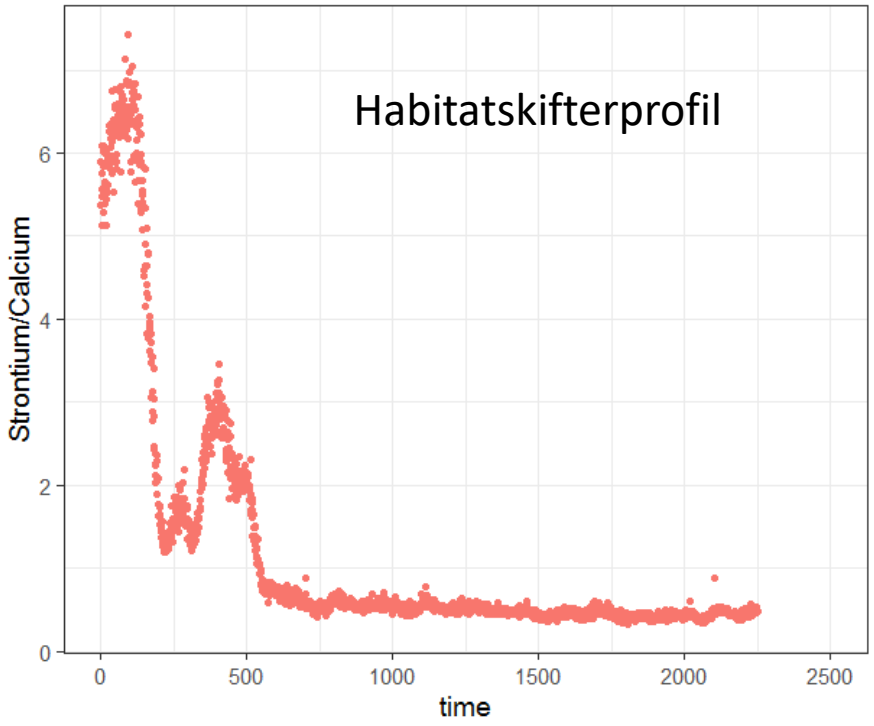


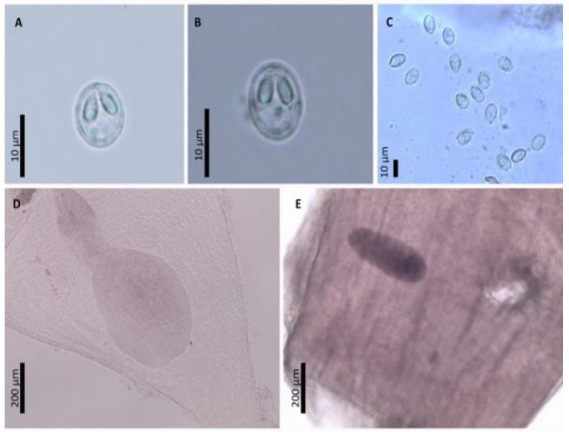


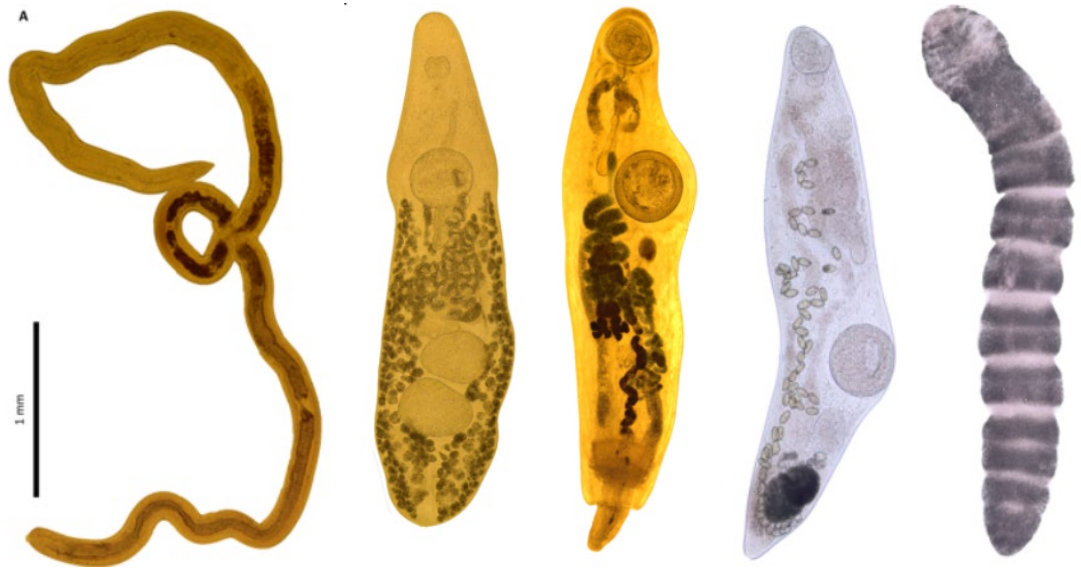
Strontium/Calcium

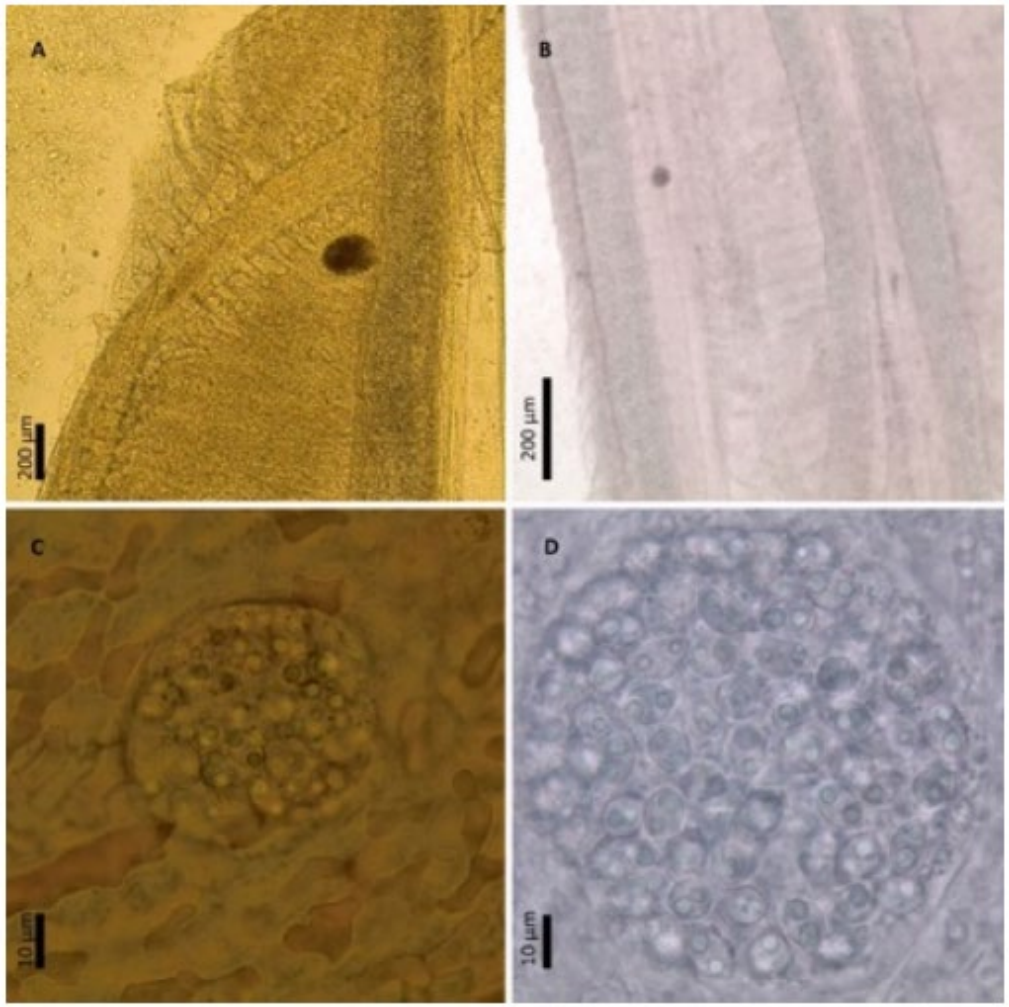












Ål parasitter

Haugsland 2020

- Vi (MAREEL) registrerte ytterligere 21 arter i Norge (tidligere: 20 arter)

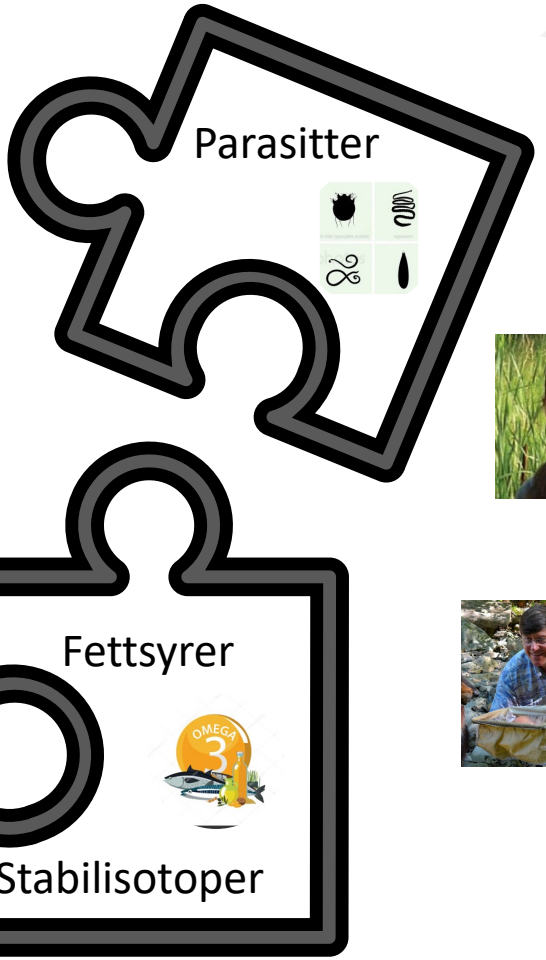
Even Moland

Esben Olsen

Eva Thorstad

Egil Karlsbakk

Signe Haugsland



Janet Koprivnikar

Anne Berit
Skiftesvik

Michael Arts

Howard Browman

Camilla Parzanini

Asbjørn
Vøllestad

Mehis Rohtla

Francoise Daverat

Michael Power

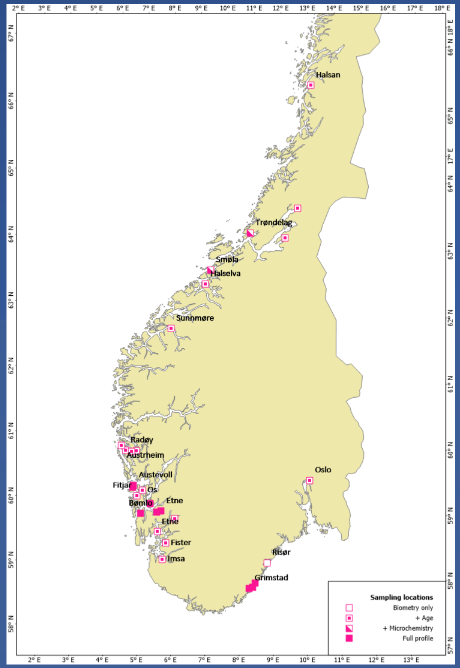
UiO : University of Oslo


Why do eels in Norway choose to stay in salt water?

By analysing their otoliths and parasites, and by tracking the swimming patterns of eels, Caroline Durif will try to ascertain what factors influence whether eels prefer to live in fresh or salt water.
Photo: Erlend A. Lorentzen / HI

Some eels migrate into fresh water, while others remain at sea, particularly in Northern Europe. The IMR has received funding to investigate why.

Published: 12.12.2017 Updated: 21.08.2018 Author: Erlend Astad Lorentzen




Kartlegg vandringa til ål

Forskarane har fått løyve til å bruke motorbåt i arbeidet med å fange ål i Litledalsvatnet.

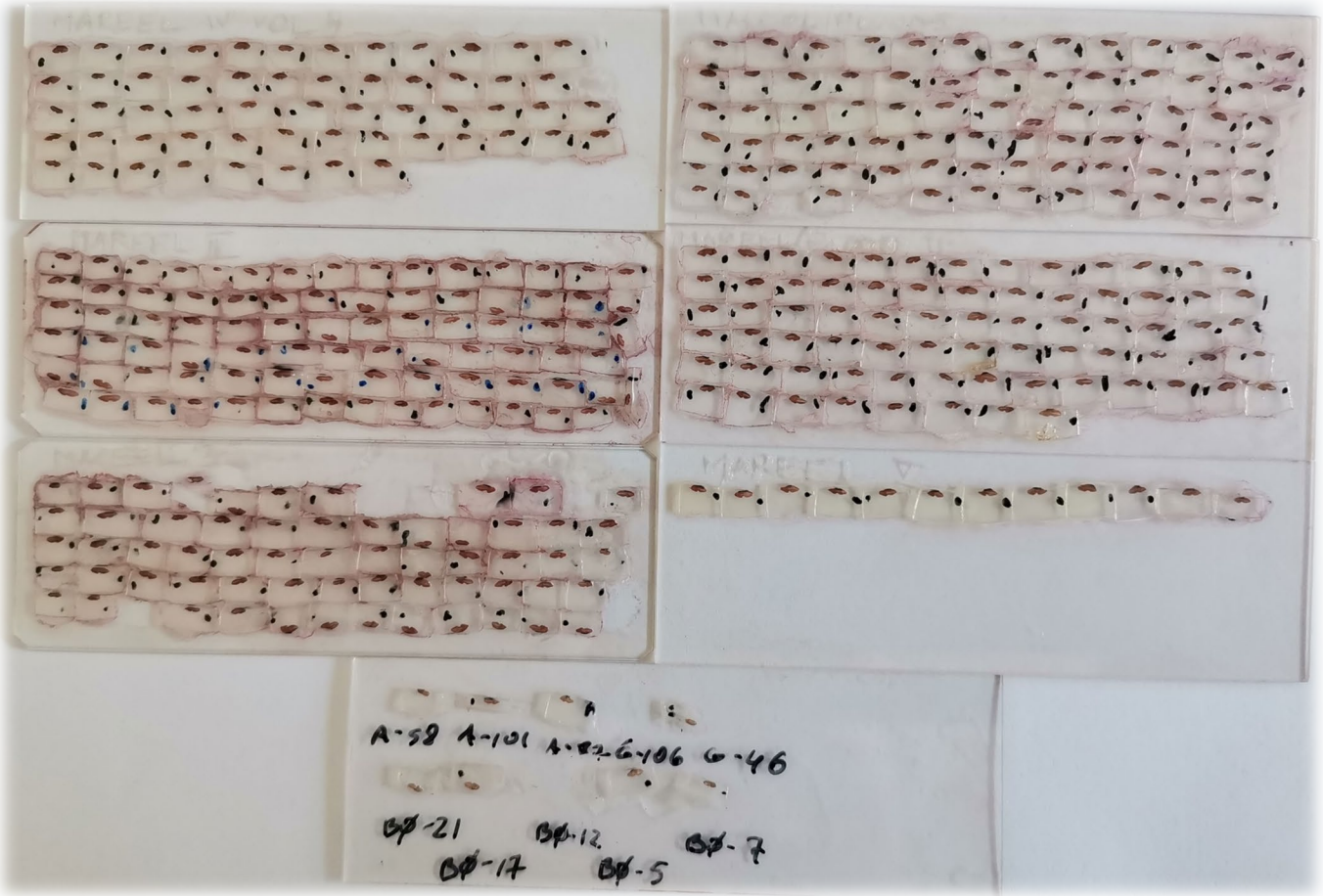
Dei måler kroppslengd, auge og finnar, og merkar ål med sporingsbrikker. Havforskningsinstituttet vil finne ut meir om den raudlista arten.

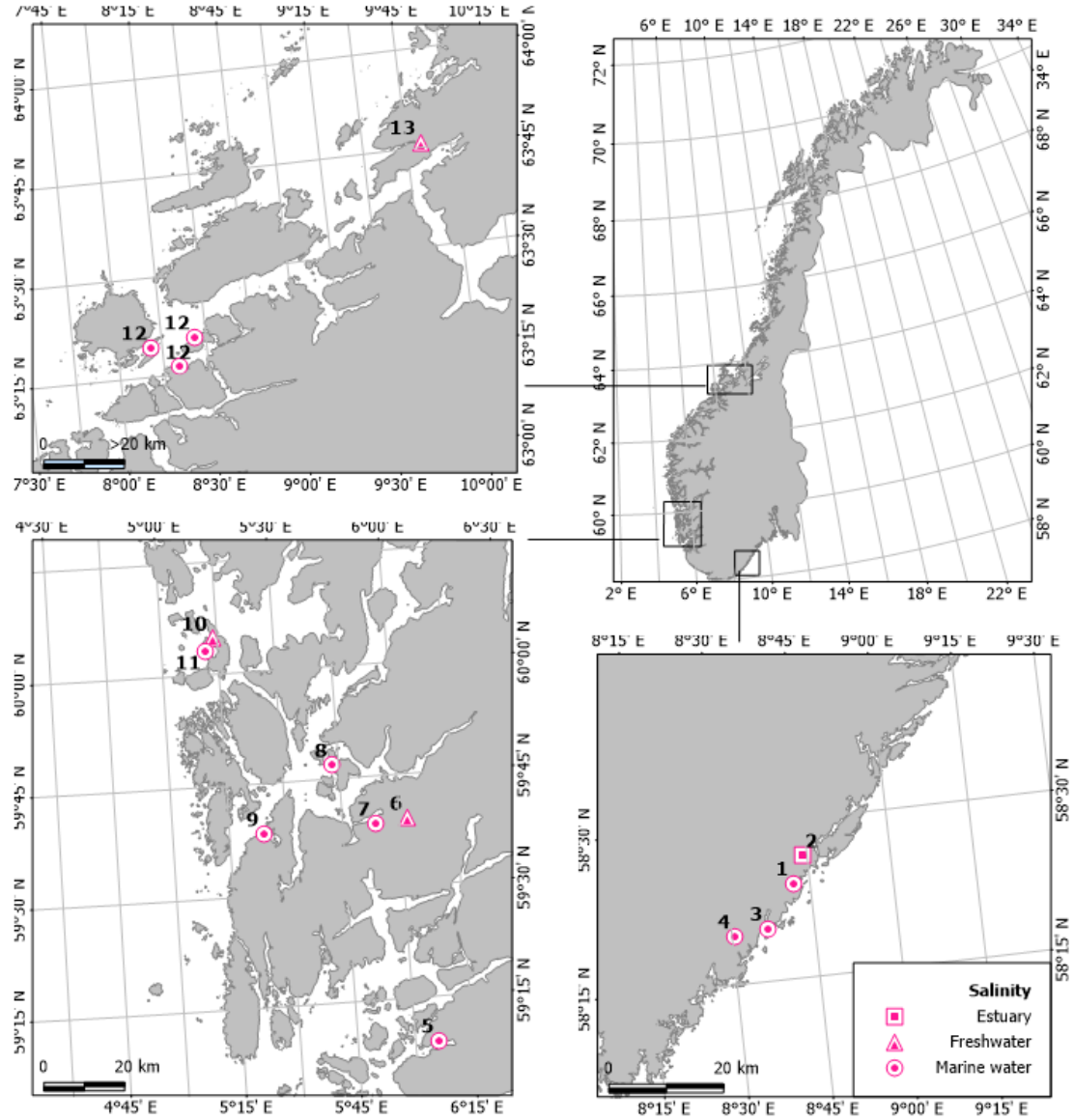
ØYSTEIN SILDE FRØNSDAL

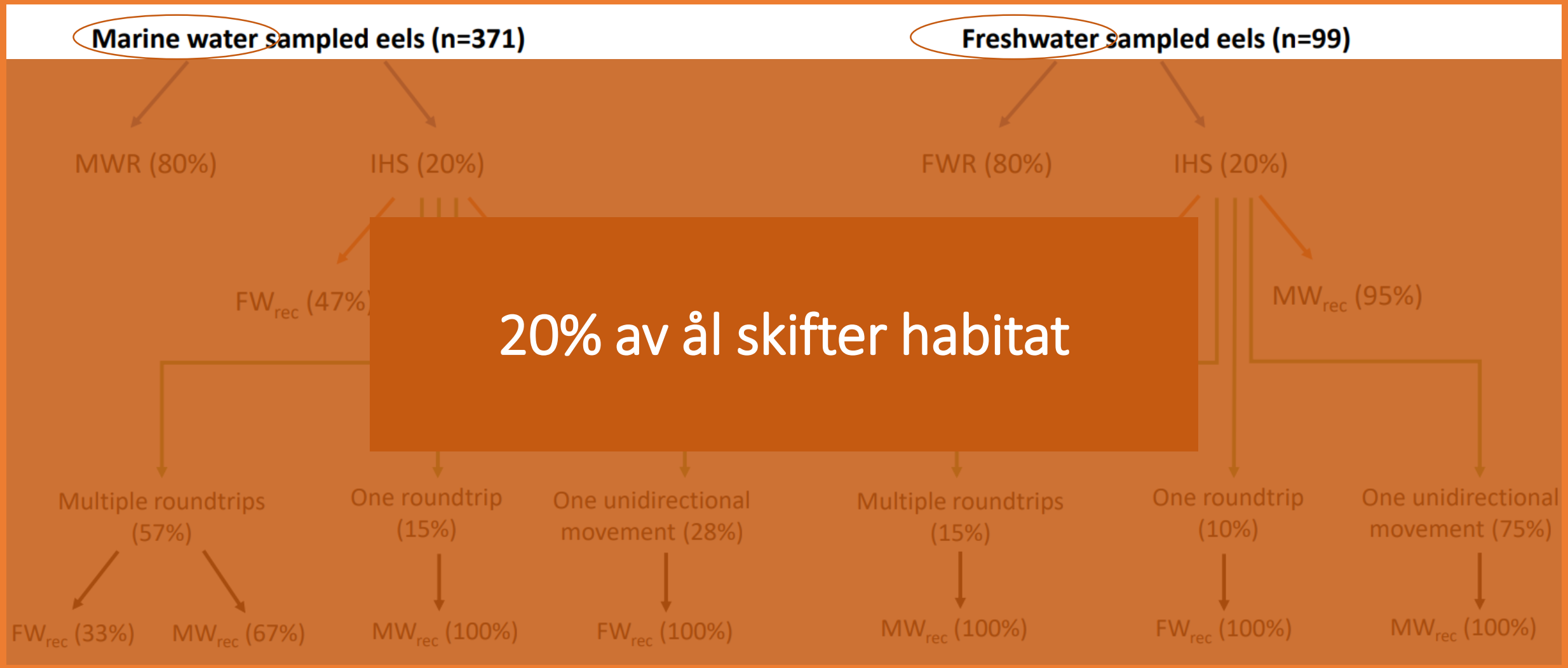
— Me har eit prosjekt der me ser på vandring av ål, og prøver å forstå kvifor nokre går opp i ferskvatn, medan andre berre blir i fjorden, fortel Caroline Durif.

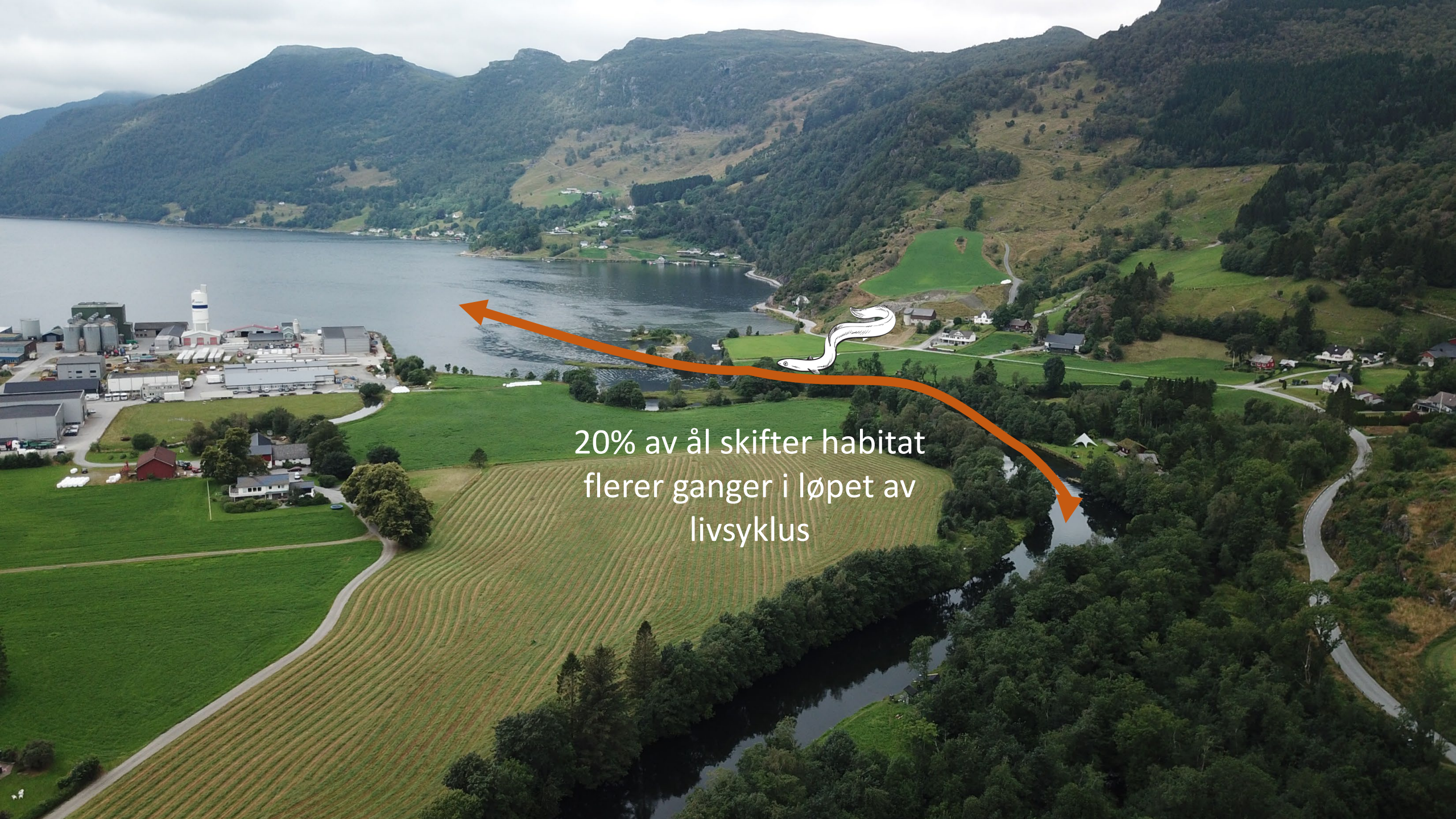
Ho er tilsett som forskar i Havforskningsinstituttet, som for tida er på plass for å finne ut meir om ålebestanden i Etnevassdraget.

Otolitt fra 470 ål – den største otolitt mikrokjemi studien!

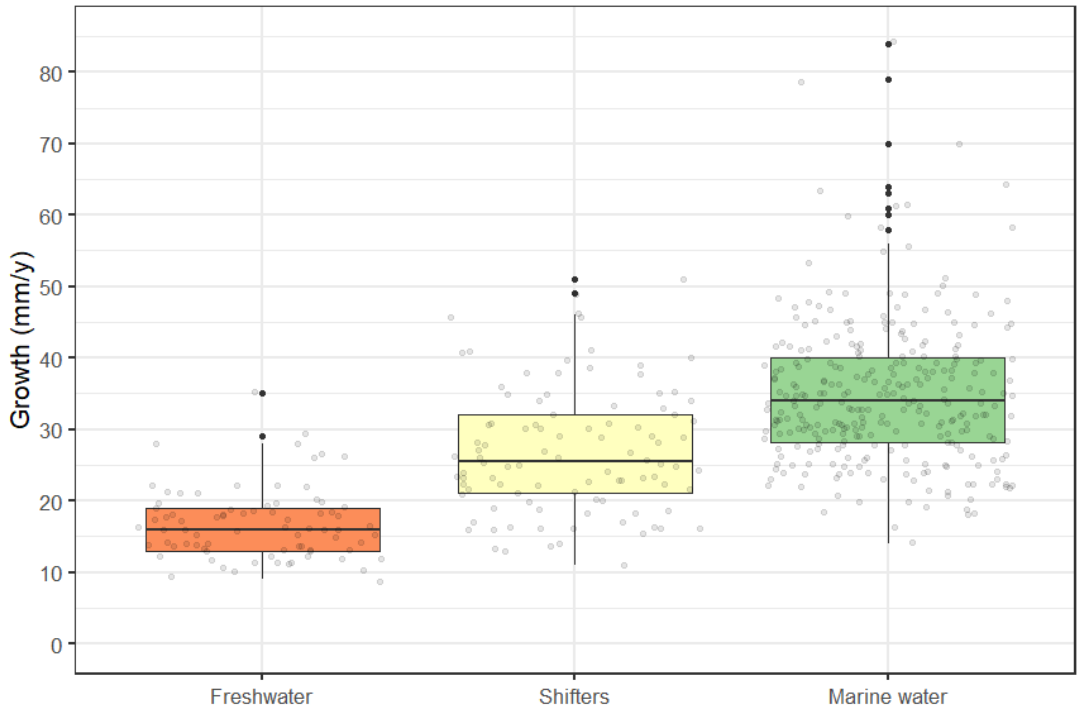


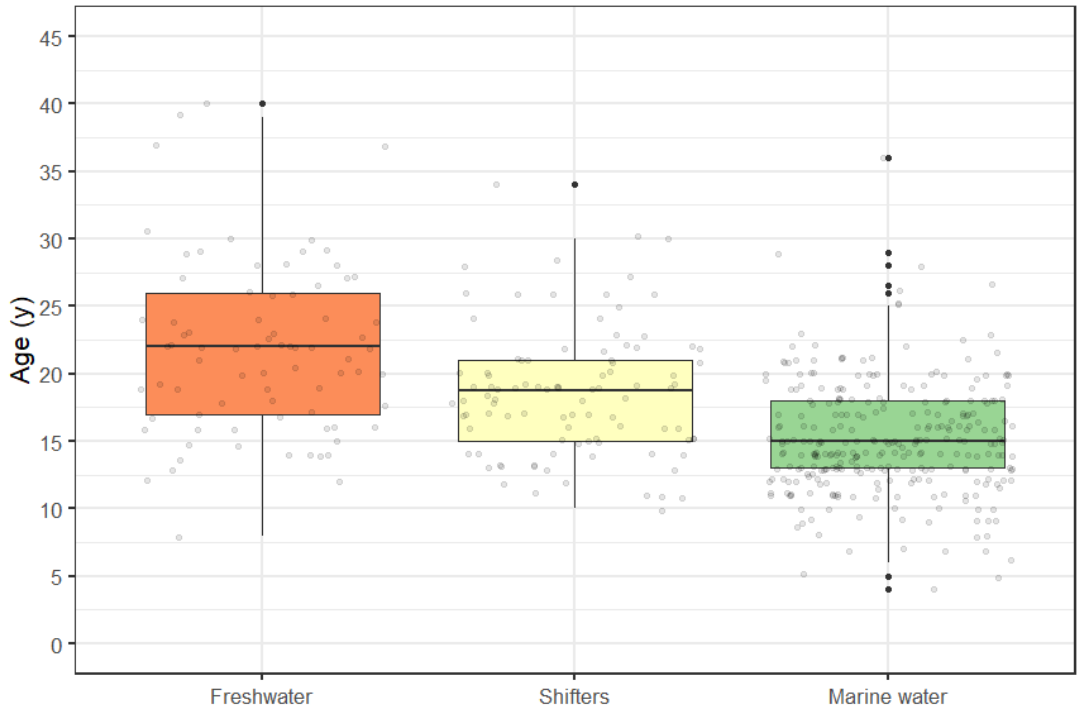


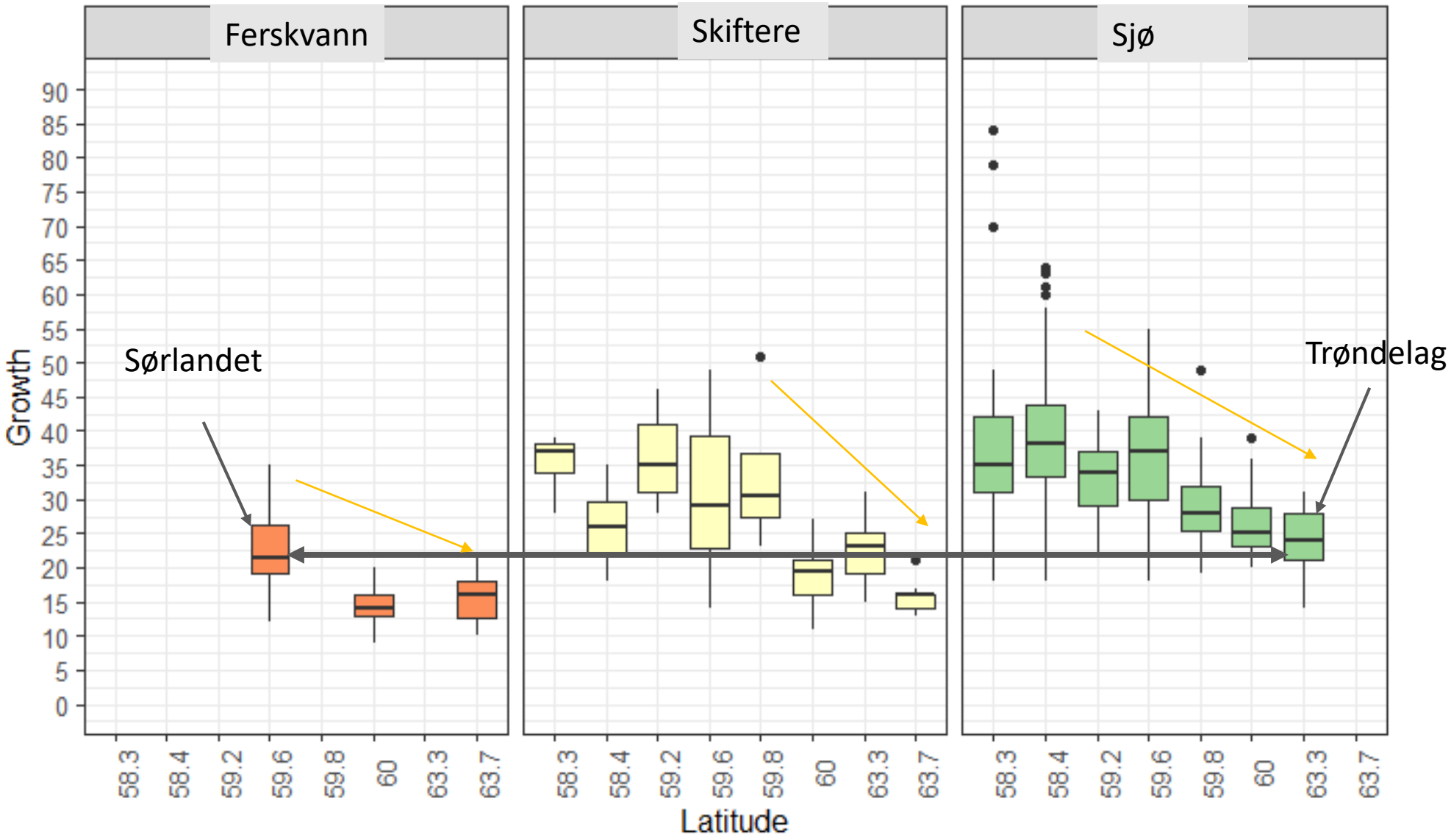

Marine water sampled eels (n=371)
Freshwater sampled eels (n=99)
MWR (80%)
IHS (20%)
FWR (80%)
IHS (20%)
FWrec (47%)
MWrec (95%)
20% av ål skifter habitat
Multiple roundtrips (57%)
One roundtrip (15%)
One unidirectional movement (28%)
Multiple roundtrips (15%)
One roundtrip (10%)
One unidirectional movement (75%)
FWrec (33%)
MWrec (67%)
MWrec (100%)
FWrec (100%)
MWrec (100%)
FWrec (100%)
MWrec (100%)

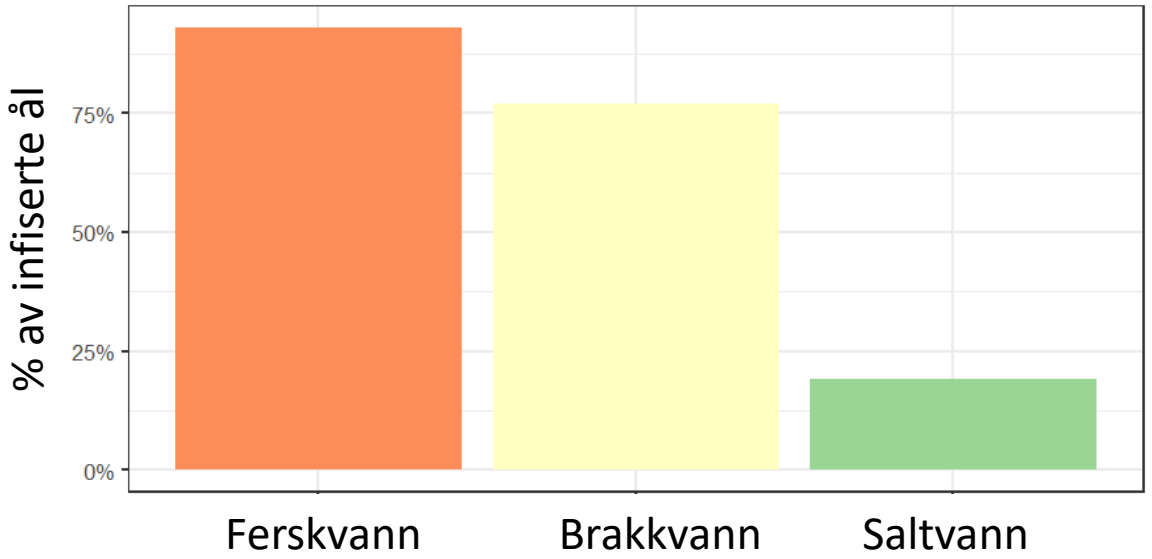

20% av ål skifter habitat
flerer ganger i løpet av
livsyklus

Ål vokser fortere i sjøen






Ferskvann
Skiftere
Sjø
Growth
Latitude
Sørlandet
Trøndelag
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
58.3
58.4
59.2
59.6
59.8
60
63.3
63.7


% av infiserte ål
75%
50%
25%
0%
Ferskvann
Brakkvann
Saltvann

Fatty acids

MUFA
n-3 PUFA (e.g. EPA+DHA)
Kjøttetende/Altetende (18:1n-9/18:1n-7)
↗Trofisk nivå

Saltvann

Ferskvann

n-6 PUFA (e.g. ARA)
↗Totalt lipid
↗ Kondisjon

Aquaculture Nutrition 2016 **22**; 725–737 doi: 10.1111/anu.12299

Development of a broodstock diet to improve developmental competence of embryos in European eel, *Anguilla anguilla*

J.G. STØTTRUP[1], J. TOMKIEWICZ[1], C. JACOBSEN[2], I.A.E. BUTTS[1], L.K. HOLST[3], M. KRÜGER-JOHNSEN[1], C. GRAVER[4], P. LAUESEN[5], S. FONTAGNÉ-DICHARRY[6], L.T.N. HEINSBROEK[7], G. CORRAZE[6] & S. KAUSHIK[6]

Abstract

The highest percentage of […] females, producing viable eggs and larvae, were […] fed the highest dietary ARA levels.

acids) were tested against a commercial diet (DE: ARA: 0.5%, EPA: 8.2% of total fatty acids). After 24 weeks of feeding, ARA levels in the muscles and ovaries increased to 0.9% and 1.3% of total fatty acids, respectively, in Feed 1 and were significantly higher than in Feed 2 and DE. Female broodstock was not fed during hormonal treatment to induce vitellogenesis and ovulation. EPA levels in females fed the test diets decreased in the both muscle and ovary and were significantly lower in eggs from females fed Feed 1. The highest percentage of stripped females, producing viable eggs and larvae, were those females fed the highest dietary ARA levels (Feed 1). The level of lipid peroxidation products in eggs was similar among treatment, indicating that the lowest dietary levels of vitamin C and vitamin E were sufficient. In the unfertilized eggs, ARA levels were also highest (1.1% of total

Aquaculture 531 (2021) 735858

Contents lists available at ScienceDirect

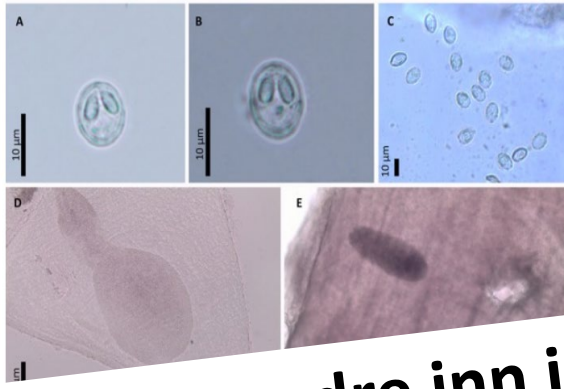
Aquaculture

journal homepage: www.elsevier.com/locate/aquaculture

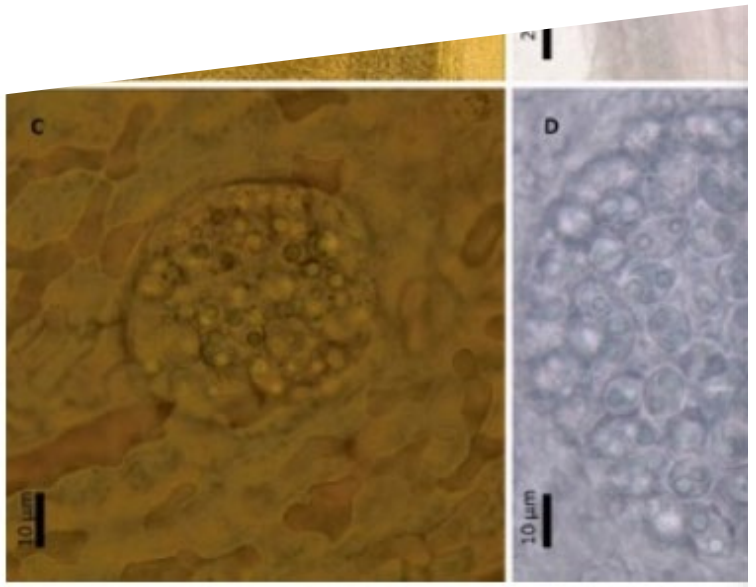
Assessment of lipid uptake and fatty acid metabolism of European eel larvae (*Anguilla anguilla*) determined by ^{14}C *in vivo* incubation

Ivar Lund[a,*,1], Diana B. Reis[b,1], Jonna Tomkiewicz[c], Elisa Benini[c], José A. Pérez[b], Johanna S. Kottmann[c], Sebastian N. Politis[c], Covadonga Rodríguez[b]

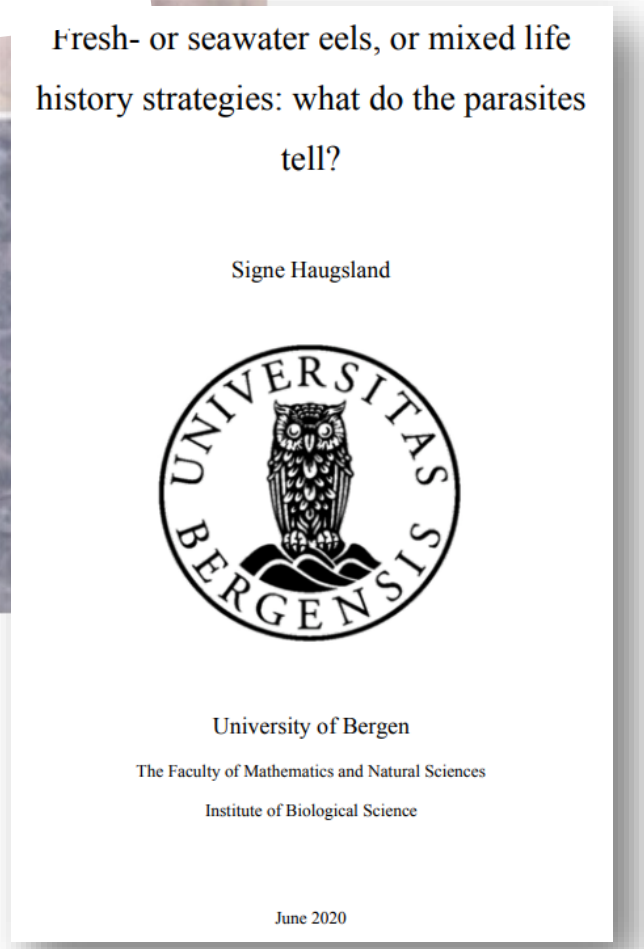
The high levels of ARA present in the European eel larvae denotes its physiological relevance for this species. It is therefore essential to consider this FA as particularly important when designing suitable broodstock – or first-feeding diets for this species.



- **Ål prøver alltid å vandre inn i ferskvann når de ankommer som larver.**



- De fleste ål hadde vært i kontakt med ferskvann på et tidspunkt – sannsynligvis som yngel



Fresh- or seawater eels, or mixed life history strategies: what do the parasites tell?

Signe Haugsland

University of Bergen

The Faculty of Mathematics and Natural Sciences

Institute of Biological Science

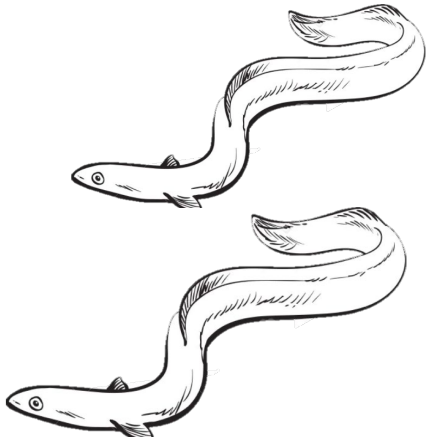
June 2020

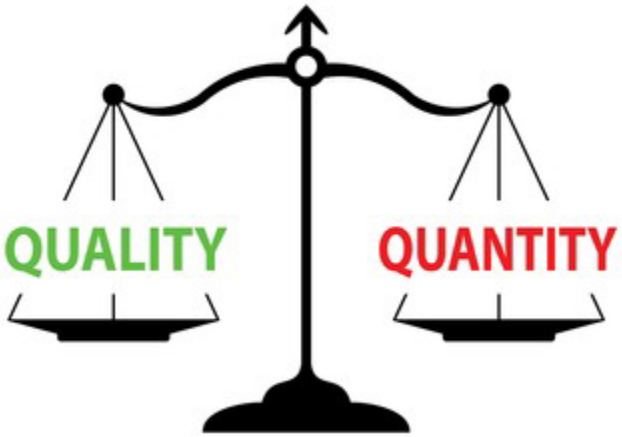
Ferskvanns ål

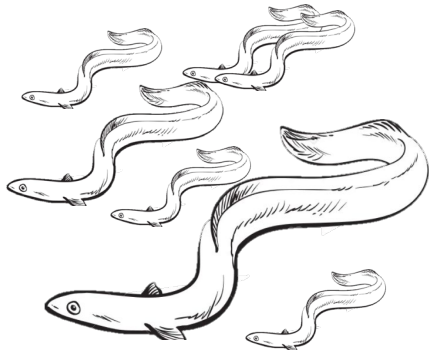
- Høyere lipidinnhold
- Bedre lipider (Arachidonic acid)
- Lavere predasjon

Saltvanns ål

- Bedre vekst
- Kortere livsyklus
- Mindre svømmeblær parasitt
- Fewer anthropogenic effects

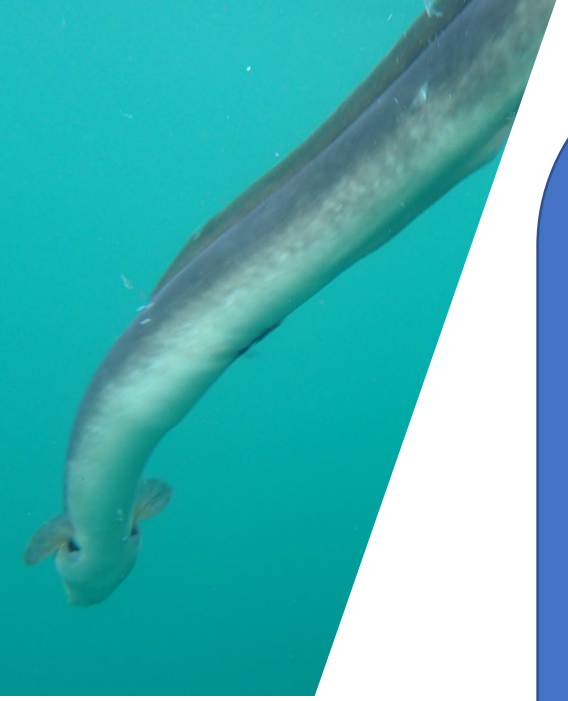






Our results have important implications for management at the European level:

- % of habitat shifters to be accounted for in population models



Forskningsrådet

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2. Parzanini, C, M.T. Arts, M. Rohtla, J. Koprivnikar, M. Power, A.B. Skiftesvik, H.I. Browman, D. Milotic, C.M.F. Durif. 2021. **Feeding habitat and silvering affect lipid content and fatty acid composition of European eel (*Anguilla anguilla*) tissues**. Journal of Fish Biology 99: 1110-1124
3. Durif, C.; Diserud, O.; Sandlund, O.T.; Thorstad, E.; Poole, R.; Bergesen, K.; Escobar-Lux, R.; Shema, S.; Vøllestad, L.A. 2020. **Age of European silver eels during a period of declining abundance in Norway.** Ecology and Evolution 2020;00:1-15.
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5. Rohtla, M., Arts, M., Browman, H., Parzanini, C., Skiftesvik A.B., Thorstad, E., van der Meeren, T. Vøllestad, L.A. Durif, C. **Marine and freshwater habitat use of the European eel along a latitudinal gradient in Norway**. Canadian Journal of Fisheries and Aquatic Science (in review)
6. Durif, C., M. A.B. Skiftesvik, Rohtla, Vøllestad, L.A, Parzanini, C., M.T. Arts, M. Power, Daverat, F., J. Koprivnikar, Thorstad, E., Moland, E., Olsen, E, Bertolini, F. , Tomkiewicz J., H.I. Browman. **Alternate life-history tactics and the evolving story surrounding catadromy in the European eel.** ICES Journal of Marine Science – Food for thought article (almost submitted)

Takk for oppmerksomhet