Finding a plaice in history: how the sentinel flatfish witnessed a century plus of environmental change.

Dr Ewan Hunter

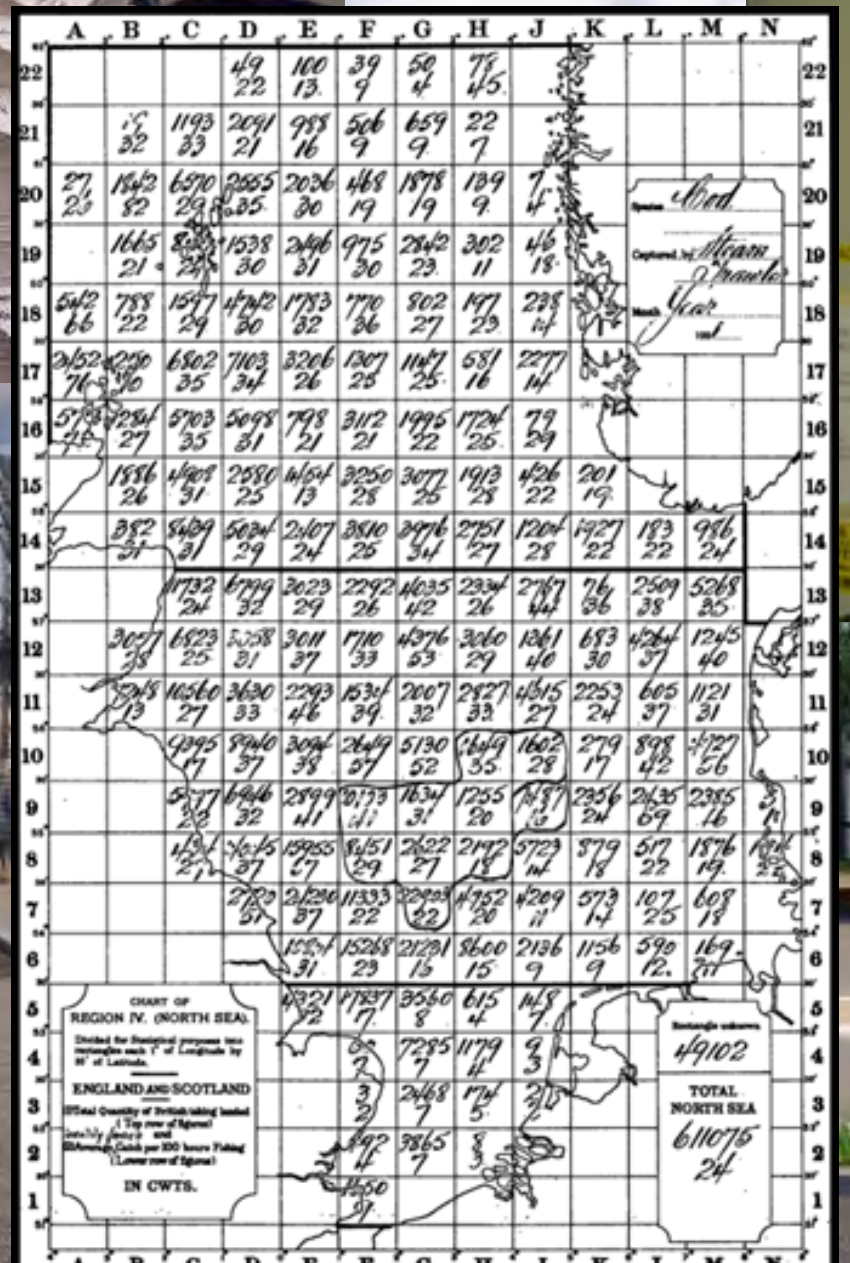
University of East Anglia

Cefas

Mintin vat!

Benthic flatfish and bentho-pelagic cod on a shore – *Jan van Kessel senior, 1626–1679*


Cefas20
1902
1997–2017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ENGLAND AND SCOTLAND
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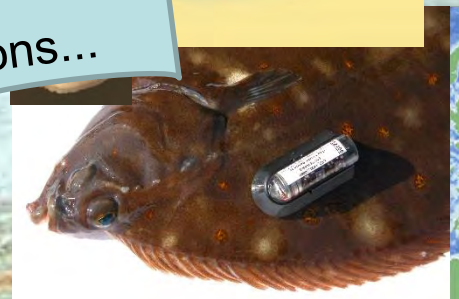
611076
24

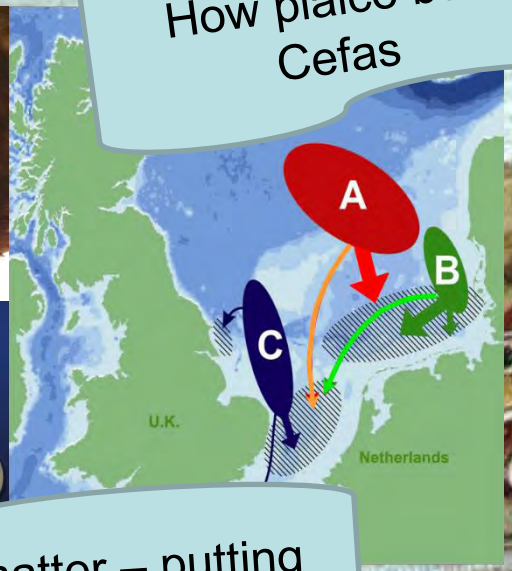
Finding a plaice in history: Synopsis

Introductions...

How plaice built Cefas

What we found in the archives – 115 years of plaice

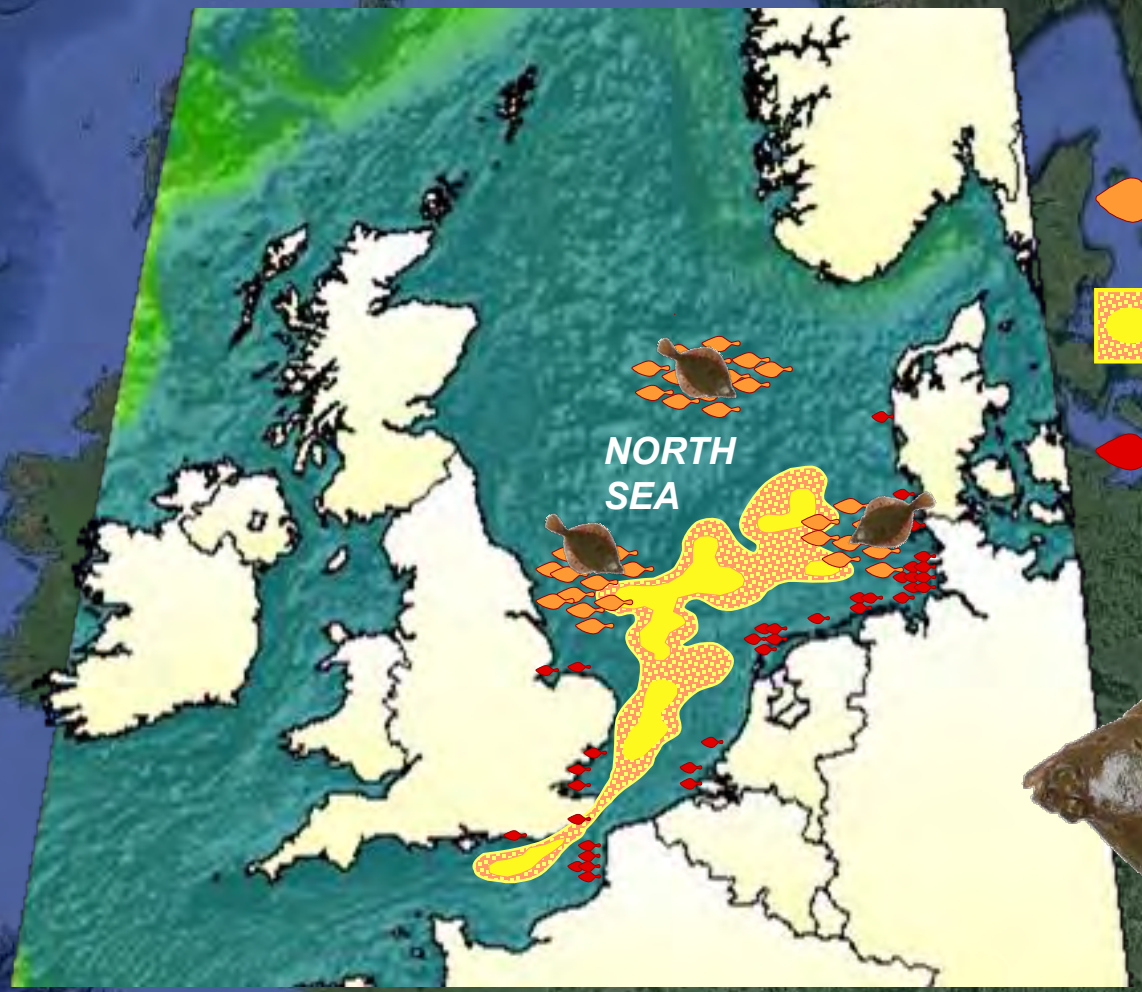




Why legacy data matter – putting the pieces together

Does wisdom come with time? - Conclusions

Finding a plaice in history: Introductions



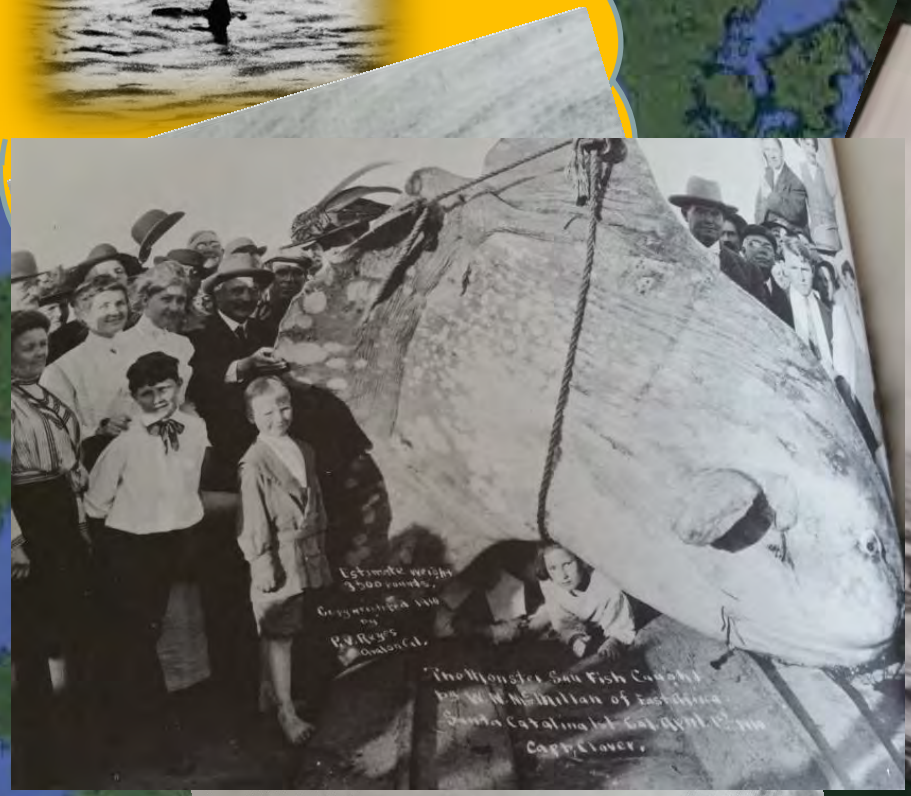
Feeding (summer)

Reproduction (winter)

Juveniles

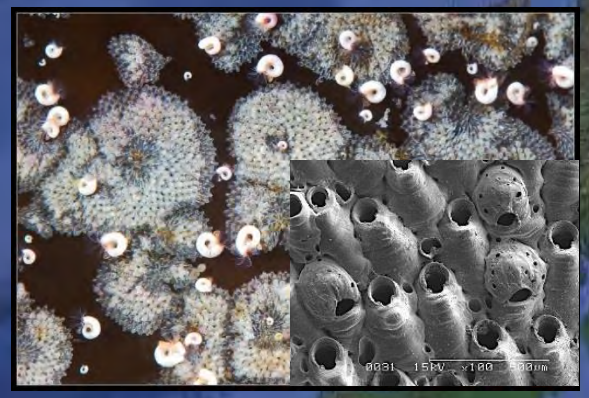
Plaice life-cycle…

Finding a plaice in history: Introductions



My life-cycle…

Finding a plaice in history: Introductions



UNIVERSITY OF ABERDEEN

Larval phase

PRIFYSGOL BANGOR UNIVERSITY

Extended post-larval phase

Swansea University
Prifysgol Abertawe

My life-cycle…

Maturity

Prifysgol Cymru
University of Wales

国立研究開発法人
科学技術振興機構
Japan Science and Technology Agency

My life-cycle…

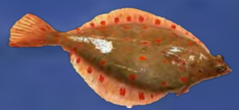
Long-term migration

Maturity

My life-cycle…

Spawning & site fidelity

Finding a plaice in history: Introductions



28 January 2011

www.fishingnews.co.uk

NEWS 11

Sea bass on the move

– help needed from fishermen

Little is known about the movements of sea bass between the Bay of Biscay to the south and the Irish Sea and English Channel to the north. **Ewan Hunter** of CEFAS and **Hélène de Pontual** of IFREMER report on an Anglo-French collaboration that will provide valuable insights into the behaviour of these popular and highly migratory fish

CATCH AND RELEASE

REWARDS FOR RETURNING INFORMATION

Partial migration!

er

Finding a plaice in history: How plaice built Cefas

Cefas, Lowestoft, UK, 2017

Cefas Research Vessel “Endeavour”

Stepping back 115 years….

Finding a plaice in history: How plaice built Cefas

Cefas, Lowestoft, UK, 1902

Cefas Research Vessel “Huxley”

“In 1902, the Marine Biological Association opened a sub-station in Lowestoft to research the plaice industry, initially to support the UK’s contribution to the newly created International Council for the Exploration of the Sea (ICES)”

Finding a plaice in history: How plaice built Cefas

Cefas, Lowestoft, UK, 1902

“Rosa Lee Phenomenon”

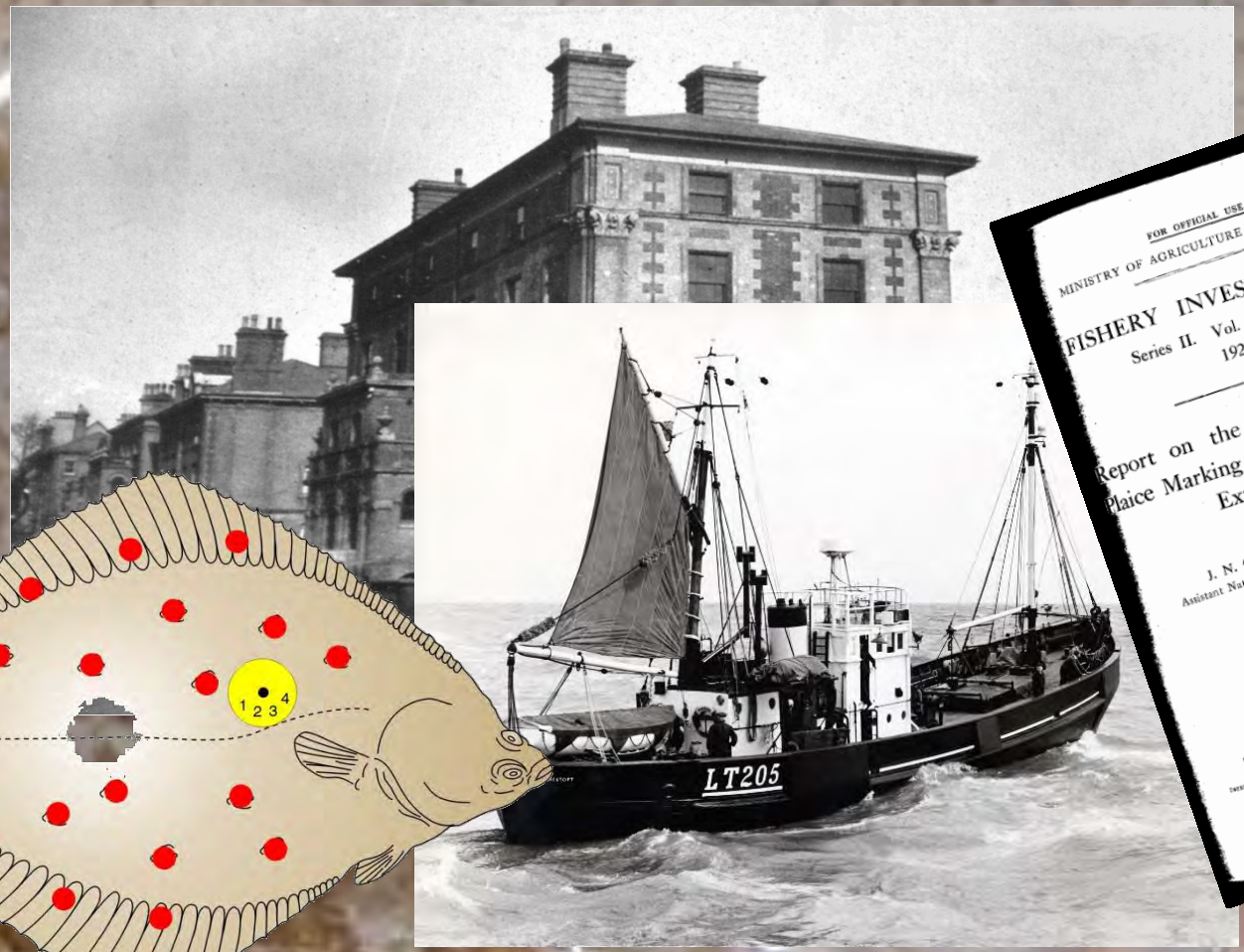
Use of comparative specimens of smaller or larger size than the test specimen results in an over-estimation or an under-estimation respectively of the total length of the fish.

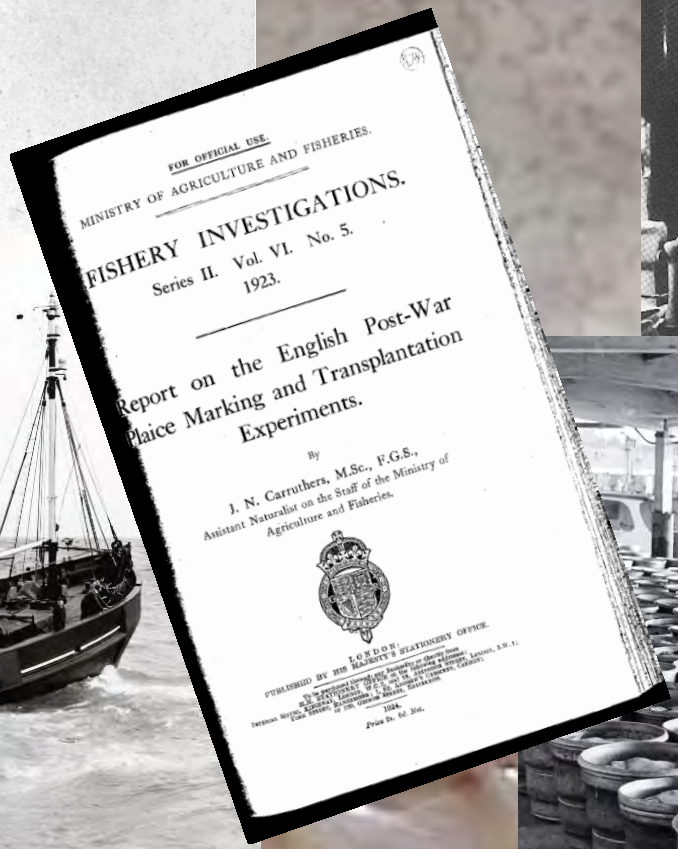
Cefas Staff Photo 1907

5b. The staff at Lowestoft in 1907: Front row (l–r): W. Wallace, W. Garstang, J. O. Borley. Middle row: James, A. E. Hefford, Rosa M. Lee, R. A. Todd, G. T. Atkinson, Dykes. Back row: Potter, Arrowsmith, Walton, Ansell

Finding a plaice in history: How plaice built Cefas

1900>>>>>>>>>>>>>>>>>>>>>1920 >>>>>>>>>>>>>>>>>>>>>1940>>>>>>>>>>1950

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MINISTRY OF AGRICULTURE AND FISHERIES.

FISHERY INVESTIGATIONS.

Series II. Vol. VI. No. 5.

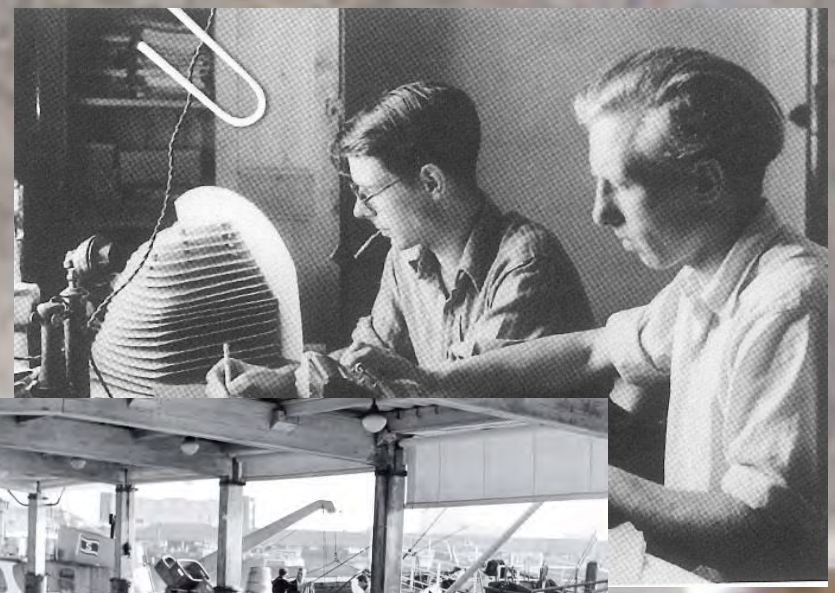
1923.

Report on the English Post-War Plaice Marking and Transplantation Experiments.

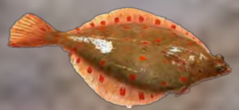
By

J. N. Carruthers, M.Sc., F.G.S.,

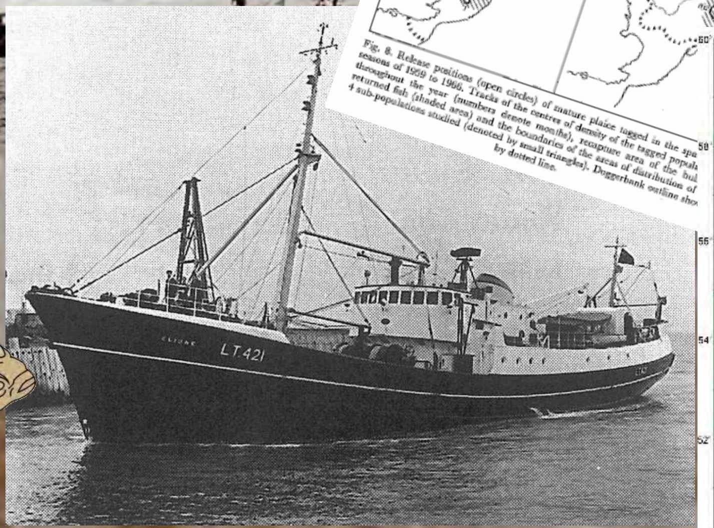
Assistant Naturalist on the Staff of the Ministry of Agriculture and Fisheries.

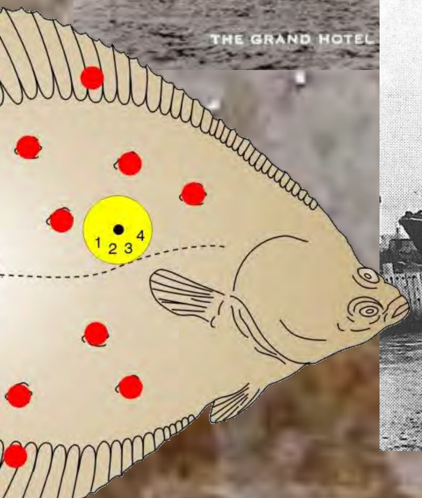


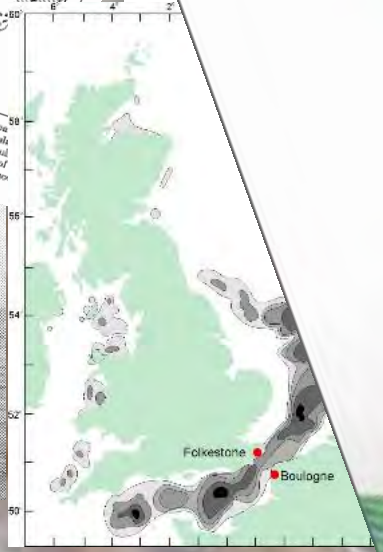
Finding a plaice in history: How plaice built Cefas



1955>>>>>>>>>>>>>>>>>>>>>1970 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>1990







Finding a plaice in history: What we found in the archives

Cefasdatahub

https://www.cefas.co.uk/cefas-data-hub/

Finding a plaice in history: What we found in the archives

130 years of North Sea temperature measurements

(Data open-source and downloadable from: **www.cefas.co.uk/cefas-data-hub/)**

Archived CEFAS survey logbooks, 1902-present

Contemporary data from ICES, 1966-present

Length distribution of plaice in the central North Sea (excluding coastal nursery areas), 1902–2014.

Fish gut content information from Cefas DAPSTOM database: http://www.cefas.defra.gov.uk/our-science/fisheries-information/fish-stomach-records.aspx

Plaice DST data 1993-2007

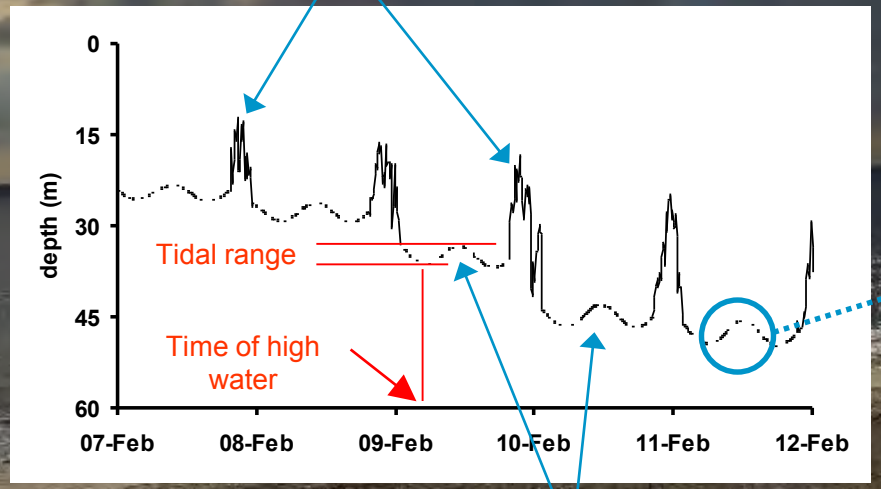
Finding a plaice in history: putting the pieces together

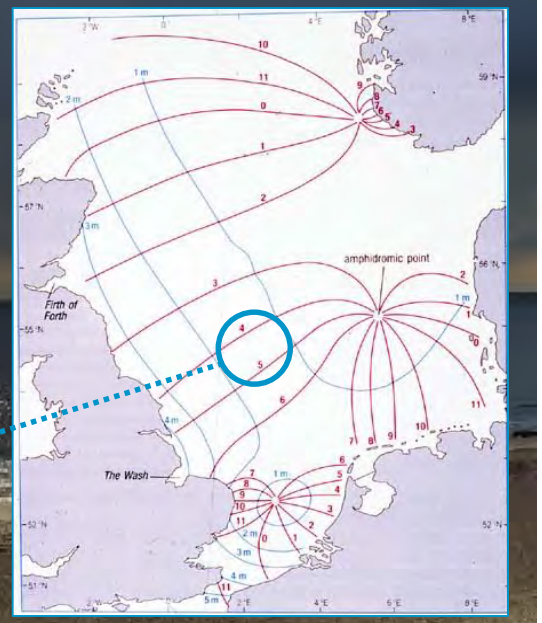
> 1000 plaice tagged with DSTs released between 1993 - 2005

Finding a plaice in history: putting the pieces together

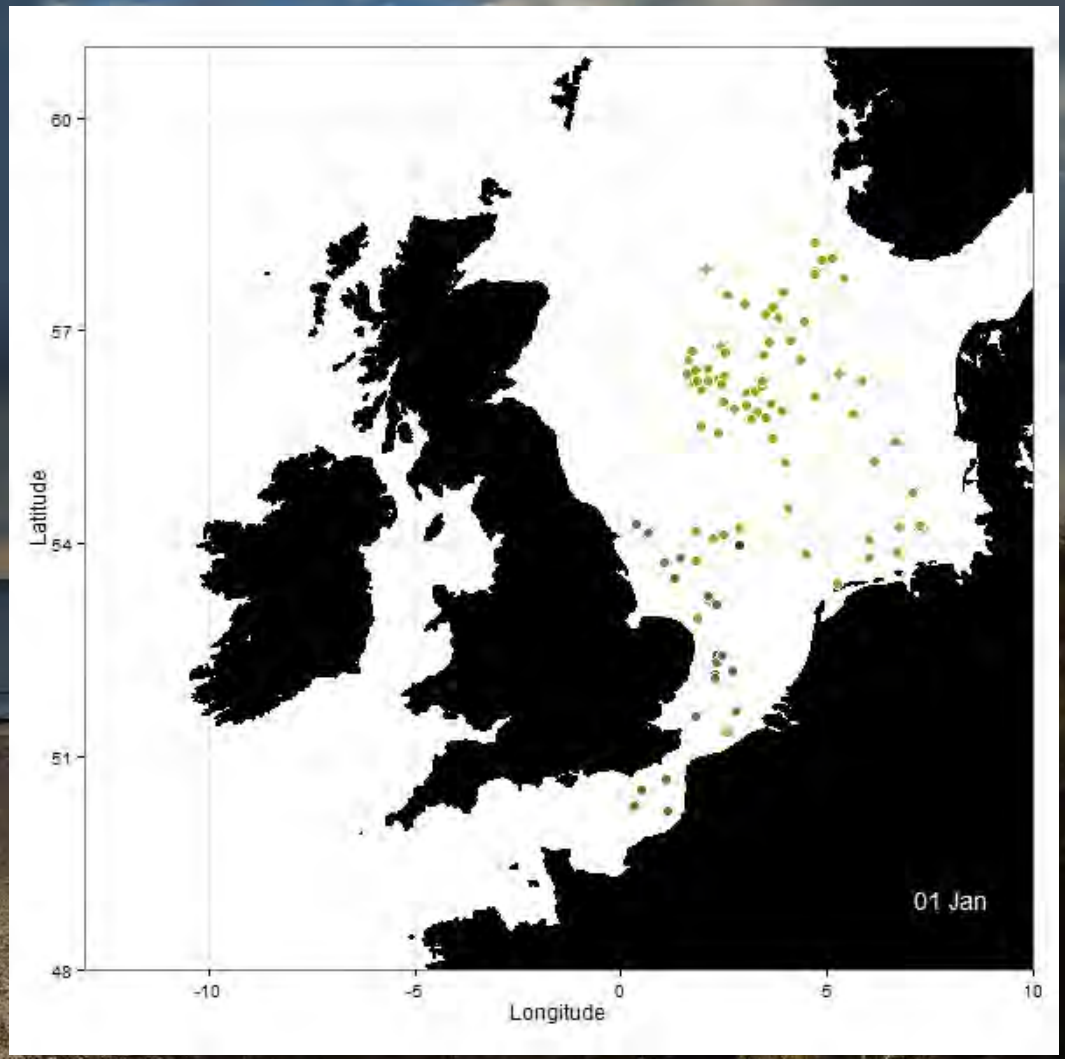
Geolocation from tidal data

Fish swimming in mid-water



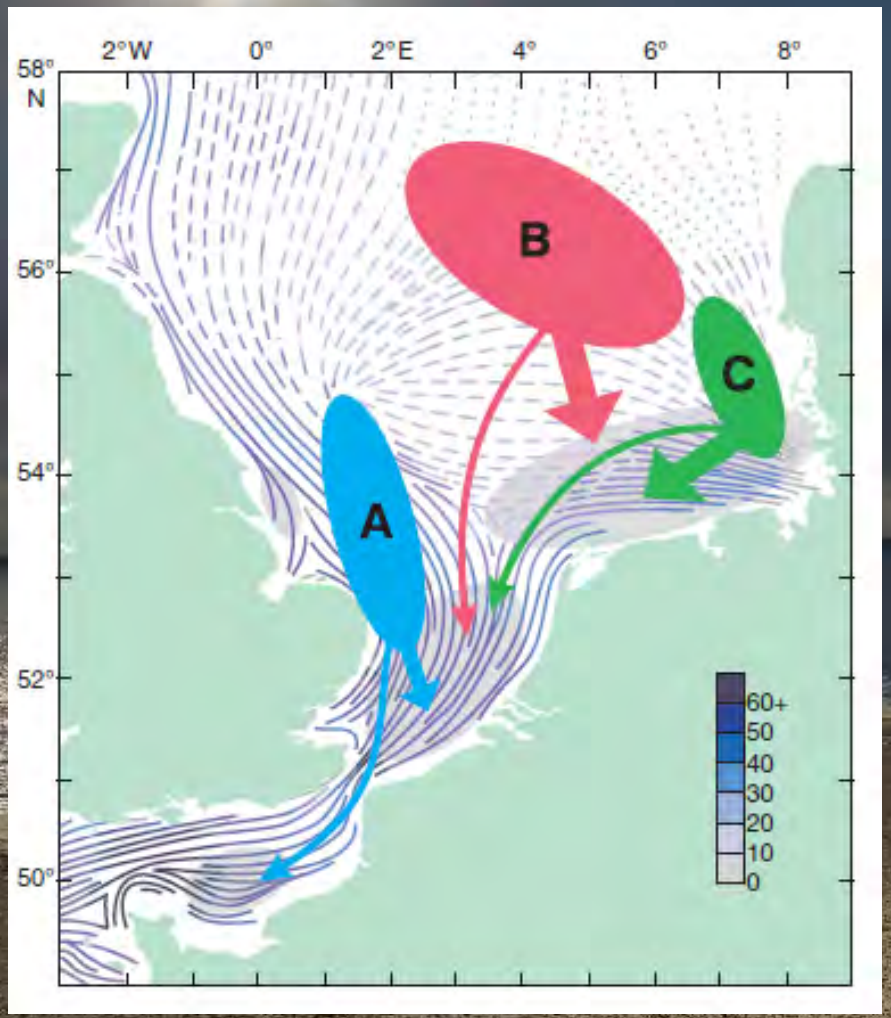


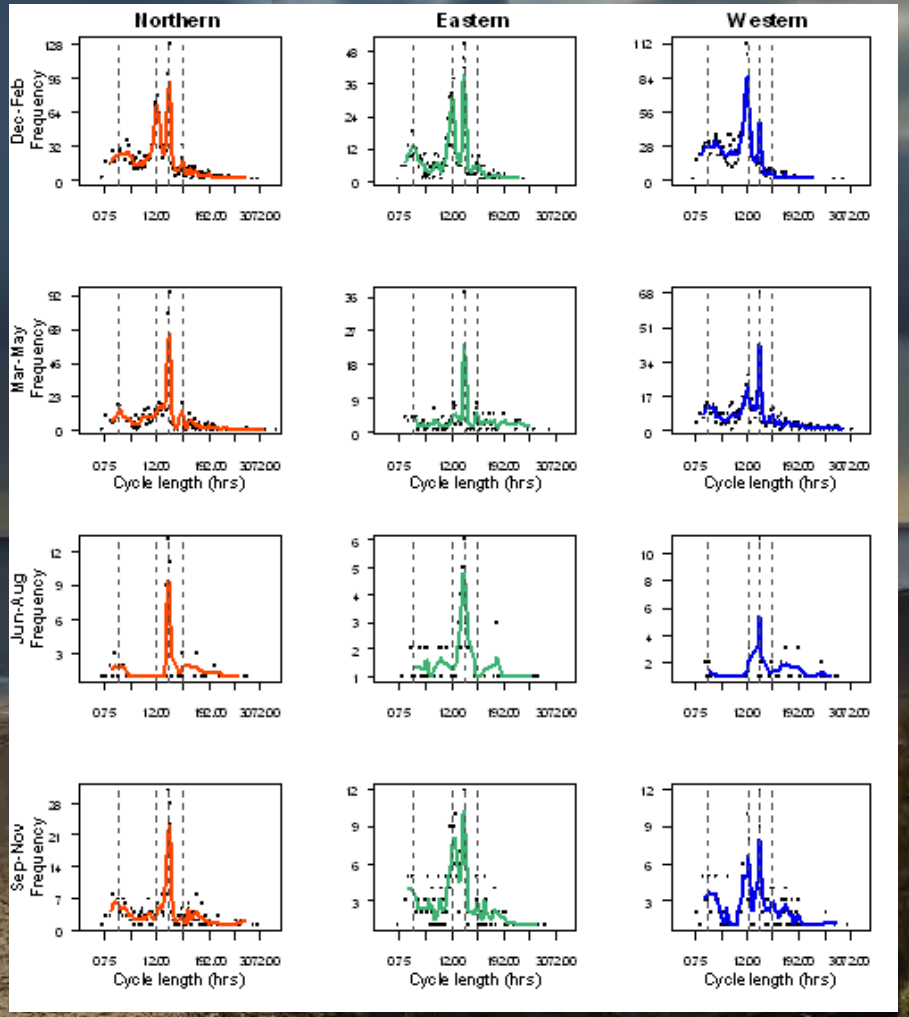
Fish resting on the sea bed



Metcalfe & Arnold 1997, Hunter et al. Mar Biol 2003

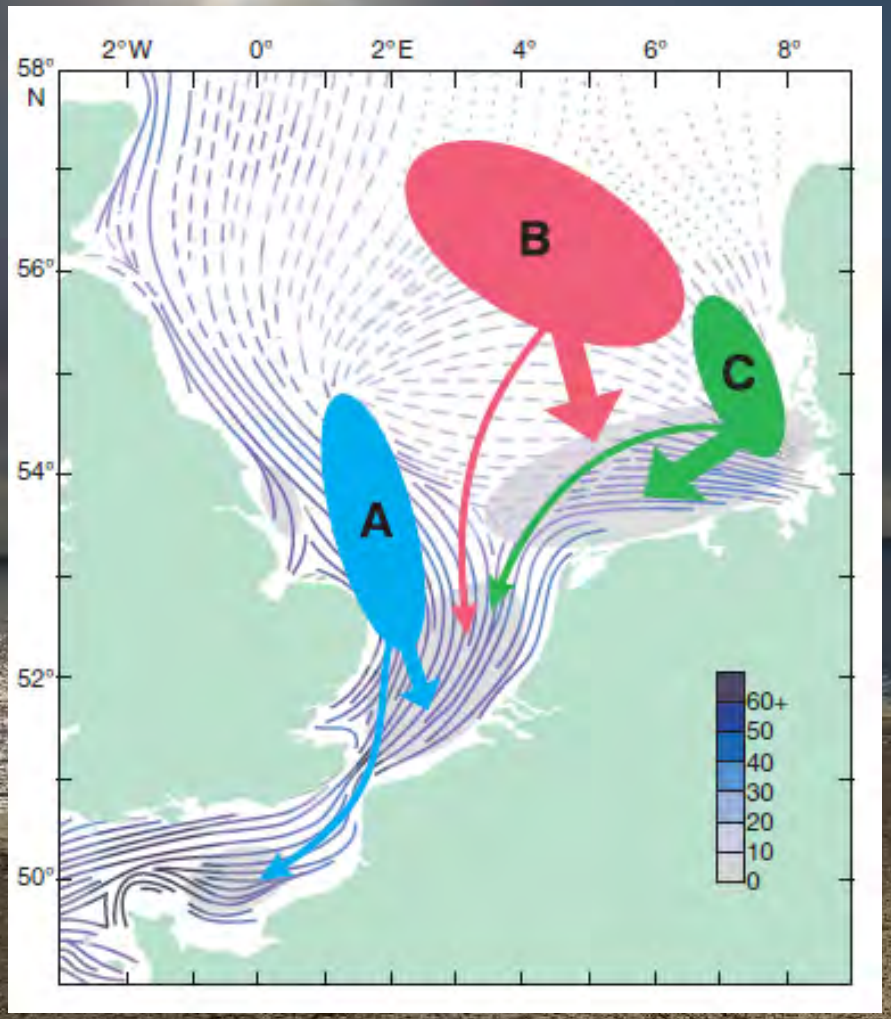
Finding a plaice in history: putting the pieces together



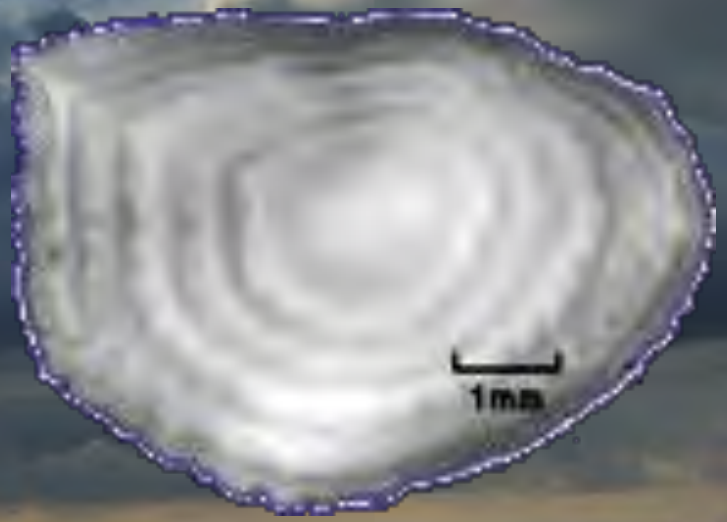


Hunter et al. MEPS (2009)

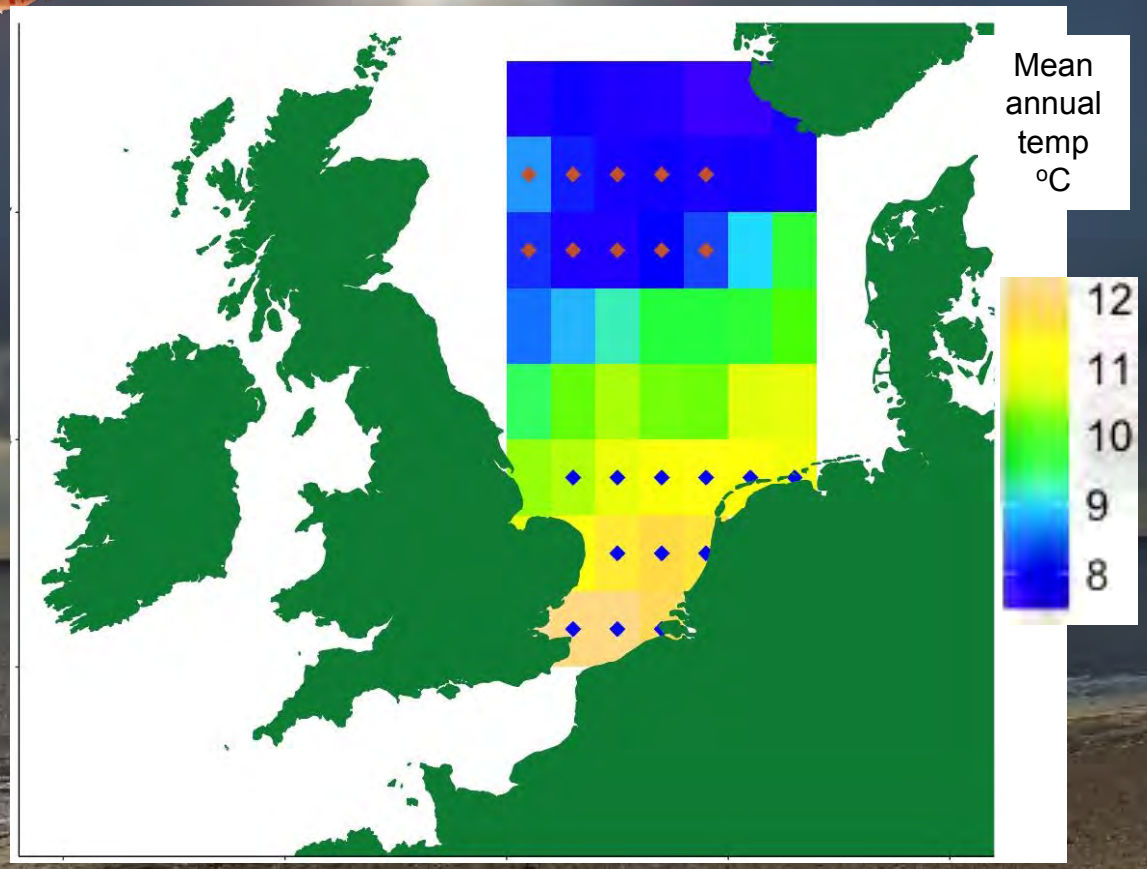
Finding a plaice in history: putting the pieces together



Hunter et al. MEPS (2009)



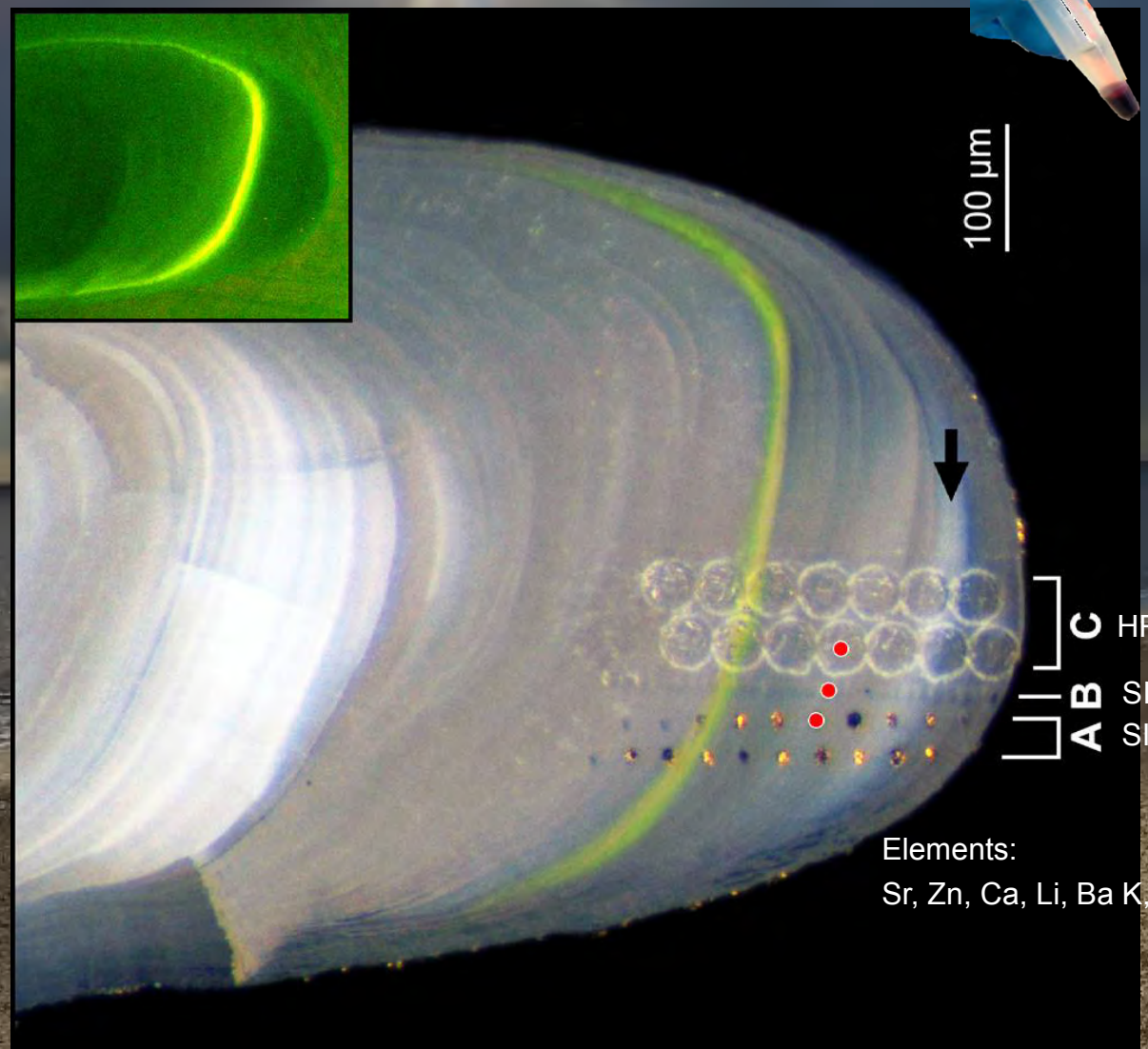
Finding a plaice in history: putting the pieces together



Louise Rutterford
University of Exeter
Sub-population responses to warming seas

"Simple predictions of fish growth under differing environmental pressures may be unsuitable for heavily fished species like plaice with complex ecology"

Finding a plaice in history: putting the pieces together



Male and female plaice kept for 1 year through reproductive cycle

Water, plasma and (ultimately) otolith trace metal compositions measured monthly

Sturrock et al. 2013 J. Trace. Elm. Med. Biol

Sturrock et al. 2014 Mar. ecol. Prog. Ser.

HR LA-ICPMS

SIMS (elemental)

SIMS ($\delta^{18}O$)

Elements:

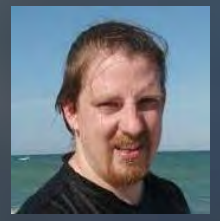
Sr, Zn, Ca, Li, Ba K, Mg, Mn, Cu, Se, Rb, Pb

Anna Sturrock
University of California
Elemental Signatures

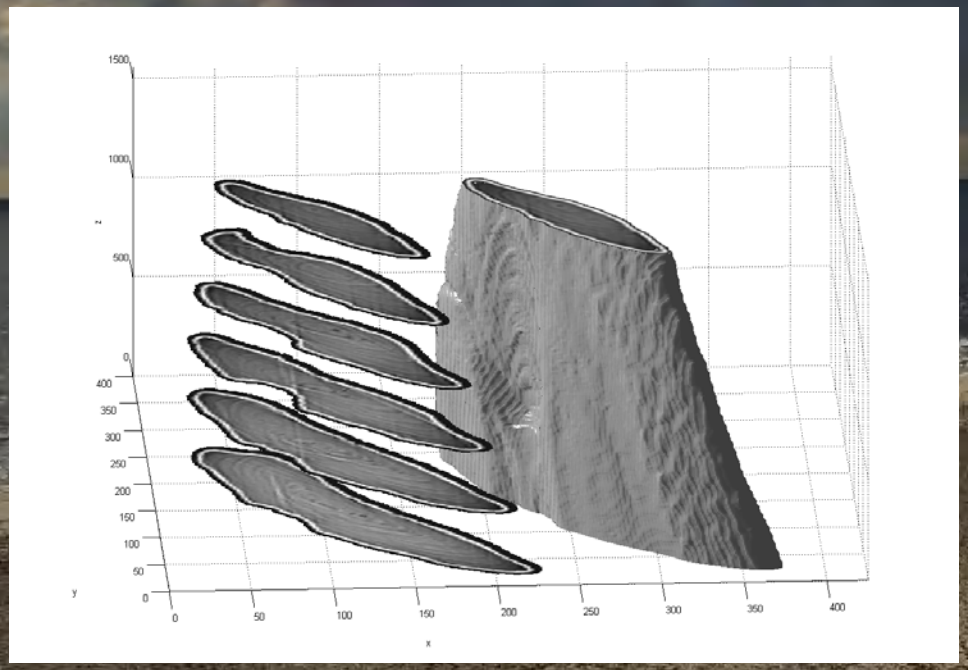
Validation of otolith microchemistry

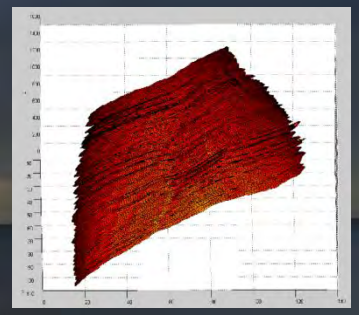
Finding a plaice in history: putting the pieces together

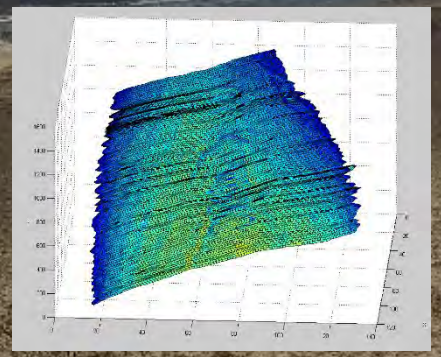
Mark Fisher
University of East Anglia
3D Imaging/Synchrotron analysis

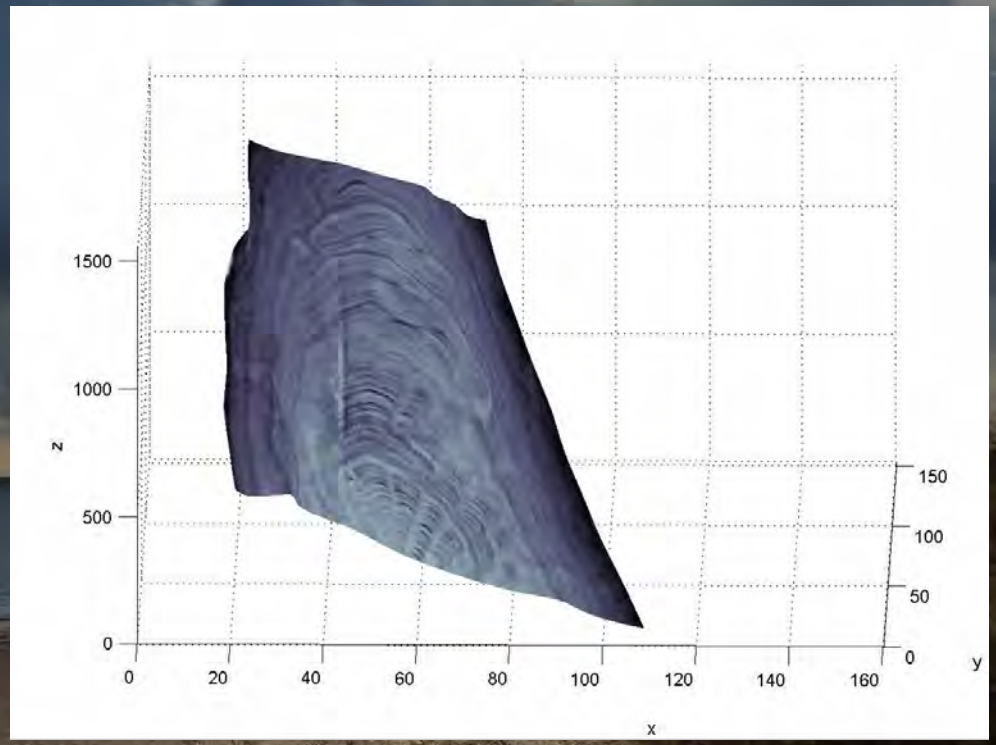


James Mapp
University of East Anglia





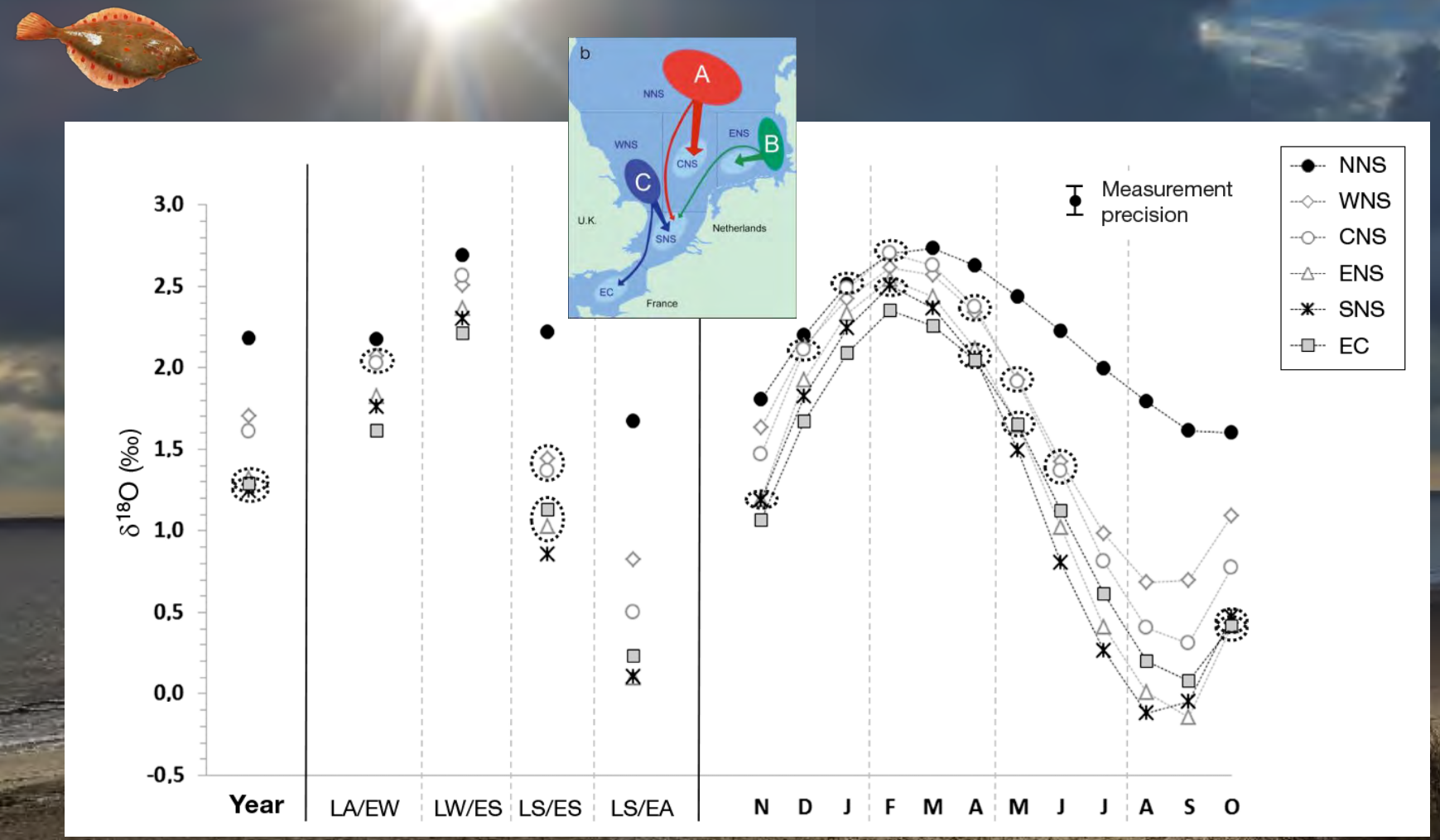




Mapp et al. 2016 J Fish Biol

Mapp et al. 2017 Fisheries Research

Finding a plaice in history: putting the pieces together



Audrey Darnaude
University of Montpellier

Otoliths as natural tags

Regional δ18O values expected for North Sea plaice Pleuronectes platessa at annual, seasonal or monthly temporal scales

Darnaude & Hunter 2017 MEPS

Finding a plaice in history: Conclusions

- Plaice have played a key role in shaping Cefas
- Legacy data are incredibly valuable: they help us understand how past experience of natural and anthropogenic stressors has shaped populations
- Legacy data will become increasingly valuable in predicting how fish sub-stocks respond/are resilient to to future climate change
- Plaice data continue to provide innovations in fisheries science
- Legacy data do not look after themselves!