

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

Dr Ewan Hunter



Mintin vat!



Benthic flatfish and benthopelagic cod on a shore – Jan van Kessel senior, 1626–1679

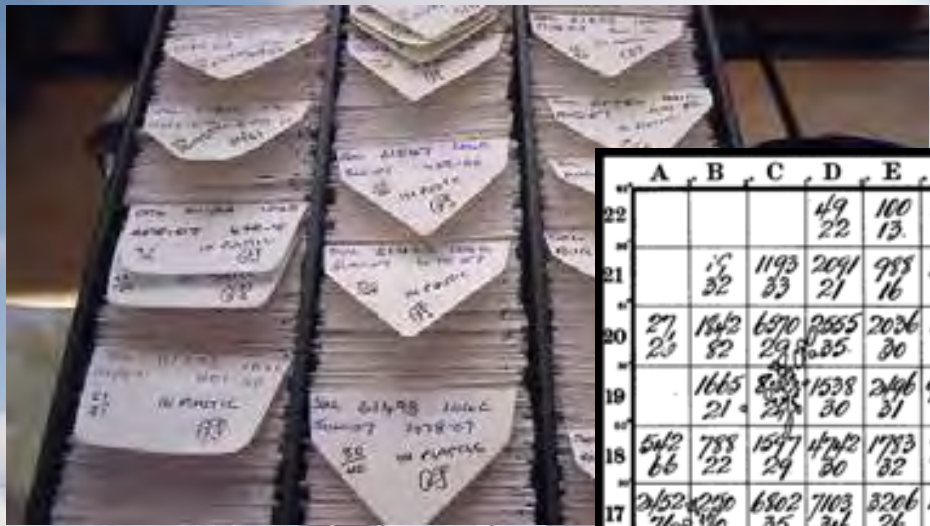


Cefas 20

1902

1997-2017





	A	B	C	D	E	F	G	H	J	K	L	M	N
22				49 22	100 13	39 9	50 4	79 45					
21		15 32	1193 33	2091 21	988 16	506 9	659 9	22 7					
20	27 23	1542 82	6570 29	2555 35	2026 30	468 19	1878 19	189 9	7 4				
19		1665 21	8233 25	1538 30	2446 31	975 30	2842 23	302 11	46 18				
18	542 66	788 22	1547 29	4742 30	1783 32	770 36	802 27	147 23	238 4				
17	2152 76	4220 30	6862 35	7103 34	3206 26	1307 25	1147 25	581 16	2277 14				
16	5734 45	4284 27	5703 35	5098 31	798 21	3112 21	1996 22	1724 25	79 29				
15		1586 26	4408 31	2580 25	1464 13	3250 25	3077 25	1913 23	426 22	201 19			
14		382 31	5409 31	5024 29	2107 24	3810 25	3476 34	2751 27	1204 25	1427 22	183 22	986 24	
13			1732 24	6799 32	3023 29	2292 26	1035 42	2334 26	2767 44	76 36	2509 38	5268 25	
12		3057 35	6823 25	5058 31	3011 37	7110 33	4376 53	3060 29	1361 40	683 30	4264 37	1245 40	
11		5248 13	10560 27	3620 33	2293 46	1534 34	2007 32	2827 33	4315 27	2253 24	605 37	1121 31	
10			4995 47	8940 37	3094 39	2649 57	5130 52	1649 35	1662 28	279 17	898 42	4727 56	
9			5777 28	6446 32	2899 41	1073 41	1634 31	1255 20	1197 13	2356 24	2435 69	2385 16	
8			191 27	3615 37	1595 37	8451 29	2622 27	2142 18	5723 14	579 18	57 22	1876 19	
7			2723 51	2126 37	11333 22	3293 22	4752 22	4209 11	573 14	107 25	608 18		
6				1554 31	15268 23	21281 15	8600 9	2136 9	1156 9	590 12	169 21		
5				4321 12	1787 7	3560 8	615 4	148 7					
4					62 3	7285 7	1179 4	9 3					
3					3 2	2468 7	174 5	210 5					
2					492 4	3865 7	3 3						
1					1550 9								

CHART OF
REGION IV. (NORTH SEA).
Divided for Statistical purposes into
squares each 1° of Longitude by
1° of Latitude.

ENGLAND AND SCOTLAND
Official Quantity of British fishing boats
(Top row of figures)
Daily Tonnage and
Value of Catch per 100 hours Fishing
(Lower row of figures)

IN CWTs.

49102
TOTAL
NORTH SEA
6110715
24



Finding a plaice in history: **Synopsis**



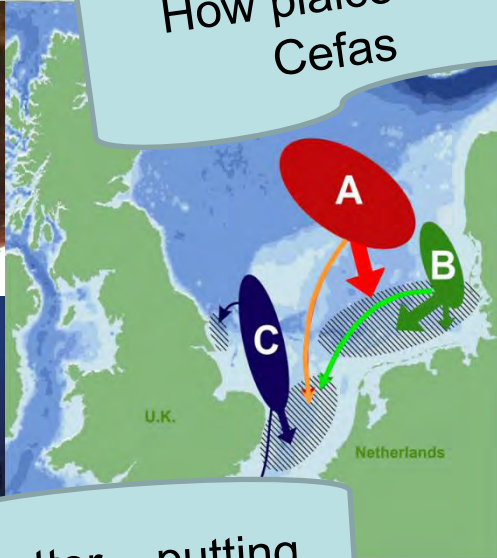
Introductions...



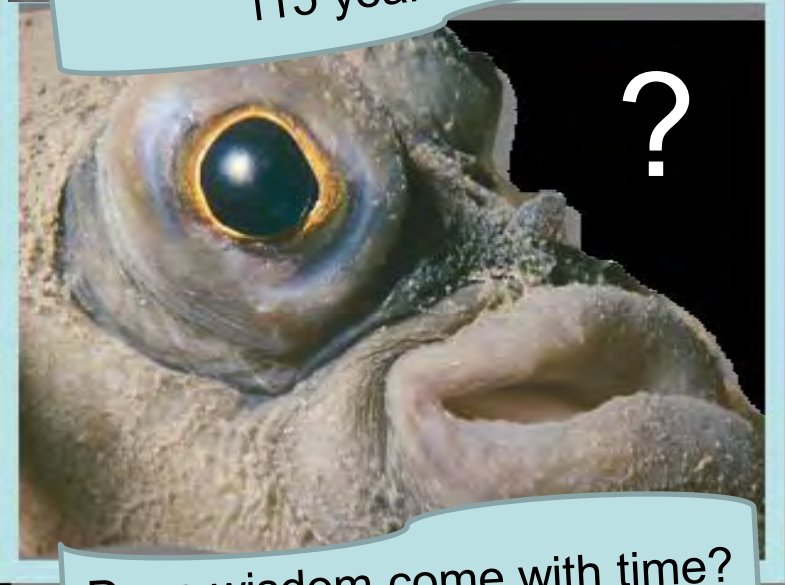
How plaice built Cefas



What we found in the archives – 115 years of plaice

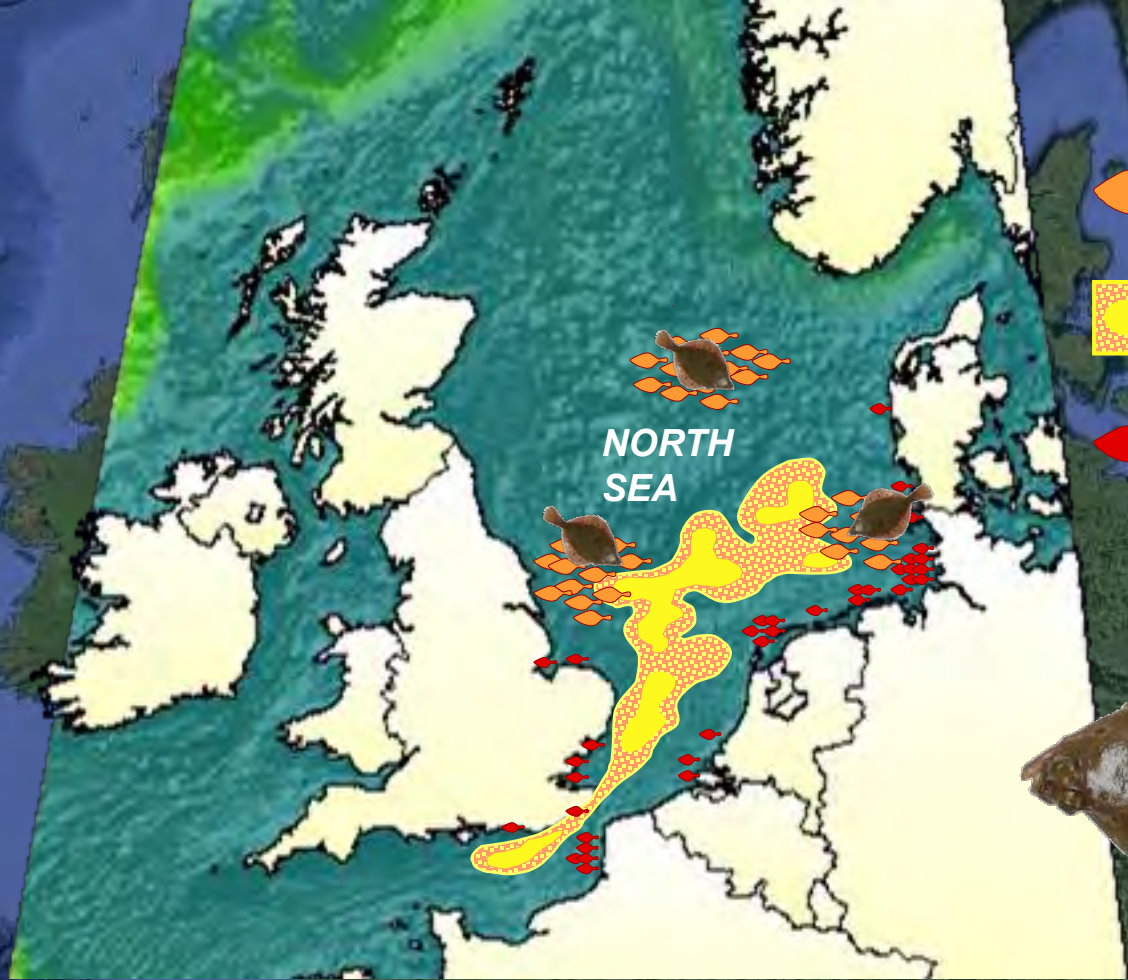


Why legacy data matter – putting the pieces together



Does wisdom come with time? - Conclusions

Finding a plaice in history: Introductions

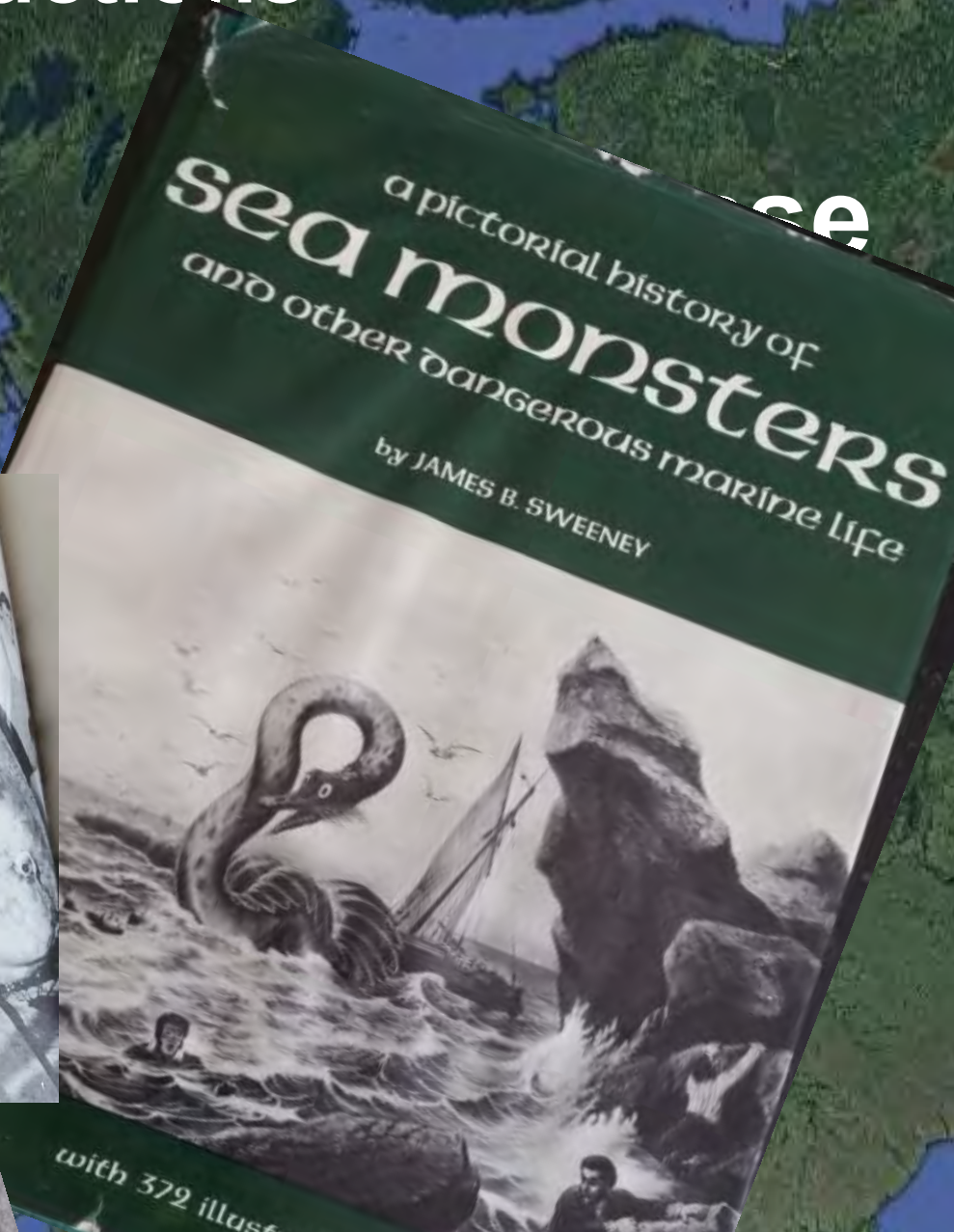


-  Feeding (summer)
-  Reproduction (winter)
-  Juveniles



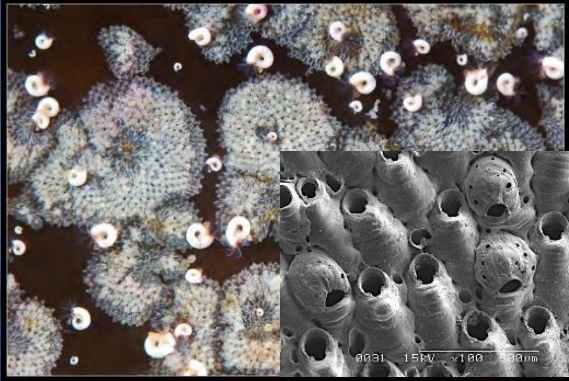
Plaice life-cycle...

Finding a plaice in history: Introductions



My life-cycle...

Finding a plaice in history: Introductions



Larval phase



Extended post-larval phase



My life-cycle...

Maturity



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

Sea bass on the move

NEWS 13

External tag

Or

2 types of electronic tags

— help needed from fishermen

'CATCH AND RELEASE'
We ask practitioners of 'catch and release' (systemic fish) to retain all tagged sea bass recaptured. By now, any tagged fish will be carrying valuable research data, considering that the programme began in August 2010.

REWARDS FOR RETURNING INFORMATION
A reward of €100 (€25) will be paid for the return of the intact, un-pooled fish carcass, including the external marker tag and the associated internal DST, plus the associated information.

Map showing the location of the Iroise Sea Marine Natural Park (INP) off the north-west coast of France, where 66 sea bass were tagged with external tags. The map also shows the location of the Iroise Sea Marine Natural Park (INP) and the location of the Iroise Sea Marine Natural Park (INP).

Partial migration!

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.

Situated at the north-west extremity of the French Atlantic coast, the Breton Marine Natural Park of the Iroise Sea is home to a diverse array of marine life. One of the principal aims of the Marine Park is to regulate the trademark fish species present in its waters, *Dicentrarchus labrax*. Towards this end, the Marine Park has been collaborating with scientists at IFREMER in France and CEFAS in the UK to launch a study of the movements and behaviour of sea bass in the Iroise Sea and surrounding areas (see [page 10](#)).

Previous tagging studies have demonstrated that sea bass are capable of migrating often over hundreds of kilometres. To obtain a better understanding of the life of sea bass, a tagging study using electronic data storage tags (DSTs) was launched by IFREMER and the Marine Park in August 2010. So far, 66 DST-tagged sea bass have been released in the Iroise Sea. For the first time, the sea bass have been tagged with CEFAS buoyant location jackets. This means that even following the death of a fish, the DST

Finding a plaice in history: How plaice built Cefas



Cefas, Lowestoft, UK, 2017



Cefas Research Vessel "Endeavour"



Stepping back 115 years....

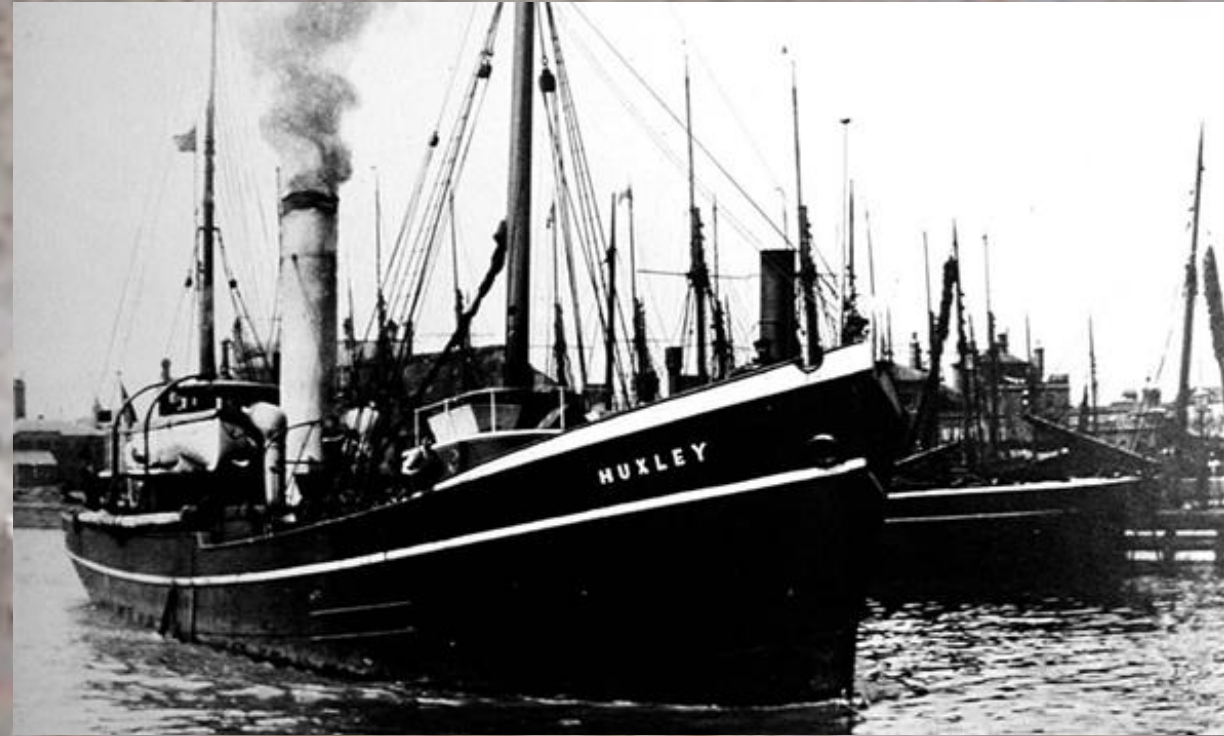
Finding a plaice in history: How plaice built Cefas



Cefas, Lowestoft, UK, 1902



Cefas Research Vessel "Huxley"

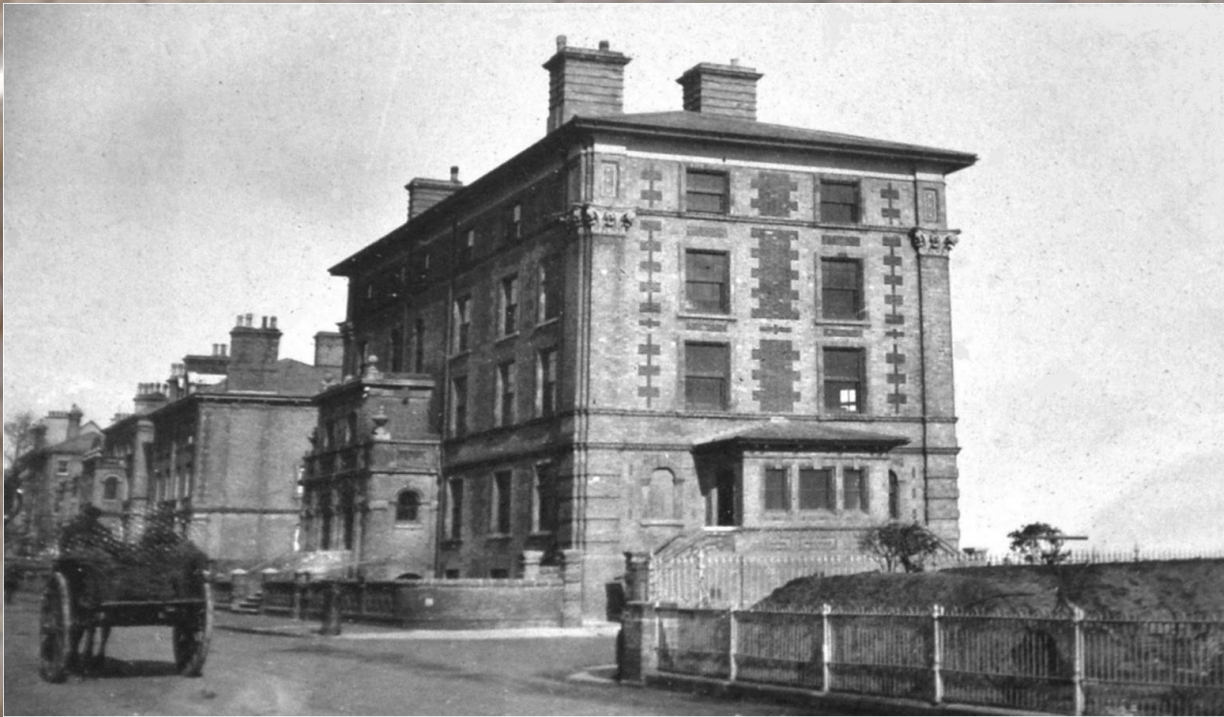


"In 1902, the Marine Biological Association opened a sub-station in Lowestoft to research the plaice industry, initially to support the UK's contribution to the newly created International Council for the Exploration of the Sea (ICES)"

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 place in history: What we found in the archives



Cefasdatahub

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


Centre for Environment
Fisheries & Aquaculture
Science

Trawling Through Time
Cefas Science and Data
1902-2014



THURSDAY NOVEMBER 28TH BETWEEN 10:00 AND 12:30 LOWESTOFT LECTURE THEATRE

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



CEFAS scientists are releasing plaice tagged with distinctive **ELECTRONIC TAGS** to study migratory behaviour.

It is essential that as many as possible are recovered



*£25 reward for the electronic tag & £25 for return of the whole fish (plus market value). In addition, you will receive a specially designed gift, and your name will be entered into an annual cash draw for £1000

We thank you for your help and co-operation

Please return the tags and the whole fish, together with details of time and place of capture to:
The Centre for Environment, Fisheries & Aquaculture Science (CEFAS),
Lowestoft Laboratory,
Pakefield Road, Lowestoft,
Suffolk NR33 0HT UK
Tel: +44 (0) 1502 4526
www.cefass.co.uk/fishtagreturns

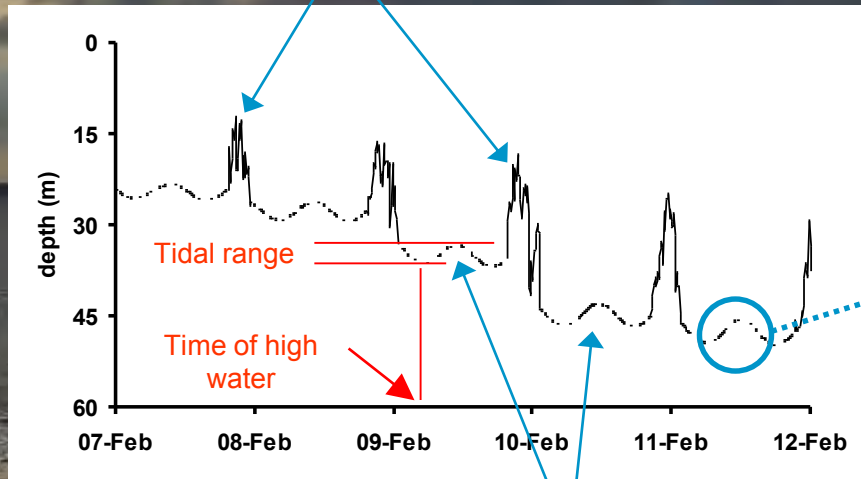


Finding a plaice in history: putting the pieces together

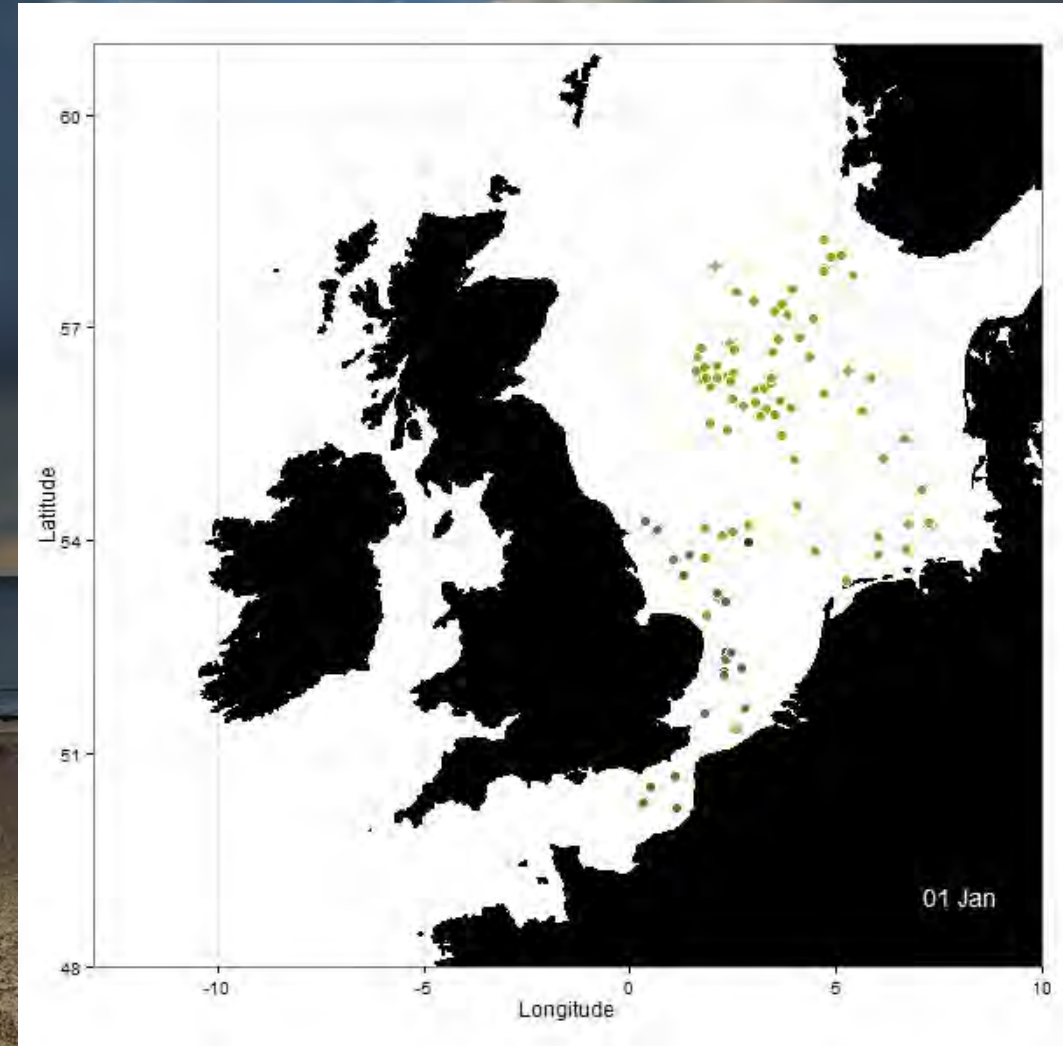


Geolocation from tidal data

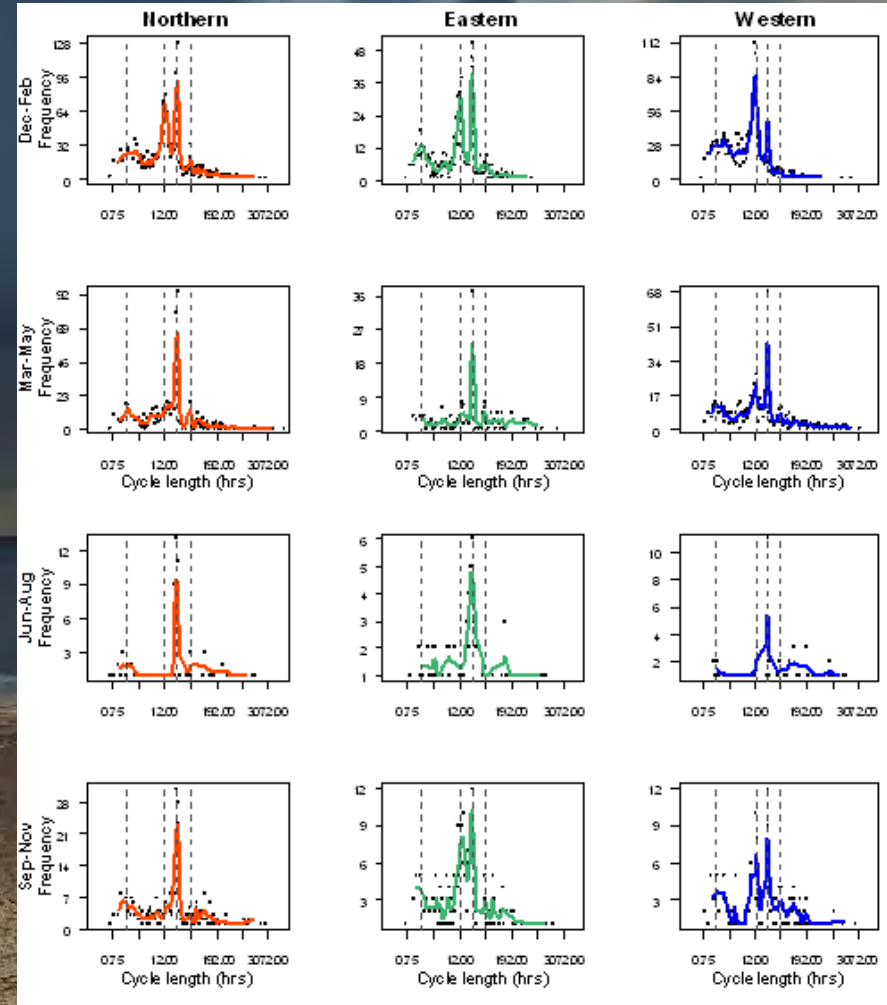
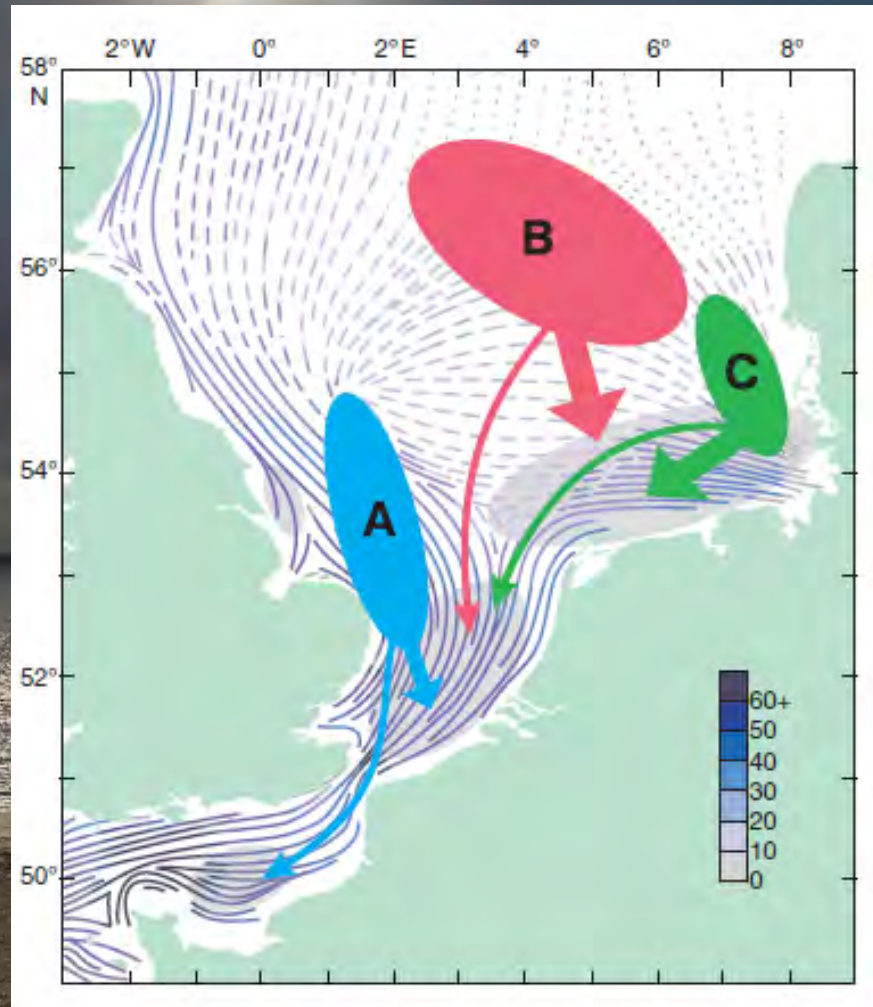
Fish swimming in mid-water



Fish resting on the sea bed

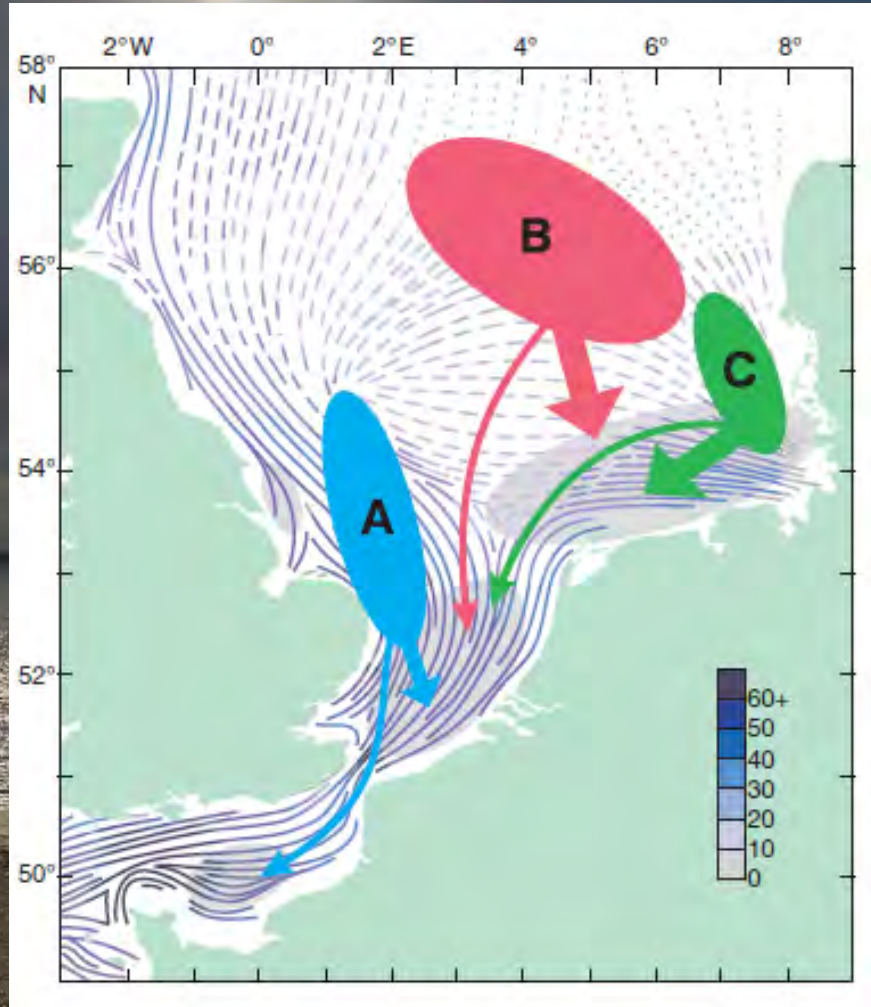


Finding a plaice in history: putting the pieces together

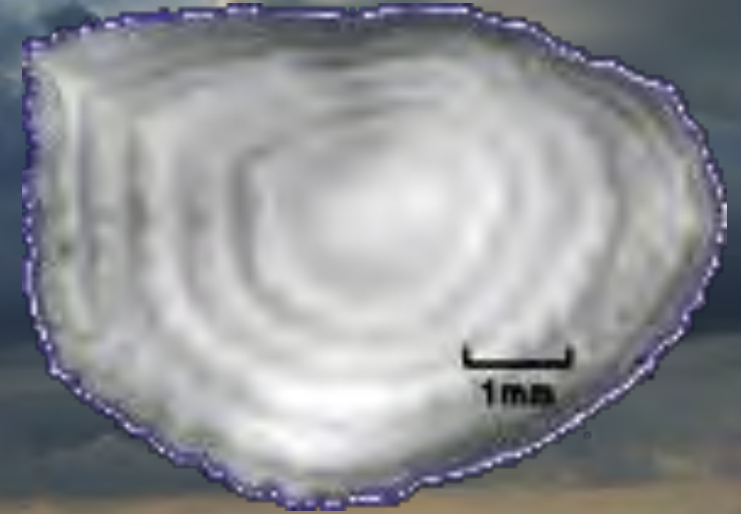


Hunter et al. MEPS (2009)

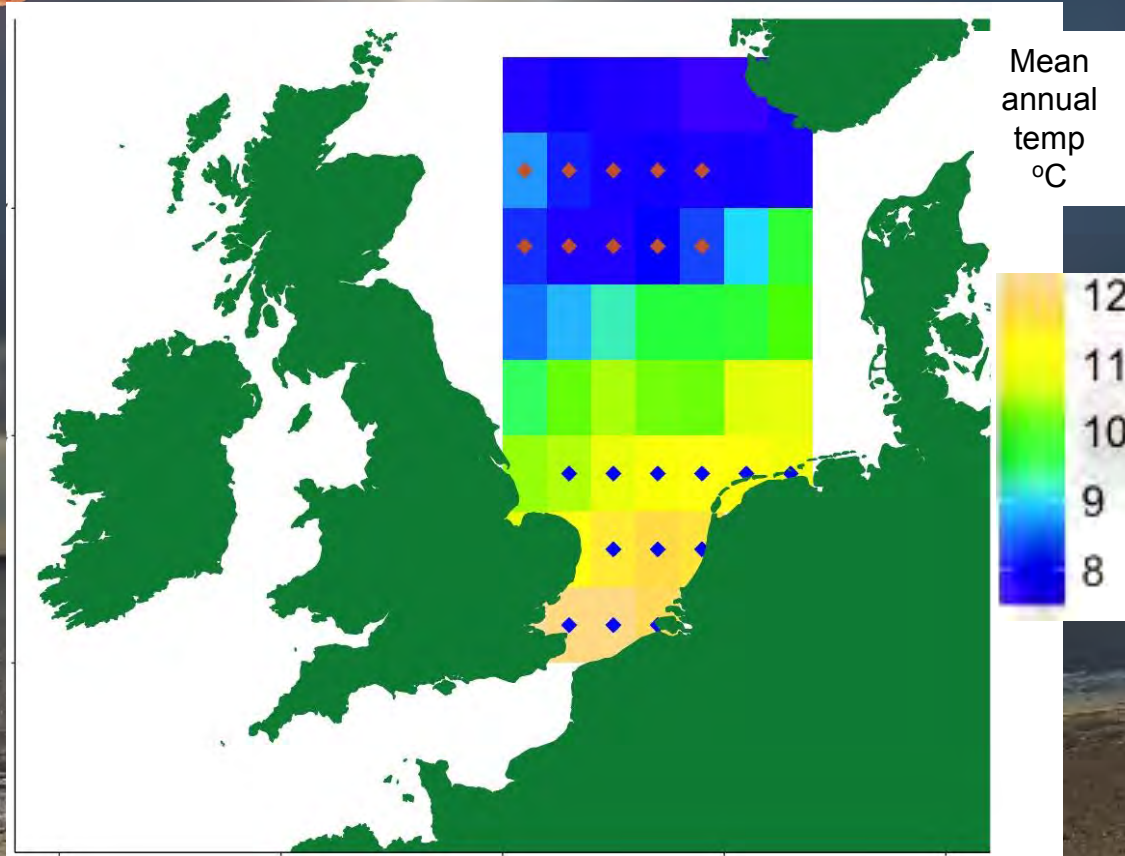
Finding a plaice in history: putting the pieces together



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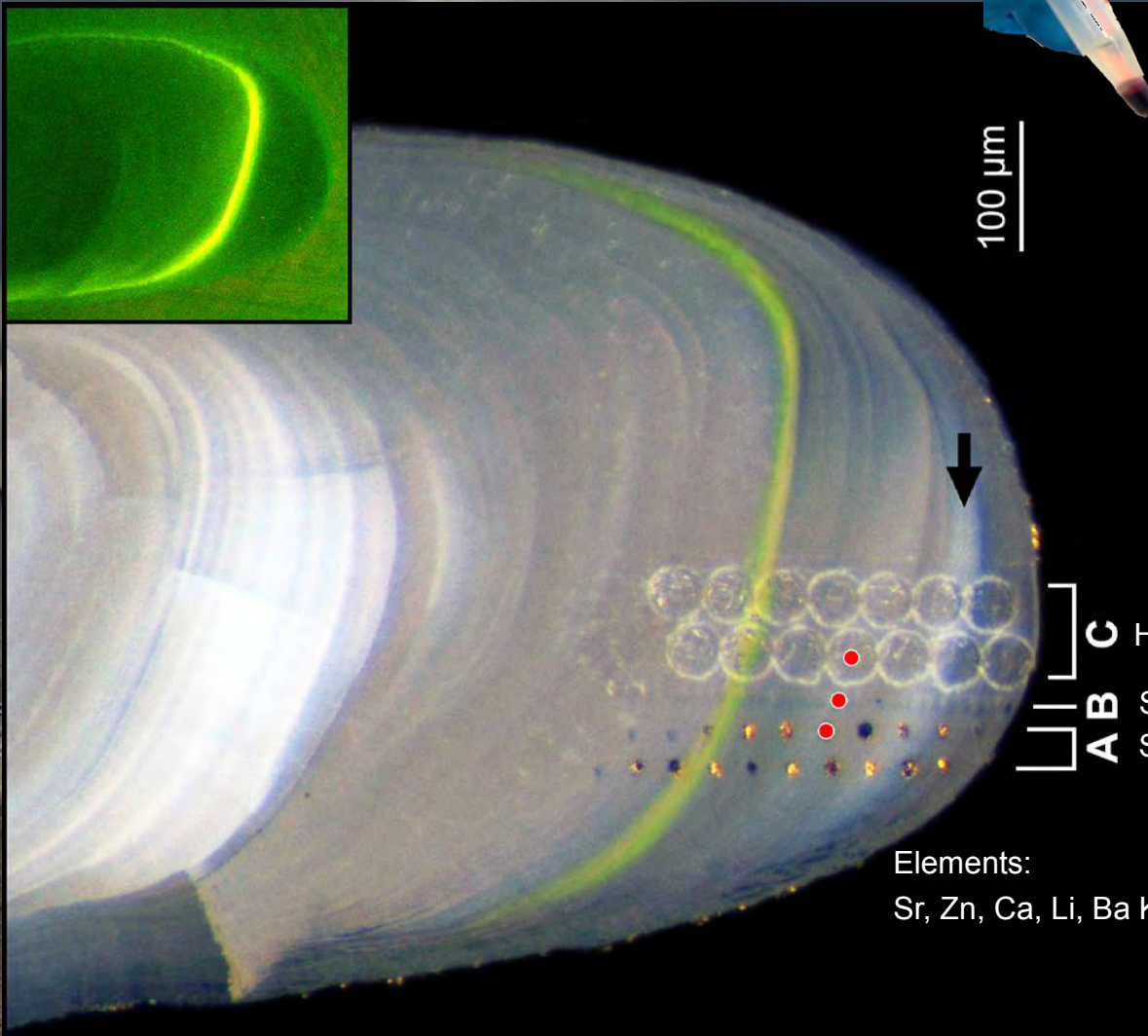
Finding a plaice in history: putting the pieces together



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.



Anna Sturrock
University of California
Elemental Signatures

Validation of otolith microchemistry

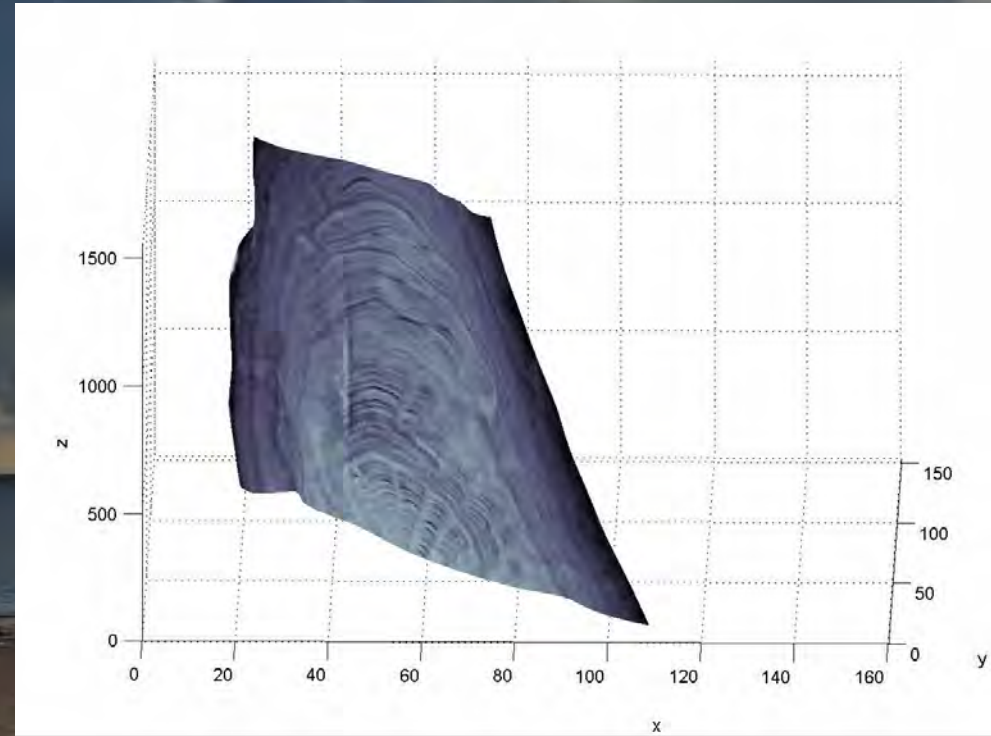
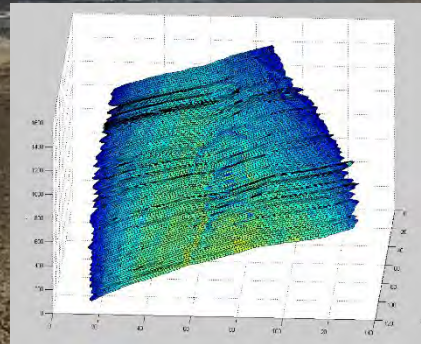
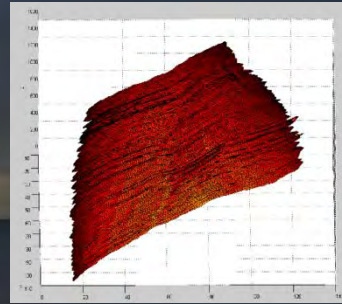
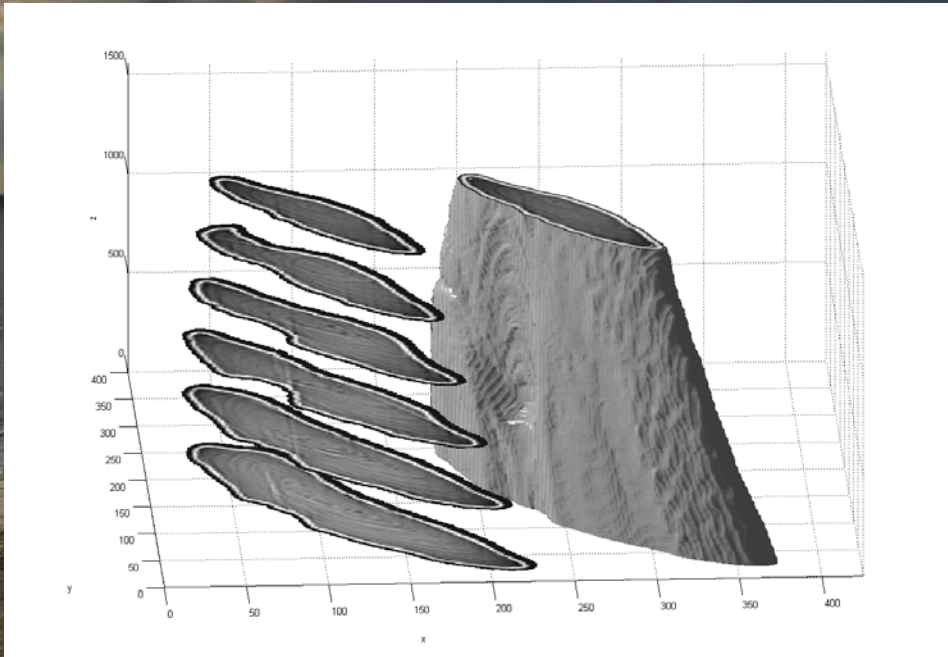
Finding a plaice in history: putting the pieces together



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



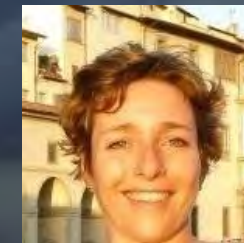
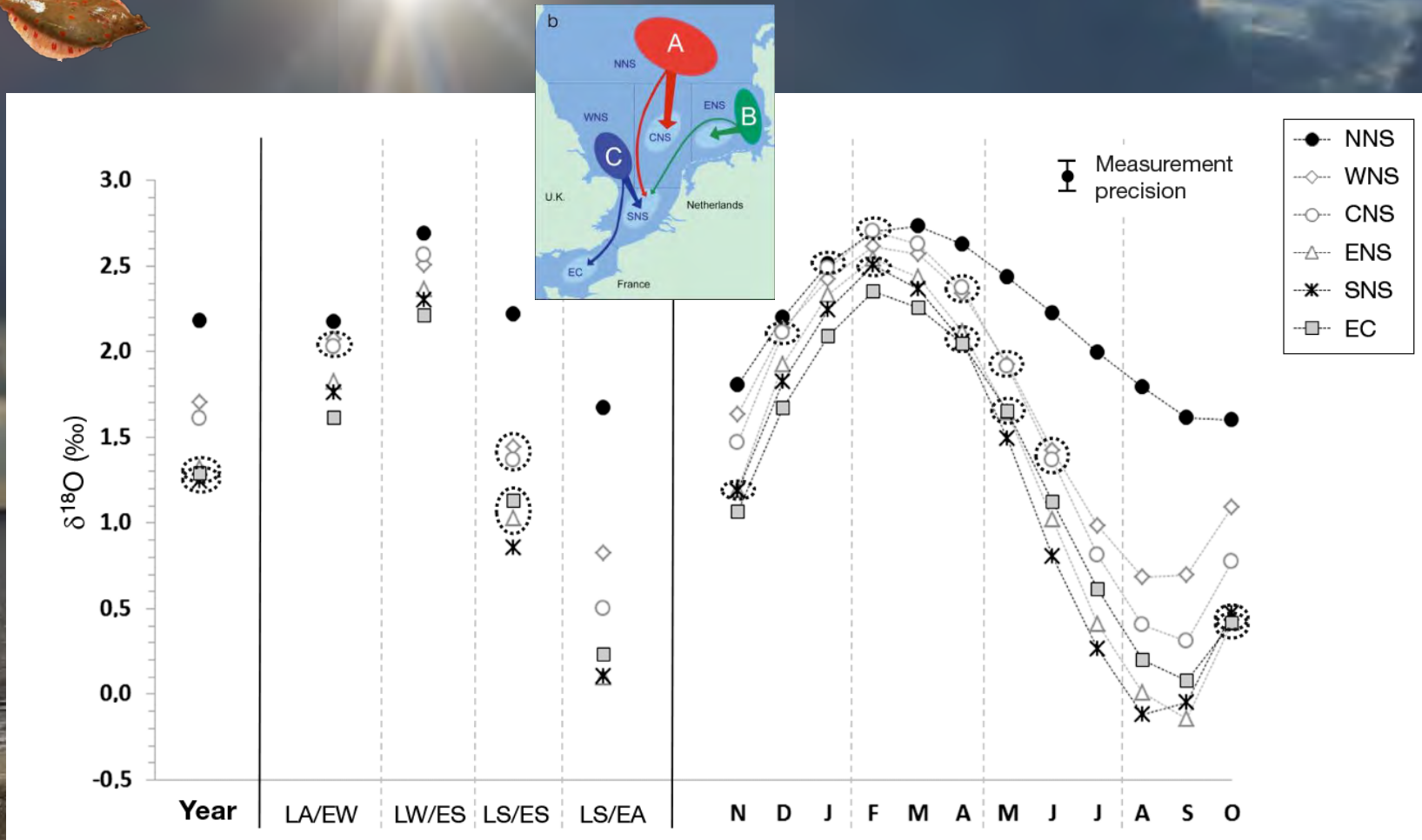
James Mapp
University of East Anglia



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 $\delta^{18}\text{O}$ 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 future climate change
- Plaice data continue to provide innovations in fisheries science
- Legacy data do not look after themselves!

