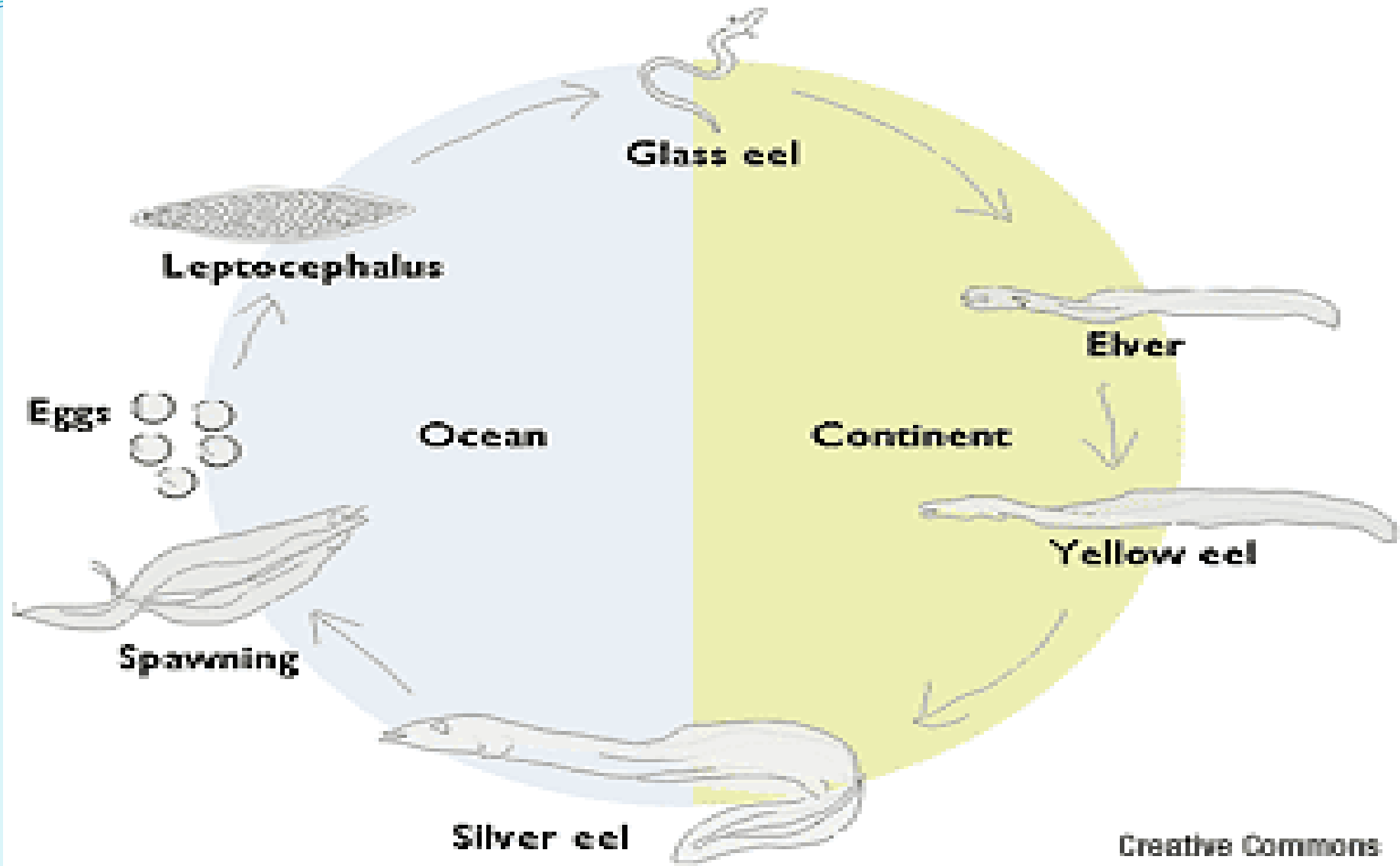


Anguilla anguilla : some aspects of life in the north Atlantic

Professor Howard S.J Roe
Sargasso Sea Commissioner

2nd Range State Meeting on the European Eel
Malmo, Sweden
15-16 May, 2018,

Eel Life Cycle



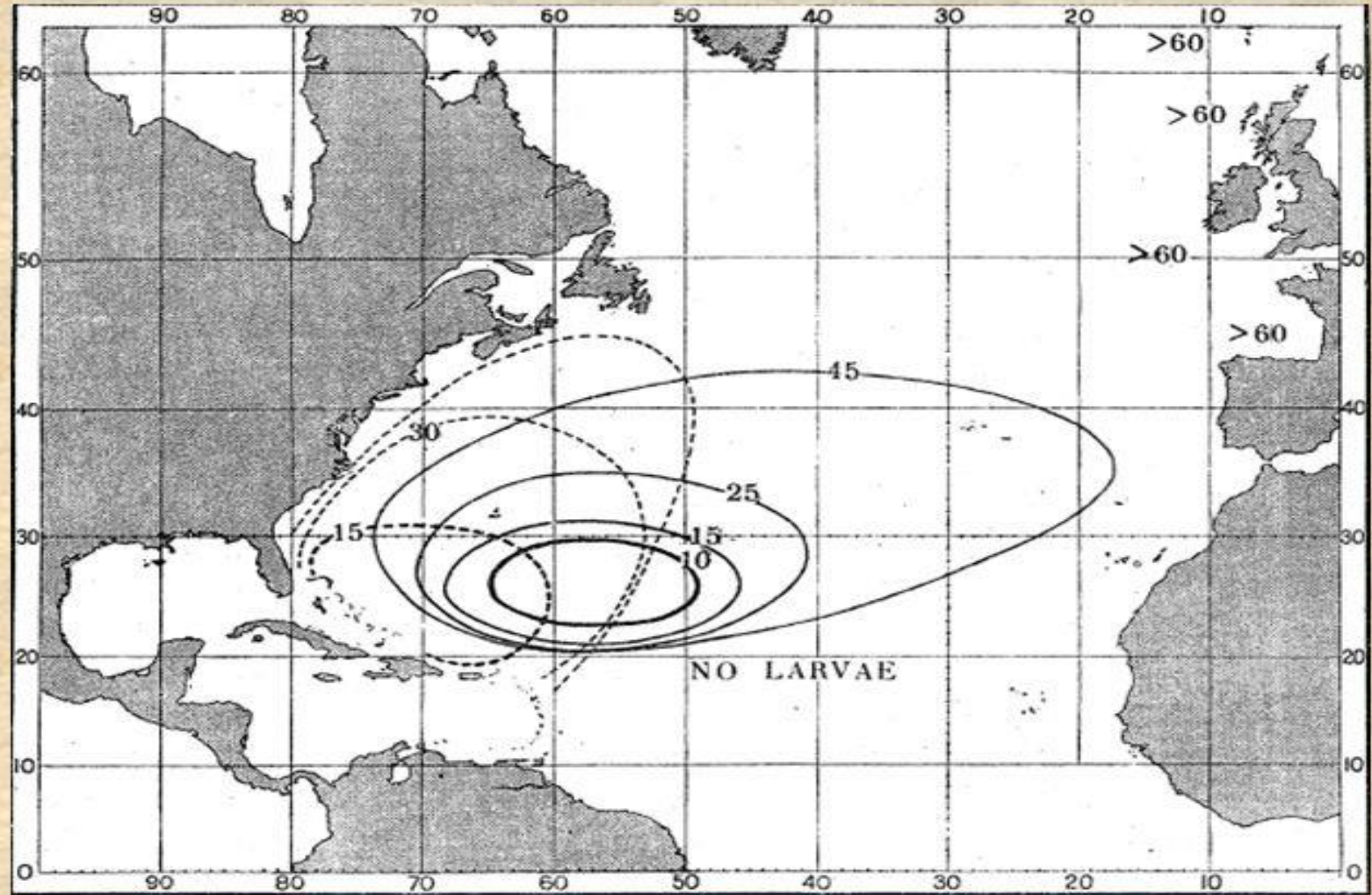
size as ocean currents carry them eastwards from
the spawning grounds in the Sargasso Sea

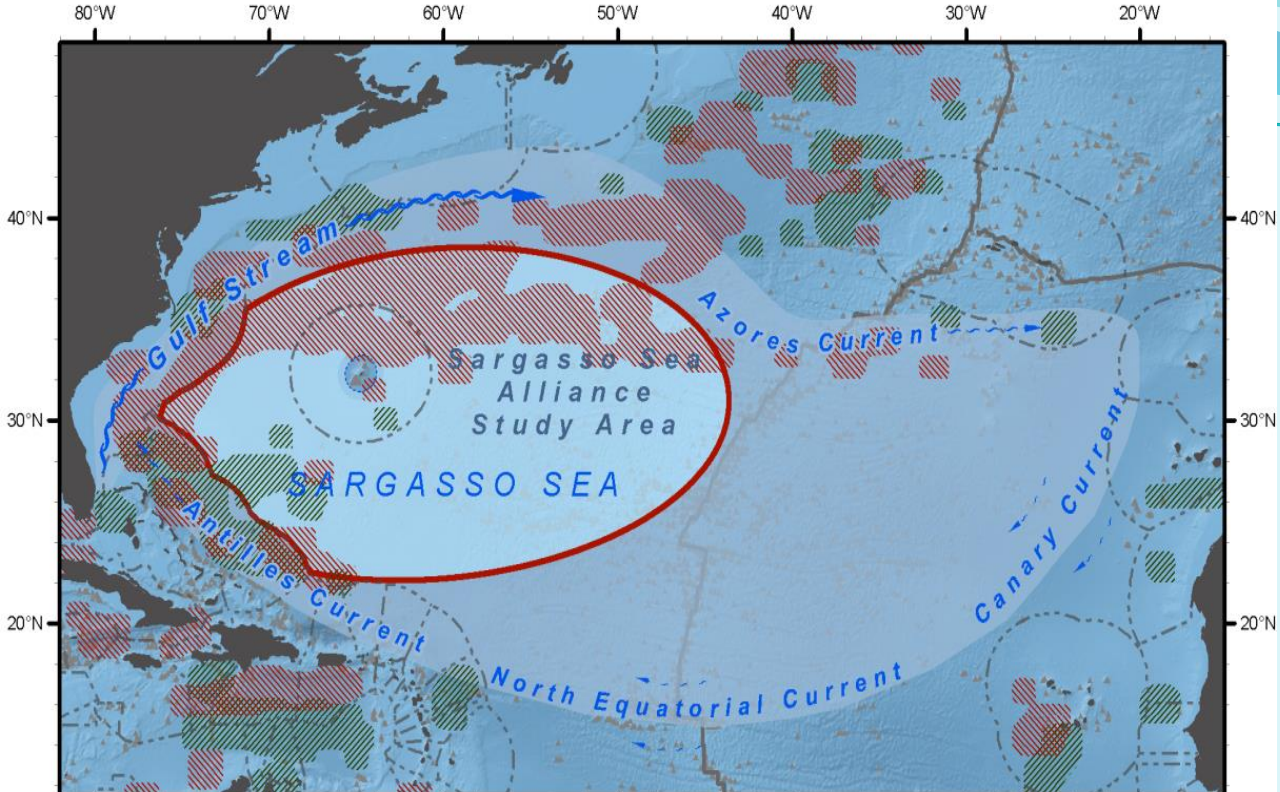


**Johannes
Schmidt**

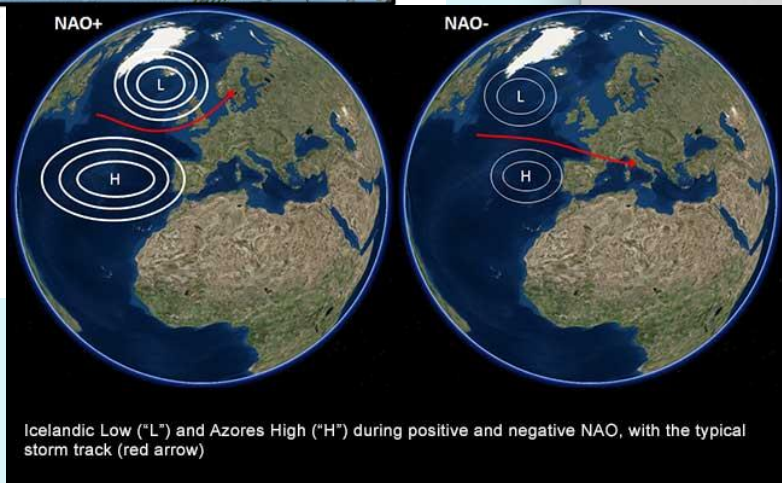
(1877-1933)

*first identification of
the eel's spawning
grounds (1904-1923)*

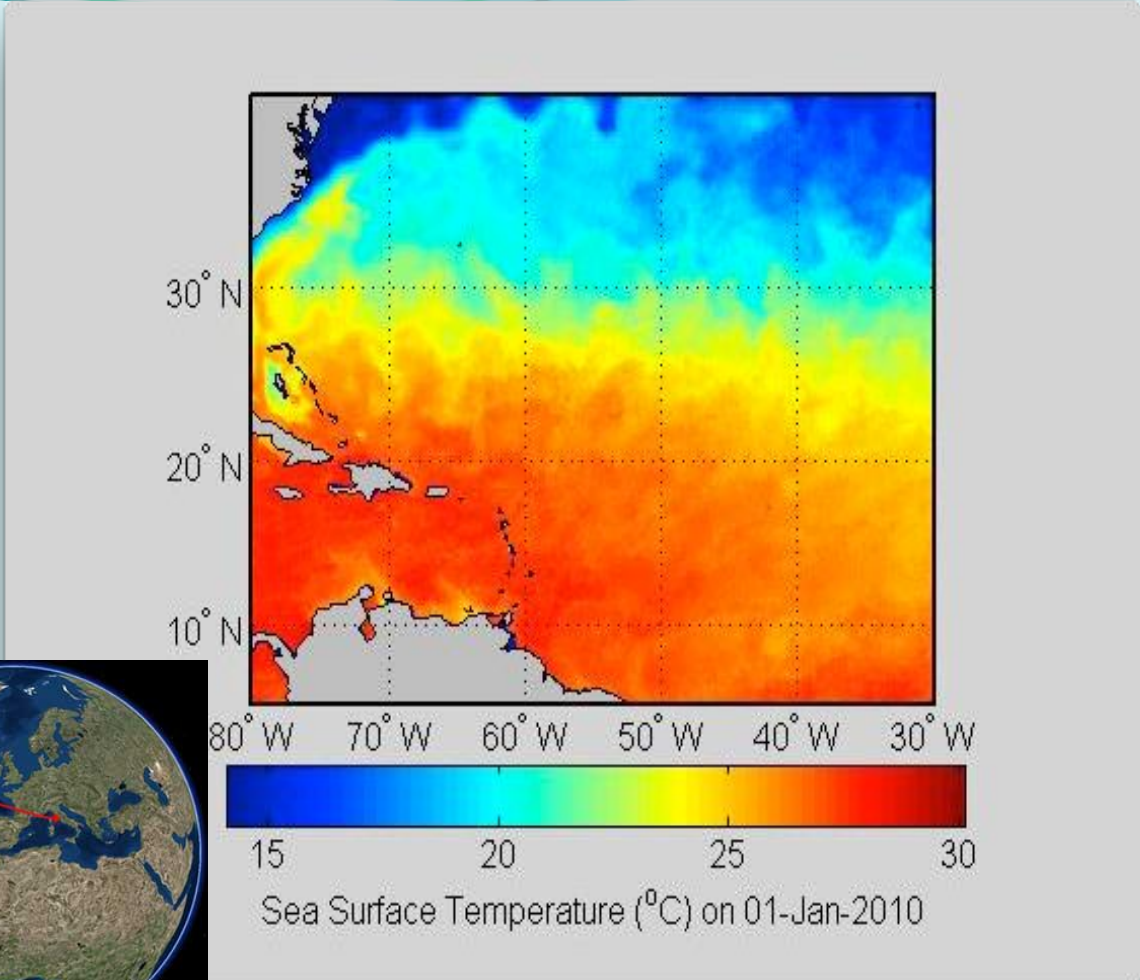




- Sargasso Sea Alliance Study Area
- North Atlantic Gyre
- High Cyclonic Eddy probability
- High AntiCyclonic Eddy probability
- EEZ
- Bermuda 50NM



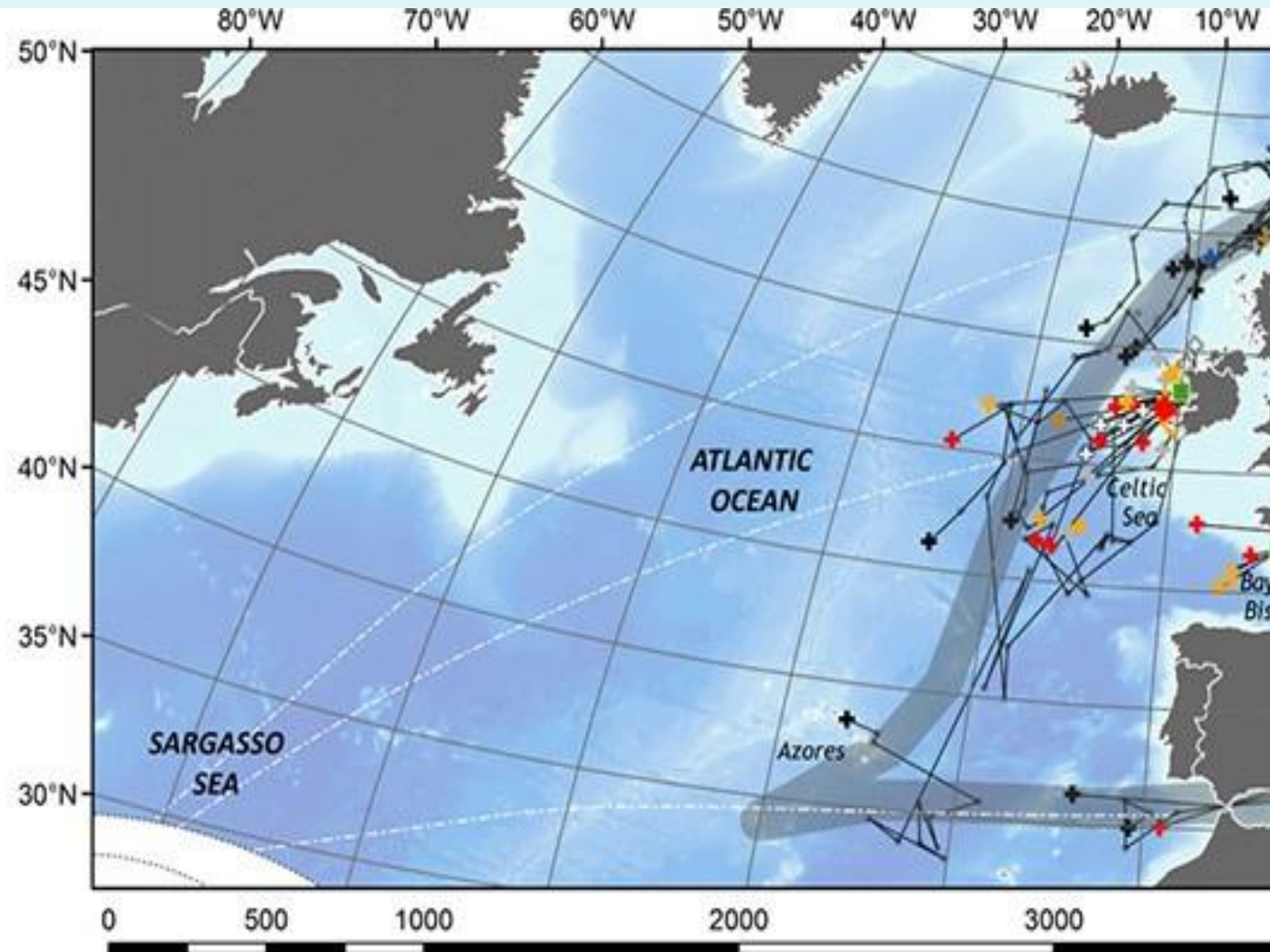
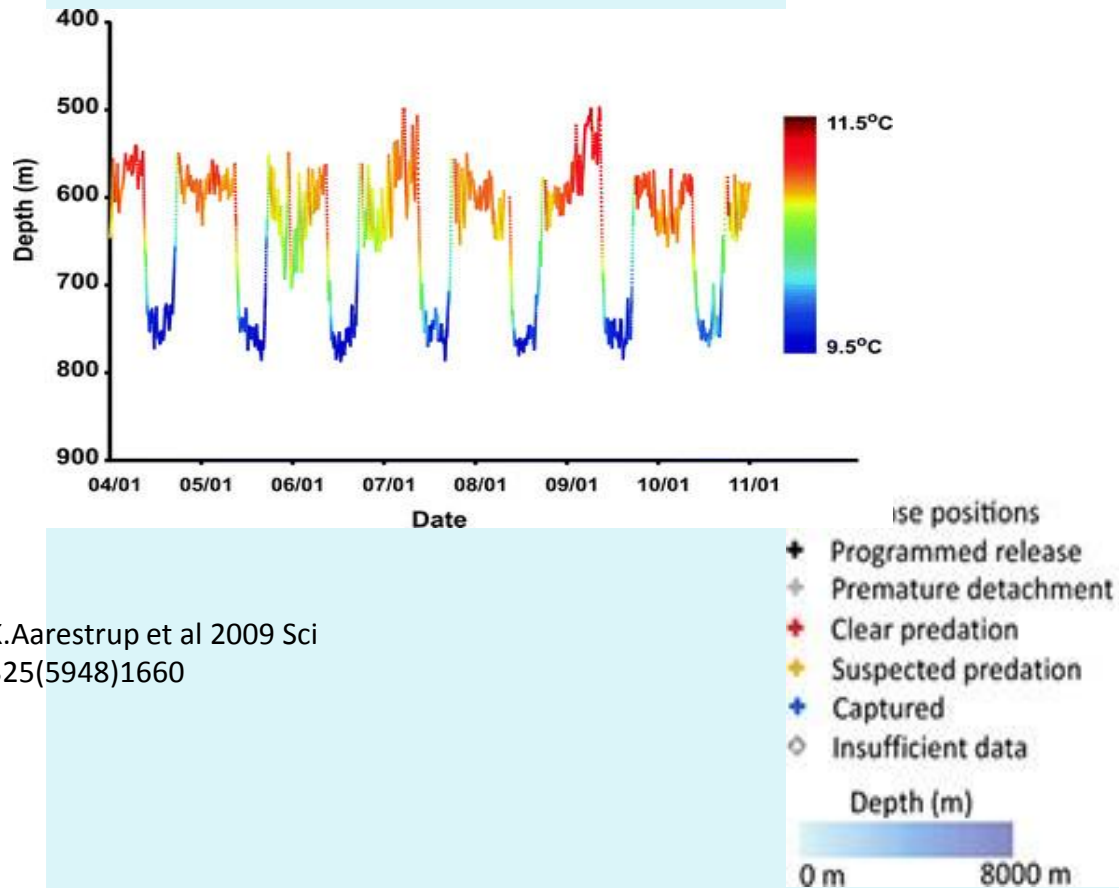
Icelandic Low ("L") and Azores High ("H") during positive and negative NAO, with the typical storm track (red arrow)



Sea Surface Temperature ($^{\circ}$ C) on 01-Jan-2010

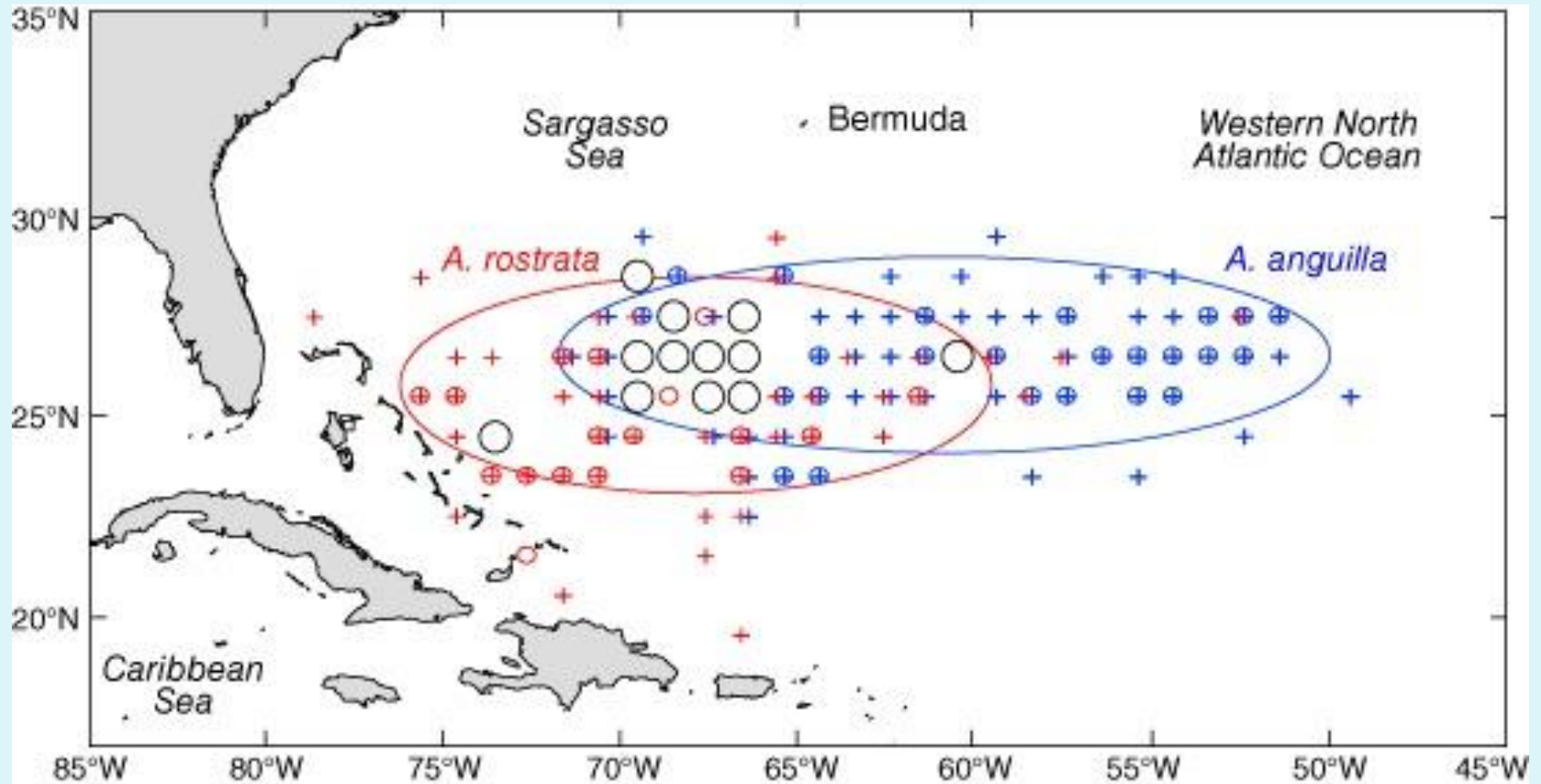
A. anguilla migration

D. Righton et al, 2016 Sci Adv 1 (10)



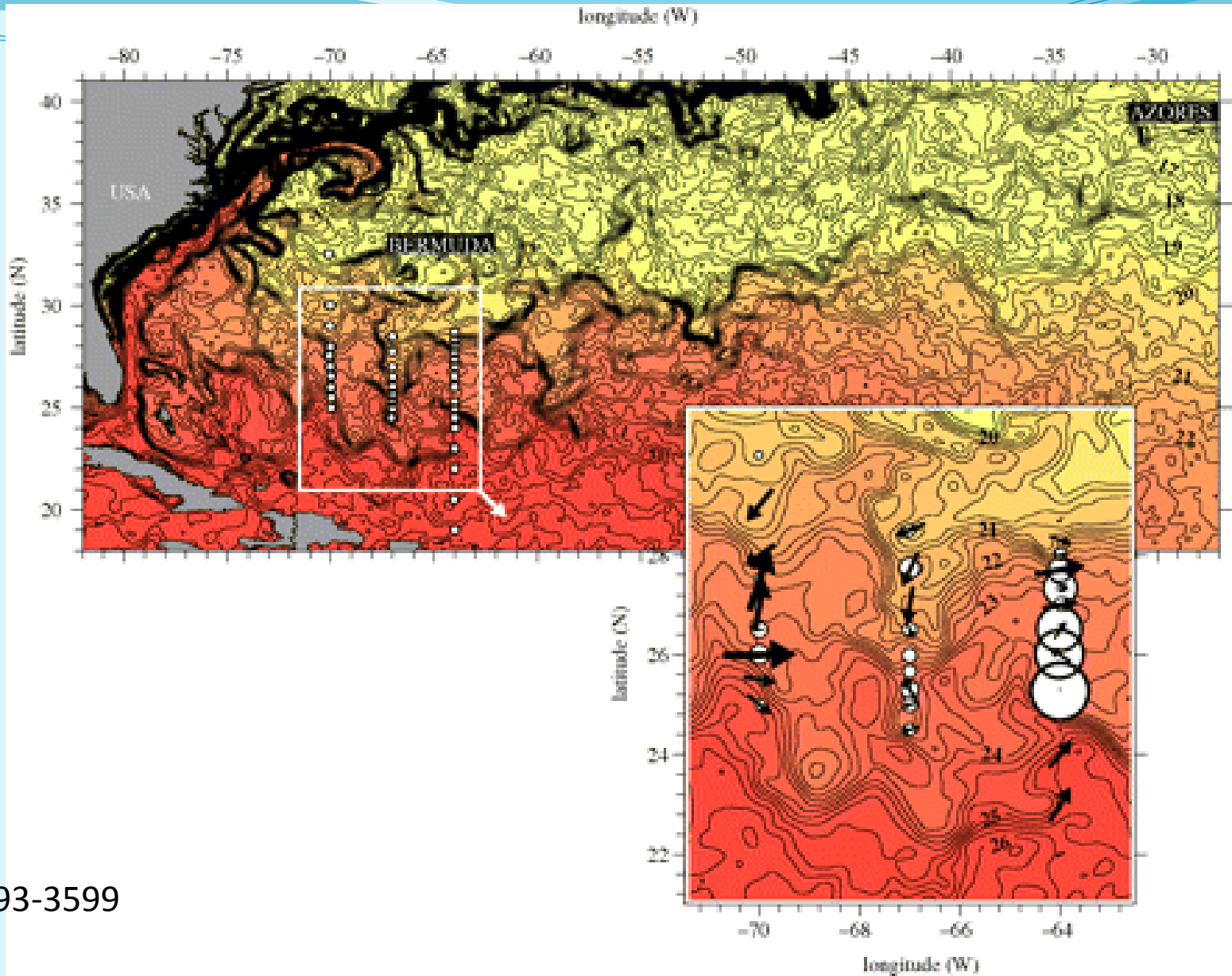
K.Aarestrup et al 2009 Sci
325(5948)1660

Locations where small larvae 0-5.9 mm (small circles) and 6.0-10.9 mm (crosses) of *A. rostrata* (red) and *A. anguilla* (blue) were collected, pooled into 1° areas. Large circles show where < 6mm long larvae of both species were collected. Ovals show estimates of the primary spawning areas of both species.

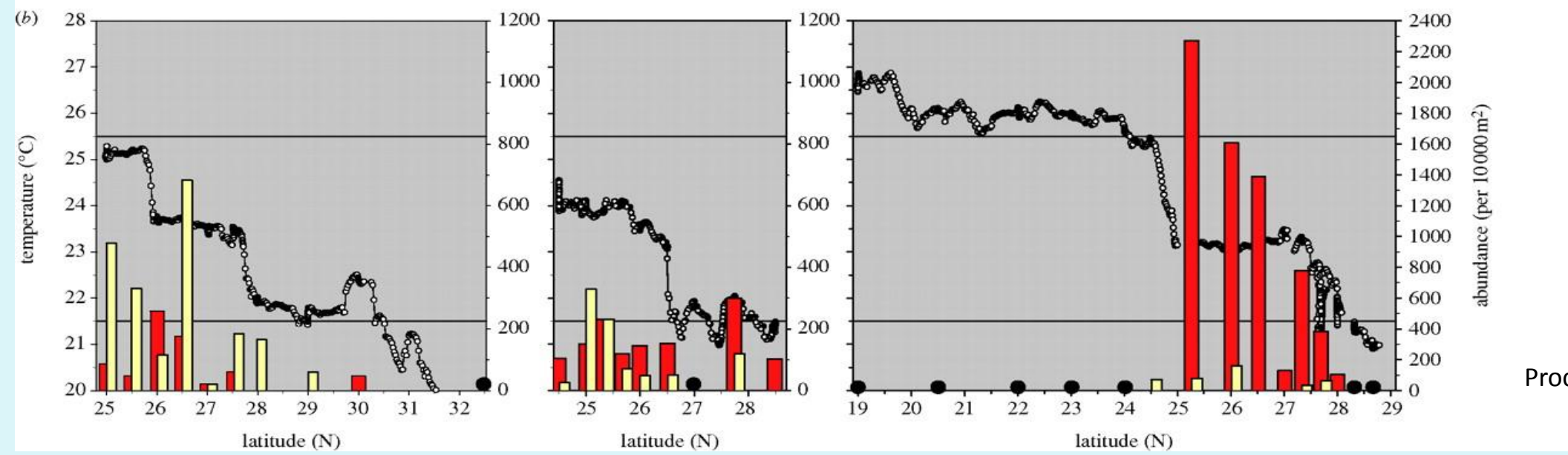
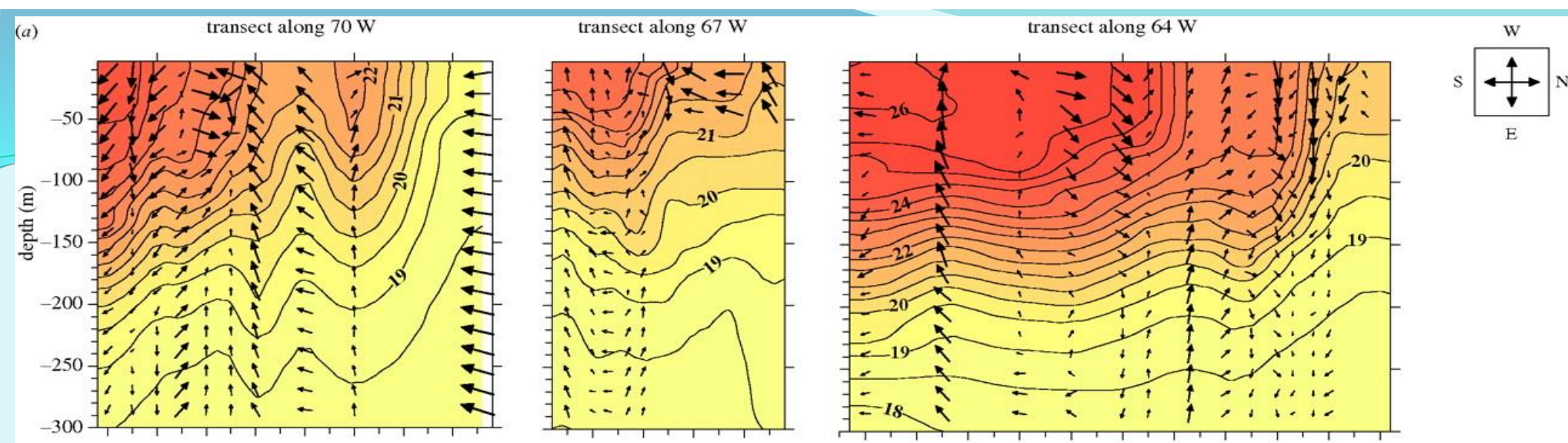


Miller, M.J. et al 2015
Biol Rev Camb Philos Soc
90(4):1035-64

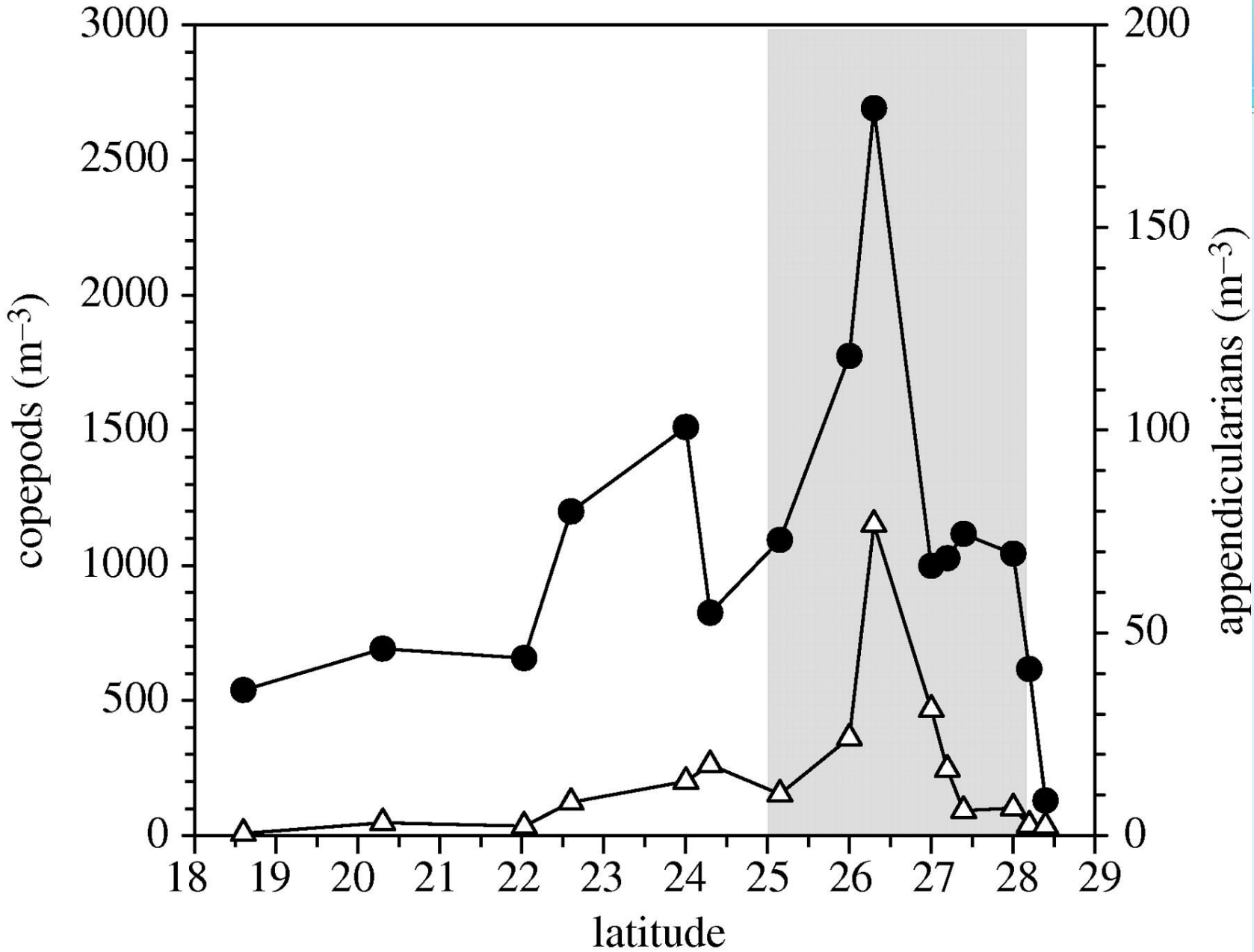
Sargasso Sea; sea surface temperatures, sampling positions and abundance of *A.anguilla*



P.Munk et al 2010 Proc Biol Sci 277(1700):3593-3599



P.Munk et al 2010
Proc Biol Sci 277(1700)



Abundance of plankton
in vicinity of frontal zone

P.Munk et al 2010 Proc Biol Sci 277(1700)

A *Sargassum* based ecosystem



Threats

Garbage and plastics

Pollution, discharges, spills

Fishing

Sargassum harvesting

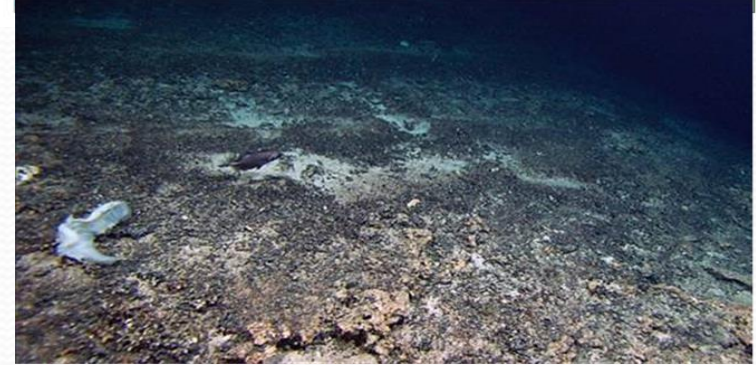
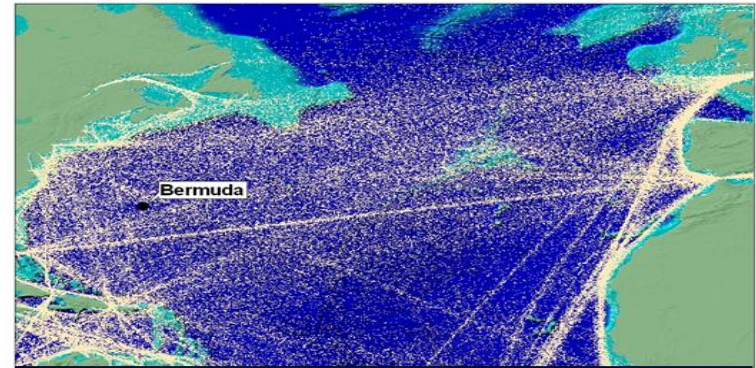
Exotic species introduction

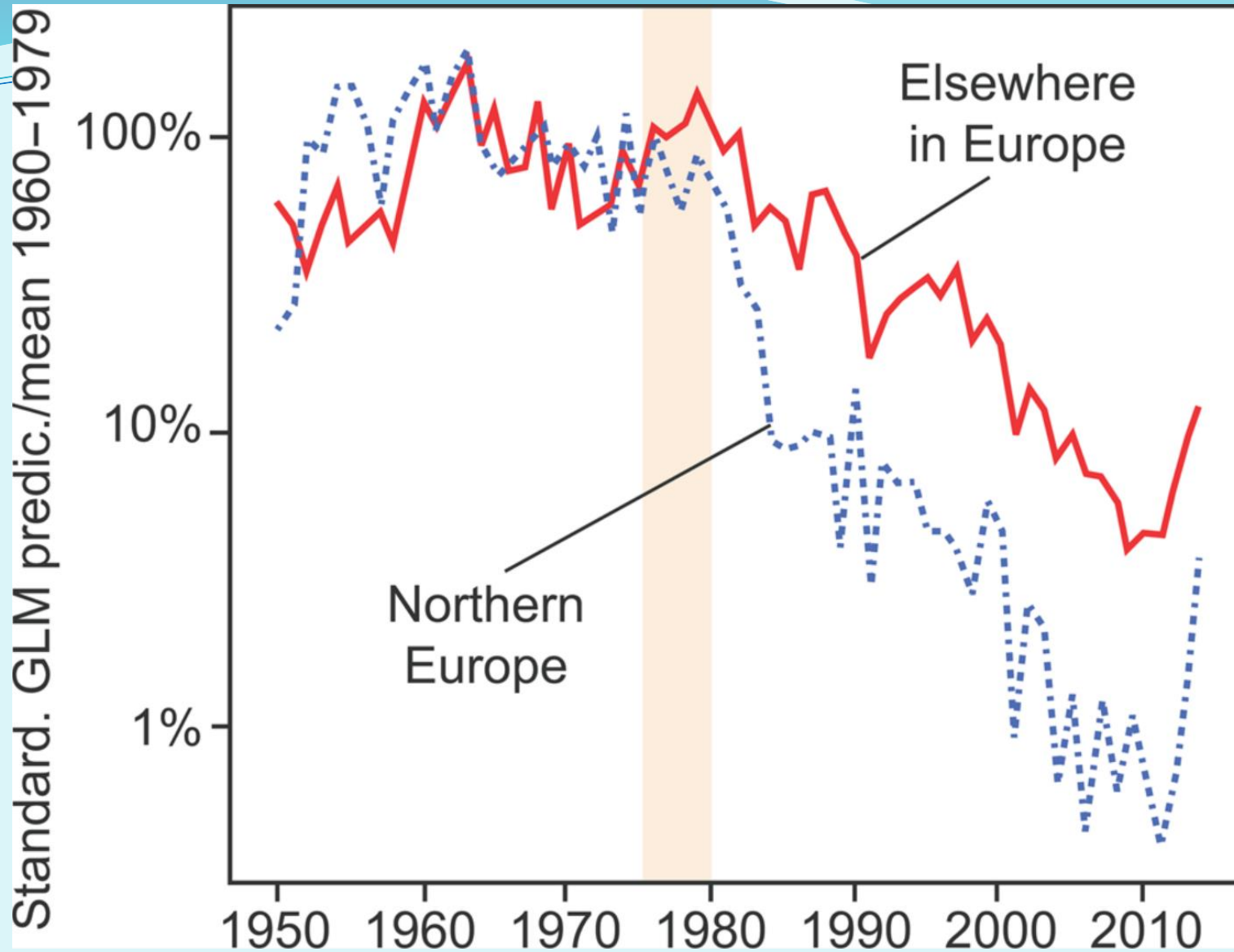
Climate change and Ocean Acidification

Underwater Noise

Deep sea mining ?

Underwater cables ?

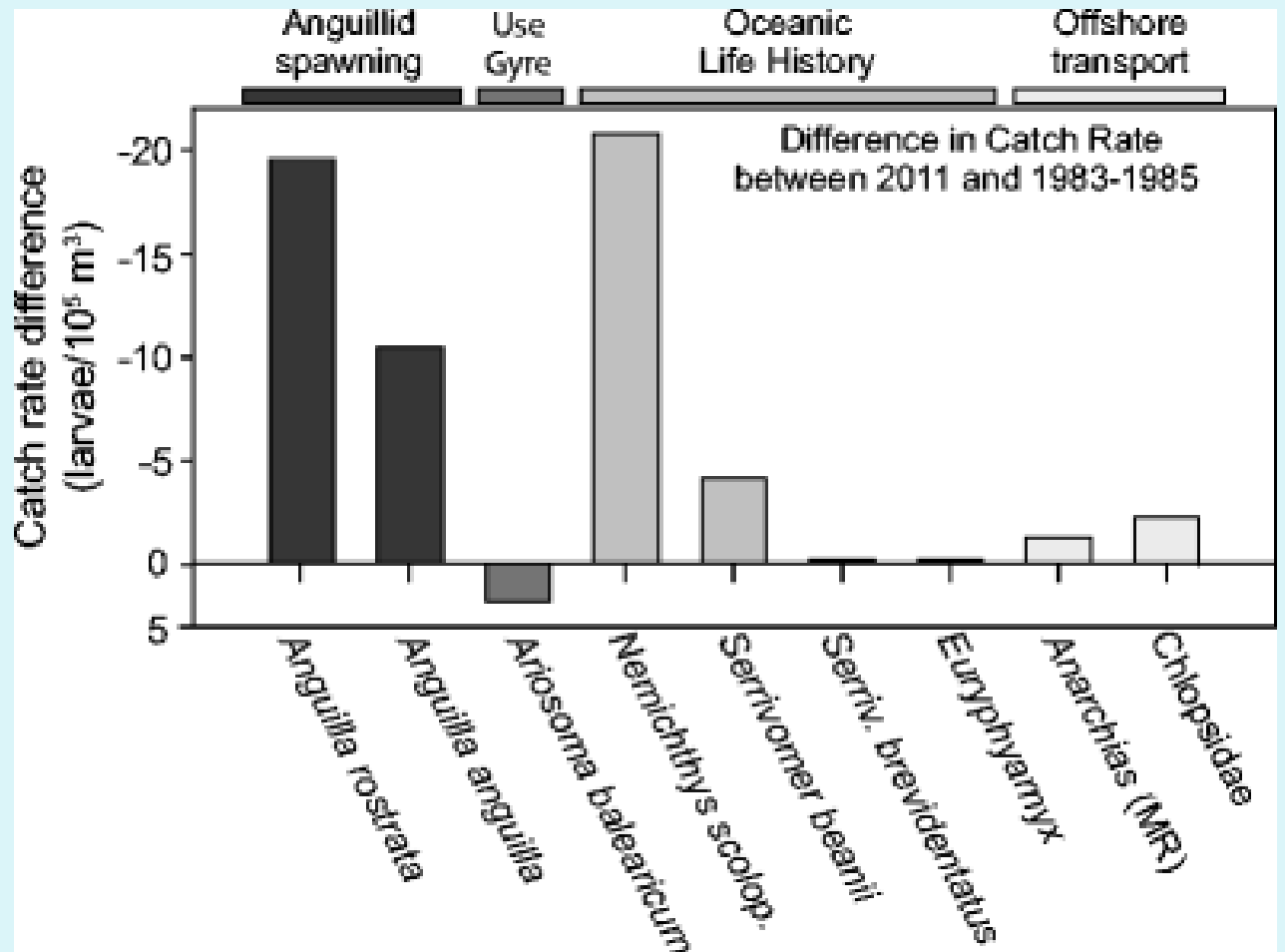
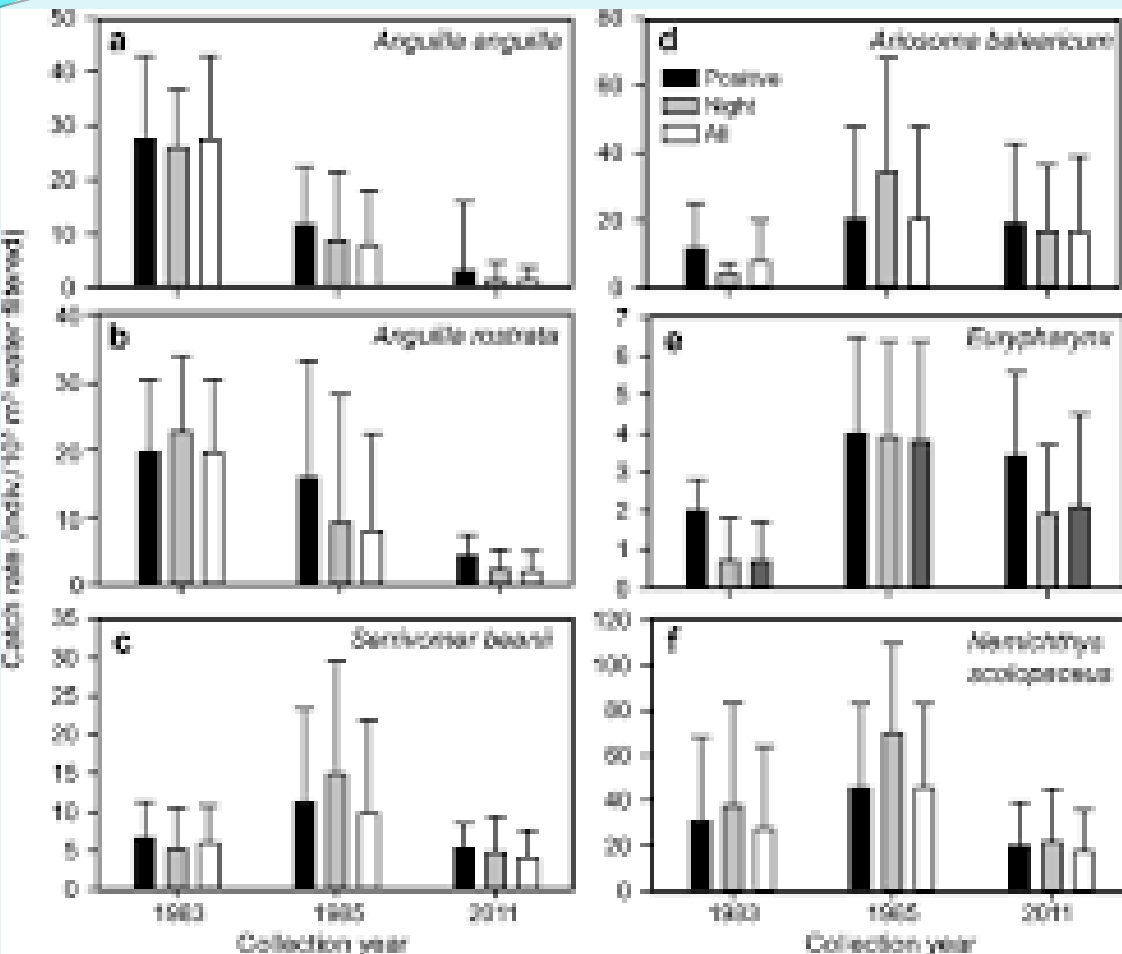




A.anguilla Changes in glass eel recruitment

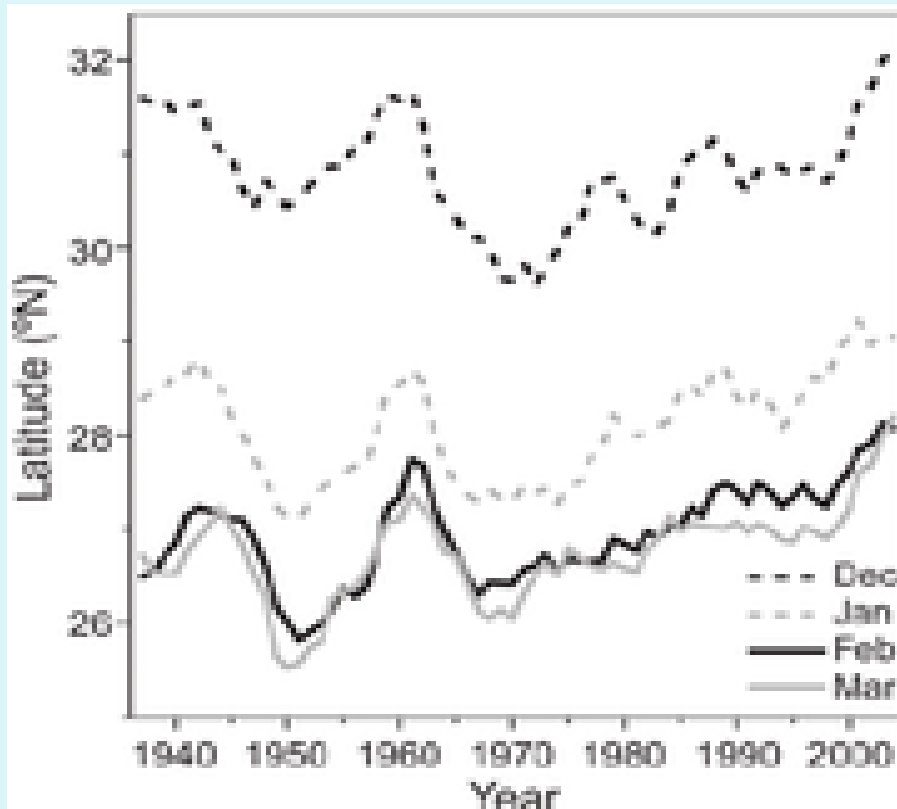
M.J.Miller et al 2016 ICES J Mar Sci 73(1) 43-56

Reduction in catches of eel larvae in Sargasso Sea

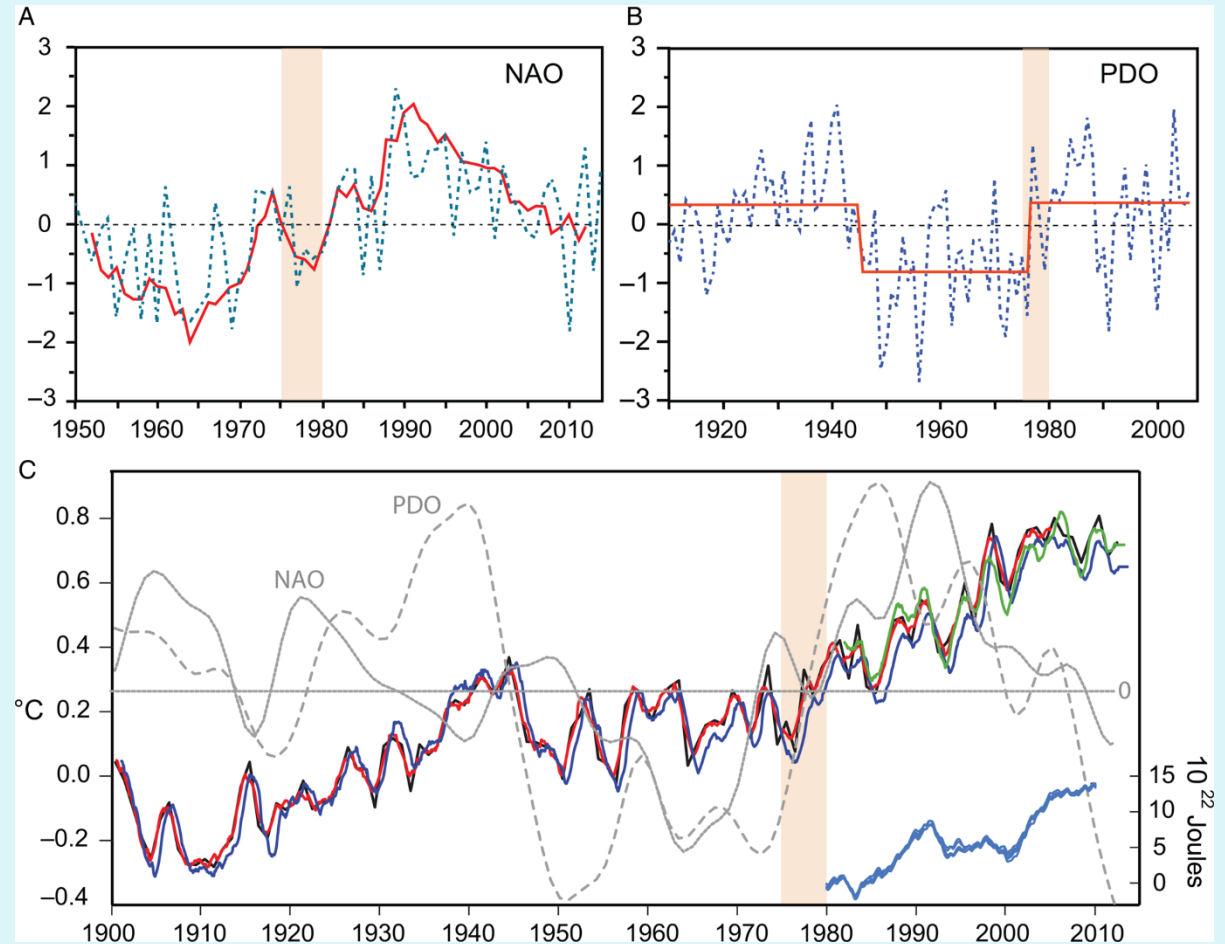


R.Hanel et al 2014 Naturwissenschaften101(12):1041-54

Changes in the Atmosphere and Ocean



Friedland et al 2007 ICES J Mar Sci 64(3);519-530



M.J.Miller et al 2016 ICES J Mar Sci 73(1):43-56

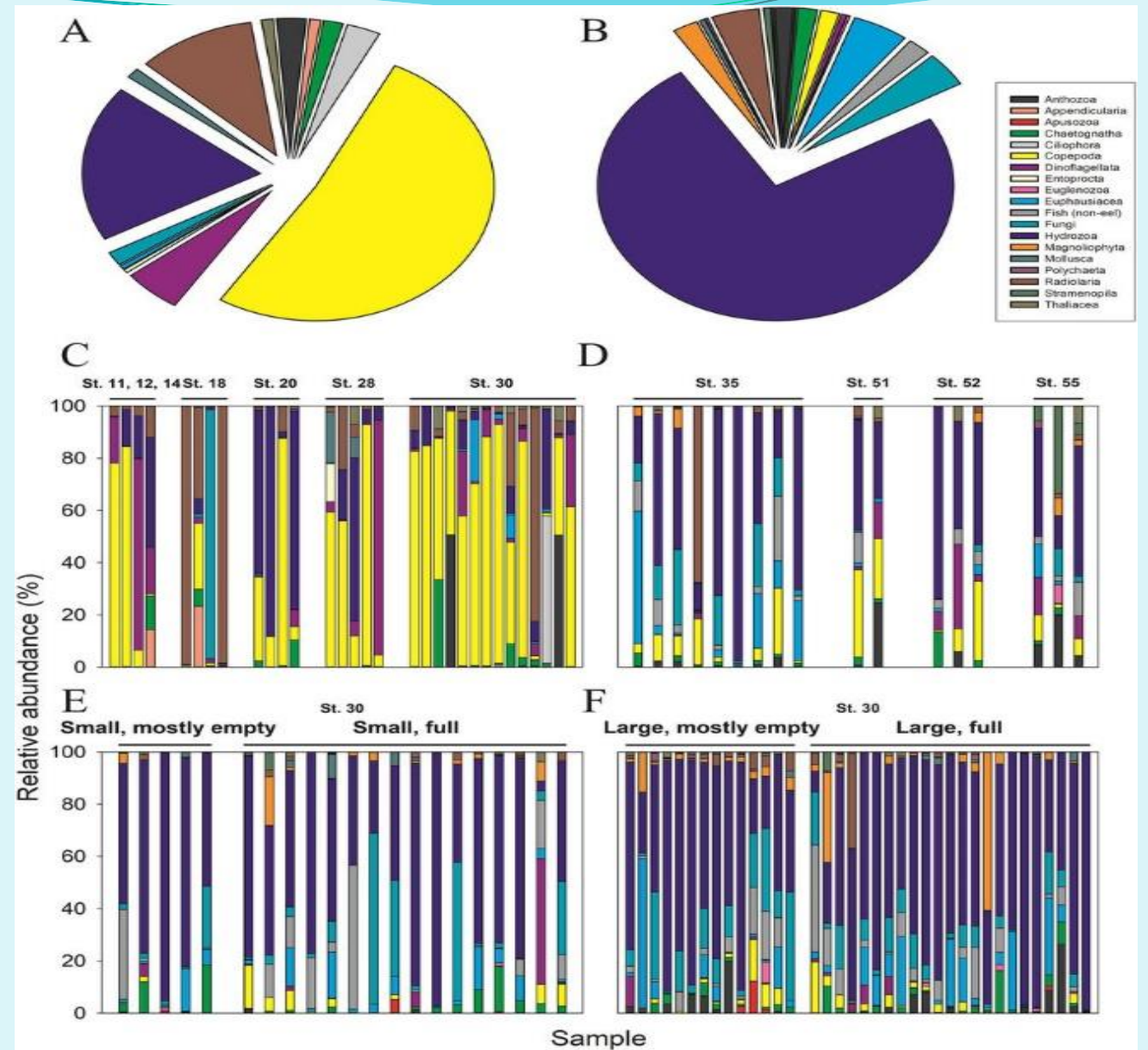
Food of Sargasso Sea *A. anguilla leptocephali* based upon RNA gene sequencing of marine snow and leptocephali gut contents.

A,B overall summation;

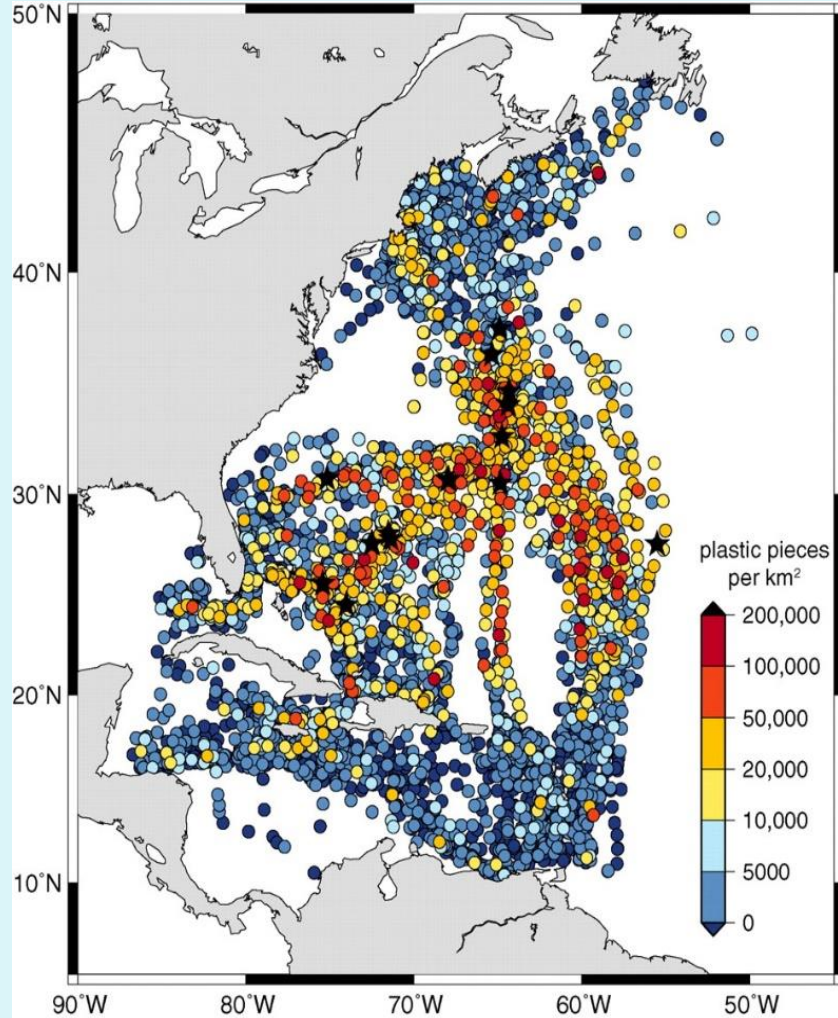
C individual marine snow particles(31);

D,E,F individual leptocephali gut samples(75)

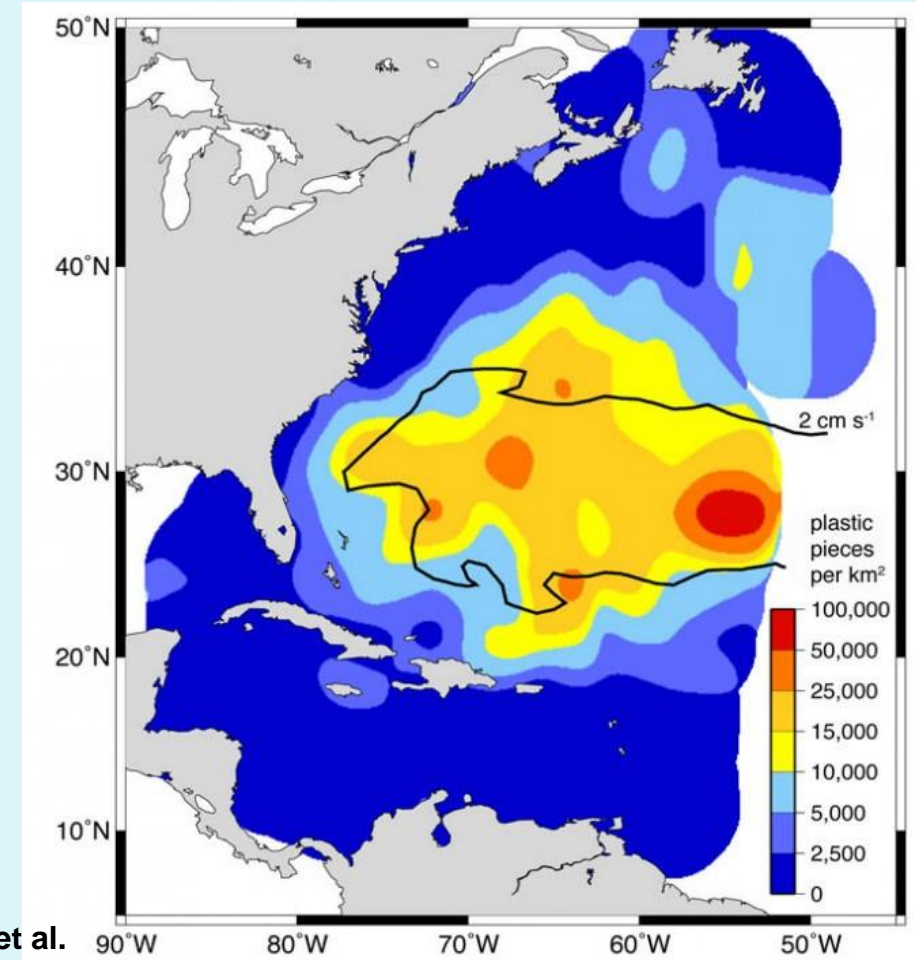
D.J.Ayala et al 2018 Sci Rep 8 (6156)



Distribution of plastic marine debris collected in 6136 surface plankton net tows on annually repeated cruise tracks from 1986 to 2008 in the western North Atlantic Ocean and Caribbean Sea.



Average plastic concentration (colour shading, units of pieces km⁻²) computed in 0.5° bins and smoothed with a 700km width Gaussian filter



Kara Lavender Law et al.
Science 2010;329:1185-1188

Science

AAAS

Conclusions

- Recent research has enhanced our understanding of the marine life of *A anguilla* but much still remains to be discovered.
- The Sargasso Sea is internationally recognised as an Ecologically and Biologically Significant Area
- It is overwhelmingly important as the sole spawning site for *A anguilla*
- Within the Sargasso Sea the seasonal Subtropical Convergence is particularly important for spawning, for development and for the potential return transport of *A anguilla* leptocephali
- Global warming and changes in ocean/atmosphere interactions have likely adversely impacted spawning and subsequent recruitment success of *A anguilla*.
- The Sargasso Sea is additionally threatened by a range of real and potential threats, which could in turn adversely impact *A anguilla*

What can we do in the marine sphere to promote spawning success and subsequent recruitment of *A. anguilla* ?

- Support international efforts to manage and conserve the open ocean in ABNJ; the Sargasso Sea is a specific example in this ongoing UN debate
- Promote international recognition for the seasonal importance of the Subtropical Convergence Zone in the Sargasso Sea
- Encourage restrictions on shipping and fishing activities in this zone between Autumn and Spring ?