Have jellyfish in the Irish Sea benefited from climate change and overfishing?

Chris Lynam, Martin Lilley,
Thomas Bastian, Tom Doyle,
Steven Beggs and Graeme Hays

Global Change Biology (2011) 17, 767–782,

Swansea University, Wales
University College Cork, Republic of Ireland
Agri-Food and Biosciences Institute, Northern Ireland

Cefas

15 August 2011 Last updated at 08:46

30 Share

Leatherback turtle sightings up in west and north Wales

Reported sightings of leatherback turtles are increasing off Wales, with the reptiles thought to be drawn by high numbers of jellyfish.

Three sightings have been reported in recent days, in Laugharne, Carmarthenshire, north Pembrokeshire and Anglesey.

Dr Peter Richardson, of the Marine Conservation Society (MCS), said Wales' waters were currently "turtle heaven".

The turtles nest in the Caribbean before travelling to UK waters to feed.

This leatherback turtle was spotted off Pembrokeshire in 2010

Dr Richardson said there had been high numbers of jellyfish - the food source of the leatherback - reported in the Irish Sea this year.

He added: "The waters around Wales are absolutely perfect at the moment for turtles - turtle heaven."

Related Stories

Hopes turtles will return to UK

Turtles' Atlantic journeys mapped


Image from newspaper: guardian.co.uk
Leatherback turtles migrate from the Caribbean to the Irish Sea. Photograph: O'Neill/Alamy

Jellyfish force Torness nuclear power station closure

30 June 2011 Last updated at 16:42

Both reactors at the Torness nuclear power station have been shut down after huge numbers of jellyfish were found in sea water entering the plant.

A clean-up operation is underway in East Lothian and it is understood it could be next week before the plant is up and running again.

The power station's operator has said the shutdown was a precautionary measure and there was never any

BBC NEWS

LIVE BBC NEWS CHANNEL

News Front Page
World
UK
England
Northern Ireland
N Ireland Politics
Scotland
Wales
Business
Politics
Health
Education
Science & Environment
Technology
Entertainment
Also in the news
Video and Audio

Last Updated: Wednesday, 21 November 2007, 20:57 GMT

E-mail this to a friend Printable version

Jellyfish attack destroys salmon

A jellyfish invasion has wiped out Northern Ireland's only salmon farm, killing more than 100,000 fish.

A Northern Salmon spokesman said last week's attack could cost more than £1m.

Billions of small jellyfish, known as Mauve Stingers, flooded into the cages about a mile into the Irish Sea, off Glenarm Bay and Cushendun.

Jellies - indicators of instability?

Gelatinous zooplankton species may

- increase in abundance rapidly
- in response to ecosystem change (degradation)
- and climate change

BUT

Gel zoo populations inherently display

- strong seasonality
- yearly fluctuations and
- multi-decadal cycles

Cefas

Irish Sea MIK-net survey for 0-group fish

Images from SE Beggs (AFBI)

Cefas

Typical catch with jellyfish

Images from SE Beggs (AFBI)

MIK-net survey
big catch with jellyfish

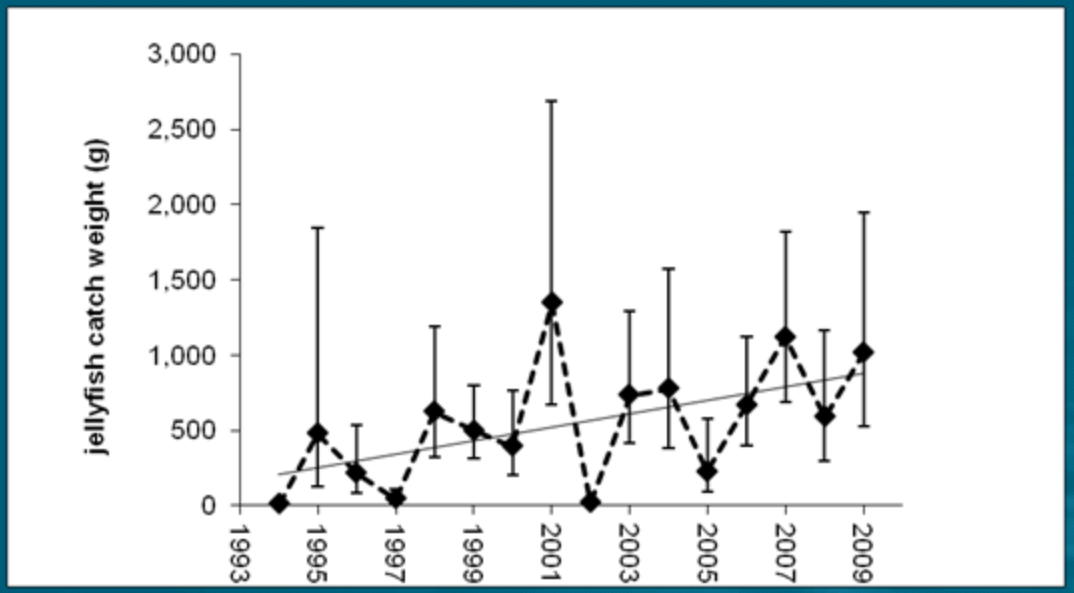
Images from SE Beggs (AFBI)

Cefas

Spatio-temporal variability

Catch per Standardised Haul (~4000 m^3 water filtered)

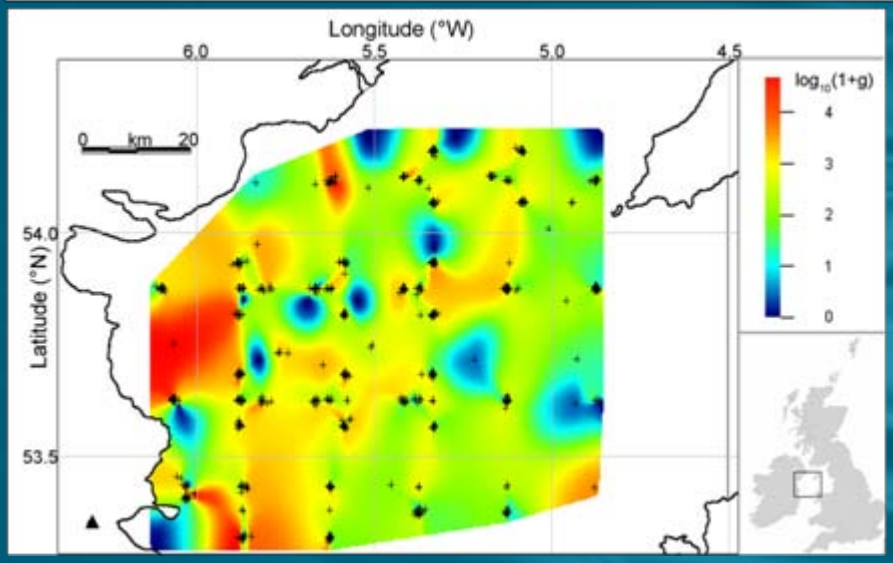
log-normal errors



Aurelia aurita
Cyanea sp
in MIK net samples

Western Irish Sea (left) selected from survey area

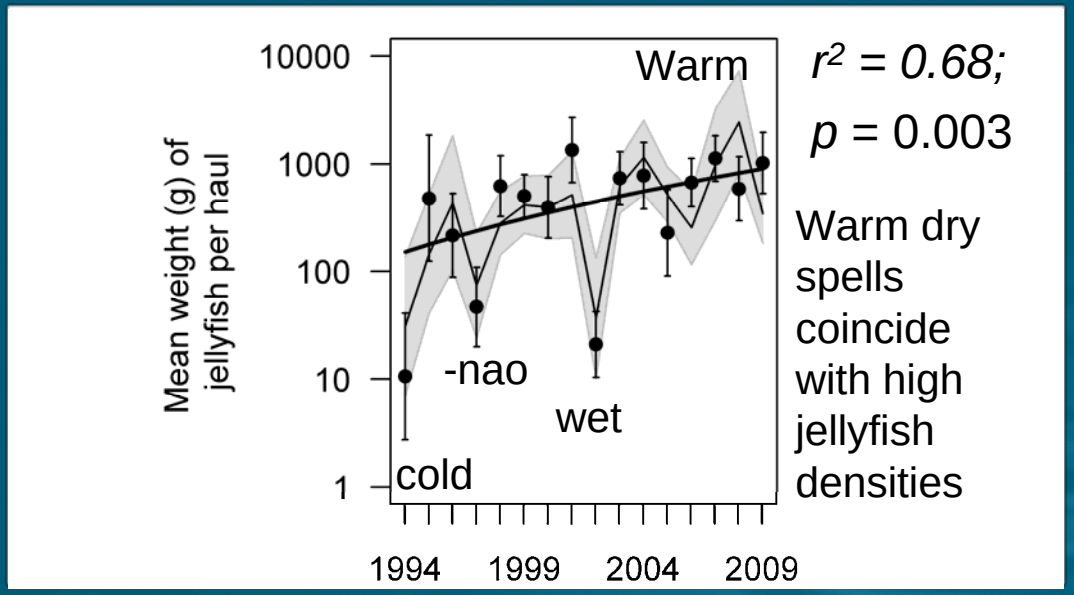
(important area for cod, haddock, sprats)



Cefas

Interannual variability in jellies

also CPR cnidarian frequency of occurrence



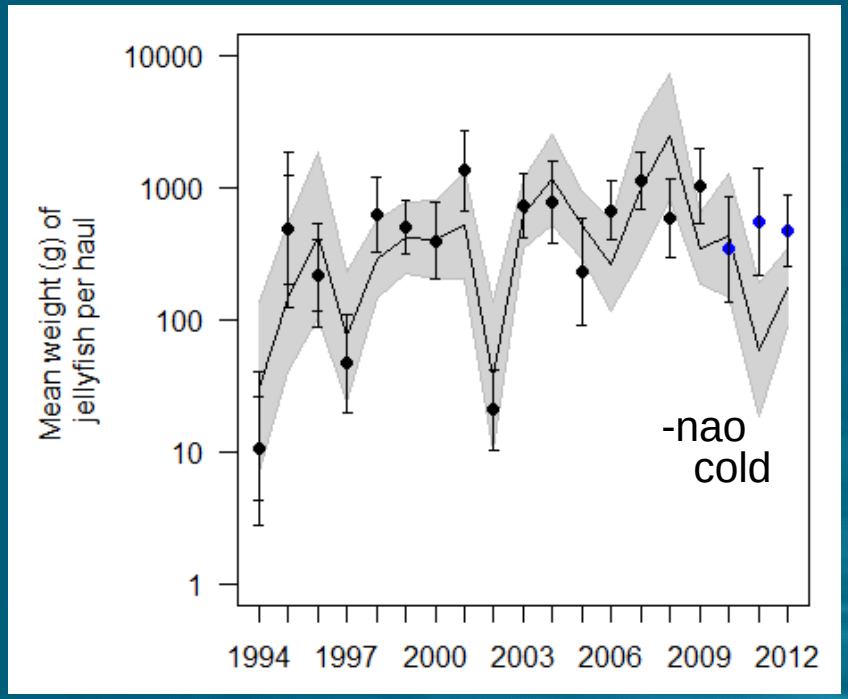
CPR includes
ctenophores
siphonophores
hydromedusae
scyphomedusae

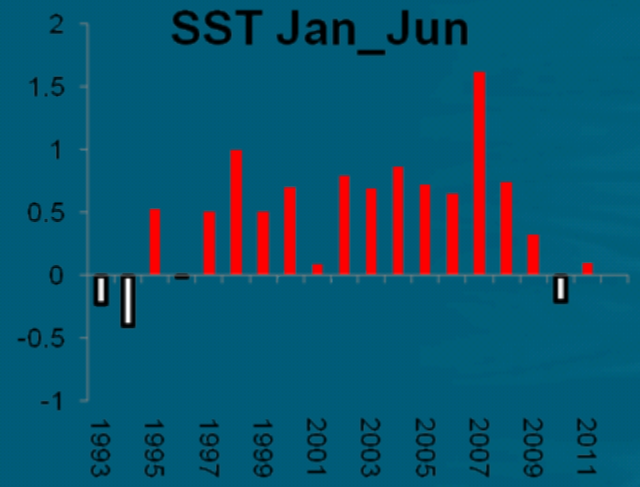
Correlative results (MIK data)	R	p_{ACF}	(also sig < 0.05)
Jelly catch vs SST (18mo)	+ 0.65	< 0.01	($SST_{jan-jun}$ ~ +NAO)
vs precipitation	- 0.57	< 0.05	
vs phyto index		ns	
vs zoo bio (1 yr lead)	+ 0.56	< 0.05	(zoo ~ –precip)
vs sprat biomass	- *0.55*	< *0.10*	(spr ~ +cod; spr ~ –zoo)
vs haddock SSB	+ 0.55	< 0.05	(haddock 1 yr lag ~ +SST)
vs cod SSB	- 0.68	< 0.01	(cod 0-group survival ~ –SST)

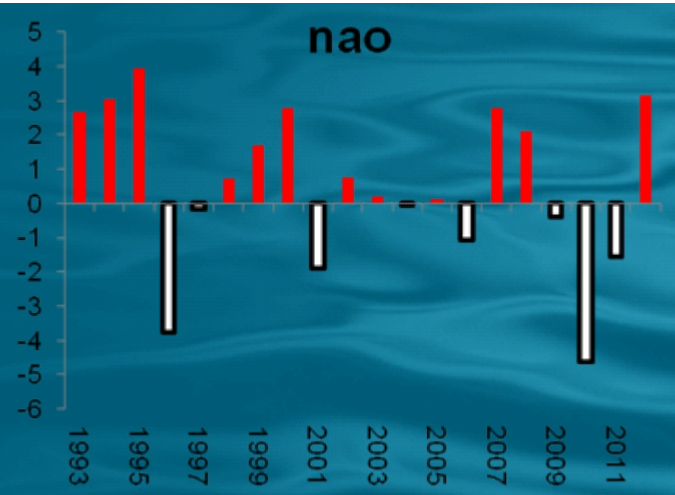
Cefas

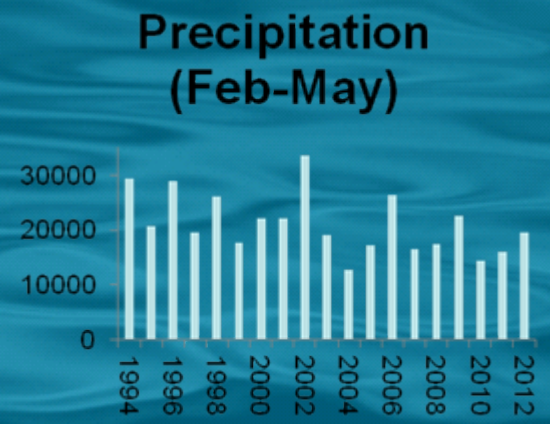
Increasing biomass of jellies 1994-2009 halted by extreme climatic events 2010-12

Climate model prediction…
based on NAO, SST, precipitation





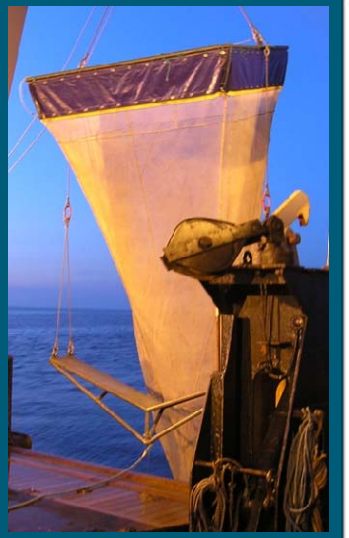


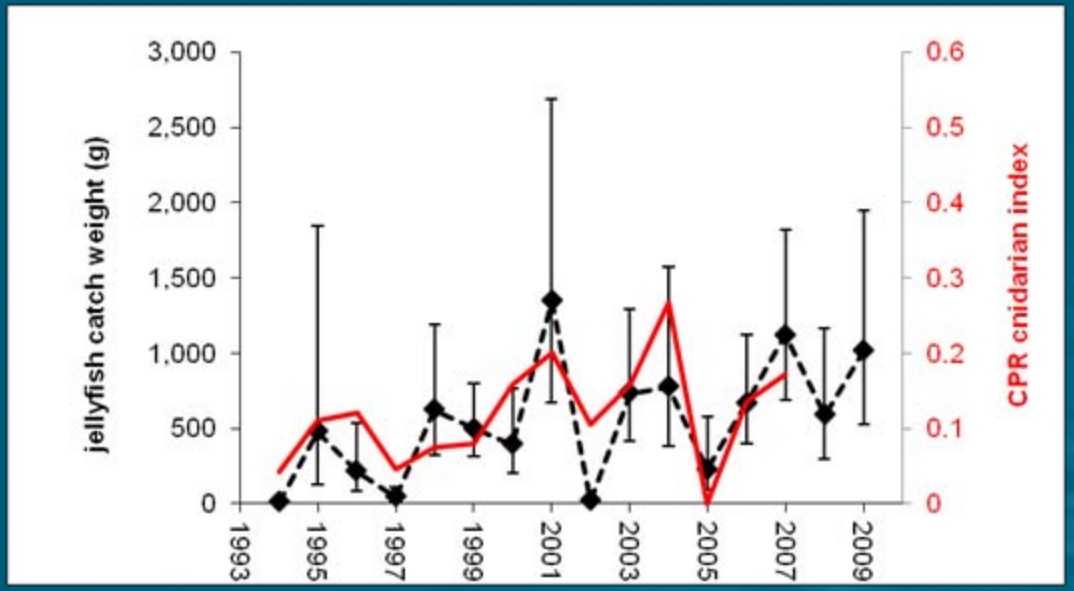


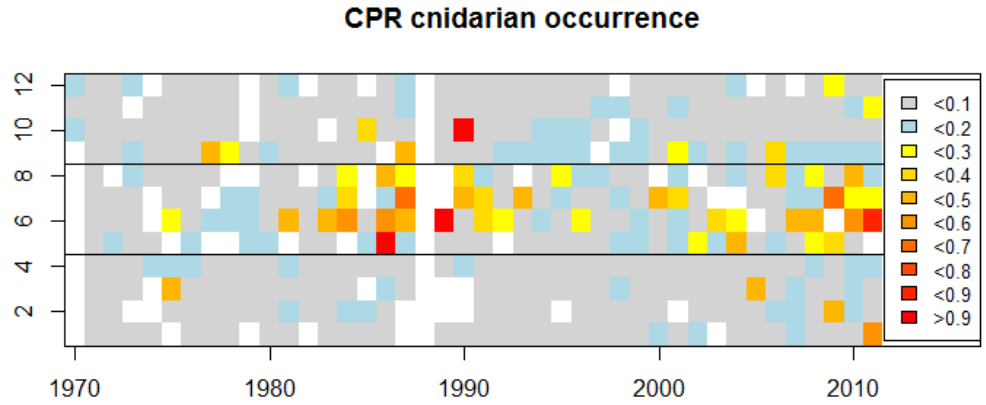
Cefas

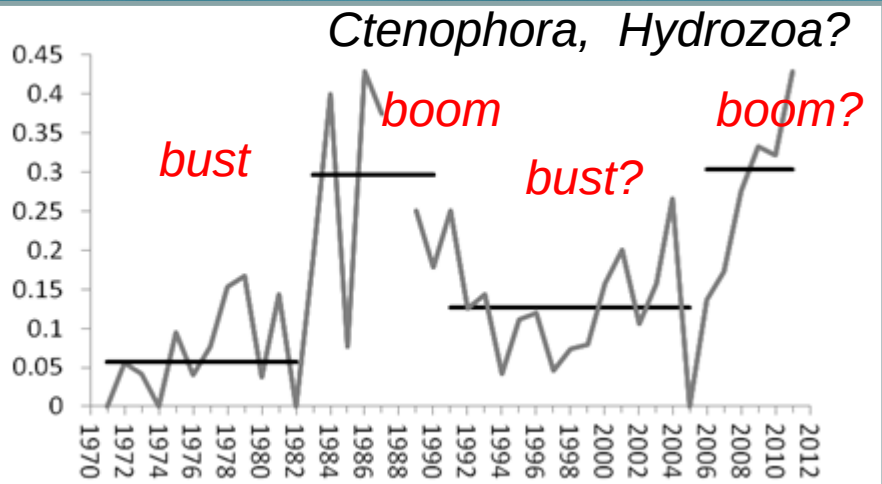
Interannual variability in gelzoo

Cnidarian frequency of occurrence index









1980s instability preceded rises in SST

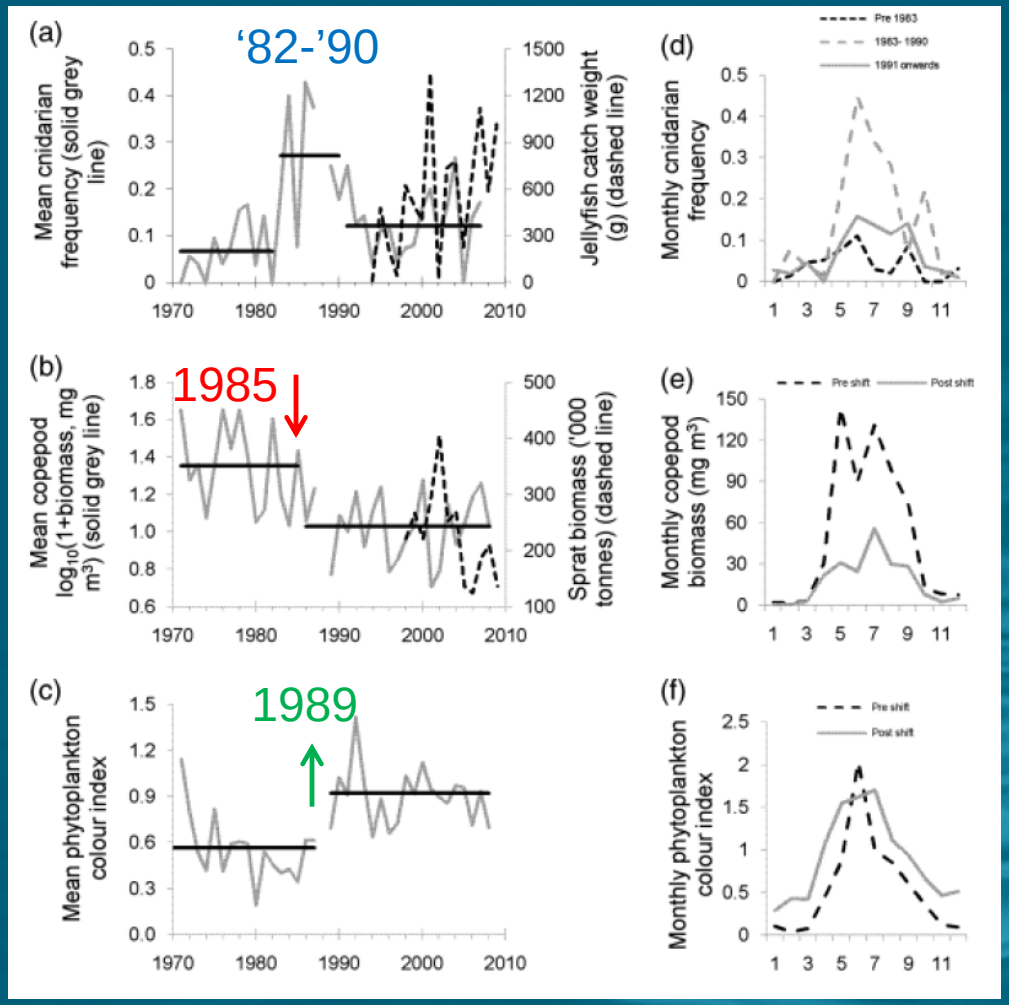
Cefas

Ecosystem wide change

Gelatinous zooplankton

Copepod biomass (*and sprat dotted line*)

Phytoplankton Colour index of standing stock '*greenness*'



Variable but dominated by summer during 1980s outbreaks

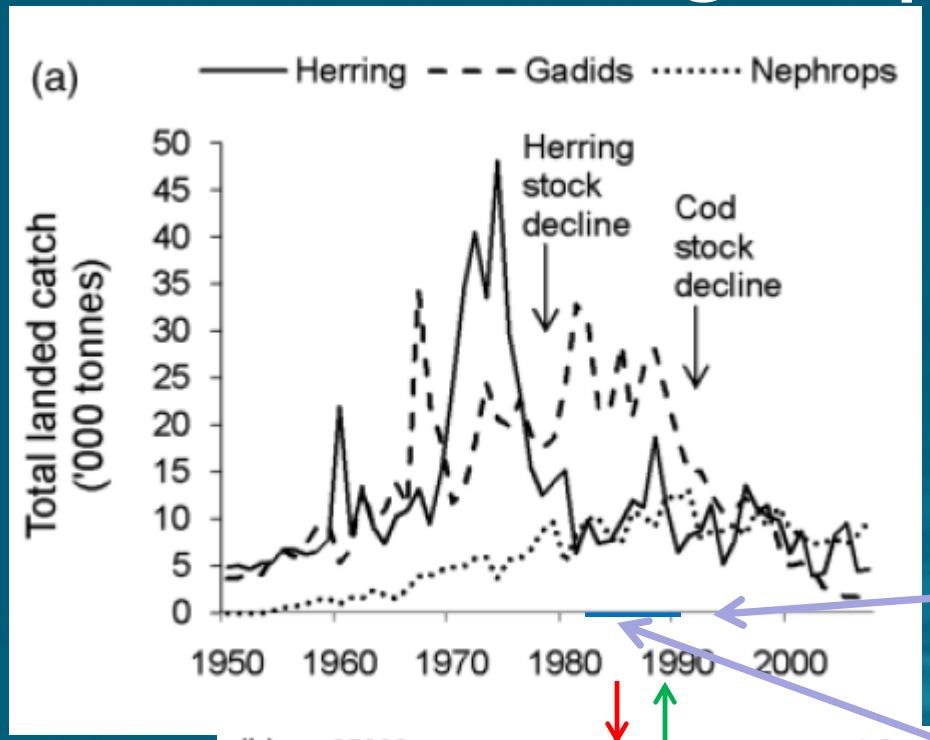
No seasonal shift in whole zooplankton community

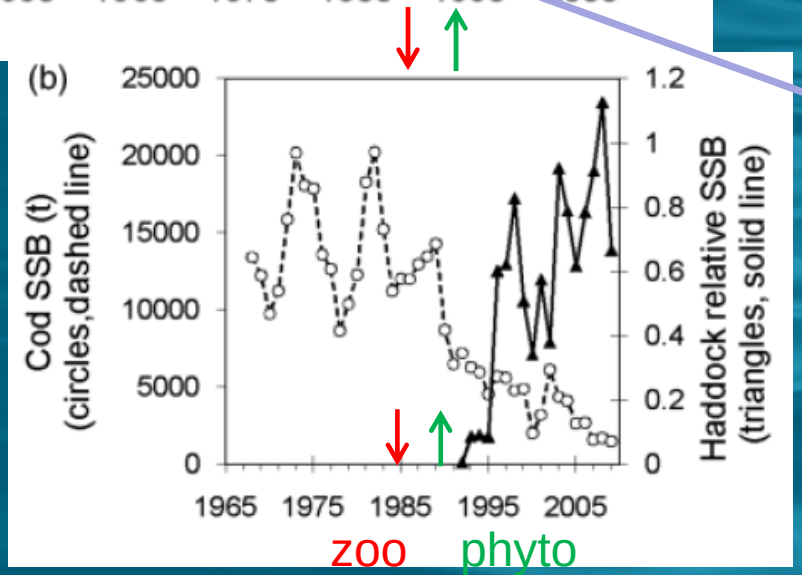
Broadening of the growing season since 1986?

1980s instability preceded rises in SST
Phyto, zoo 2010-2012?

Cefas

Coupled with fishing impacts…





Jellyfish medusae

MIK-net rise since 1994

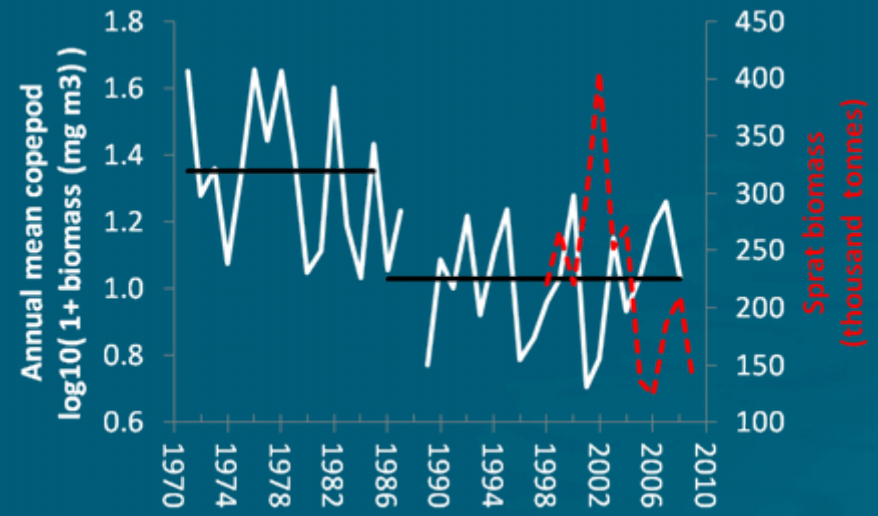
CPR occurrences '82-'90 gel zoo 'boom'

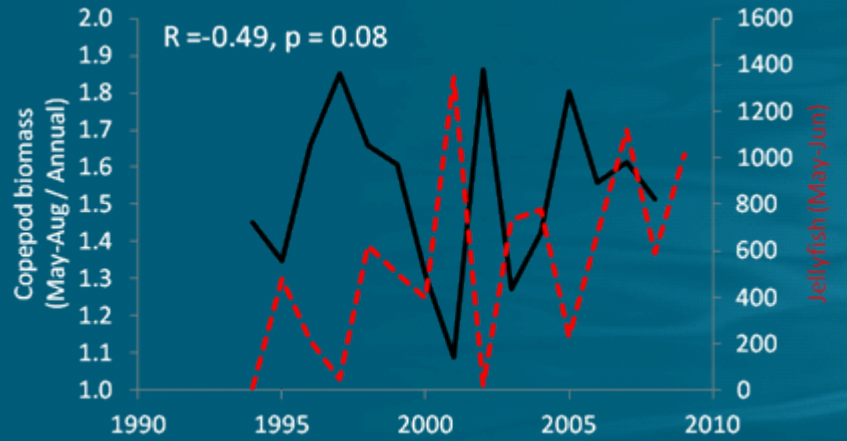
New ecosystem state?

Cefas

Predation on zooplankton (*low zoo yrs*)

***Top*. Annual copepod biomass grey line with step change and sprat biomass from acoustic survey dashed line**





***Bottom* Jellyfish catch (dashed line) and copepods (solid line) summer biomass relative to annual biomass**

sprat biomass correlates negatively with annual biomass of copepods (R = -0.67, p = 0.03, n = 10), **indicating top-down control** during low zoo regime

Weaker predation impact on copepod biomass by jellyfish during summer suggests potential **competition with planktivorous fish** (R = -0.49, p = 0.08, n = 14)

Copepod relative biomass in summer ~
I(scale(jelly) + scale(sprat))
R^2 = 0.40, p = 0.03
[*nb. sprat not sig effect if on own*]

Feedback loop - recall jelly vs zoo (lag1)
R = +0.56, p < 0.05

Summary - ecosystem change

1960-1970s. Cold, low phyto index, high biomass zoo

high herring / plaice / sole / cod

overexploitation of planktivorous fish ↓ herring

1980s. *Instability* – outbreaks gel.zoo, plankton changes

overexploitation of gadoids and flatfish

↓ cod, whiting, plaice and sole

1990s. Warm, low biomass zoo, high phyto index

↑ sprat / jellyfish / haddock

2000s. Reductions in fishing pressure. ↑ plaice and ↓ sprat

2010s. ↑ plaice and herring

2010-12 Cold, wet, low nao ↓ medusae

But CPR index ↑ Ctenophora?

Cefas

Thanks for listening!

Any questions?

Ecojel meeting, Cork, Rep of Ireland 2008

www.jellyfish.ie