Scyphozoan jellyfish trends during 1992-2010 at Flødevigen, Southern Norway

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Jellyfish increase

• Problems several places
  – Fisheries, tourism, industry
• Anthropogenic causes
  – Overfishing, eutrophication, lower visibility and $O_2$, introduced species, climate change, artificial constructions etc.
• BUT: Few time series
Explanatory variables (monthly)

- Temperature at 20 m
- Salinity at 20 m
- Zooplankton DW 0-50 m (1994 →)

→ Deseasonalised & detrended
Explanatory variables (monthly)

- Temperature at 20 m
- Salinity at 20 m
- Zooplankton DW 0-50 m (1994 →)

\[ P < 0.001 \]
\[ r^2 = 0.11 \]

\[ P = 0.02 \]
\[ r^2 = 0.03 \]

→ Deseasonalised & detrended
Aurelia aurita and Cyanea spp.
Daily observations

Aurelia aurita

Cyanea spp.

1993  1995  1997  1999  2001  2003  2005  2007  2009
Aurelia

A. aurita

Cyanea

Cyanea spp.

Modified from Gröndahl 1988
Cyanea spp.

First observation
Span
Last observation

• % positive observations within span
• Average positive observation

positive Aurelia observations
p (Spearman):
0.05 - 0.01
0.01 - 0.001
< 0.001
Index of annual abundance

span * % pos. obs. * average pos. obs.

Aurelia

Cyanea

\[ r^2 = 0.49 \]
\[ p = 0.002 \]
Jellyfish life cycle

Asexual reproduction

POLYP

Strobilation

PLANULA LARVAE

Sexual reproduction

EPHYRAE

MEDUSA
Seasonal development of polyps

Modified from Gröndahl 1988

Set seasonality – varies between populations
Abundance index vs. T anomaly crosscorrelations

Max. -0.26 at lag 5

Max. 0.29 at lag 7
T effect: preceding 12 months

Aurelia index (detrended)

Temperature anomaly (deseasonalised & -trended)
T effect: preceeding 12 months

Temperature anomaly (deseasonalised & -trended)
Other considerations

• T – or something else?
• Interactions between *Cyanea* and *Aurelia*
• Local production vs. transport from further away (e.g. southern North Sea)?
• 2 species of *Cyanea*
• Competition/predation by *Mnemiopsis leidyi*?
Conclusions

• Early *Cyanea* observations indicate an abundant *Cyanea* year to come

• *Aurelia* abundances exhibit a decreasing trend

• T anomalies during the 12 months preceding the annual abundance max correlate negatively with *Aurelia* and positively with *Cyanea* abundance.
  – Conditions experienced during the polyp stage may be of importance.
To be continued...