POPULATION DYNAMICS AND PREDATION IMPACT OF THE INTRODUCED CTENOPHORE *MNEMIOPSIS LEIDYI* IN THE GULLMARS FJORD, WEST COAST OF SWEDEN

Lene Friis Møller & Peter Tiselius
Dep. Of Marine Ecology – Kristineberg
University of Gothenburg
The Gullmar Fjord

- Always stratified
- Well-documented
- Rich and diverse fauna

Kristineberg
Also many jellies

**Cnidarians**

Aurelia aurita  
Cyanea capillata

Many hydromedusae

**Ctenophores**

Pleurobrachia pileus  
Bolinopsis infundibulum

Beroe cucumis  
Beroe gracilis

What is dominating has now changed....
Mnemiopsis leidyi
- invasive ctenophore

Native species along the American East Coast

Invaded northern Europe in 2005/2006

Eats zooplankton (and fish eggs)

High reproduction

Most famous for its invasion into the Black Sea in the 80’s
Given the rapid growth and high reproductive output of the *Mnemiopsis*, severe effects on its prey populations may be expected.

It is impossible to predict the outcome of the introduction into Swedish waters based on observations from other areas – both potential prey and predators differ.

It is therefore necessary to investigate the development and impact of *Mnemiopsis* locally.
In the current project we study the development of the *Mnemiopsis* population in the Gullmar fjord by regular sampling from March 2007 to present (for long periods every week)

(+ zooplankton, chl a, primary production, CTD)
Biomass (g wet weight m\(^{-3}\))

Mnemiopsis biomass

- 2007
- 2008
- 2009
Lobate at ca. 3-4 mm
- factor 1.4 between total and oral-aboral length

Rapoza et al. 2005
Abundances (ind m\(^{-3}\)) in 2008

From 450 µm net (ind. larger than 4mm)
Size-range
- lobates

Lengths measured as oral-aboral

Length, mm
2008 - abundance of larvae (ind m\(^{-3}\))

From 90 um net: ca. 0.4-1 mm
From 450 um net: ca. 1 - 3 mm
The potential predation impact of *Mnemiopsis* has been estimated by multiplying abundances with specific feeding rates measurements to obtain % removal of zooplankton per day.

Feeding rates have been obtained from both controlled laboratory experiments with different prey species and from gut content analysis on individuals from the fjord. Granhag et al. (in press), Møller & Tiselius (in prep.)

Here representative rates have been used.

Predation impact is minimum values since averages for 20 m is used – and larvae have been excluded – for now…
2008

Predation impact (% removal per day)

Zooplankton abund.
(ind m\(^{-3}\))
2009

Zooplankton concentration

![Graph showing zooplankton concentration over time in 2009. The x-axis represents dates from 26-Jun-09 to 23-Dec-09, and the y-axis represents zooplankton concentration in Ind. m-3. The graph includes data points for copepods, copepod nauplii, and cladocerans.]
A severe reduction in zooplankton is observed – potentially caused by *Mnemiopsis*

Zooplankton fluctuations are of course also affected by other parameters

However it deserves further investigations!

1) Continue analyze data already obtained
2) Apply *Mnemiopsis* carbon budgets
3) Analyze microzooplankton samples
4) Continue monitoring!!
The monitoring was continued during 2010 and is still ongoing

Many additional intensive investigations during 2010

Still much to analyze e.g. all zooplankton

However *Mnemiopsis* came later (beginning of September) -probably due to a very long and cold winter
Back in 2007 we asked our selves:

Would *Mnemiopsis* become a problem at the West Coast?

Most concern was regarding the Baltic because of eutrophication, the cod, the simple and sensitive food web and no potential *Mnemiopsis* enemies.

On the West Coast there are several potential enemies:

e.g. the jellyfish *Cyanea capillata*

and the ctenophores *Beroe gracilis* and *Beroe cucumis*
Parasites

*Edwardsiella sp. (sea anemone)*

Erik Selander, Lene Friis Møller, Per Sundberg, Peter Tiselius
(Biol Inv 2010)
By use of models, experiments and field studies, BAZOOCA will quantify ecosystem consequences of the occurrence of the comb jelly *Mnemiopsis leidyi* in the pelagic food web – from microbes to gelatinous top predators in the Baltic Sea.
Process cruise October 2009

R/V Skagerak – University of Gothenburg
Process cruise, 12-23 Oct 2009
Process cruise, 12-23 Oct 2009
Highest abundances of *Mnemiopsis* are found on the West coast.

However lots of *Aurelia aurita* in the Baltic.

What is interesting is the total impact of jellies on the ecosystem.
S2-7150
(Presenters: Lene Friis Møller/ Aino Hosia)
*Mnemiopsis* vs. *Aurelia*: The role of gelatinous top predators in the northern Baltic Sea food web

GP-7157 Matilda Haraldsson, Cornelia Jaspers, Josefin Titelman, Dag L. Aksnes and Peter Tiselius
A place for *Mnemiopsis*: Spatio-temporal habitat characterization in Scandinavian waters
Jelly community has changed in the Gullmar Fjord

*Aurelia aurita* used to dominate during summer – in 2010 there was none

How it used to be like……

*Cyanea capillata*  

*Aurelia aurita*

\[\begin{array}{ccccc}
J & F & M & A & M \\
\hline
J & J & A & S & O & N & D
\end{array}\]
To find out what is going on with the jellyfish and in turn the effect on the rest of the ecosystem more monitoring is needed!!
Acknowledgement:

Baltic Organisations Network for funding Science EEIG, BONUS & The Swedish Research Council FORMAS

All photos of Mnemiopsis and parasites by Erik Selander