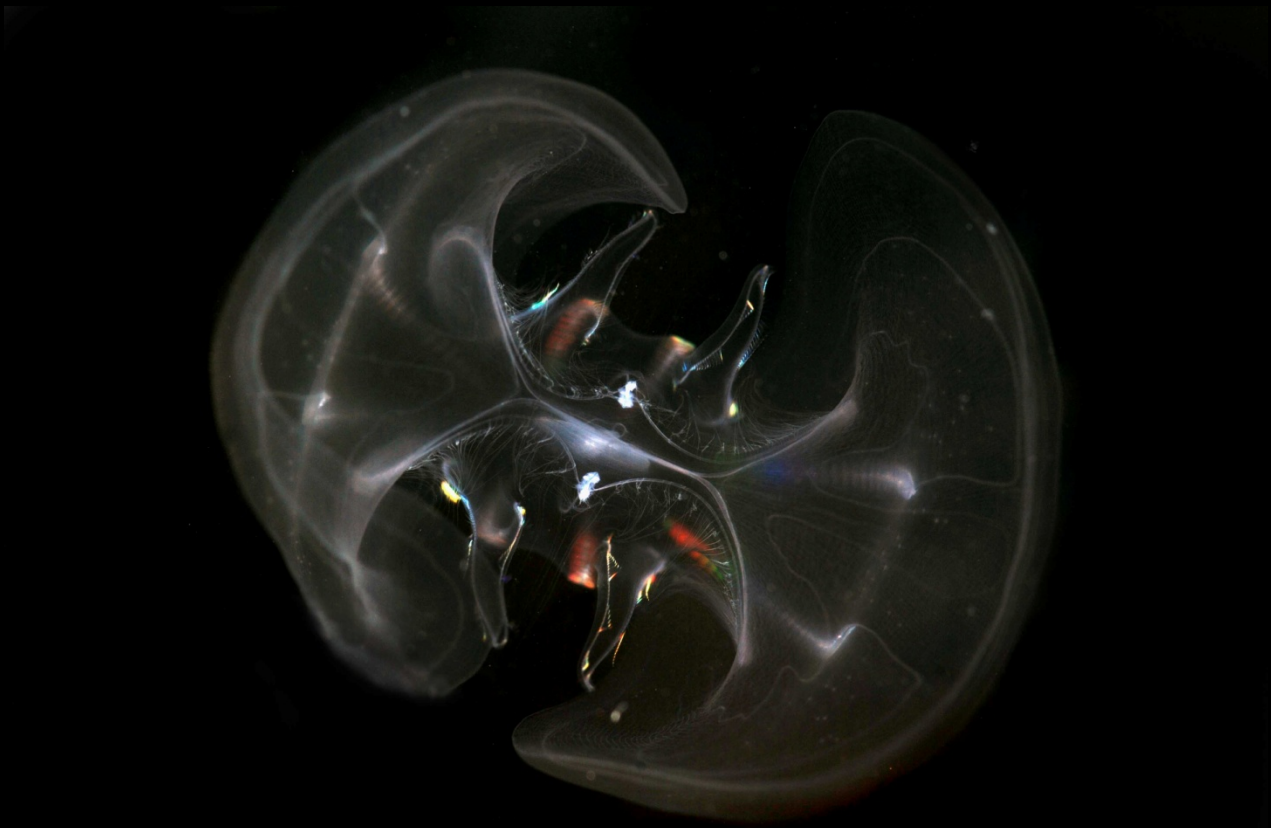
POPULATION DYNAMICS AND PREDATION IMPACT OF THE INTRODUCED CTENOPHORE *MNEMIOPSIS LEIDYI* IN THE GULLMARS FJORD, WEST COAST OF SWEDEN



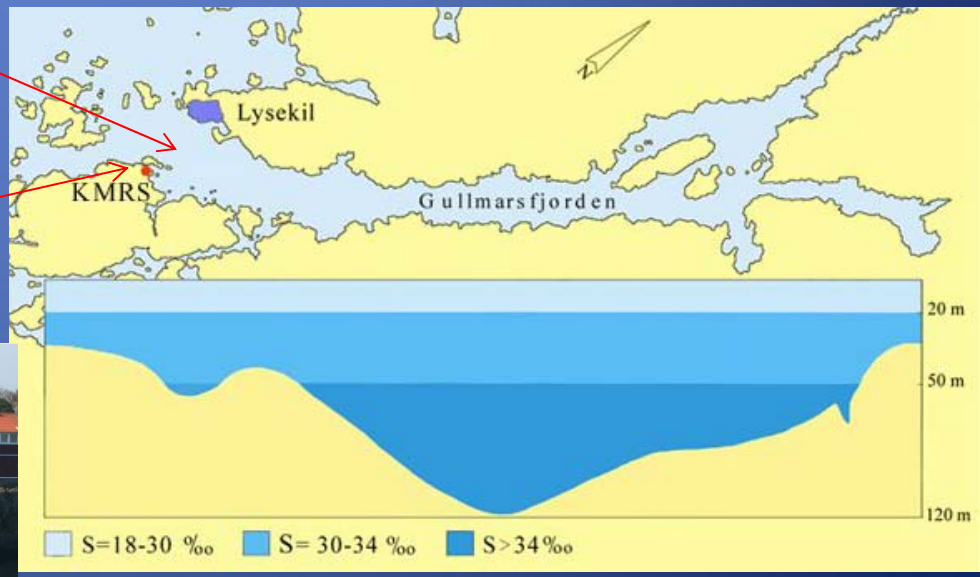
Lene Friis Møller & Peter Tiselius
Dep. Of Marine Ecology – Kristineberg
University of Gothenburg

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

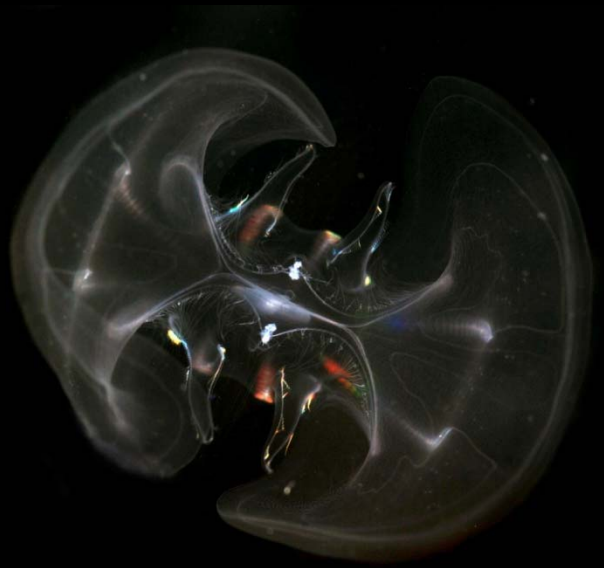
Beroe gracilis

What is dominating has now changed....

Mnemiopsis leidyi

- invasive ctenophore

Native species along the American East Coast



Eats zooplankton (and fish eggs)

Invaded northern Europe in 2005/2006

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

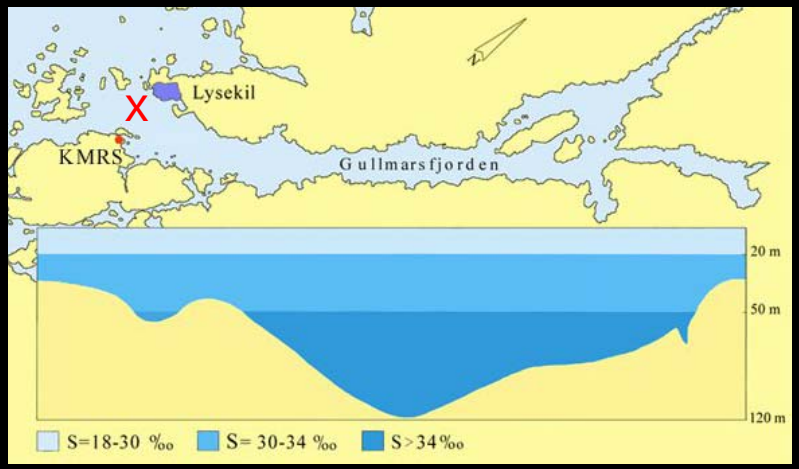
It is impossible to predict the outcome of the introduction into Swedish waters based on observations from other areas – both potential prey and predators differ

It is therefore necessary to investigate the development and impact of *Mnemiopsis* locally

Mnemiopsis studies in the Gullmar Fjord

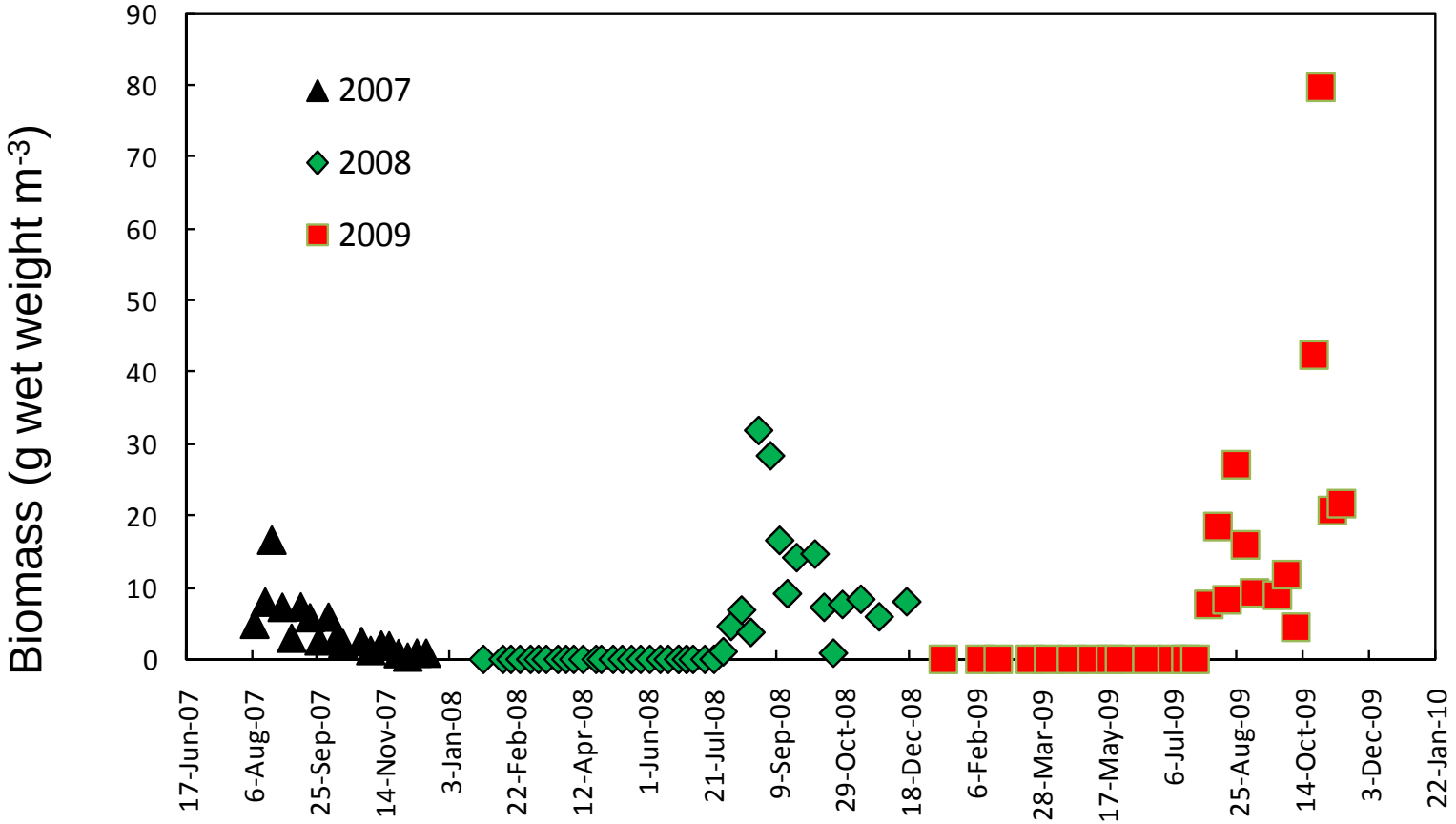
In the current project we study the development of the *Mnemiopsis* population in the Gullmar fjord by regular sampling from March 2007 to present (for long periods every week)

(+ zooplankton, chl a, primary production, CTD)

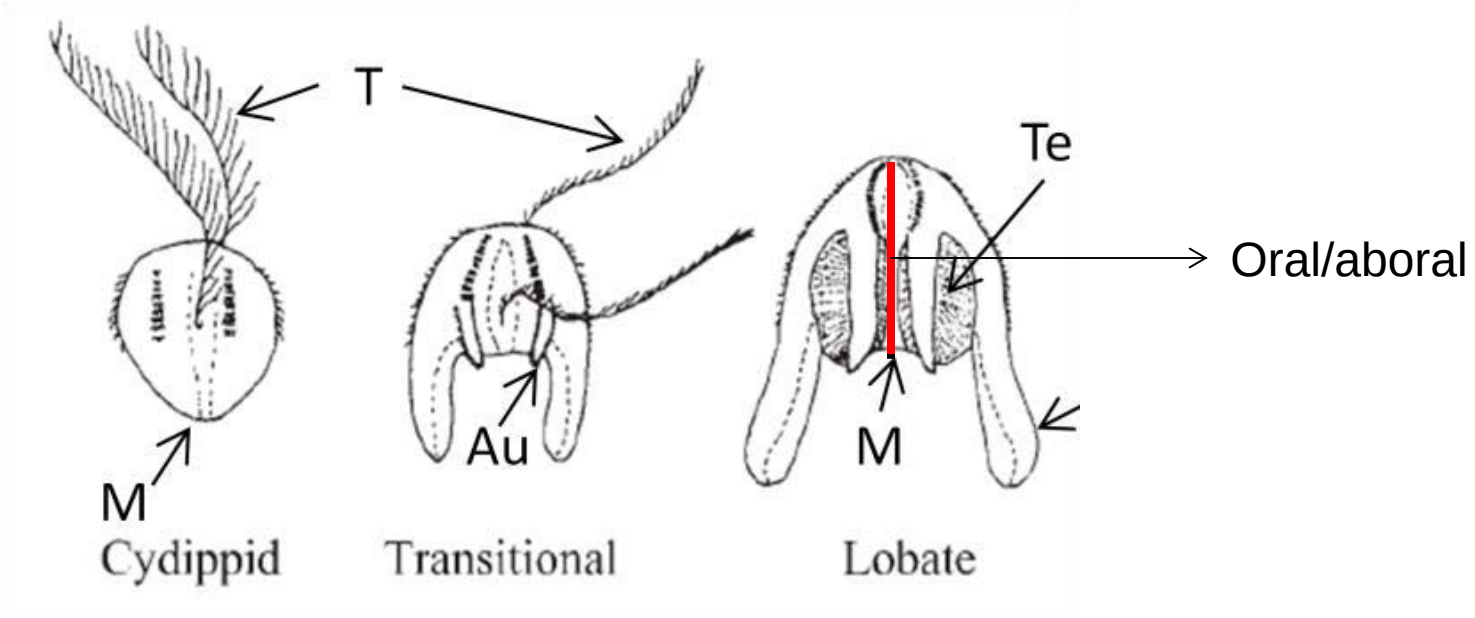


2007-2009

Mnemiopsis biomass



Development



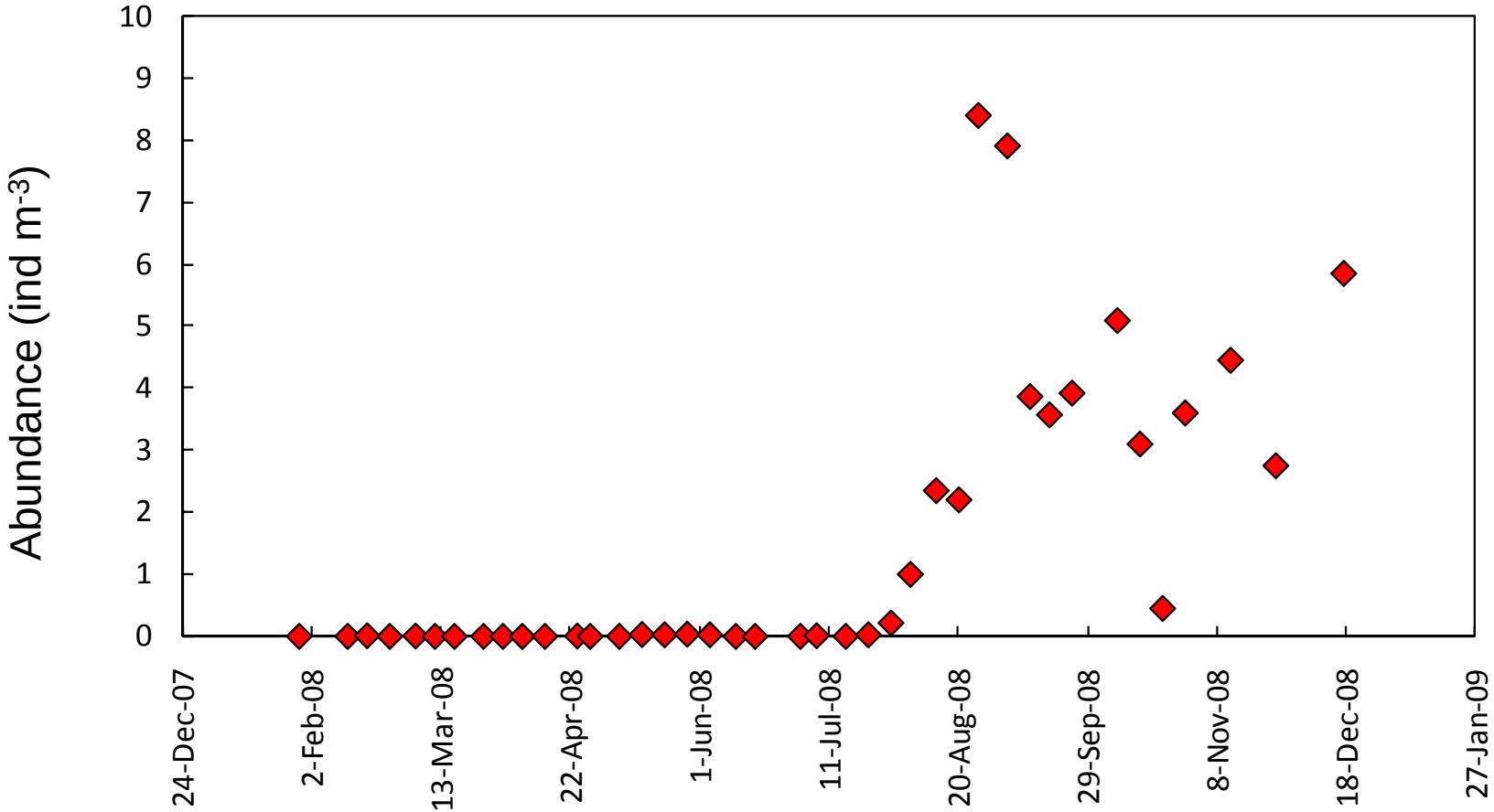
Rapoza et al. 2005

Lobate at ca. 3-4 mm

- factor 1.4 between total and oral-aboral length

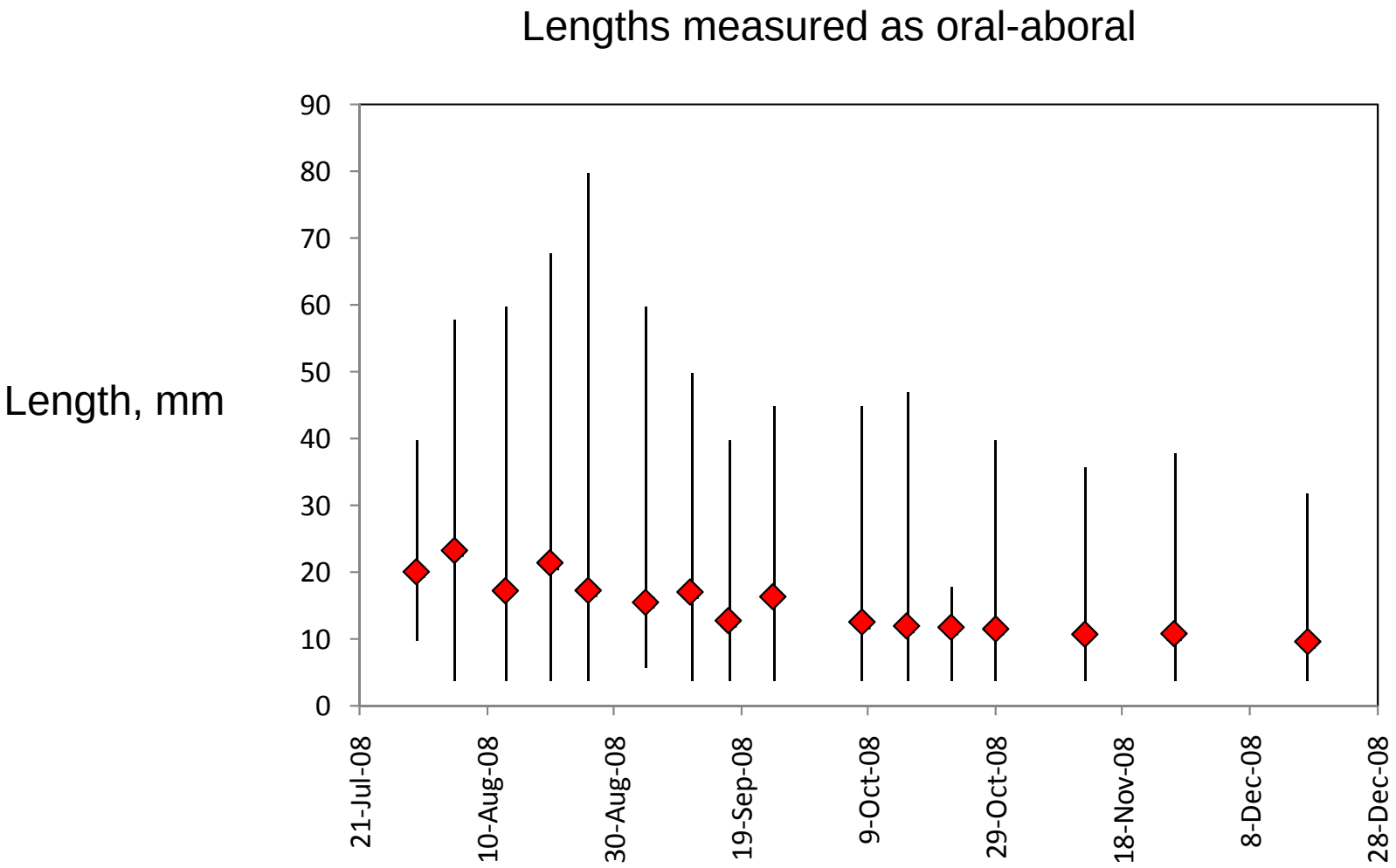
Abundances (ind m^{-3}) in 2008

From 450 µm net (ind. larger than 4mm)



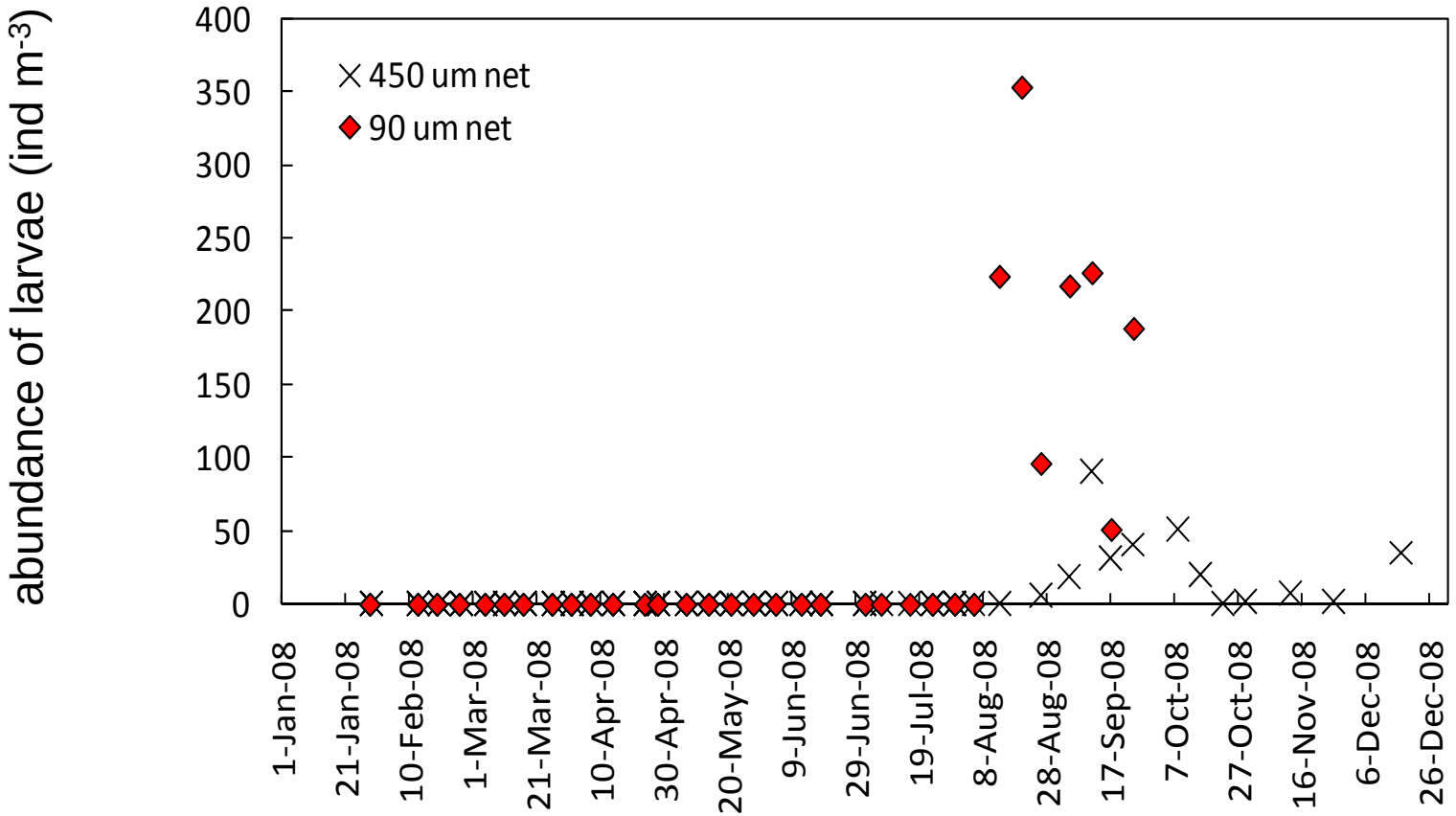
Size-range

- lobates



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.)

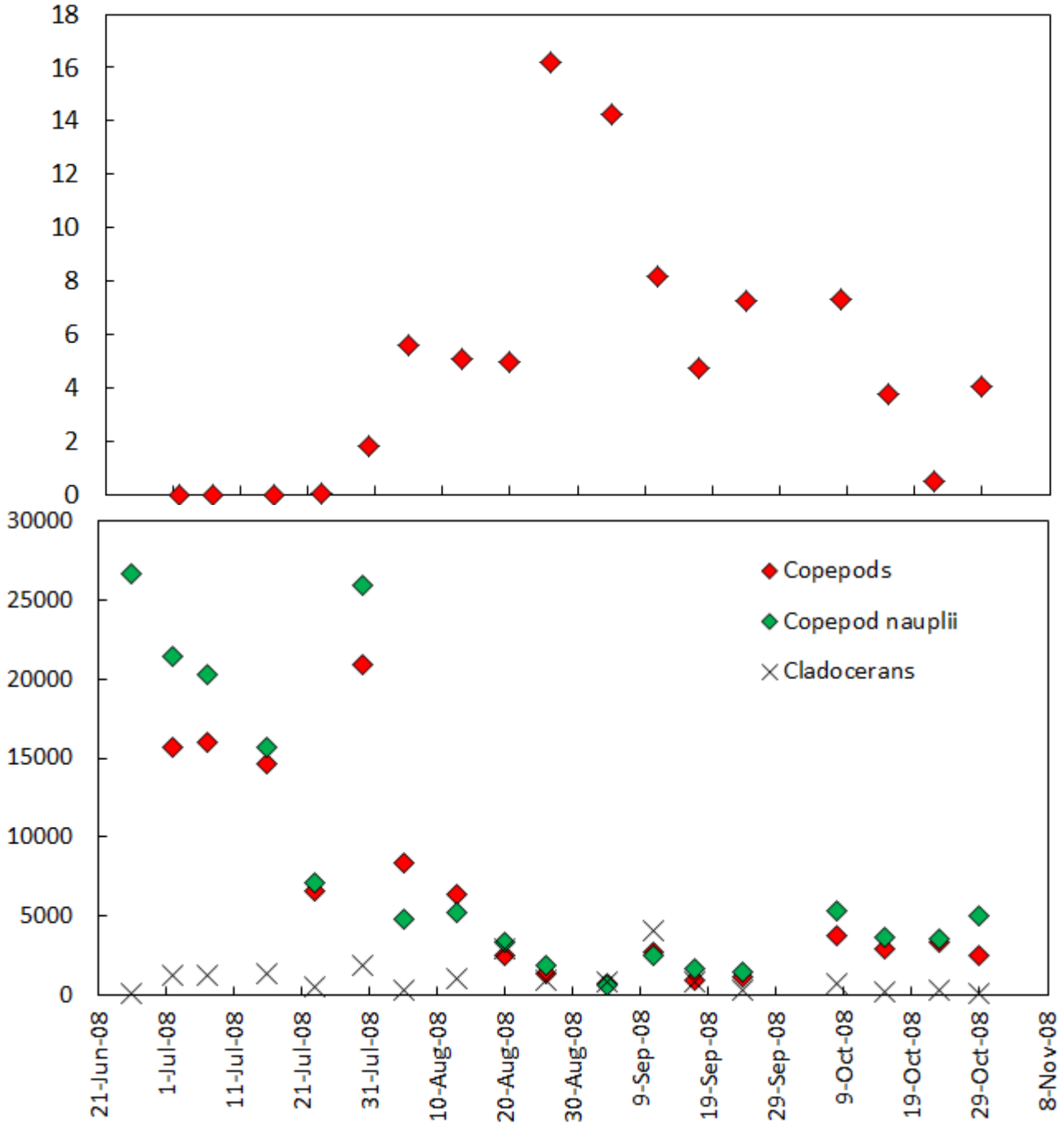
Here representative rates have been used

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)

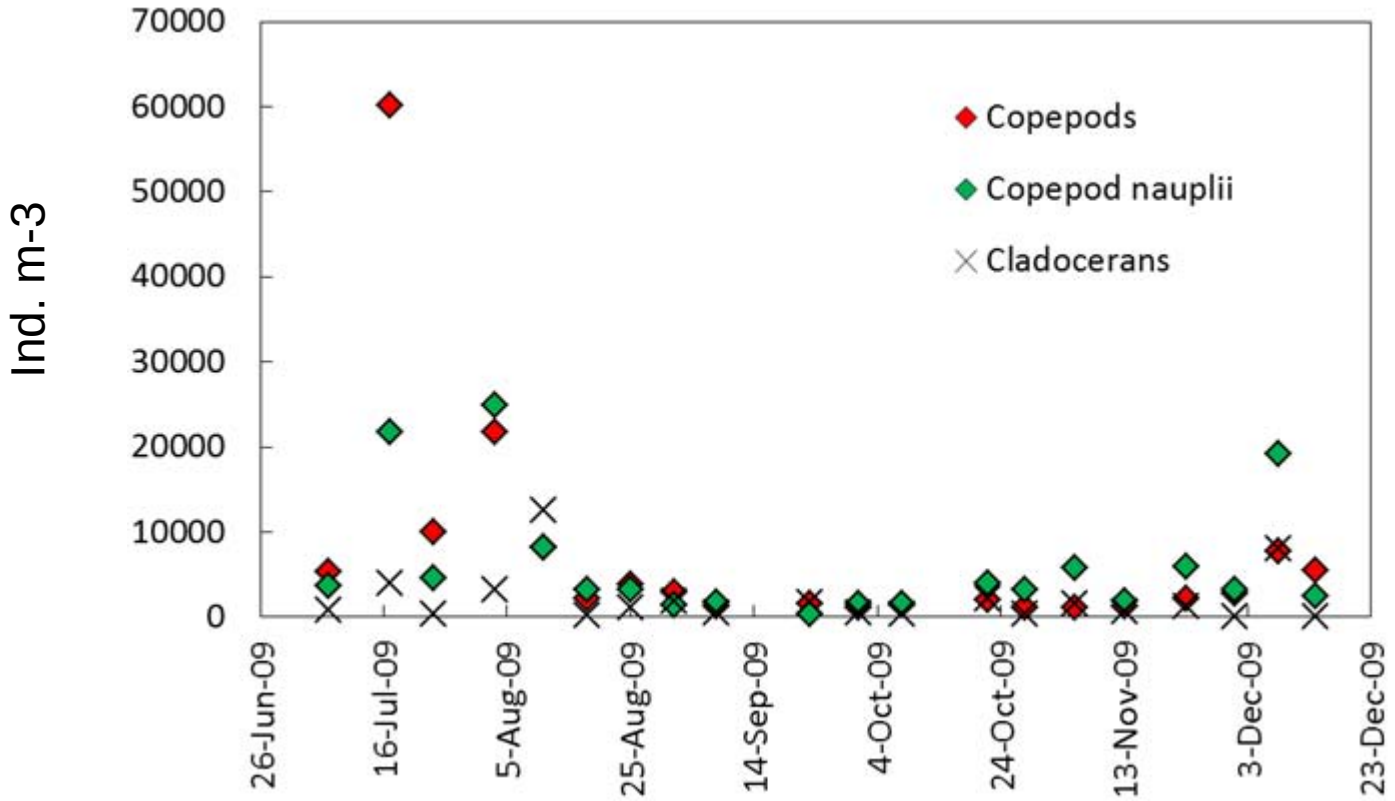
Zooplankton abund.
(ind m^{-3})



Zooplankton abund.
(ind m3)
30000
25000
20000
15000
10000
5000
0
Copepods
Copepod nauplii
Cladocerans
Chl a
(µg l-1)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Chl a
PP
Primary production
1600
1400
1200
1000
800
600
400
200
0
21-Jul-08
31-Jul-08
10-Aug-08
20-Aug-08
30-Aug-08
9-Sep-08
19-Sep-08
29-Sep-08
9-Oct-08
19-Oct-08
29-Oct-08

2009

Zooplankton concentration



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:

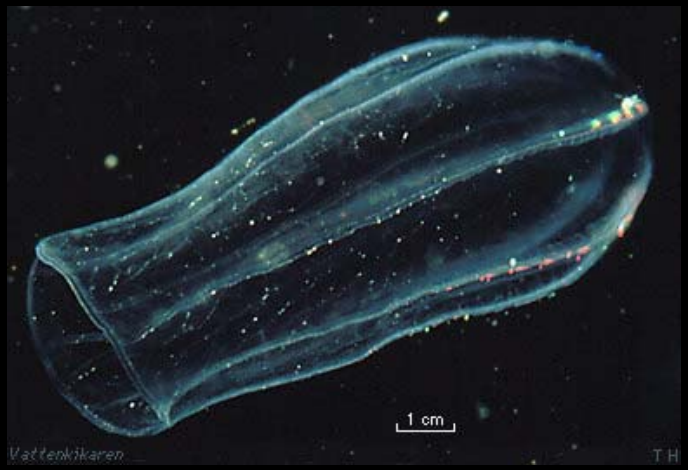
Would *Mnemiopsis* become a problem at the West Coast ?

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*

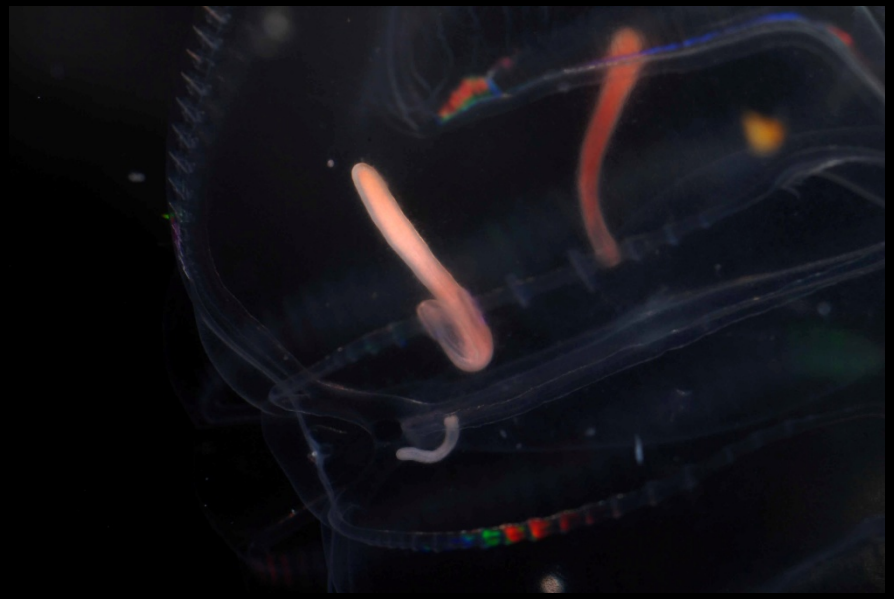
and the ctenophores *Beroe gracilis* and *Beroe cucumis*



Parasites

Edwardsiella sp. (sea anemone)

Erik Selander, Lene Friis Møller, Per Sundberg, Peter Tiselius
(Biol Inv 2010)



BAZOOCA

(BAltic ZOOplankton CAscades)

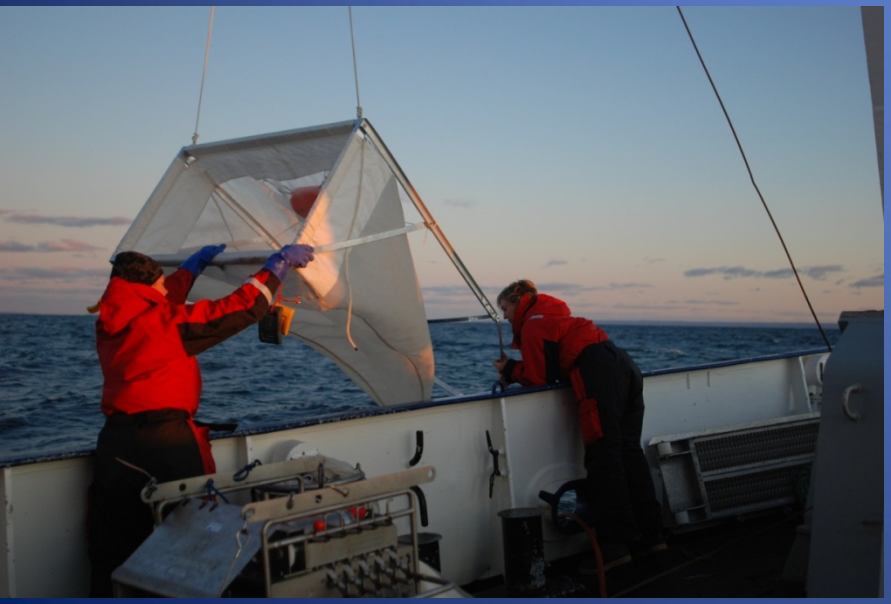
A 3 year EU project (Bonus + program) with 11 partners from the Nordic countries
- co-ordinated by Peter Tiselius University of Gothenburg

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

Kick-off at Kristineberg Dec 2008

Process cruise October 2009

R/V Skagerak – University of Gothenburg



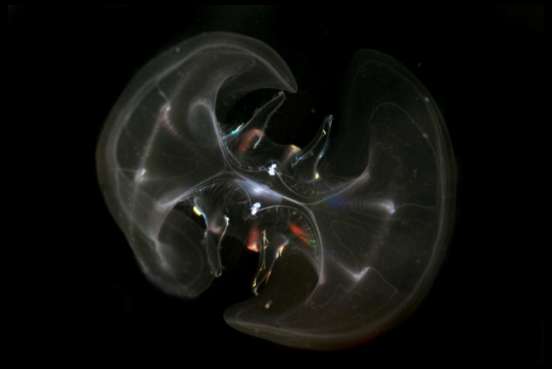
Process cruise, 12-23 Oct 2009

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

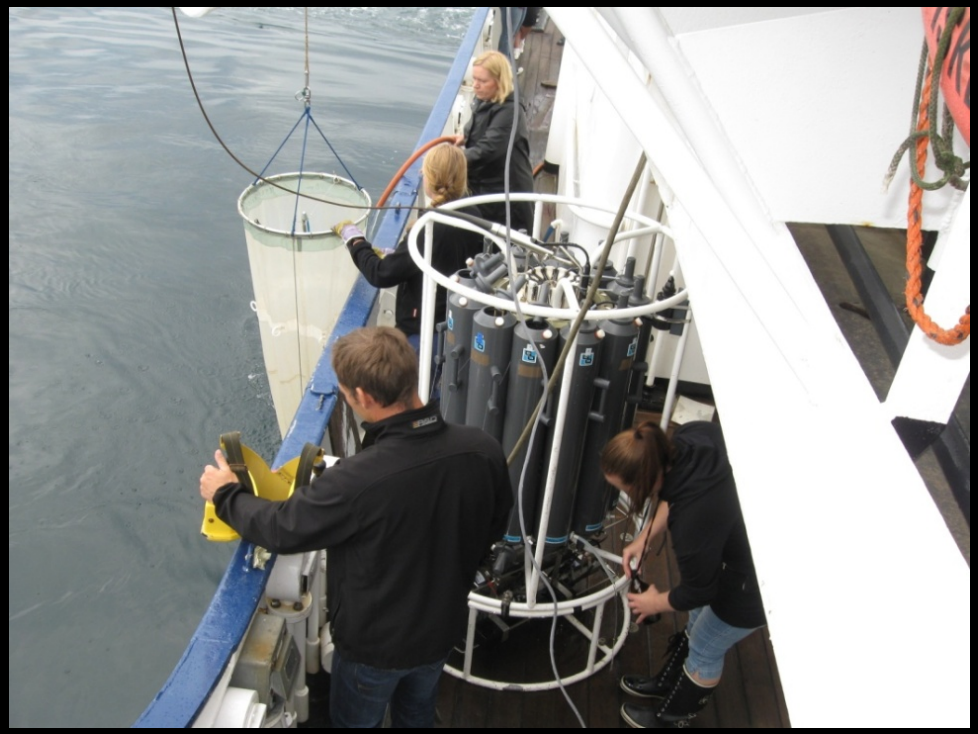
GP-7157 **Matilda Haraldsson, Cornelia Jaspers, Josefin Titelman, Dag L. Aksnes and Peter Tiselius**
A place for *Mnemiopsis*: Spatio-temporal habitat characterization in Scandinavian waters

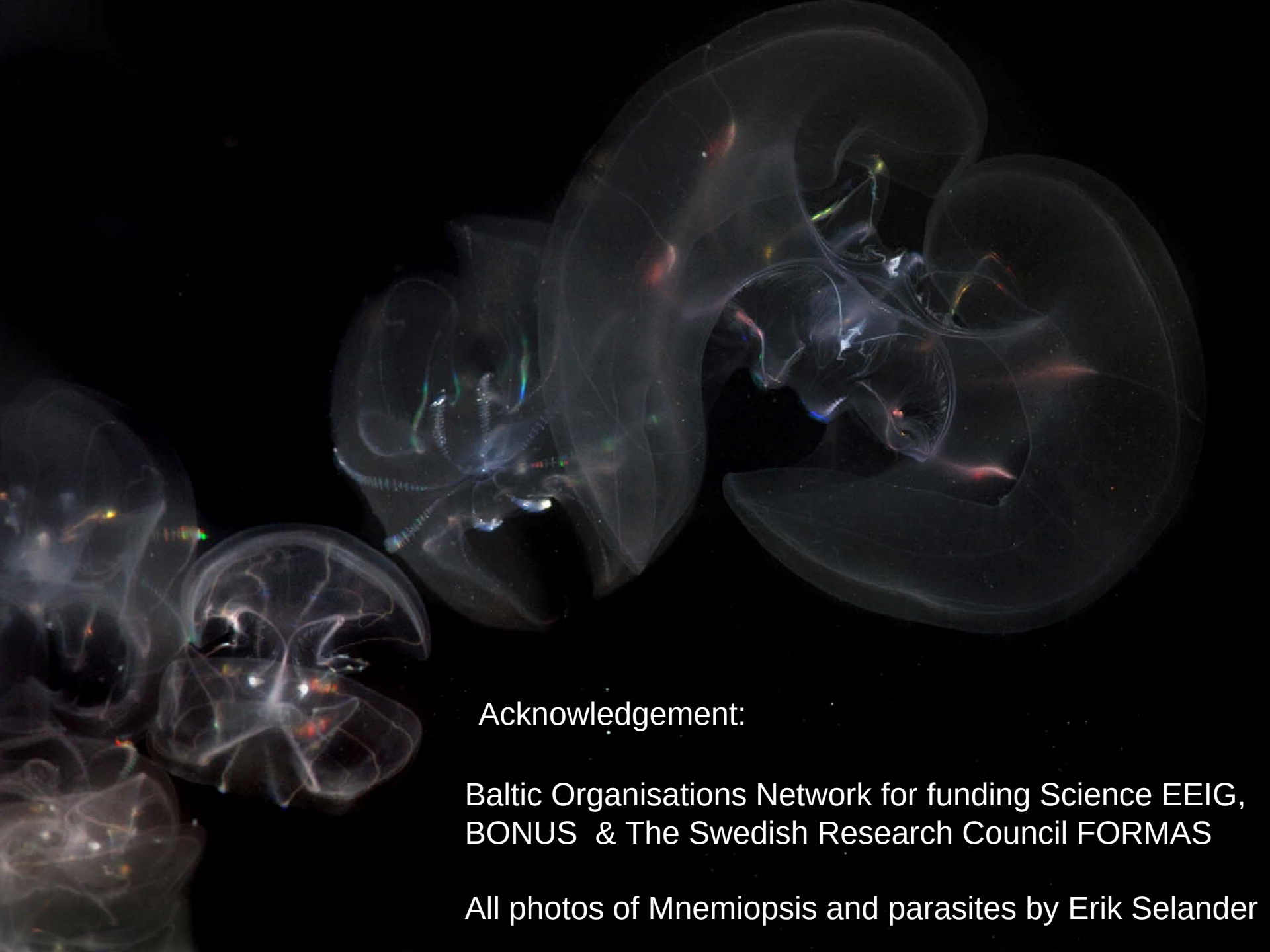
Jelly community has changed in the Gullmar Fjord

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

How it used to be like……

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 !!





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All photos of Mnemiopsis and parasites by Erik Selander