Memo NEWSLETTER

Mnemiopsis leidyi: Ecology, Modelling and Observation

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Content

Colophon

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www.ilvo.vlaanderen.be/memo

MEMO in a nutshell

This research project started the 1st January 2011 and is funded by the Interreg IVa MEMO-2 Seas Program. In total, € 3.5 million is allocated over three years and 20 scientists are involved. The project is a cooperation between 5 scientific research institutes in 4 countries and led by ILVO.
The participating marine scientific institutes are:

- **Institute for Agricultural and Fisheries Research, ILVO-Ostend, Belgium**
- **Institut Français de recherche pour l'exploitation de la mer, IFREMER, Boulogne-sur-mer, France**
- **Université du Littoral Côte d'Opale – Laboratoire d'Océanologie et de Géosciences, ULCO-LOG, Wimereux, France**
- **Centre for Environment, Fisheries, and Aquaculture Science, CEFAS, Lowestoft, UK**
- **Stichting Deltares, Delft, Netherlands.**

The subject of the research is the American comb jelly *Mnemiopsis leidyi* that was observed in the North Sea in 2006.
This comb jelly comes from the Atlantic Ocean near the North American coast where it has natural predators. Presumably it is transferred to our region by ballast water of ships.
The jellyfish measures up to 12cm, although in the 2 Seas area they are rather around 1 to 4 cm. It is a voracious animal that feeds on all kinds of fish larvae, fish eggs and plankton. *M. leidyi* are capable of self-fertilization, so one copy is sufficient to start the reproductive cycle which lasts about 2 weeks. *M. leidyi* appears to need little energy and has survived two cold North Sea winters so far.

The invasiveness of *M. leidyi* in the Black and Caspian Sea in the 80s has led to a major change in the marine ecosystem and economic losses due to a decline in fish and shellfish stocks. In 2006 this species was detected in the 2 Seas area. The spread of *M. leidyi* in this area is a major concern because of the presence of important spawning and nursery areas and migration routes for many commercial fish and shellfish. The presence and distribution of *M. leidyi* in the 2 Seas region, and its interaction with potential prey and predators in relation to possible changes in the environment must be closely monitored to avoid disasters like in Eastern Europe.

The project seeks a better understanding of the identification, biology and physiology of this comb jelly, attendance, behavior and impact monitoring in the 2 Seas region and the development of models to assess the ecological and economic impact of *M. leidyi* in this region.

This will be achieved through 3 activities:

1. Development of Standard Operational Procedures (SOP) for identification (morphological and genetical), monitoring and modeling of potential habitats and population dynamics of *M. leidyi*. (Responsible partner: ILVO)
2. Study of the physiology, feeding behavior and potential predators of the species through experiments. (Responsible partner: IFREMER)
3. Evaluation of the potential environmental and socio-economic costs of the impact of the species by an ecosystem-based approach. (Responsible partner: CEFAS)

The ultimate goal is to perform a risk assessment and to inform, with the support of the EU (Interreg), stakeholders and the general public about the potential risks of *M. leidyi* on the marine ecosystem and professional activities in the 2 Seas region and to identify possible measures to counter this threat.

The Interreg IVa -2 Seas Program is a unique opportunity to improve and standardize the monitoring of the various partners in this region. This cross border cooperation will ensure an exchange of expertise on taxonomy, identification, databases, data analysis and modeling between several renowned marine institutes.

» *M. leidyi.*

MEMO Kick-off meeting

The Kick-off meeting of the project was held in Boulogne-sur-mer at the IFREMER institute on the 21st and 22nd of February. Next to several administrative matters, a workshop was held about taxonomy and sampling procedures.

Sampling procedure:

A main objective within the MEMO project is developing a Standard Operational Protocol (SOP) for the sampling, conservation and correct identification of *M. leidyi*.

Sampling is carried out using a WP3 plankton net. As gelatinous zooplankton can aggregate at certain depths in the water column or near the sea bottom, the net is towed in an undulating manner. During one sampling campaign sampling with this WP3 net was optimized by attaching underwater camera's to the net. Like that an accurate idea of the position of the net in the water was obtained and some parameters e.g. the speed of the ship were optimized to ensure effective sampling.

Preservation:

In the literature two possible preservation solutions for gelatinous zooplankton are suggested: Lugol's solution and Trichloroacetic acid (TCA). Both solutions are currently being tested for this purpose.

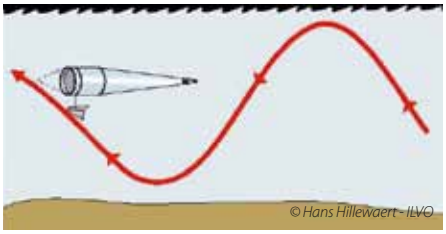
Identification:

The early observations of *M. leidyi* in Western Europe should be viewed with some caution. Morphologically, *M. leidyi* can easily be confused with another ctenophore namely *Bolinopsis infundibulum*. The major differences between these two ctenophores are described by Faasse and Bayha (2006). The most striking difference is the position of the oral lobes relative to the statocyst (the organ for balance). In *M. leidyi* the oral lobes extend to the statocyst, while they terminate near the mouth in *B. infundibulum*.

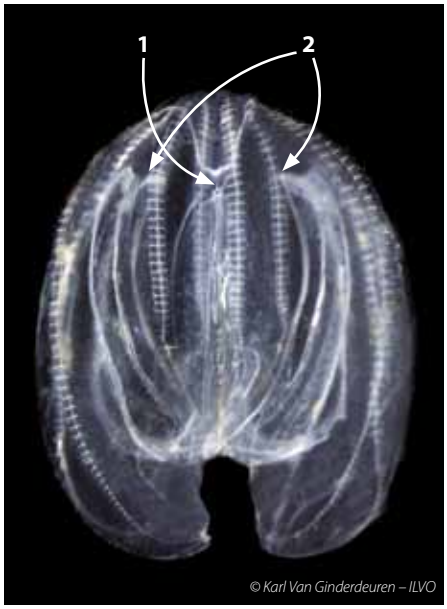
» *Sampling is carried out using a WP3 plankton net (net diameter 1m, mesh size 1mm).*

» *The Kick-off meeting of the project was held in Boulogne-sur-mer at the IFREMER institute on the 21st and 22nd of February.*

Juvenile *M. leidyi* specimens can also be confused with juvenile *Pleurobrachia pileus*. Three major characteristics to distinguish them are the thickness of the ctene rows, the shape of the tentacle bulbs, the width of the stomodaeum and the overall shape of the specimen. Field identification keys for cnidarians and ctenophores in the Southern North Sea are developed. With genetic identification, we can clearly show what kind it is. Therefore a parallel identification is performed at samples of the various sampling campaigns.



» *The net is towed in an undulating manner.*



» *M. leidyi. 1: the statocyst, 2: the oral lobes*

First observations of *M. leidyi* in Dutch coastal waters.

The presence of the invasive comb jellyfish *M. leidyi* in Dutch coastal waters was first confirmed in 2006. It is likely though that the species was present at least a few years earlier, mistaken for the native *Bolinopsis infundibulum*. Because the species can tolerate a wide range of salinities and temperatures it is now found in a variety of habitats from the saline North Sea to the brackish, almost fresh Amsterdam IJ where it is clogging fishermen's fykes in summer. High densities of ctenophores are frequently observed in Zeeland estuaries as well as the Wadden Sea.

An ongoing monitoring programme by the Royal Netherlands Institute for Sea Research (NIOZ) in the western Wadden Sea shows that the species is capable of forming blooms of very high densities almost up to 1.000 individuals per cubic meter. At times the biomass of *M. leidyi* is so high that the NIOZ-operated fish fyke near the island of Texel also becomes clogged by it. The species is most abundant in late summer and early autumn, but in recent years blooms in spring are also observed (Royal NIOZ unpublished data). For Dutch coastal waters other than the western Wadden Sea quantitative estimates of densities and biomass of *M. leidyi* are still lacking.

MEMO The website

To reach a broad public, a project website was created: www.ilvo.vlaanderen.be/memo.
This website contains information about the project and the cooperating partners with a brief presentation of the scientists involved.

All recent public results and news about the scientific research will be placed on the page "activities" to keep everyone updated.

There is also an overview of all interesting meetings and workshops relating to the MEMO project available on the "communication" page together with a summary of press releases and publications. The website has a "gallery" with photo's and video's about the research.

If you are interested to be stakeholder and receive information about our research and upcoming meetings do not hesitate to subscribe on the "contact" page.

MEMO Workshop on genetics

The 2nd two-day meeting with steering committee and workshop will be held at ILVO in Ostend the 27th and 28th of October. During the workshop several presentations will be given about the genetic research led on *M. leidyi* within the MEMO project.
The objectives of this research are:

- Unambiguous identification of *M. leidyi* individuals using molecular markers.
- Development and application of a real-time PCR probe and PCR assays for the identification of *M. leidyi* in the stomach contents of fish and in plankton samples.
- A molecular marker based study of phylogeny, population dynamics and migratory patterns of *M. leidyi* populations.

External speakers will also be invited to talk about genetic research.
Further information and an up-to-date program can be found on the MEMO website (www.vlaanderen.be/memo).
Both stakeholders and scientists are welcome.

ILVO as Lead partner

In each newsletter we will present a partner institute of the MEMO project. The first is the "lead partner", the Institute for Agricultural and Fisheries Research (ILVO) in Ostend.

The Institute for Agricultural and Fisheries Research (ILVO) is a Research Institute of the Flemish Government.

ILVO performs scientific research and provides services to policy-makers and professionals in agriculture, horticulture and fisheries.
One of the research areas is fisheries within the animal sciences unit, where MEMO is ongoing.

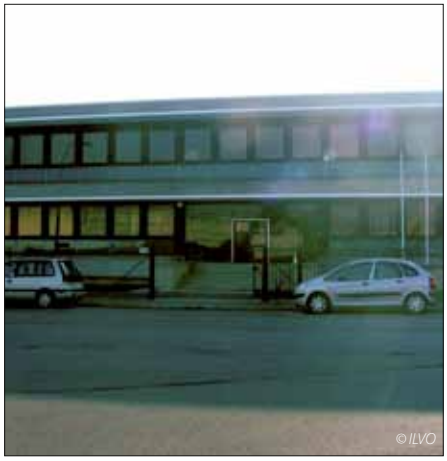
ILVO Fisheries

The research program of ILVO Fisheries is situated in the fields of the fishery biology, the aquaculture, the technical fisheries and the quality of the marine habitat and its natural resources. The different aspects of the research program and their interrelationships are carefully examined from an ecosystem viewpoint and the ultimate goal is the achievement of a sustainable management plan for the natural resources of the seas. The implementation of the research program and related activities is realized by more than 40 persons, under the supervision of Dr. ir. Hans Polet (section technical fisheries), Dr. Kris Hostens (section biological monitoring), Dr. Johan Robbens (section chemical monitoring and product technology), Lic. Daan Delbare (section aquaculture), ir. Els Torreele (section biology) and the science director Dr. Kris Cooreman.

ILVO & MEMO

ILVO is the lead partner of the project and is responsible for coordination / management and communication. But ILVO is also responsible for activity 1 which aims to characterize the spatio-temporal distribution of the comb-jelly *M. leidyi* based on Standardised Operational Protocols for sampling and preservation of gelatinous plankton and for species identification (morphological as well as molecular-genetic). Furthermore ILVO will also work on activity 2 and 3. The research on the MEMO-project is a cooperation between the sections chemical monitoring, biological monitoring and aquaculture.

The section chemical monitoring will focus on the genetic research while the biological group will contribute in assessing the spatial and temporal distribution of *M. leidyi* in the Belgian part of the North Sea and the Westerschelde estuary. It will also develop the SOP for catching, conserving and identifying *M. leidyi* and other gelatinous zooplankton. The section aquaculture is involved in research of the role of *M. leidyi* in the food web, focusing on prey and potential endemic predators. For activity 3, ILVO will supply data to be incorporated in the applied model of the plankton ecosystem, will distribute and gather information from the socio-economic questionnaire and will contribute to the case study on the economic impact on tourism and fisheries.



» *ILVO Fisheries.*

Interview of the month:

Lies Vansteenbrugge PhD student at ILVO

In every newsletter we take the opportunity to present you one of the employees within the MEMO project. The first is Lies Vansteenbrugge who works at the Institute of Agricultural and Fisheries Research (ILVO) in Ostend.

Lies, tell us a bit more about yourself and your job within the MEMO project?
My name is Lies Vansteenbrugge and I am working as a PhD student within the MEMO project. In 2004, I chose to study biology at the University of Ghent. In 2009, I graduated as a Master in Biology. After spending 7 months in Norway doing arctic marine research, I joined the biological monitoring section within ILVO. In January 2011 I started my PhD research within the MEMO project on the impact of the invasive comb jelly *M. leidyi* in the North Sea.

During my PhD research I will focus on two main objectives. The first objective is to monitor the spatial and temporal distribution of *M. leidyi* in the Belgian Part of the North Sea (BPNS) and the Westerschelde estuary. Monthly sampling is carried out on three locations in the BPNS. Every three months, three locations in the Westerschelde estuary are sampled. A Standard Operational Protocol (SOP) for sampling, conserving and correctly identifying this fragile species for analysing purposes, is further developed.

> Knowing the impact of this species in the Black Sea and knowing it was also found in Belgian waters, stimulated my curiosity and made me eager to get started.

The second objective is to assess the impact of *M. leidyi* on the food web in the Southern North Sea using stable isotope and fatty acid analyses. Competition and predation experiments will be carried out, to identify potential autochthonous predators and competitors in Belgian waters. Results will be disseminated to stakeholders (fisheries, tourism, industries with large cool water intakes) and local, regional and federal governments.

Why did you choose to get involved in the MEMO project?
Reading the research proposal, I became very interested in the story of invasion of *M. leidyi*. Knowing the impact of this species in the Black Sea and knowing it was also found in Belgian waters, stimulated my curiosity and made me eager to get started.

» *Lies Vansteenbrugge, PhD student within the research on M. leidyi at ILVO.*

What is so interesting about jellyfish and more specifically M. leidyi?
Jellyfish are very fascinating animals. Many people seem to have an aversion for them, but their fluorescent colours, shape and behaviour are in my opinion very evocative. Although the Belgian part of the North Sea is a well-studied ecosystem, the knowledge on cnidarians and ctenophores is poorly documented. Due to climate change, eutrophication and overfishing, jellyfish are blooming currently in oceans around the world. In order to understand this phenomenon and in order to protect our ecosystems from becoming jellyfish-dominated, we need to get an insight by conducting research.

M. leidyi is, apart from having a difficult name, one of the world's most notorious invaders. Invasive species have done harm in many ecosystems around the world, by competing with and predating on native species. This is the reason why it is important that we investigate and monitor their influence in the North Sea ecosystem and food web very closely.

What do you hope to achieve?
I hope we will get an insight in the role of jellyfish and more specifically *M. leidyi* in our North Sea ecosystem. We want to estimate the influence of this species on fisheries, tourism and industries. And we hope we will be able to give policy advice on this subject, towards local, federal and European governments.

In the next newsletter we will interview Thomas Raud (ULCO-LOG) , member of the MEMO project.