

Ctenophores

– peeking into the group of
unidentified species

Morphological and molecular evidence
reveal underestimated ctenophore species richness

Majaneva Sanna,

Hosia A, Halsband C, Lehtiniemi M, Majaneva M, Renaud P and J Berge

Outline

- Background
 - What are they? Why should we care?
 - Where are we today?
- Local and global case studies
 - Arctic
 - Ryggefjord
 - Taxa with potential world wide distribution

- Slightly modifying sample processing
- combining morphological and molecular tools
- > **increase knowledge on ctenophore diversity and distributions**
- without the need to necessarily increase sampling effort

- Focus on monitoring programs and net samples

Background

Ctenophores - What are they?

Why should we care?

Ctenophores - terminology



- Gelatinous zooplankton
 - Overarching synonym for taxonomically different groups
- Jellyfish / Jellies
 - Gelatinous animals belonging to the phyla Cnidaria and Ctenophora
- Cnidaria
 - Invertebrate phylum (e.g. scyphozoans, hydrozoans, anemones and corals)
- Medusa
 - Mobile, bell-shaped lifestage of Cnidarians
- Ctenophora
 - Invertebrate phylum, sometimes called comb jellies or sea gooseberries

Ctenophores - ecology

- Holopelagic
- Carnivorous
- High feeding rates
- Fast growth
- Ability to starve and shrink
- Regenerative ability
- Self-fertile hermaphrodites
- High reproductive potential

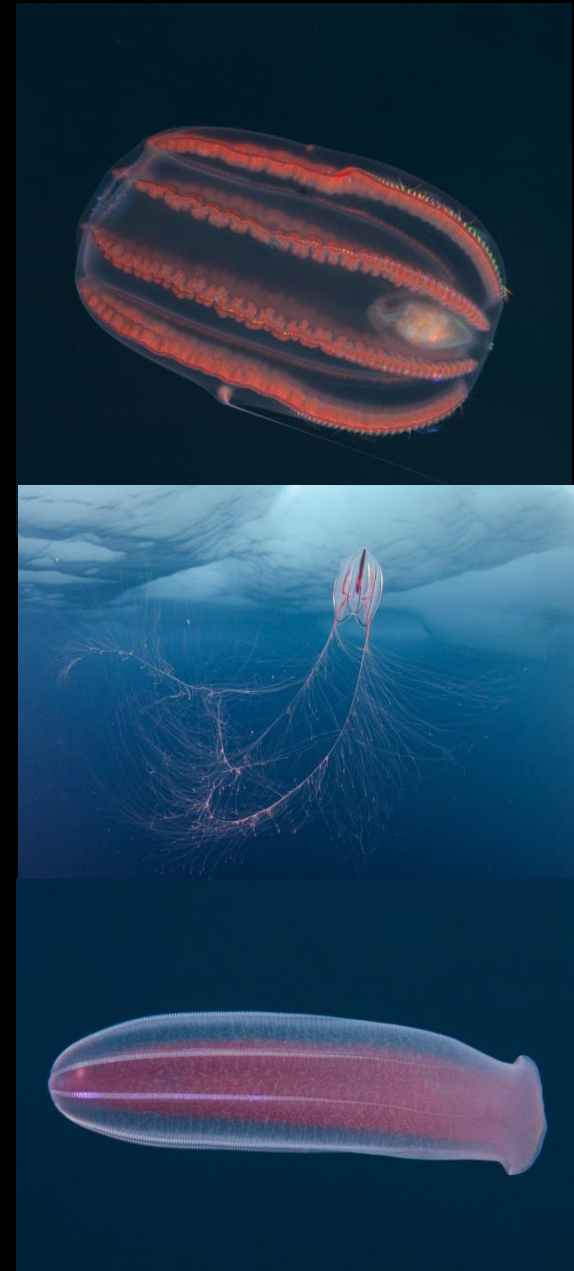


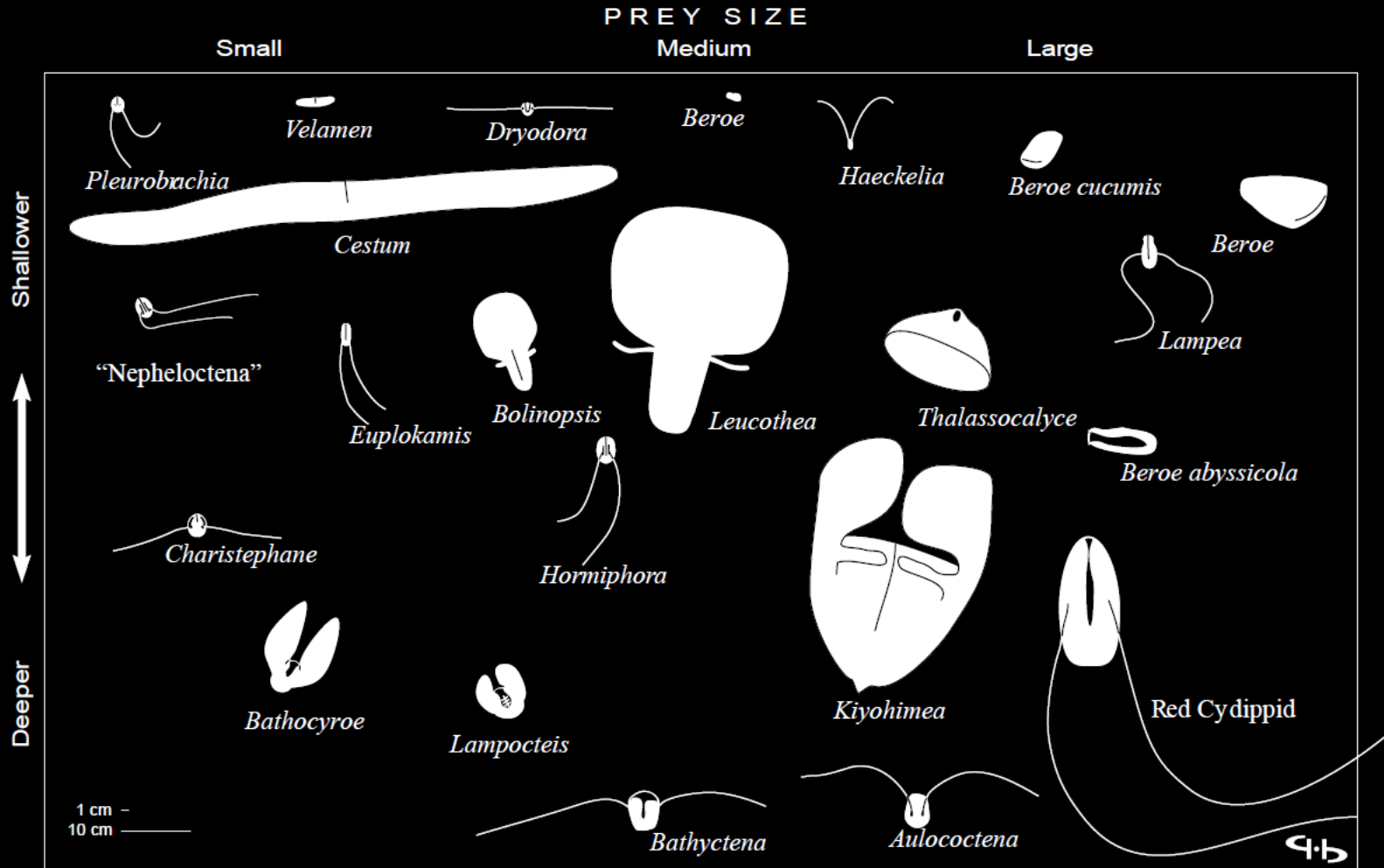
Photo: P. Leopold

Ctenophores - ecology



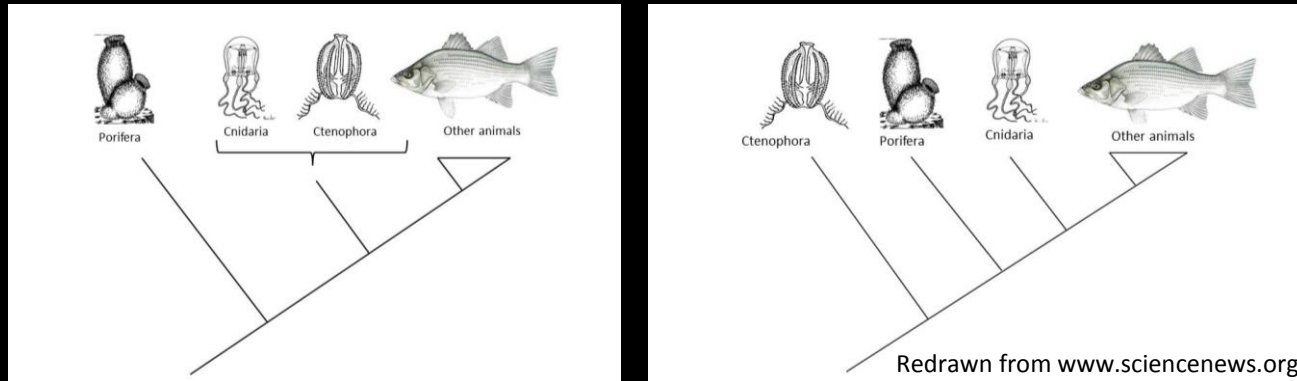
Photo: R. Larsen

Ctenophores - ecology



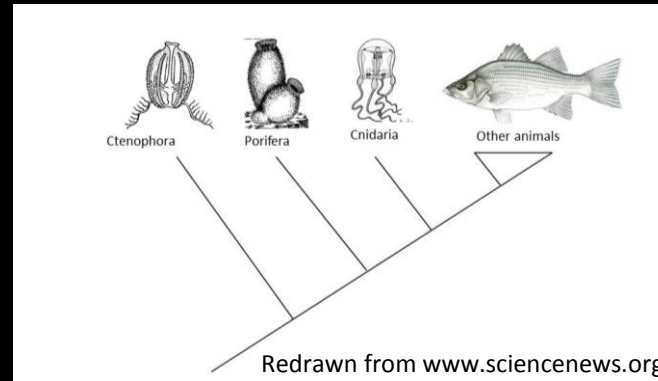
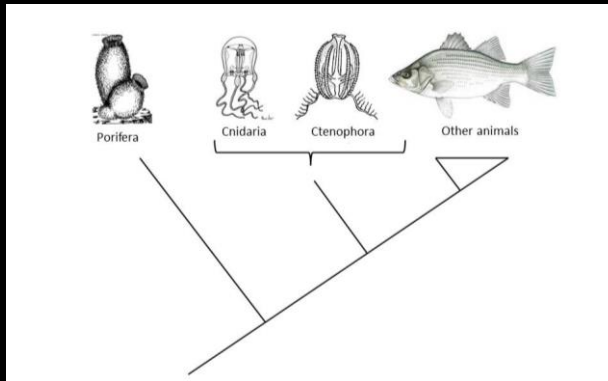
Haddock 2004

Ctenophores - Phylogeny



- The relationship to the rest of Metazoa
 - to understand the early evolution of animals
 - E.g. the origin of multicellularity

Ctenophores - Phylogeny



Vol 452 | 10 April 2008 | doi:10.1038/nature06614 nature

LETTERS

Broad phylogenomic sampling improves resolution of the animal tree of life

CrossMark
Click for updates

Error, signal, and the placement of Ctenophora sister to all other animals

Nathan V. Whelan^{a,1}, Kevin M. Kocot^b, Leonid L. Moroz^c, and Kenneth M. Halanych^a

^aMolette Biology Laboratory for Environmental and Climate Change Studies, Department of Biological Sciences, Auburn University, Auburn, AL 36849; ^bSchool of Biological Sciences, Auburn University, Auburn, AL 36849; ^cDepartment of Biology, University of Alabama at Birmingham, Birmingham, AL 35294

© 2015. Published by The Company of Biologists Ltd | The Journal of Experimental Biology (2015) 218, 592–597 doi:10.1242/jeb.111872

Casey Dunn¹, Elaine Leys², Steven H.D. Haddock³, and Ward Wilson¹

Genomic data do not support comb jellies as the sister group to all other animals

Davide Pisani^{a,b,1}, Walker Pett^c, Martin Dohmann^d, Roberto Feuda^a, Omar Rota-Stabelli^f, Hervé Philippe^{g,h}, Nicolas Lartillot^e, and Gert Wörheide^{d,i,1}

^aSchool of Earth Sciences, University of Bristol, Bristol BS8 1TG, United Kingdom; ^bSchool of Biological Sciences, University of Bristol, Bristol BS8 1TG, United Kingdom; ^cLaboratoire de Biométrie et Biologie Évolutive, Université Lyon 1, CNRS, UMR 5558, 69622 Villeurbanne cedex, France; ^dDepartment of Earth & Environmental Sciences & GeoBio-Center, Ludwig-Maximilians-Universität München, Munich 80333, Germany; ^eDivision of Biology and Biological Engineering, California Institute of Technology, Pasadena, CA 91125; ^fDepartment of Sustainable Agro-Ecosystems and Bio-Innovation Centre, Fondazione Edmund Mach, San Michele all'Adige 38010, Italy; ^gCentre for Biodiversity Theory and Modelling, Ecology Experimentale du CNRS, Moulis 93200, France; ^hDépartement de Biochimie, Centre Robert-Cedergren, Université de Québec à Montréal, Québec H3C 3J7; and ⁱBayerische Staatssammlung für Paläontologie und Geologie, Munich 80333, Germany

REVIEW

The ctenophore lineage is older than sponges? That cannot be right! Or can it?

Review

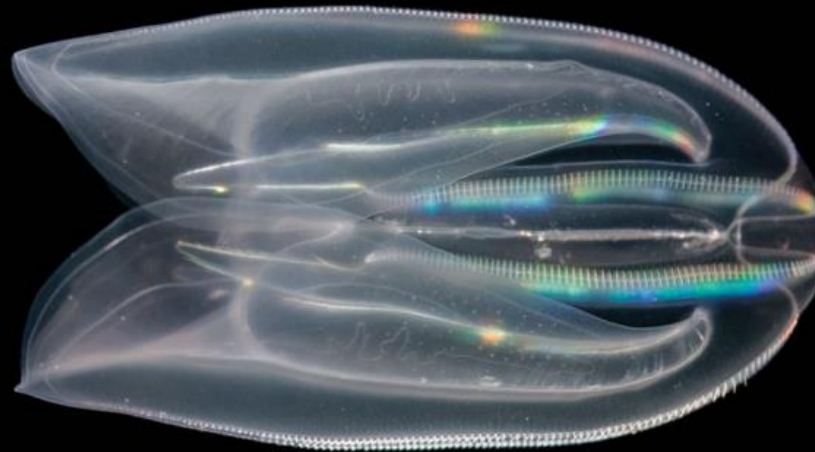
The hidden biology of sponges and ctenophores

Casey W. Dunn¹, Sally P. Leys², and Steven H.D. Haddock³

¹Department of Ecology and Evolutionary Biology, Brown University, 80 Waterman St, Providence, RI 02906, USA
²Department of Biological Sciences, University of Alberta, Edmonton, AB, T6G 2E9, Canada
³Monterey Bay Aquarium Research Institute, 7700 Sandholdt Rd, Moss Landing, CA 95039, USA

Ctenophores – EvoDevo

Why watching comb jellies poop has stunned evolutionary biologists



Comb jellies such as *Mnemiopsis leidyi* have a through-gut, challenging when this evolutionary innovation arose.

Science 

[Home](#)

[News](#)

[Journals](#)

[Topics](#)

[Careers](#)

Background

Ctenophore taxonomy - where are we today?

Ctenophores - taxonomy

- Estimated 150-250 species worldwide
- 25-50 undescribed species
- Main focus on 3-5 species

Example from Australia

Taxon	Described species	Known undescribed/ undetermined species	Estimated unknown species
Tentaculata	12	4	10
Cydippida	5	2	5
Platyctenida	1	0	0
Lobata	4	2	5
Cestida	2	0	0
Nuda	3	0	2
Beroida	3	0	2
Totals	15	4	12

Ctenophores - taxonomy

Bits and pieces



Shrinking

Cydippid larvae



Preservatives

Working with net caught specimens
is like trying to construct a snowball
after it has hit a wall.

Peter Herring

The Biology of the Deep Ocean, 2002

Ctenophores - taxonomy

- They are difficult to sample...
- They are impossible to identify...
- Slime clogs my nets and are a nuisance...



Photo: M. Daase

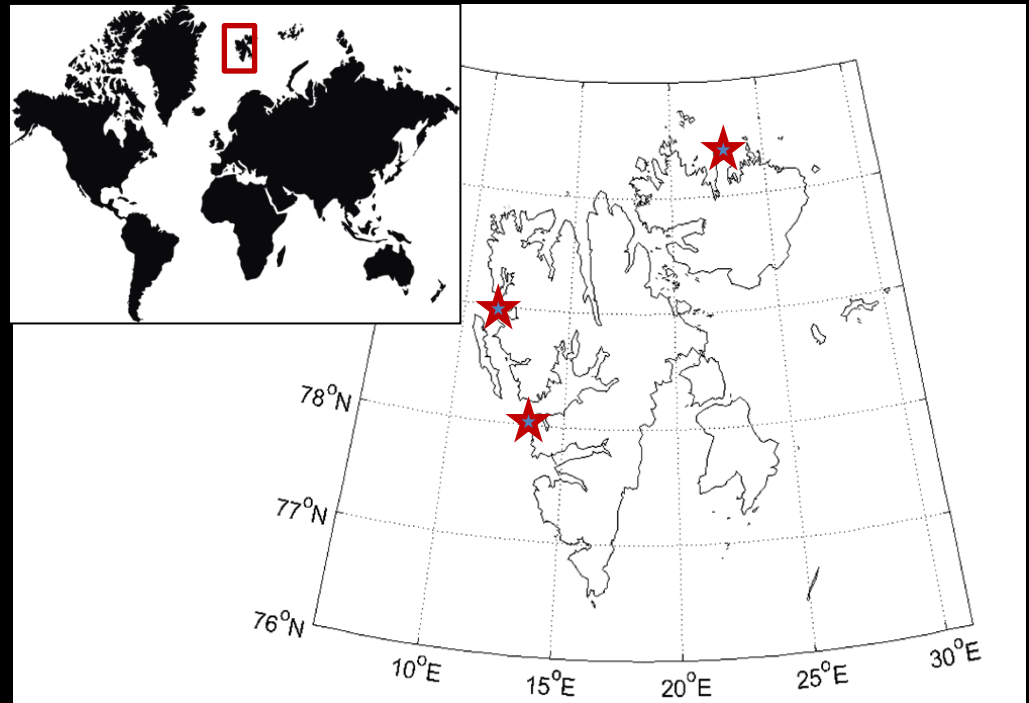
Case studies

With little effort we can increase our knowledge

Case: Arctic

Methods:

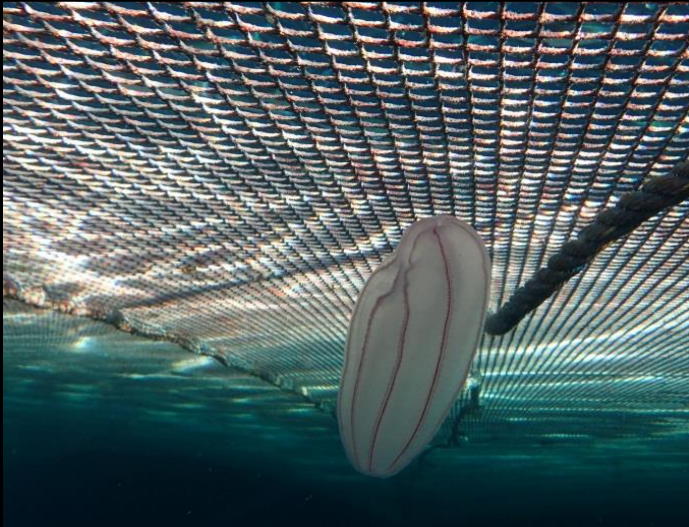
- WP2 and multinet
- Upper 50m
- Picked up alive
- Photo-ID
- EtOH
- 18S, ITS1



Case: Arctic



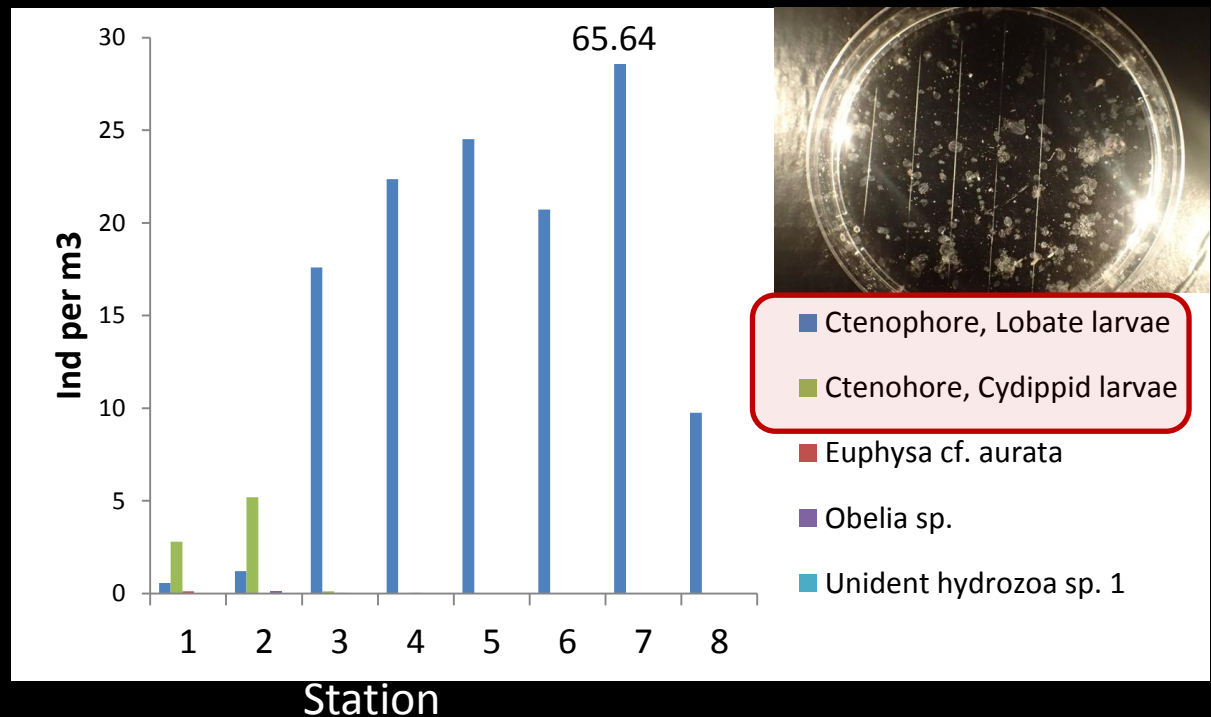
Case: Ryggefjord, Northern Norway



Case: Ryggefjord, Northern Norway

Methods:

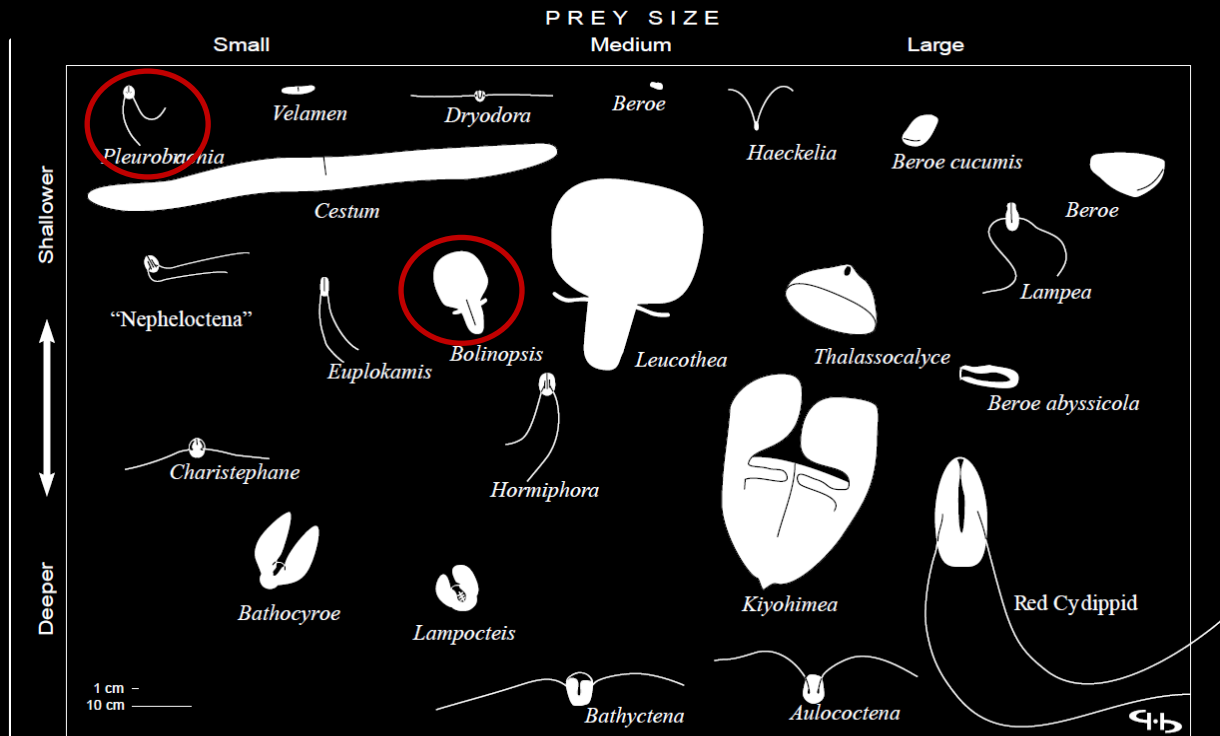
- WP2
- Picked up and enumerated alive
- Photo-ID
- EtOH



Case: Ryggefjord, Northern Norway

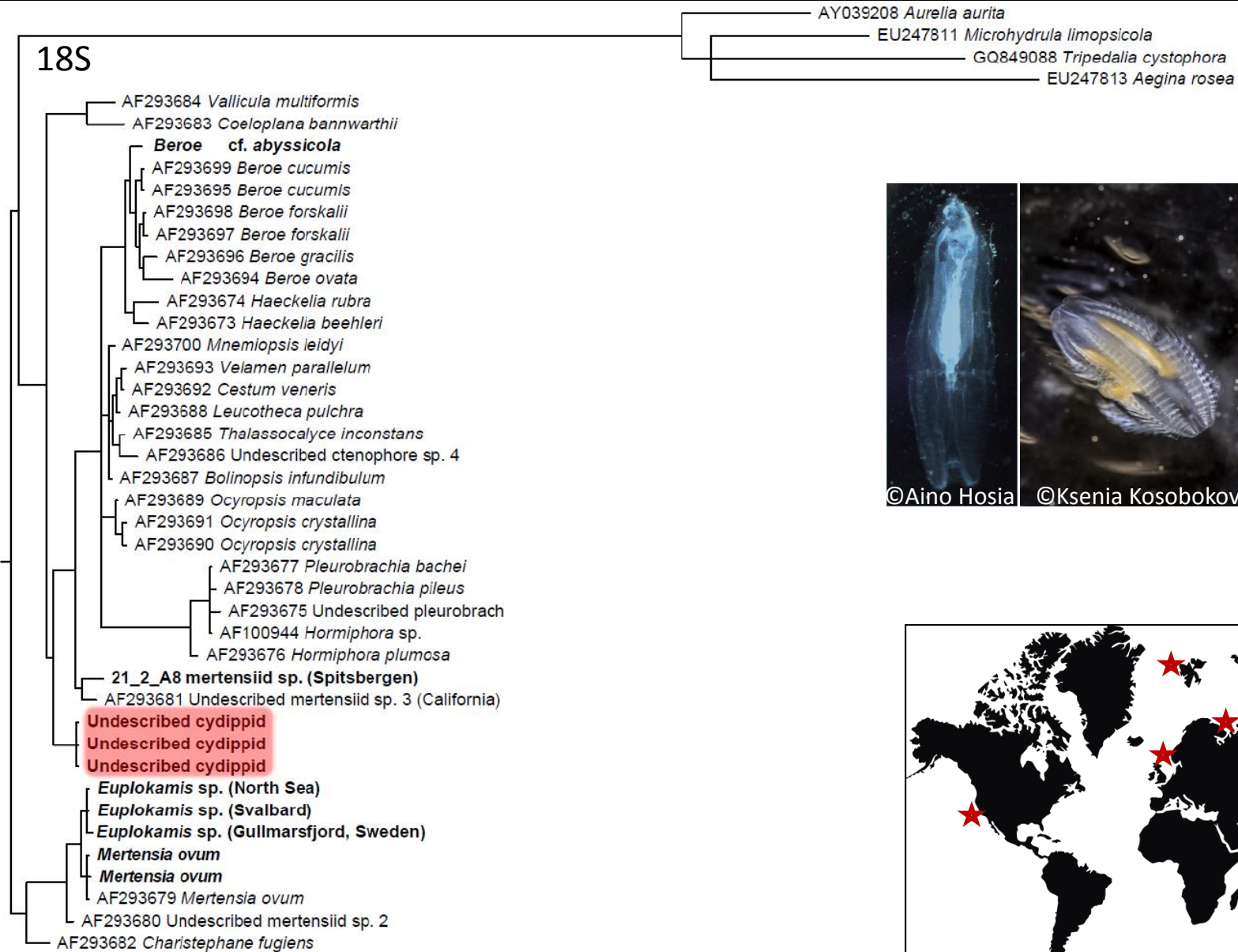
Methods:

- WP2
- Picked up and enumerated alive
- Photo-ID
- EtOH
- In future
18S, ITS1
CO1



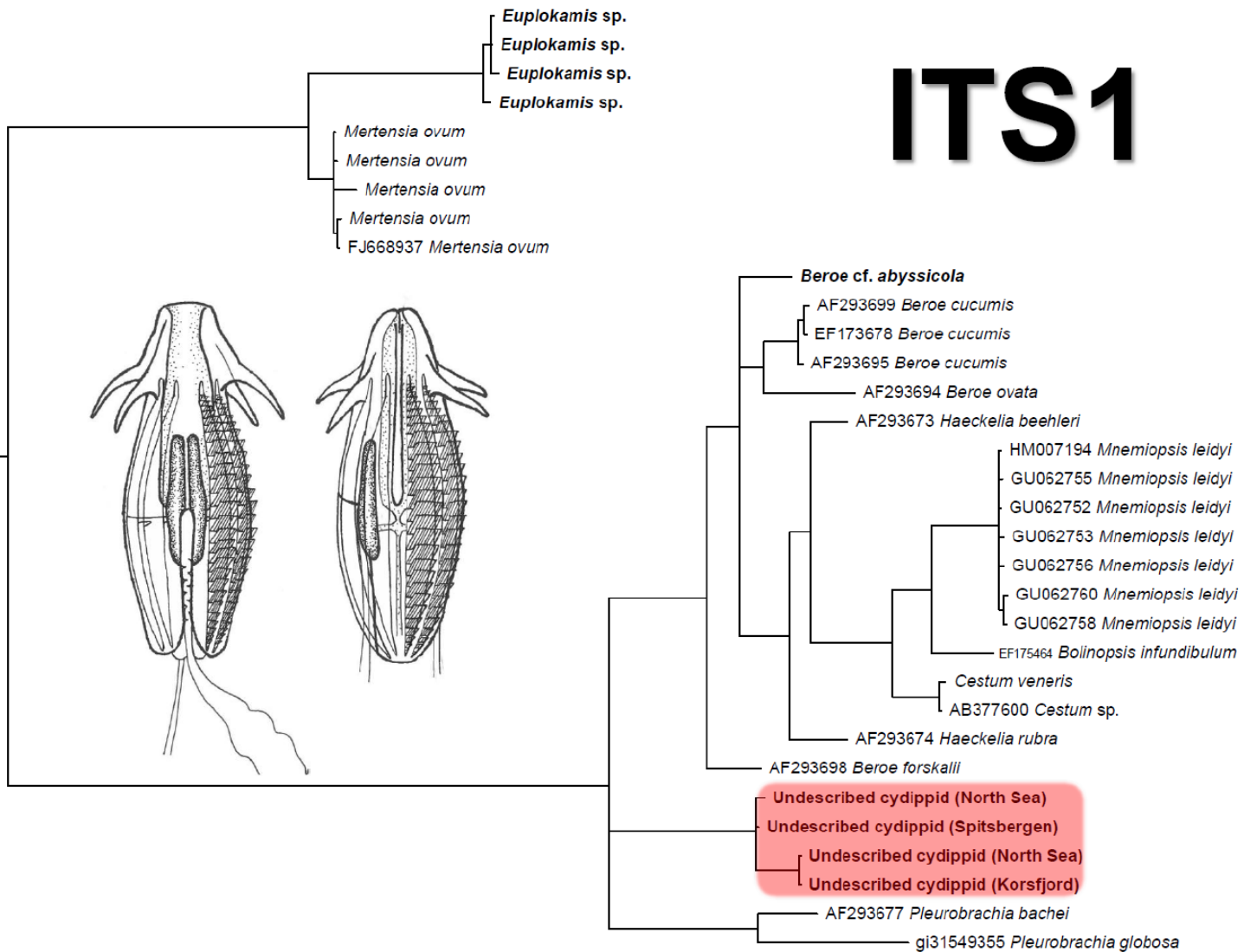
Case: undescribed cydippid

18S



Case: undescribed cydippid

ITS1



Case: *Euplokamis* sp.

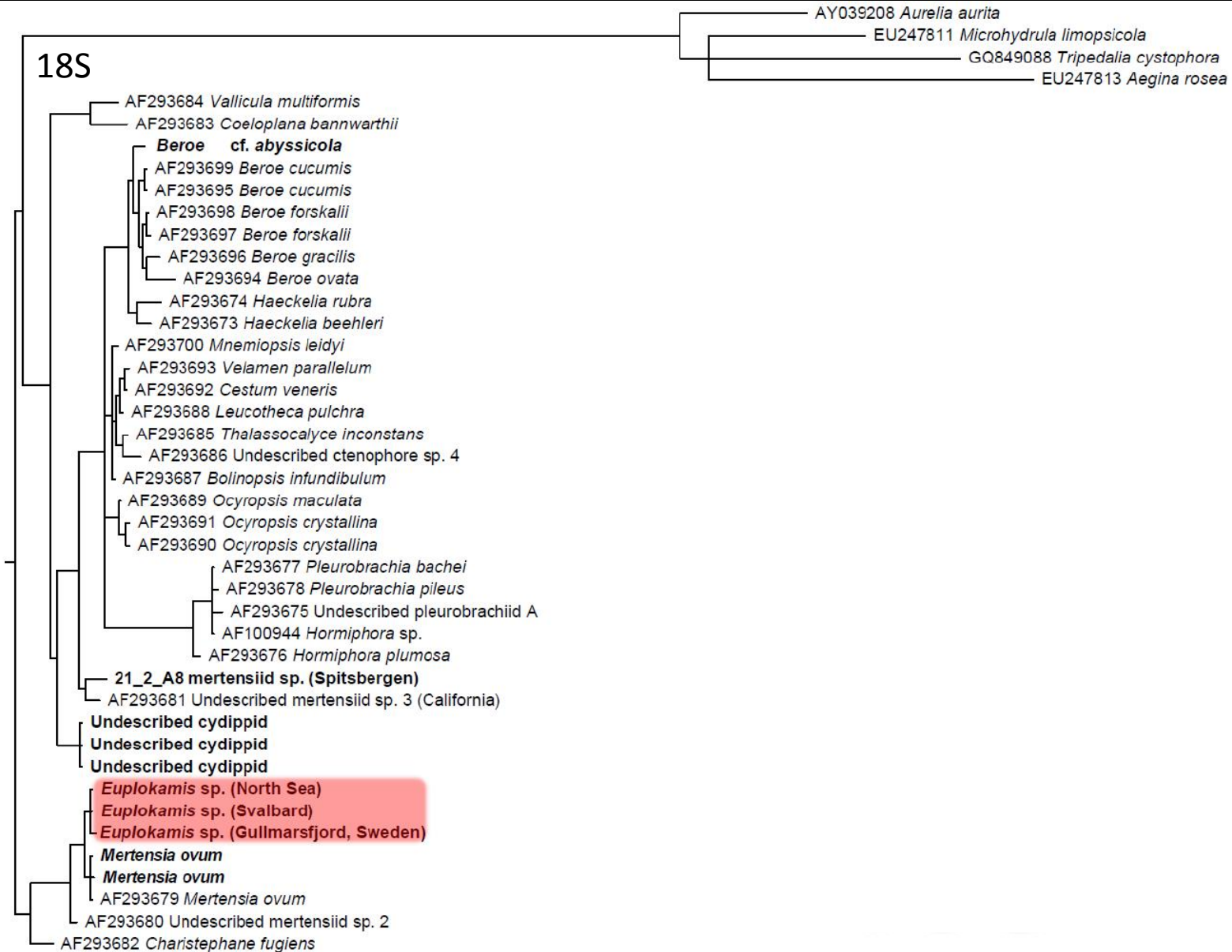
Family Euplokamididae (= Euplokamidae)

- *Euplokamis* Chun, 1879
- *crinita* (Moser, 1909) (moved to Euplokamis by Mills (1987))
- *dunlapae* Mills, 1987
- *evansae* Gershwin, Zeidler and Davie, 2010 - the tentacles of this species do not seem to justify its inclusion in Euplokamis (C.E.M.)
- *helicoides* (Ralph and Kaberry, 1950) (moved to Euplokamis by Mills (1987))
- *octoptera* (Mertens, 1833) - likely to be *Mertensia ovum* (moved to Euplokamis by Mills (1987))
- *stationis* Chun, 1879

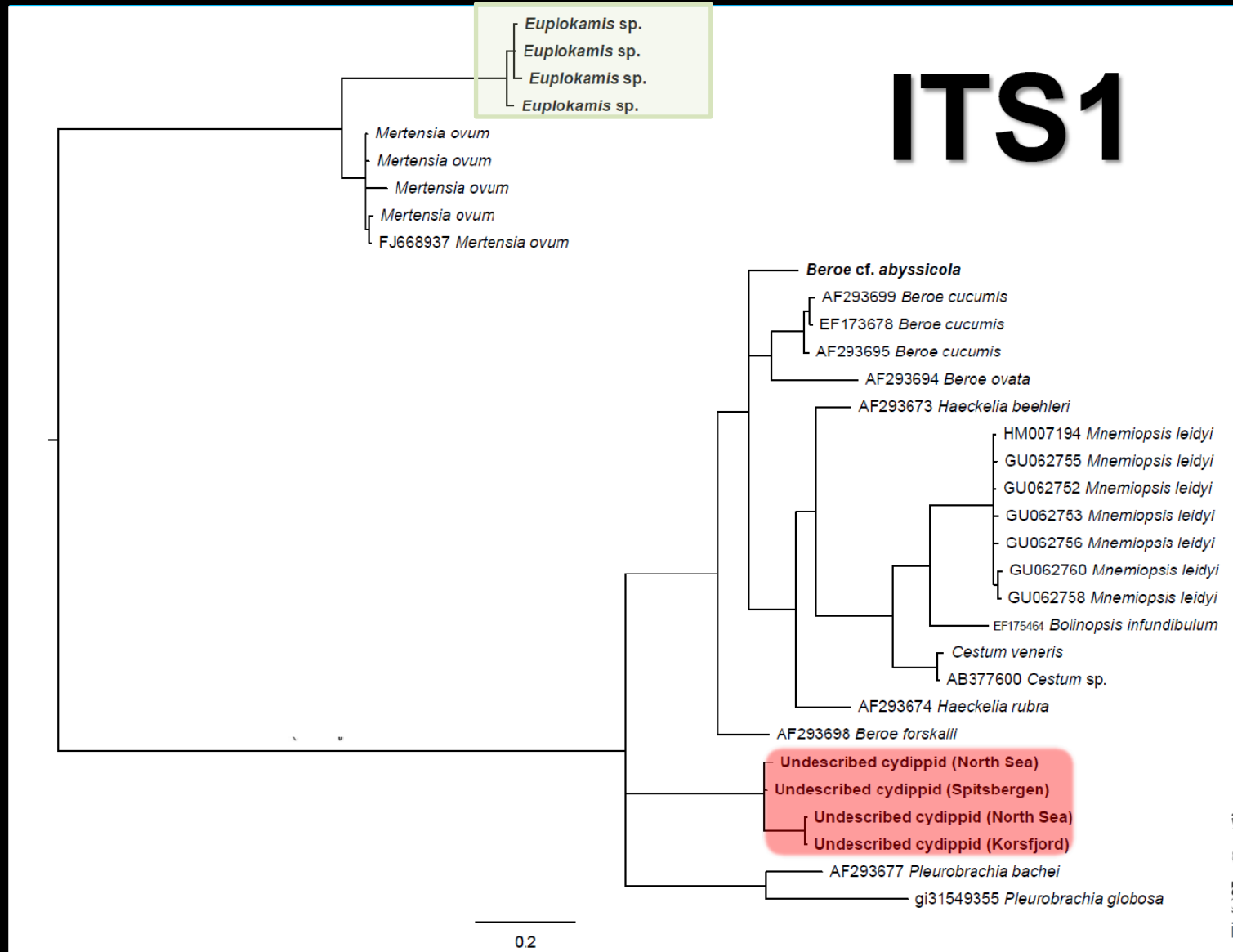
By Mills 2016



Case: *Euplokamis* sp.



Case: *Euplokamis* sp.



Morphological and molecular tools

- In GenBank 18S: 111 Sequences from app. 30 species (portion of partial sequences is high)

BOLDSYSTEMS

Species With Records on BOLD

Species	Specimens	Sequences	Barcodes >500bp
<i>Beroe abyssicola</i>	5	0	0
<i>Beroe cucumis</i>	11	0	0
<i>Beroe ovata</i>	1	0	0
<i>Bolinopsis infundibulum</i>	10	3	3
<i>Callianira antarctica</i>	3	0	0
<i>Coeloplana bocki</i>	1	1	1
<i>Dryodora grandiformis</i>	2	0	0
<i>Mertensia ovum</i>	6	3	3
<i>Mnemiopsis leidyi</i>	9	2	0
<i>Pleurobrachia bachei</i>	2	0	0
<i>Pleurobrachia pileus</i>	10	1	1
<i>Velamen</i> sp. BMOO06966	1	1	0

Total 4, of which 3 are currently public

- Misidentification problem

Suggested modifications

- Routine protocol
 - Gentle processing
 - Picking up and enumerating specimens alive
 - Photographic ID
 - Preserve samples in EtOH for molecular analysis
- Need for a reference database
- **Need for a collaboration!**

Thank you!

Akvaplan
niva



UiT / THE ARCTIC UNIVERSITY
OF NORWAY



ARTSDATABANKEN



S Y K E



Linnæus University

Ecology and Evolution in
Microbial model Systems

Centre