

Ctenophores

– native aliens in Norwegian waters

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IMPORTANCE

The role of ctenophores in the Arctic and temperate systems is often ignored, although the few existing studies indicate more important ecological role than expected^[1,2]. At the same time, our taxonomical knowledge of ctenophores remains rudimentary at best.

The disproportionately fast warming of the Arctic together with massive reduction of sea ice mean that an ice-free Arctic summer is likely to occur within the next few decades^[3]. This, as well as increasing shipping traffic, will pose significant challenges for the organisms. There is strong evidence that southern species are expanding their distribution ranges northwards and increasing in population size, whereas some of the northerly species are declining. Shifts in biodiversity can directly and indirectly change species interactions and ecosystem processes with implications for the entire Arctic ecosystem as well as for ecosystem services.

AIM:

The project aims to:

- Describe and document the biodiversity of ctenophores in Norwegian waters, from the North Sea to the Arctic
- Combine genetic sequences together with careful morphological analysis

To clarify the taxonomy as well as understand their diversity and species distributions now and in the future. The accurate species identification is valuable first step towards understanding the role of these organisms in the marine ecosystems and potential changes in species composition.

It will also engage the public audience to collect samples to increase the geographical coverage and, in return, the laymen involved will learn to appreciate completely new aspects of their own environment.

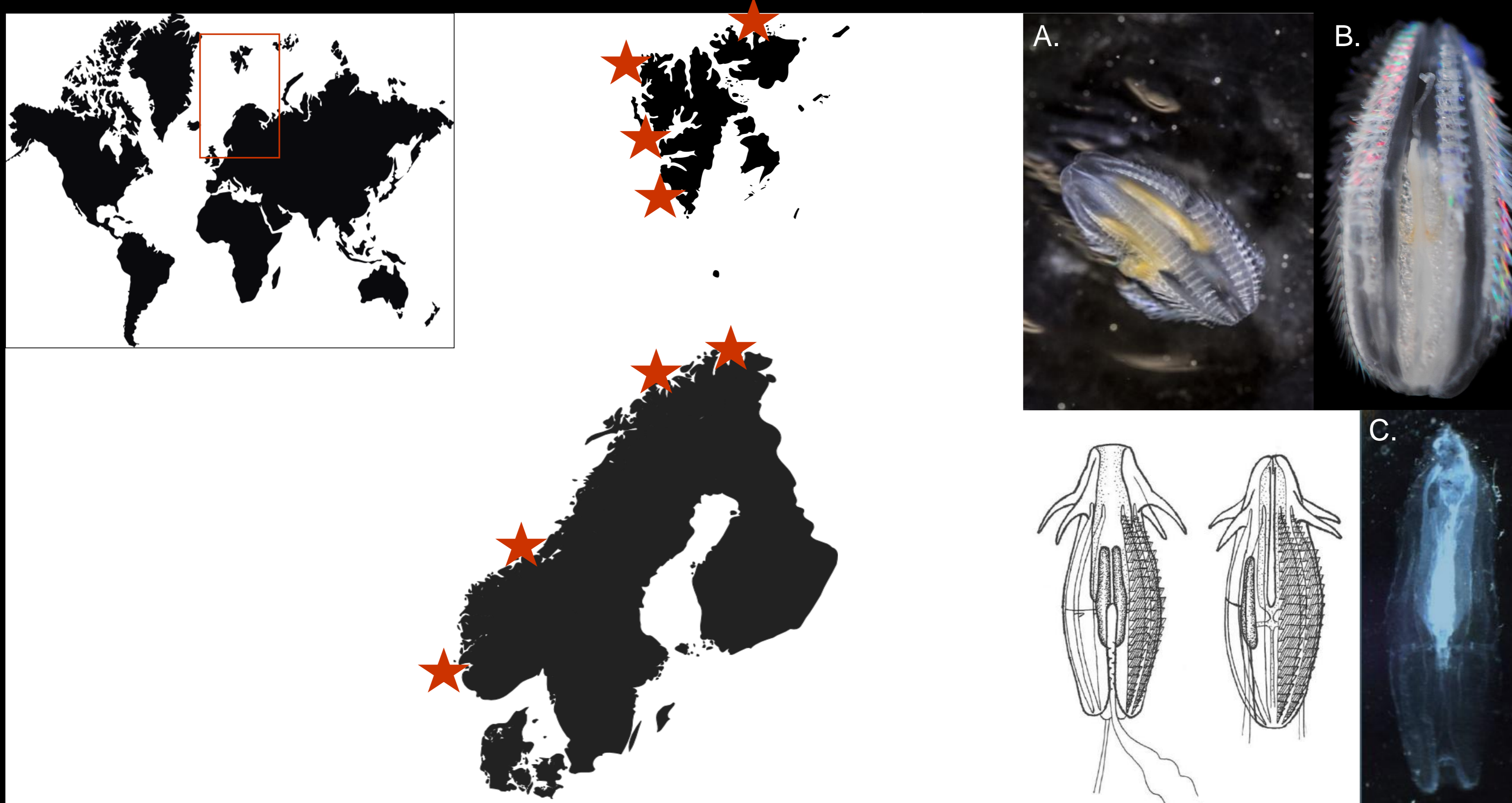
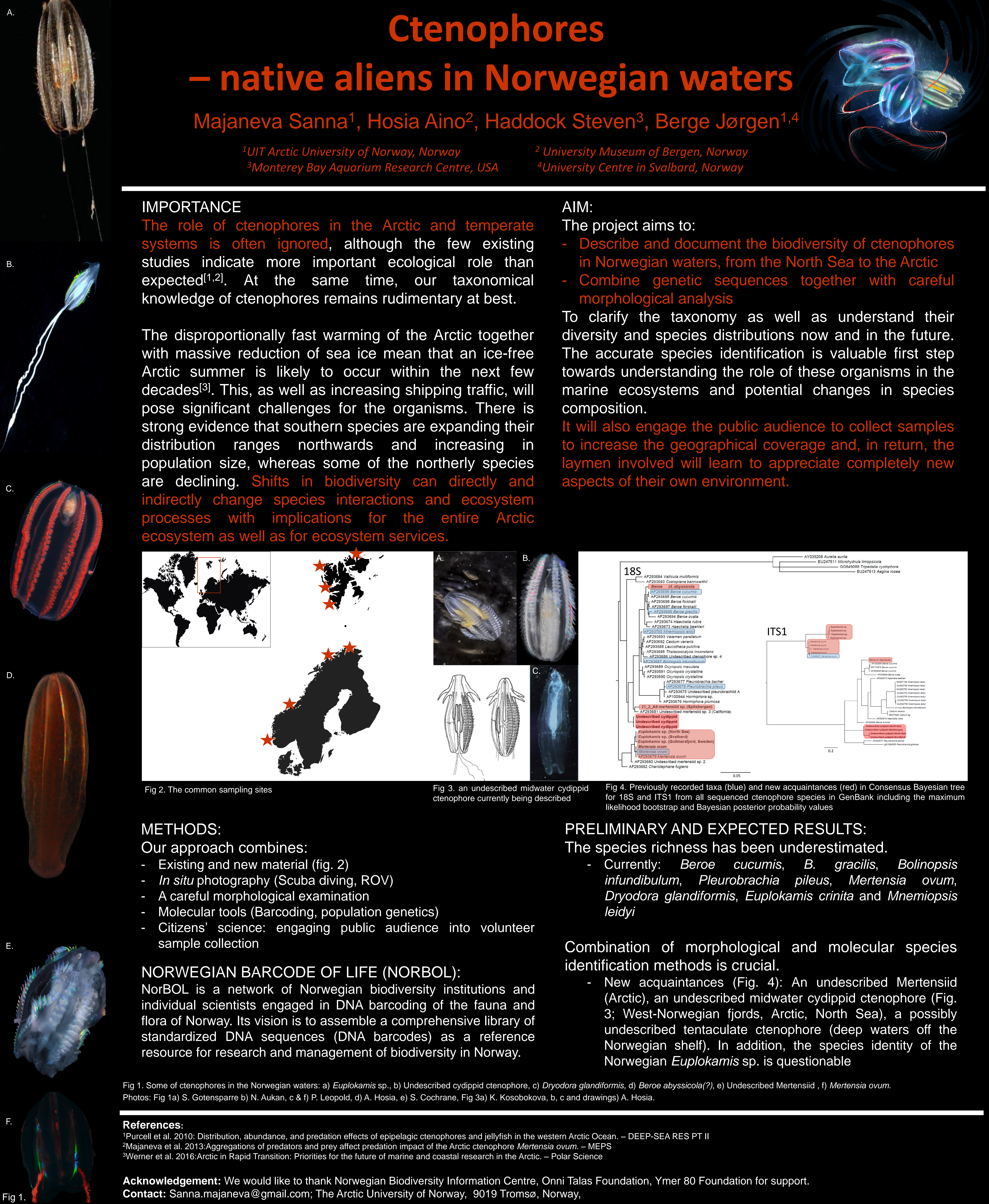


Fig 2. The common sampling sites

Fig 3. an undescribed midwater cydippid ctenophore currently being described

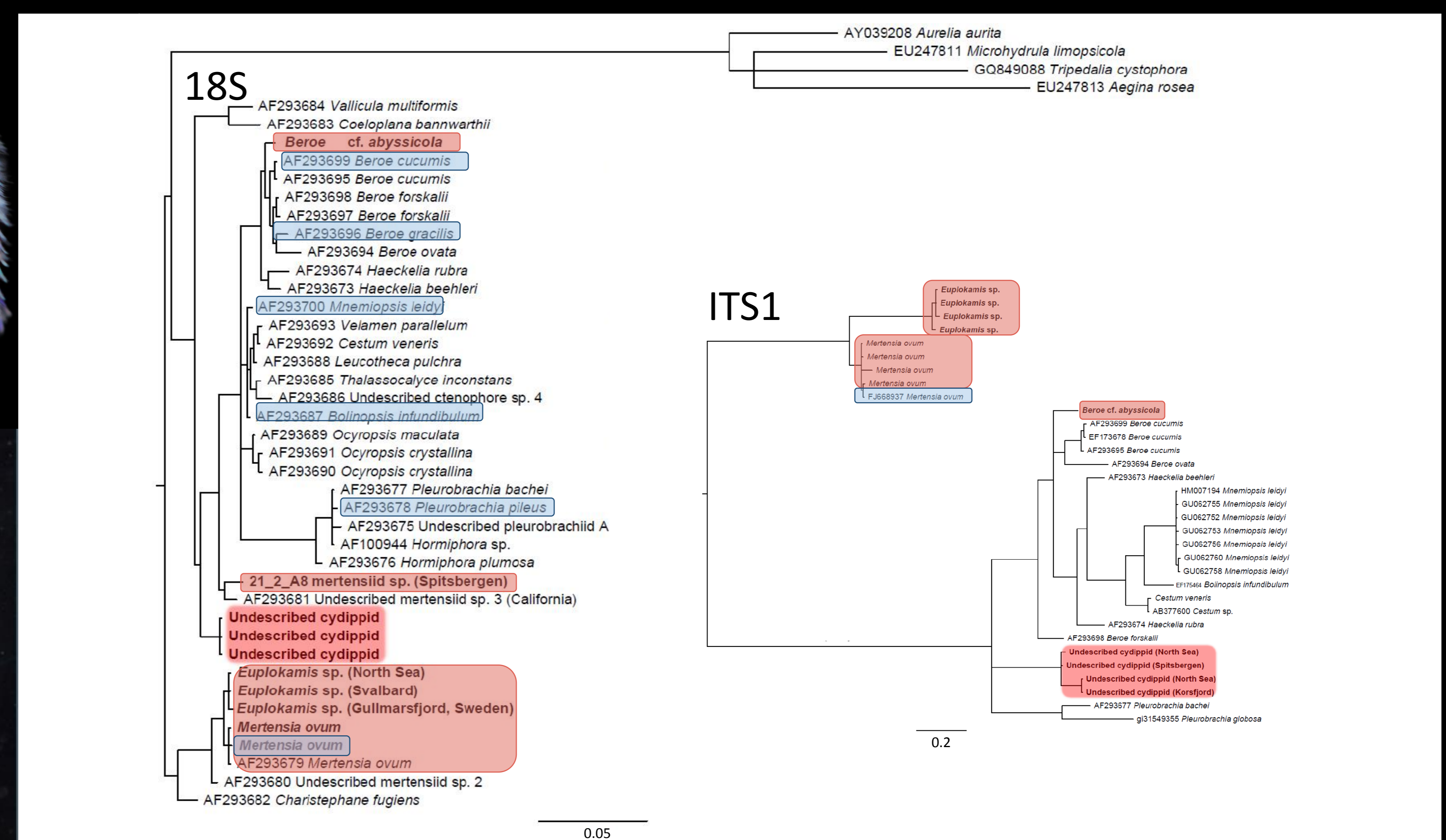


Fig 4. Previously recorded taxa (blue) and new acquaintances (red) in Consensus Bayesian tree for 18S and ITS1 from all sequenced ctenophore species in GenBank including the maximum likelihood bootstrap and Bayesian posterior probability values

METHODS:

Our approach combines:

- Existing and new material (fig. 2)
- *In situ* photography (Scuba diving, ROV)
- A careful morphological examination
- Molecular tools (Barcoding, population genetics)
- Citizens' science: engaging public audience into volunteer sample collection

NORWEGIAN BARCODE OF LIFE (NORBOL):

NorBOL is a network of Norwegian biodiversity institutions and individual scientists engaged in DNA barcoding of the fauna and flora of Norway. Its vision is to assemble a comprehensive library of standardized DNA sequences (DNA barcodes) as a reference resource for research and management of biodiversity in Norway.

PRELIMINARY AND EXPECTED RESULTS:

The species richness has been underestimated.

- Currently: *Beroe cucumis*, *B. gracilis*, *Bolinopsis infundibulum*, *Pleurobrachia pileus*, *Mertensia ovum*, *Dryodora glandiformis*, *Euplokamis crinita* and *Mnemiopsis leidyi*

Combination of morphological and molecular species identification methods is crucial.

- New acquaintances (Fig. 4): An undescribed Mertensiid (Arctic), an undescribed midwater cydippid ctenophore (Fig. 3; West-Norwegian fjords, Arctic, North Sea), a possibly undescribed tentaculate ctenophore (deep waters off the Norwegian shelf). In addition, the species identity of the Norwegian *Euplokamis* sp. is questionable

Fig 1. Some of ctenophores in the Norwegian waters: a) *Euplokamis* sp., b) Undescribed cydippid ctenophore, c) *Dryodora glandiformis*, d) *Beroe abyssicola*(?), e) Undescribed Mertensiid, f) *Mertensia ovum*. Photos: Fig 1a) S. Gotensparre b) N. Aukan, c & f) P. Leopold, d) A. Hosia, e) S. Cochrane, Fig 3a) K. Kosobokova, b, c and drawings) A. Hosia.

References:

- 1Purcell et al. 2010: Distribution, abundance, and predation effects of epipelagic ctenophores and jellyfish in the western Arctic Ocean. – DEEP-SEA RES PT II
- 2Majaneva et al. 2013: Aggregations of predators and prey affect predation impact of the Arctic ctenophore *Mertensia ovum*. – MEPS
- 3Werner et al. 2016: Arctic in Rapid Transition: Priorities for the future of marine and coastal research in the Arctic. – Polar Science

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