U N I V E R S I T Y   O F   B E R G E N

University Museum of Bergen, Department of Natural History

Including gelatinous zooplankton in plankton surveys

challenges, suggestions and potential gain

Aino Hosia
University Museum of Bergen

Priscilla Licandro
Sir Alister Hardy Foundation for Ocean Science

Sanna Majaneva
Linnaeus University

Tone Falkenhaug
Institute of Marine Research

Image problem = sparse data

«Difficult to sample…
Impossible to identify…
Clog nets and are a nuisance…»

Why monitor jellies?

Why monitor jellies?

Brotz et al. 2012, Hydrobiology

- ”62 % of LMEs show increasing trends”

Condon et al. 2012, BioScience

- “Current paradigm of global increase in gelatinous zooplankton is unsubstantiated”

Hydrobiologia (2012) 690:3–20
DOI 10.1007/s10750-012-1039-7

JELLYFISH BLOOMS

Increasing jellyfish populations: trends in Large Marine Ecosystems

Lucas Brotz · William W. L. Cheung ·
Kristin Kleisner · Evgeny Pakhomov ·
Daniel Pauly

Published online: 3 April 2012

Abstract Although there are various indications and claims that jellyfish (i.e., scyphozoans, cubozoans, most hydrozoans, ctenophores, and salps) have been increasing at a global scale in recent decades, a rigorous demonstration of this has never been presented. Because this is mainly due to scarcity of quantitative time series of jellyfish abundance from scientific surveys, we attempt to complement such data with non-conventional information from other

erage. Data were aggregated and analyzed at the scale of Large Marine Ecosystem (LME). Of the 66 LMEs defined thus far that cover the world's coastal waters and seas, trends of jellyfish abundance after 1950 (increasing, decreasing, or stable/variable) were identified for 45, with variable degrees of confidence. Of those 45 LMEs, the majority (28 or 62%) showed

Articles

Questioning the Rise of Gelatinous Zooplankton in the World's Oceans

KYLIE A. PITT, CATHY H. LUCAS,
ON, MICHAEL N DAWSON, MARY BETH
EJ, HERMES MIANZAN, SHIN-ICHI UYE,

Not enough data!

e been reported in many estuarine and coastal ecosystems. global ocean ecosystems are thought to be heading toward nting a broad overview of gelatinous zooplankton in a his- mediated alteration of global ocean ecosystems. To this end, we synthesize information related to the evolutionary context of contemporary gelatinous zooplankton blooms, the human frame of reference for changes in gelatinous zooplankton populations, and whether sufficient data are available to have established the paradigm. We conclude that the current paradigm in which it is believed that there has been a global increase in gelatinous zooplankton is unsubstantiated, and we develop a strategy for addressing the critical questions about long-term, human-related changes in the sea as they relate to gelatinous zooplankton blooms.

Keywords: bloom, media, jellyfish, salp, global synthesis

The enigmatic gelatinous zooplankton are widely heralded by “nuisance” jellyfish. We present a broad overview of

Why monitor jellies?

- Changes in
  - abundance
  - distribution
  - species composition
    - early detection of NIS
- Understanding blooms

Monitoring – how?

- Spatial and temporal coverage
- Cost effective
- Realistic

Monitoring – how?

- Spatial and temporal coverage
- Cost effective
- Realistic

→Better utilization of existing sampling effort!
- Trawling surveys
- Plankton monitoring (nets)

Progress in Oceanography 77 (2008) 103–111

Contents lists available at ScienceDirect

Progress in Oceanography

journal homepage: www.elsevier.com/locate/pocean

Rise and fall of jellyfish in the eastern Bering Sea in relation to climate regime shifts

Richard D. Brodeur [a,*], Mary Beth Decker [b], Lorenzo Ciannelli [c], Jennifer E. Purcell [d], Nicholas A. Bond [e], Phyllis J. Stabeno [f], Erika Acuna [g], George L. Hunt Jr. [h]

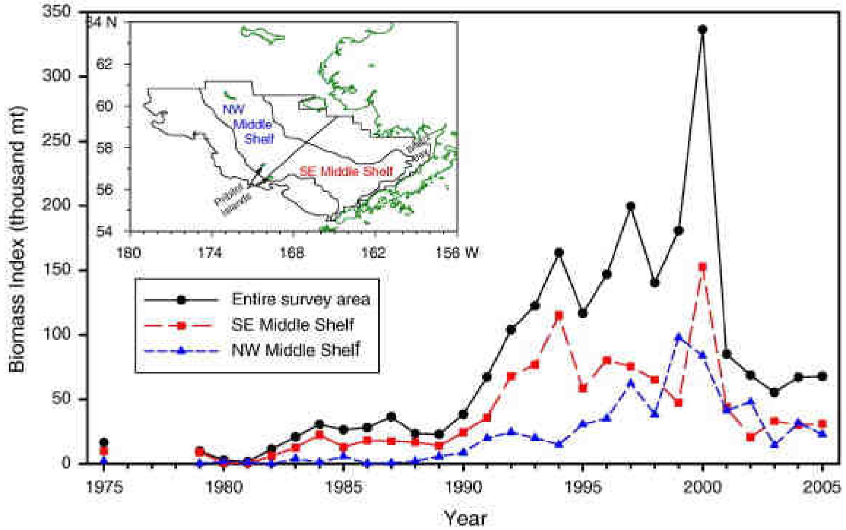


Fig. 3. Trend in jellyfish biomass from standardized trawl surveys in the Bering Sea since 1975. Shown are the total biomass (solid line) and subsets for the SE (long dashed line) and NW (short dashed line) Middle Shelf Domains…

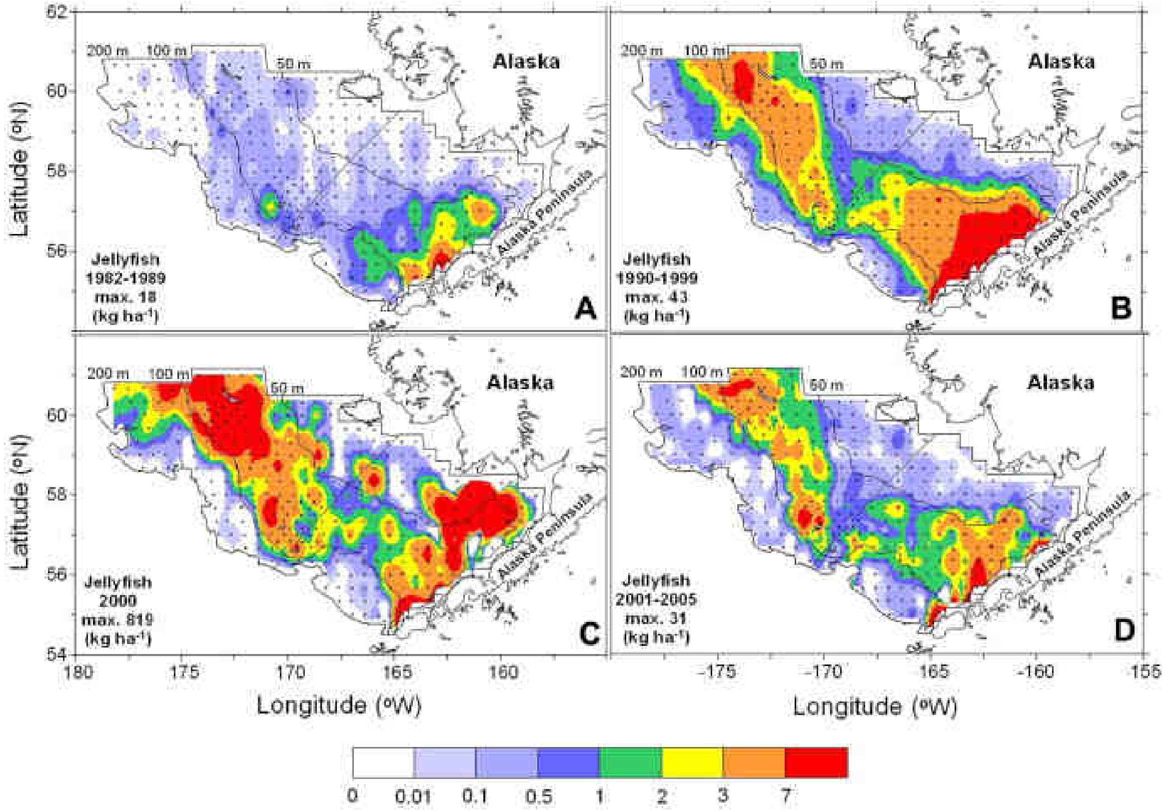


Fig. 4. Distribution of jellyfish biomass based on trawl surveys in the Bering Sea averaged over four periods (A) 1982–1989, (B) 1990–1999, (C) 2000, and (D) 2001–2004 identified in this paper as being oceanographically unique.

Biomass of Scyphozoan Jellyfish, and Its Spatial Association with 0-Group Fish in the Barents Sea

Elena Eriksen[1]*, Dmitry Prozorkevich[2], Aleksandr Trofimov[2], Daniel Howell[1]

1 Institute of Marine Research, Bergen, Norway, 2 Polar Research Institute of Marine Fisheries and Oceanography, Murmansk, Russia

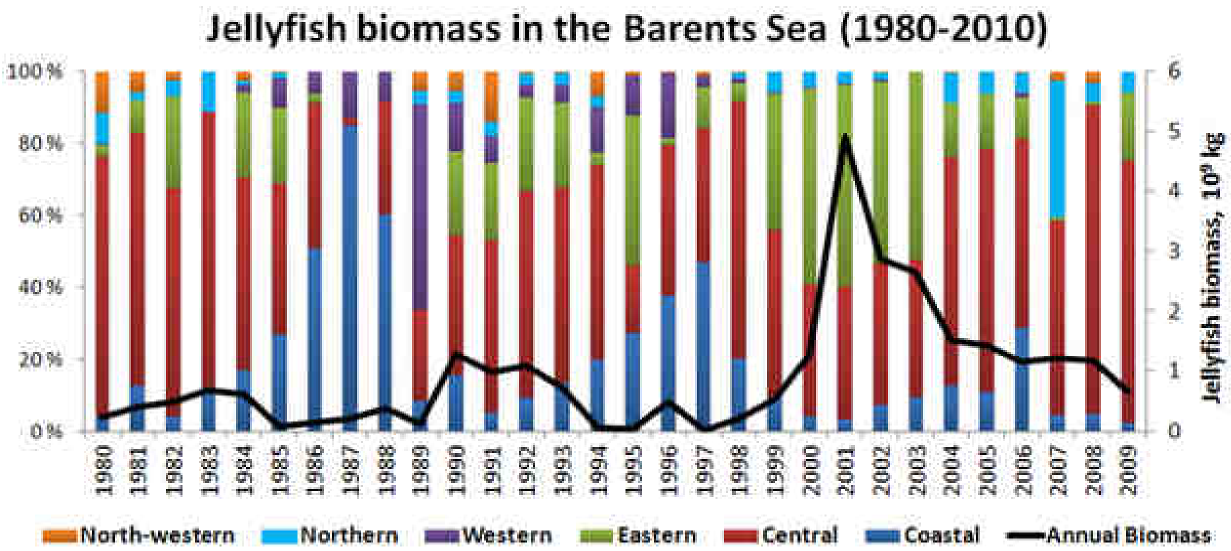


Figure 5. Variation of jellyfish biomass indices in the Barents Sea (109 kg, black line) and the spatial distribution of jellyfish biomass (colored bars).

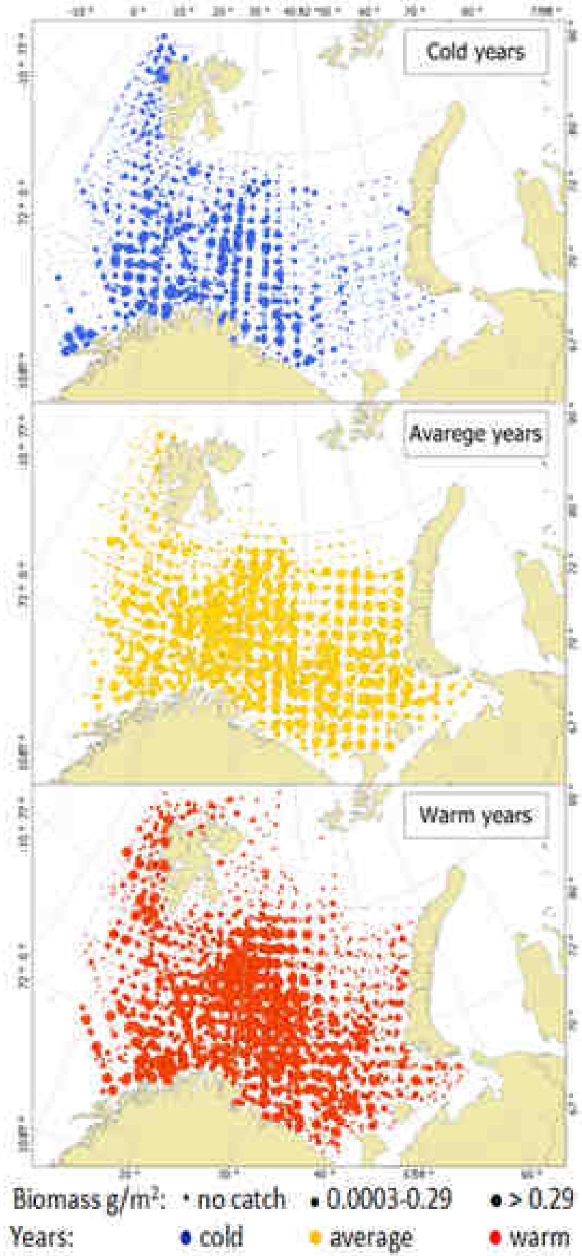
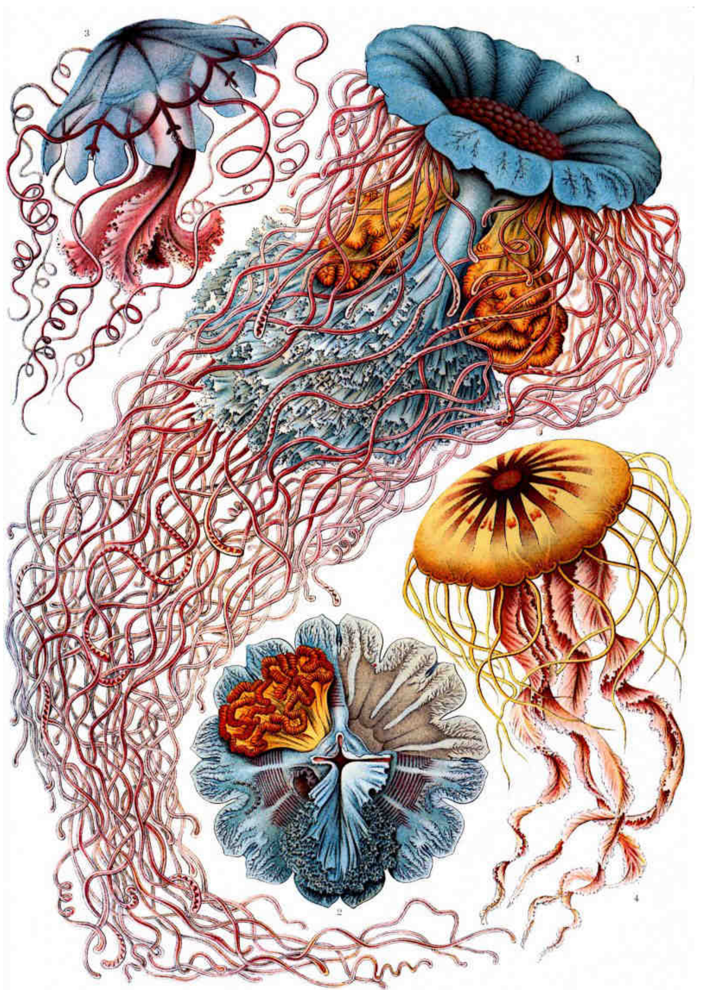


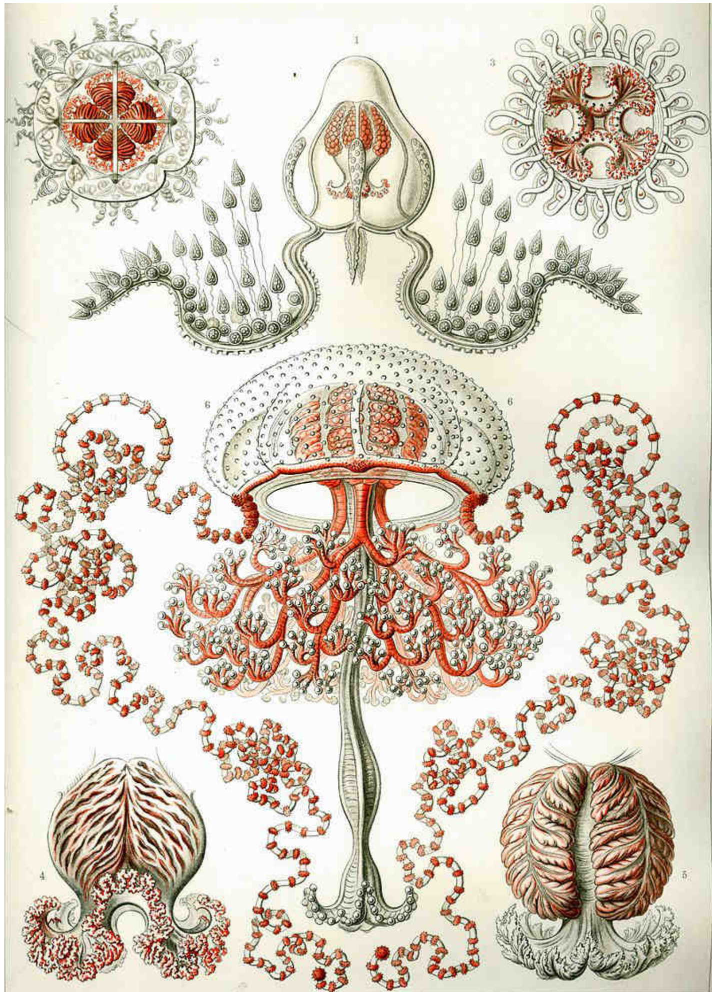
Figure 4. Spatial distribution of jellyfish biomass (wet weight g/m2) during years with different temperature regimes in the Barents Sea (see Figure 3).

Diversity

Scyphozoa
200-400 spp.

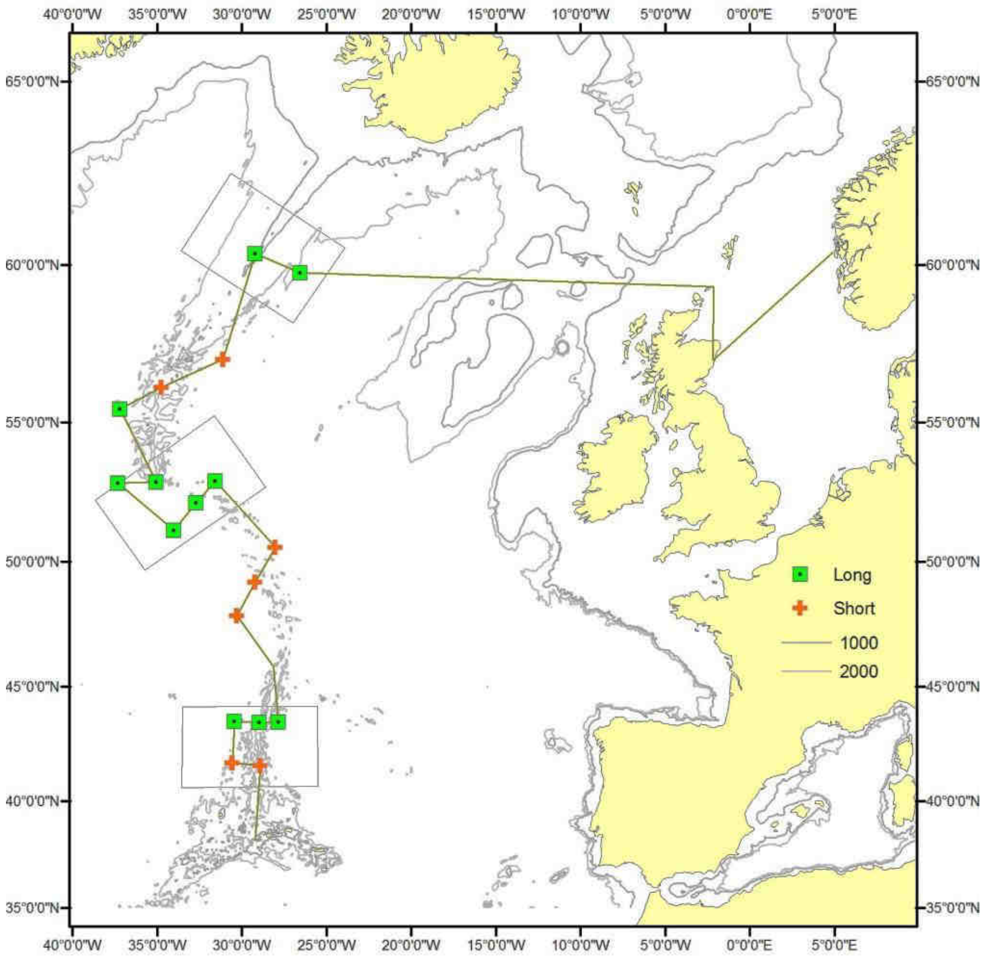


Hydrozoa >3500
spp. (not all pelagic)



Ctenophora
150-200 spp.

Mar-Eco 2004



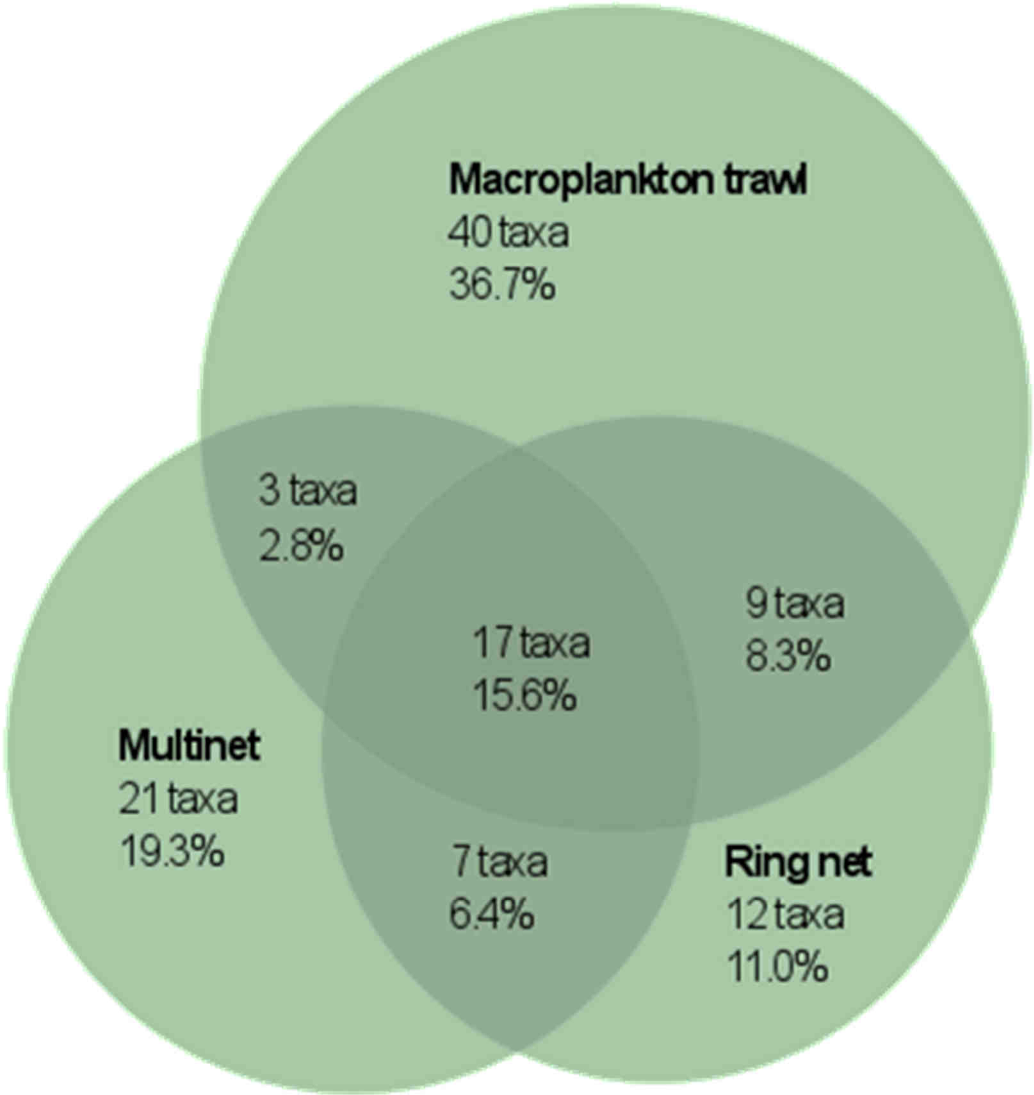
Various nets/trawls NOT targeting jellies

- Multinet midi
- Macroplankton trawl
- Ring net on bottom trawl

Optical methods

- UVP
- ROV

Mar-Eco 2004

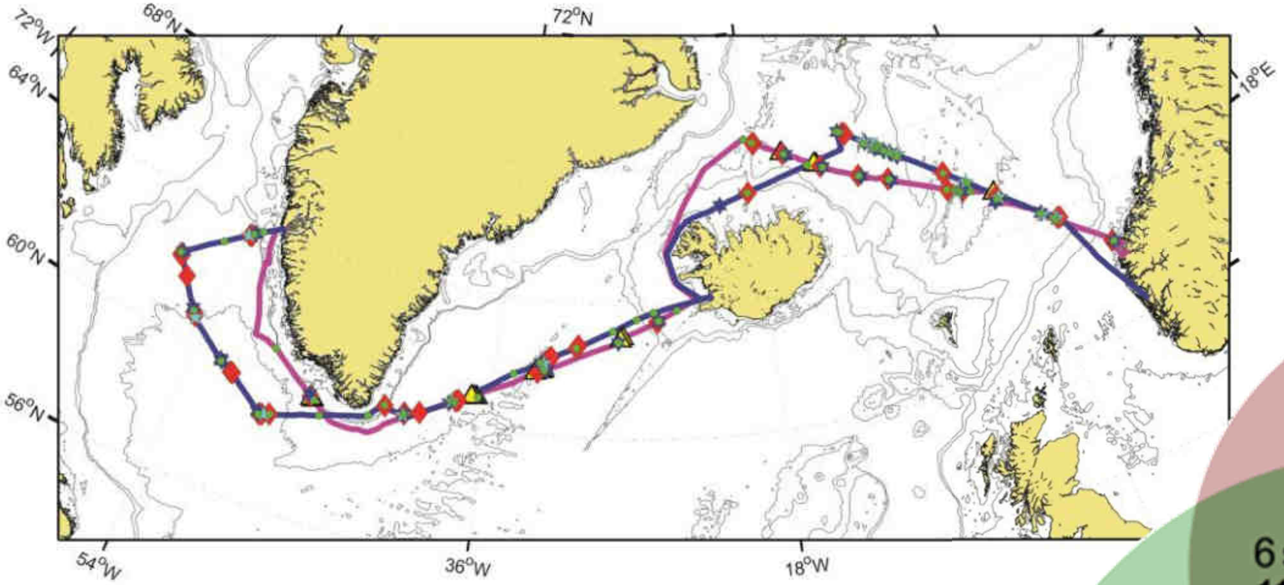


Total 109 spp/taxa of jellies (cnidarians) collected with nets/trawls.

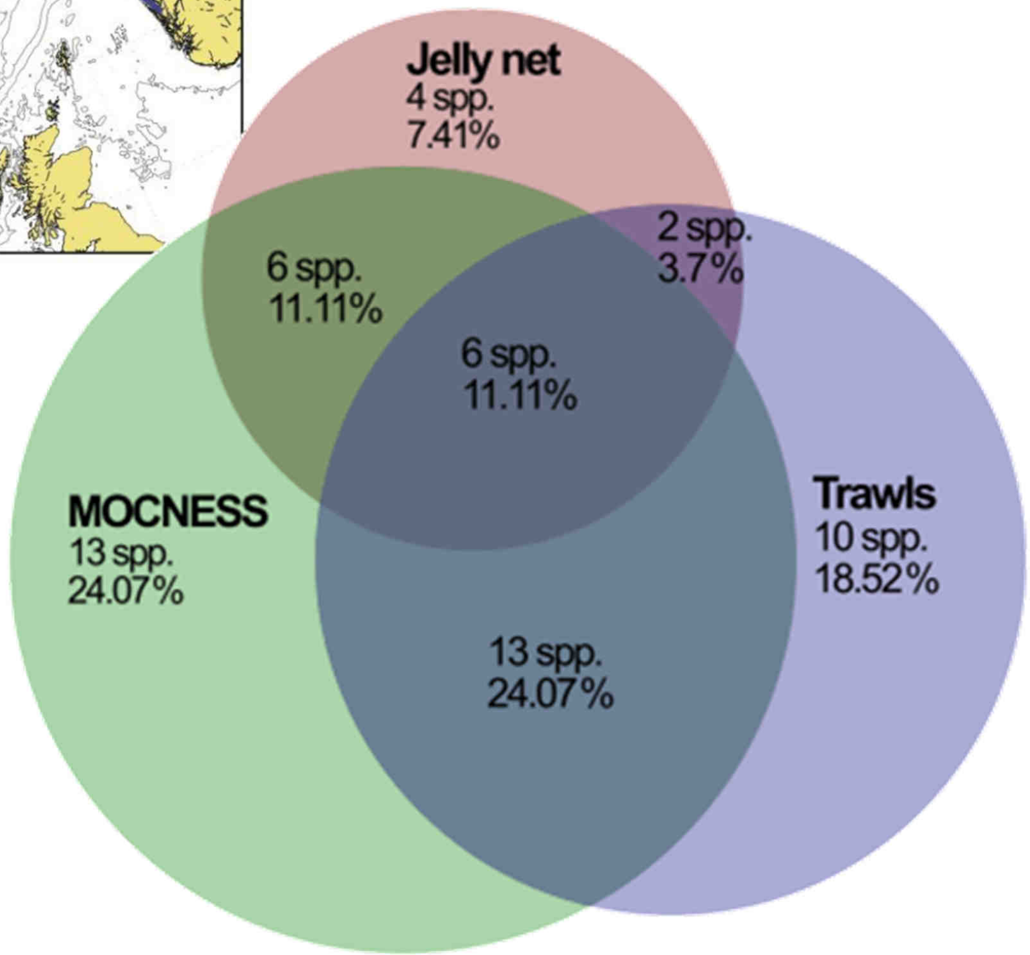
Distributions clearly related to hydrography.

High selectivity!

Euro-Basin 2013



- Jellynet (200-0 m), MOCNESS & Harstad/macroplankton trawl
- >50 spp./taxa of jellies



High gear selectivity!

- Smaller plankton nets:
  - Small, common species (small hydromedusae & diphyid siphonophores)
  - Highest densities (ind. m^{-3})

- Macroplankton & Harstad trawls:
  - Higher diversity
  - Rare larger species (eg. Prayid siphonophores)

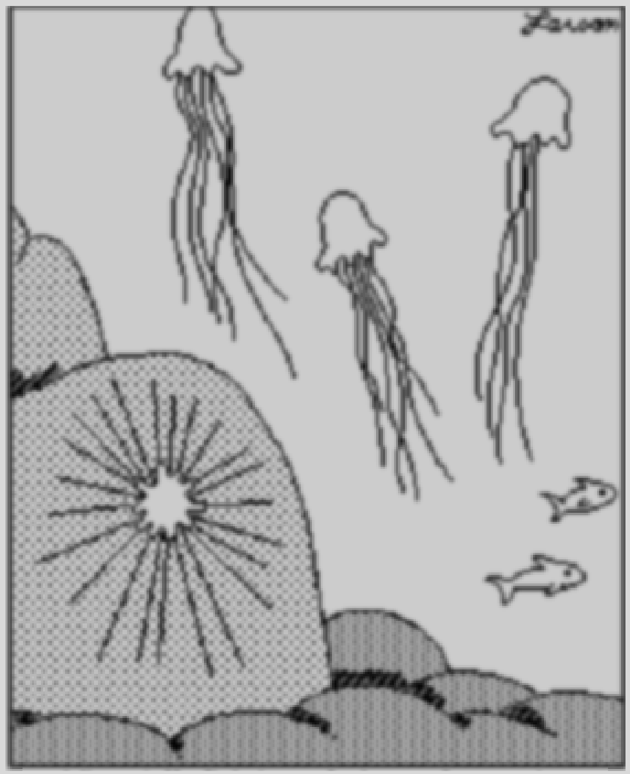
- MOCNESS:
  - Good compromise?

Suggested modifications

- Routine protocol
  - Identifying, enumerating & weighing large jellyfish
  - Preserving small jellies
- Training personnel

Suggested modifications

- Routine protocol
  - Identifying, enumerating & weighing large jellyfish
  - Preserving small jellies
- Training personnel
- Gentle processing…



When jellyfish travel at unsafe speeds

Ctenophores = Misery

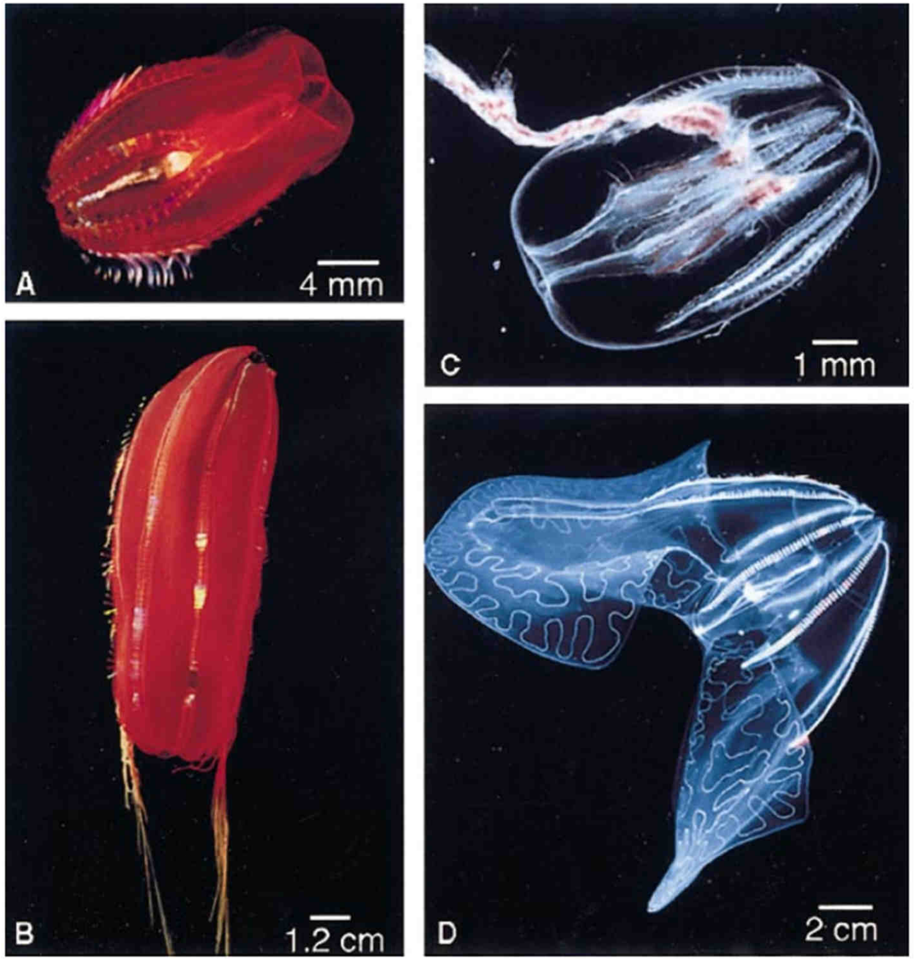


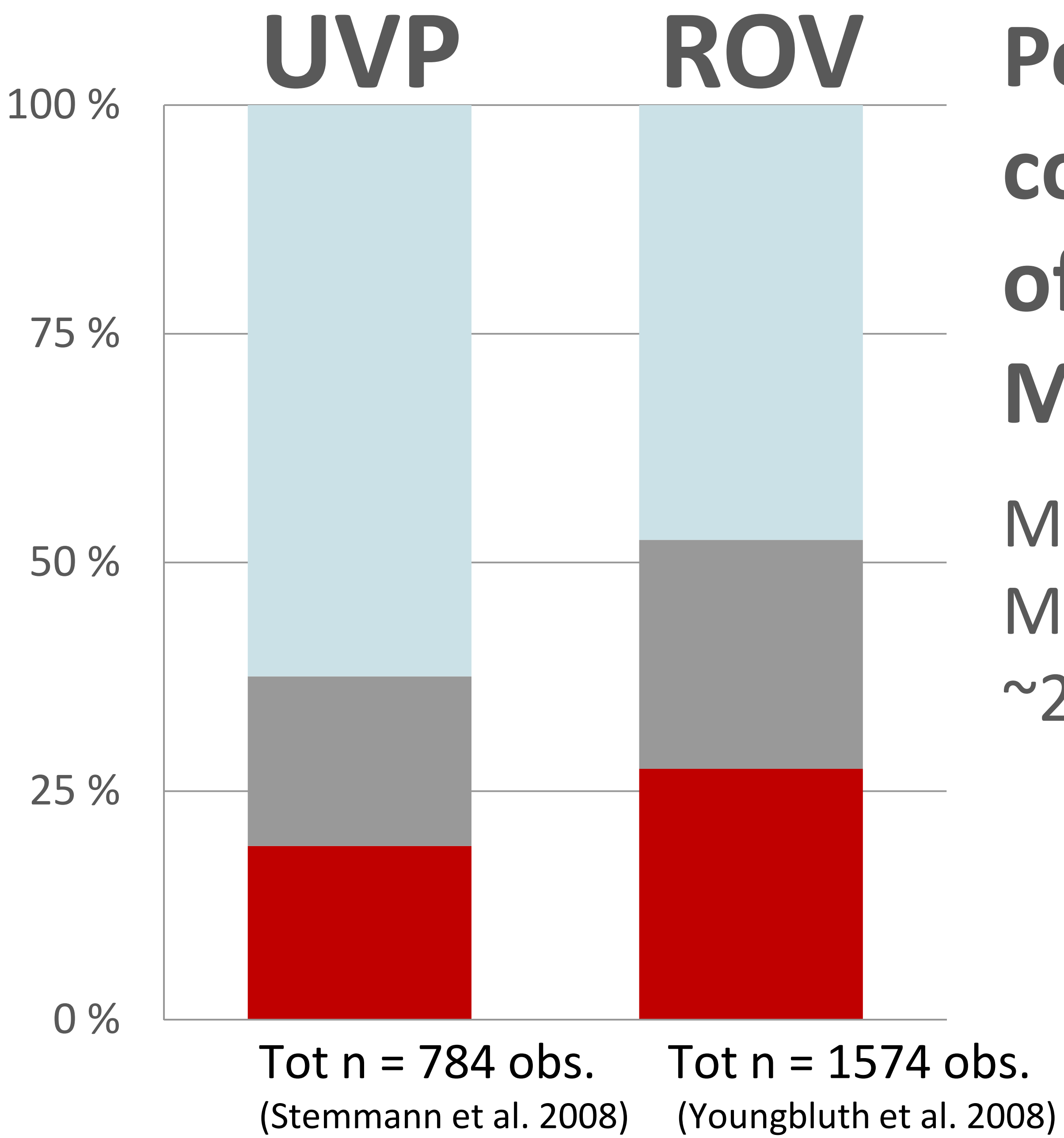
FIG. 1. Undescribed ctenophores analyzed in this study. (A) Cydippid, undescribed sp. 1; (B) cydippid, undescribed sp. 2; (C) cydippid, undescribed sp. 3; (D) lobate, undescribed sp. 4.

Podar et al. 2001

Percentage contribution of ctenophores in Mar-Eco samples

Multinet <1%

Macroplankton trawl ~2%

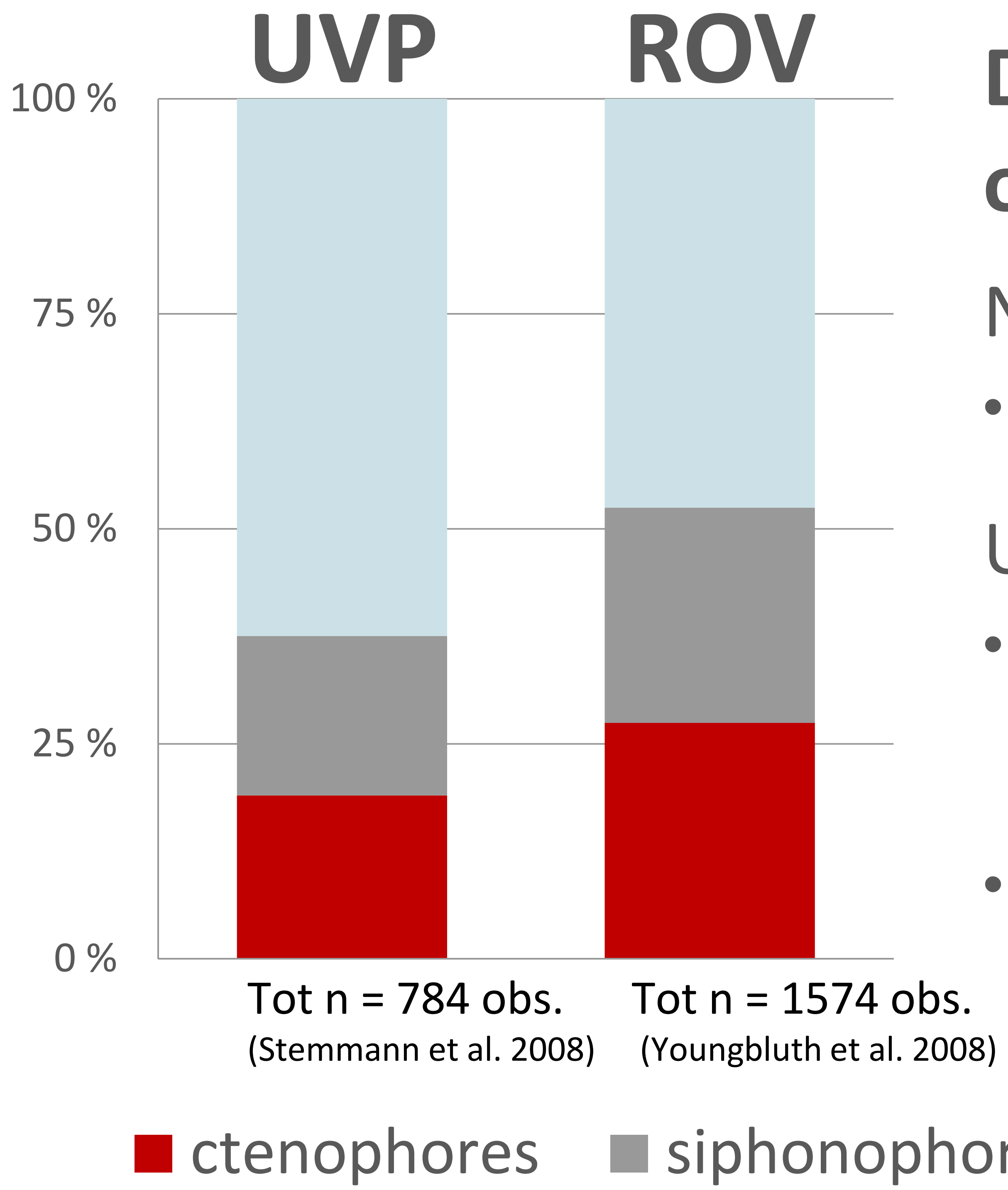


ctenophores siphonophores medusae

Percentage contribution of ctenophores in Mar-Eco samples

Multinet <1%

Macroplankton trawl ~2%



Diversity of ctenophores

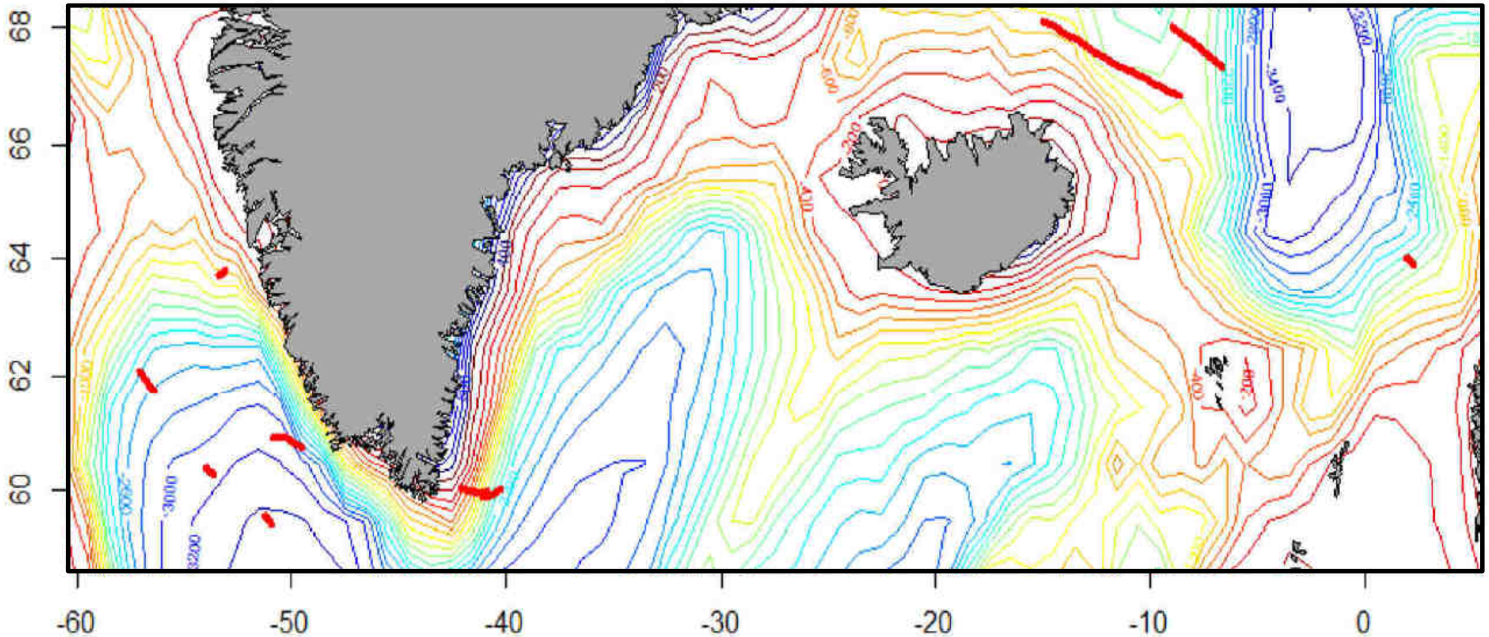
Net & trawl:

- only beroid ctenophores

UVP & ROV:

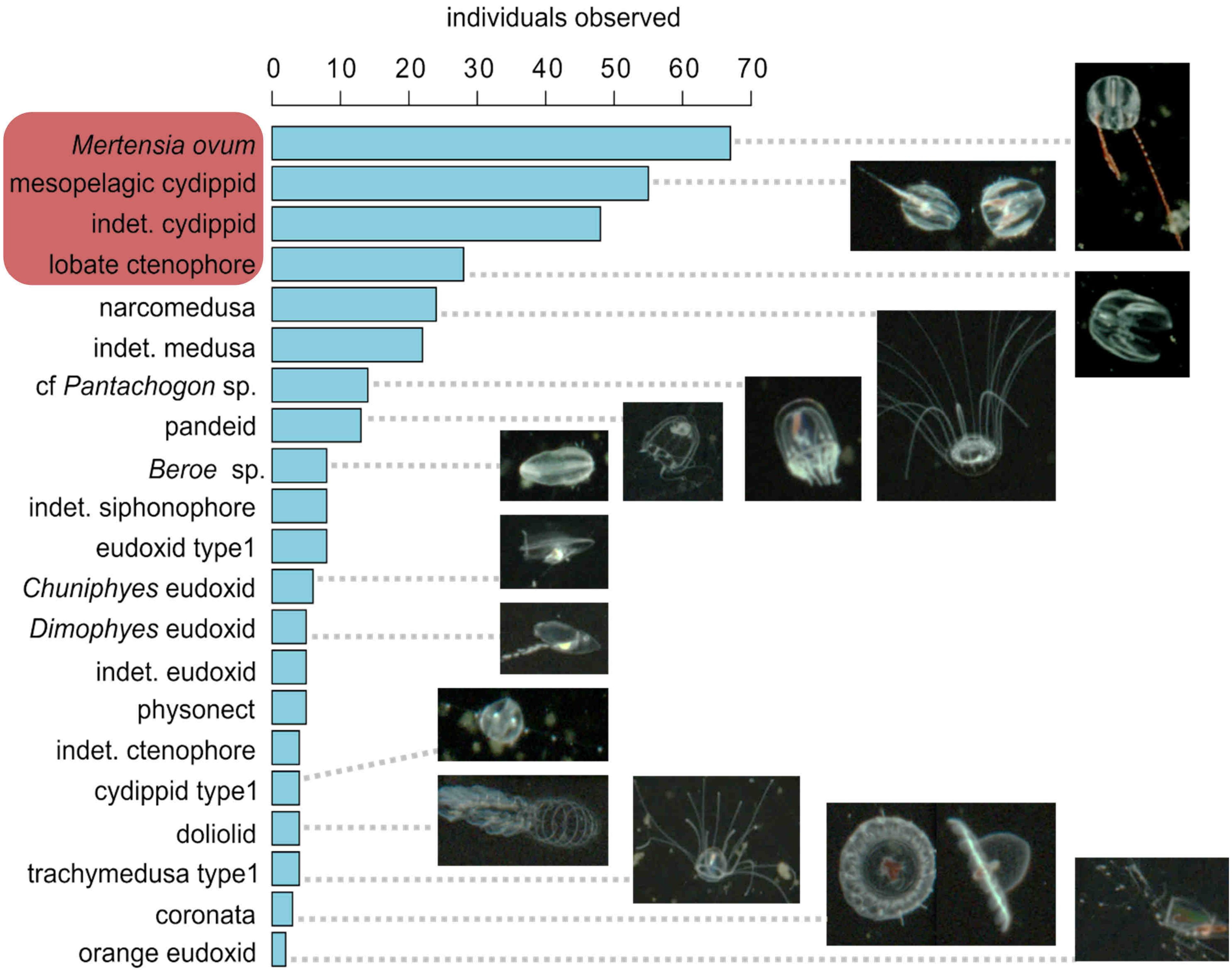
- 67-95 % lobates
  - *Bathocyroe*
  - *Bolinopsis*
- Rest primarily unidentified mesopelagic cydippids

Euro-Basin VPR



Survey report (2013)

- MESSOR platform with digitally-autonomous video plankton recorder etc.
- 9 transects, tow-yo between 0-400 m depth
- 338 jellies identified from VPR images

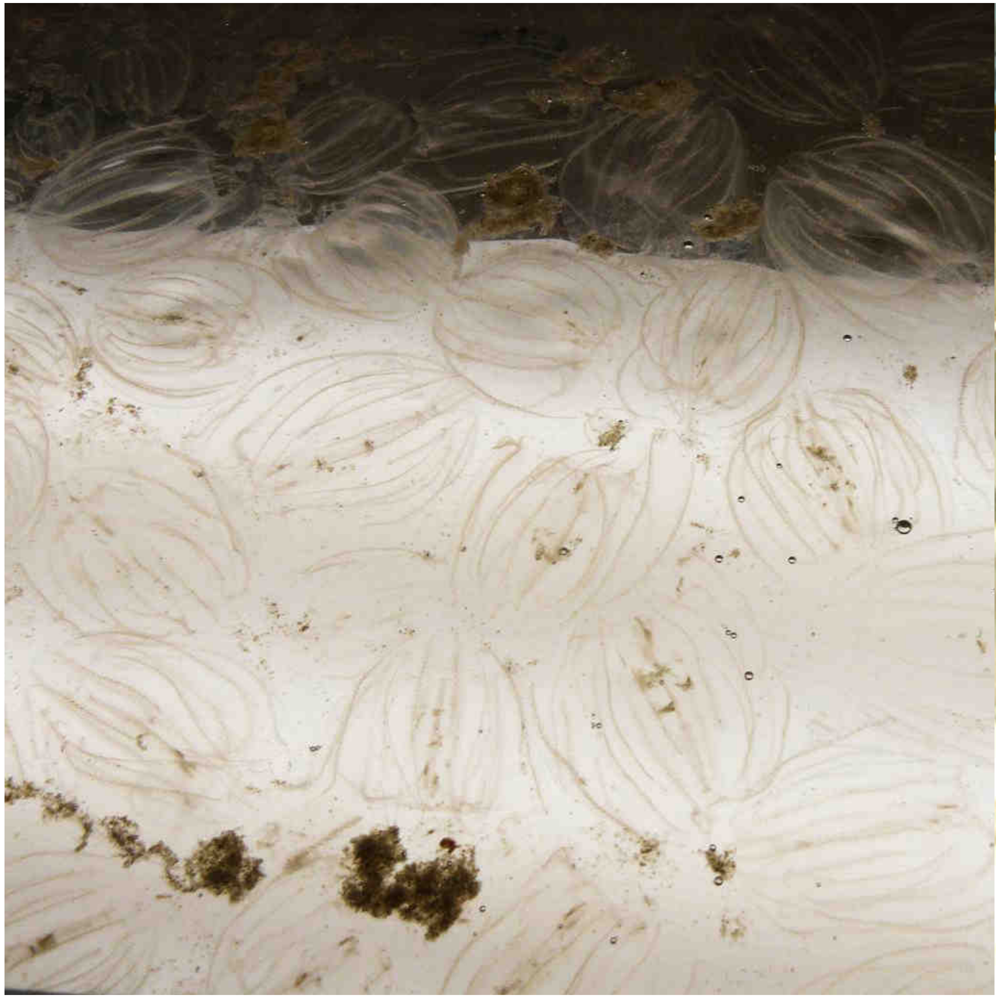


individuals observed
0
10
20
30
40
50
60
70
Mertensia ovum
mesopelagic cydippid
indet. cydippid
lobate ctenophore
narcomedusa
indet. medusa
cf Pantachogon sp.
pandeid
Beroe sp.
indet. siphonophore
eudoxid type1
Chuniphyes eudoxid
Dimophyes eudoxid
indet. eudoxid
physonect
indet. ctenophore
cydippid type1
doliolid
trachymedusa type1
coronata
orange eudoxid

Ctenophore best practice?

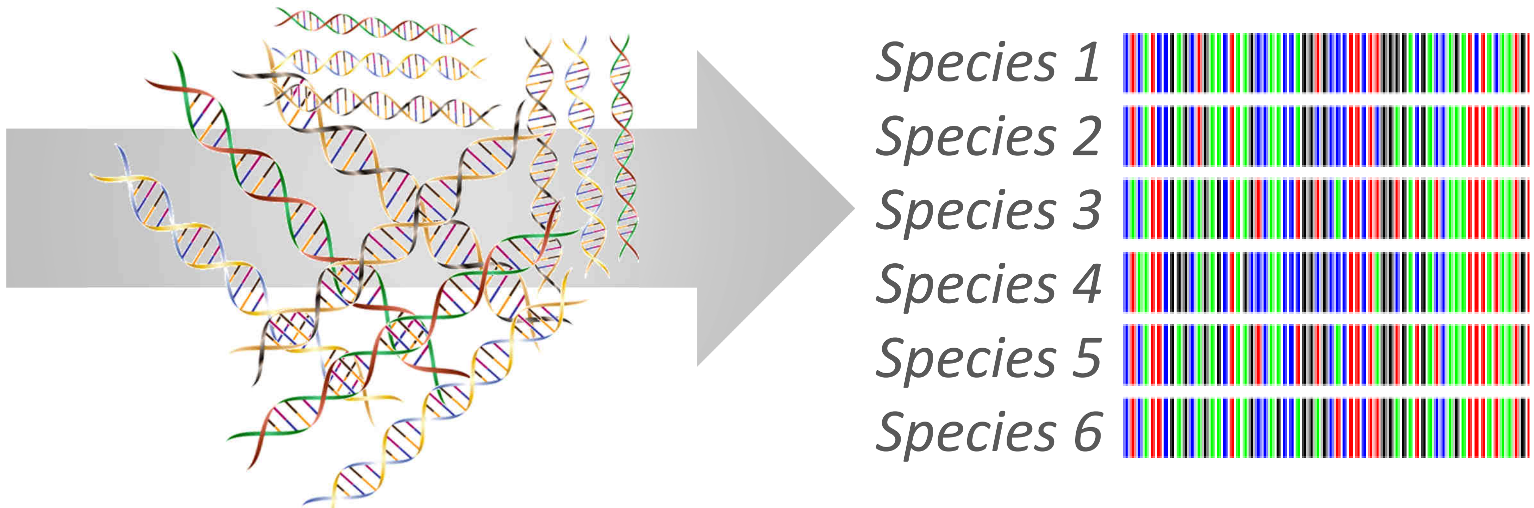
Ctenophore best practice?

Live sorting…



Future perspectives

- Metabarcoding!
  - No need for morphological ID
  - Currently poor for estimating abundances
  - Need for a reference database
    - NTI: Pelagic Hydrozoa (PI Hosia) & ctenophores (PI Majaneva)



Take home:

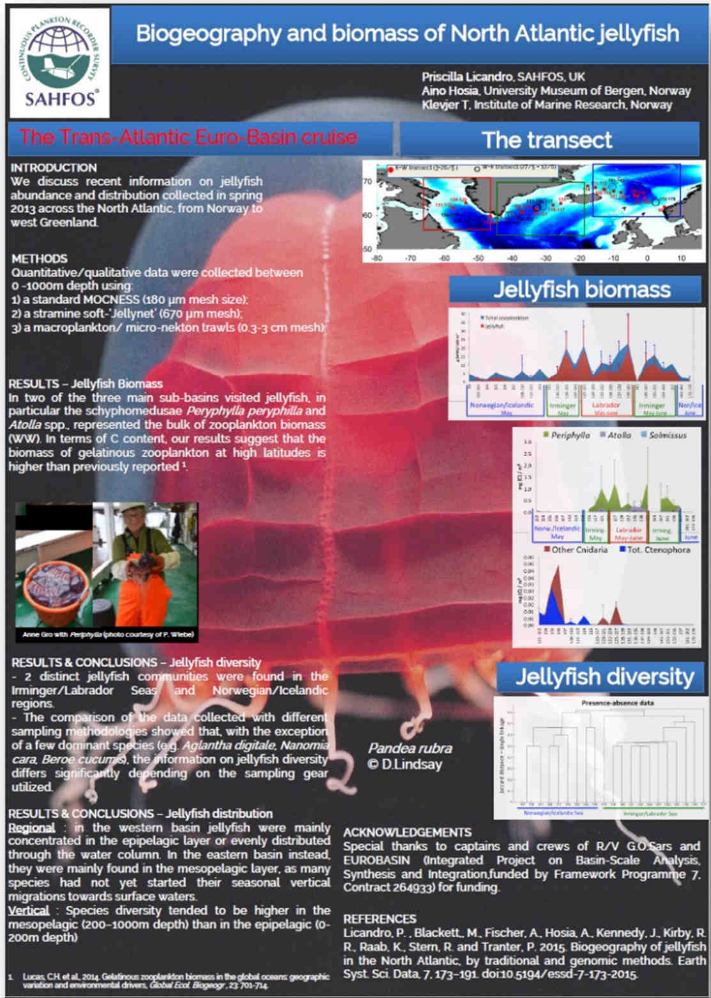
Loads of data on cnidarian abundances and distribution to be gained from existing monitoring with minor adjustments to sample processing and investment in taxonomic skills.

Consistency is key: Establishment of routine protocols and training of personnel.

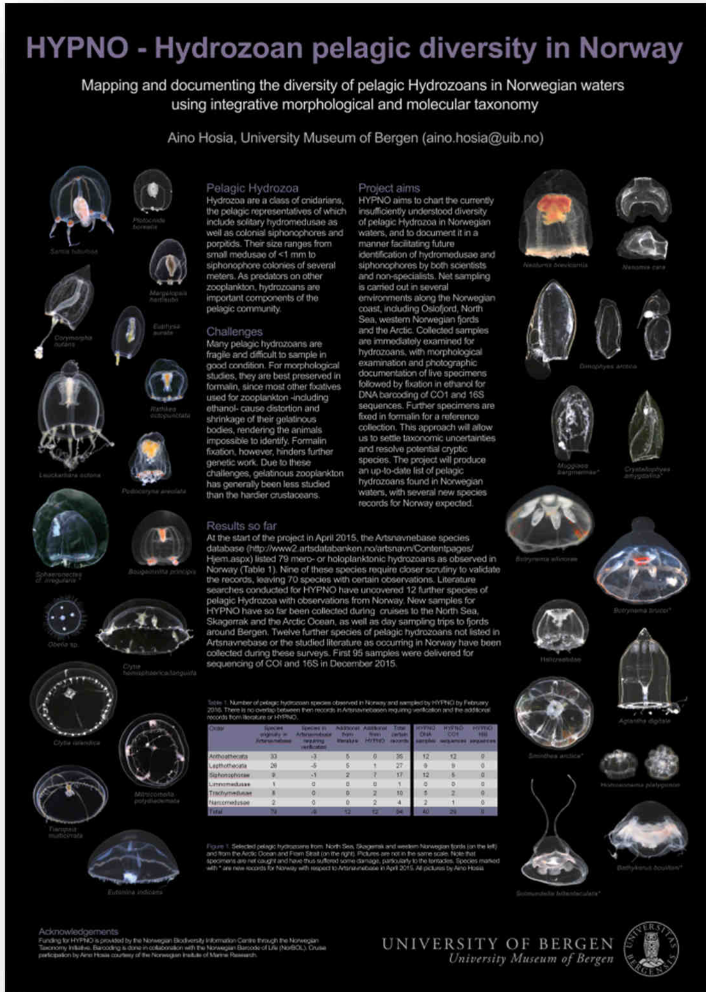
Jellies are a diverse group - gear highly selective!

Ctenophores = misery…

S3 poster session Tuesday
on Euro-Basin jellies:



S4 poster session Wednesday
on barcoding pelagic Hydrozoa:



Session 4, Friday at 14:40
Sanna Majaneva
Morphological and molecular evidence reveal underestimated ctenophore species richness – peeking into the group of unidentified species