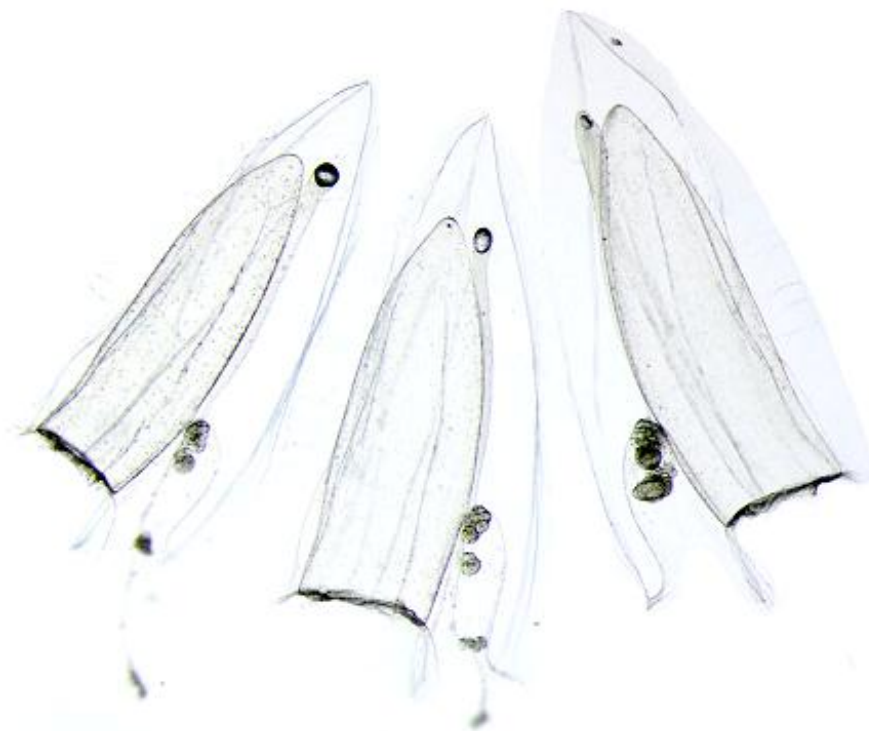
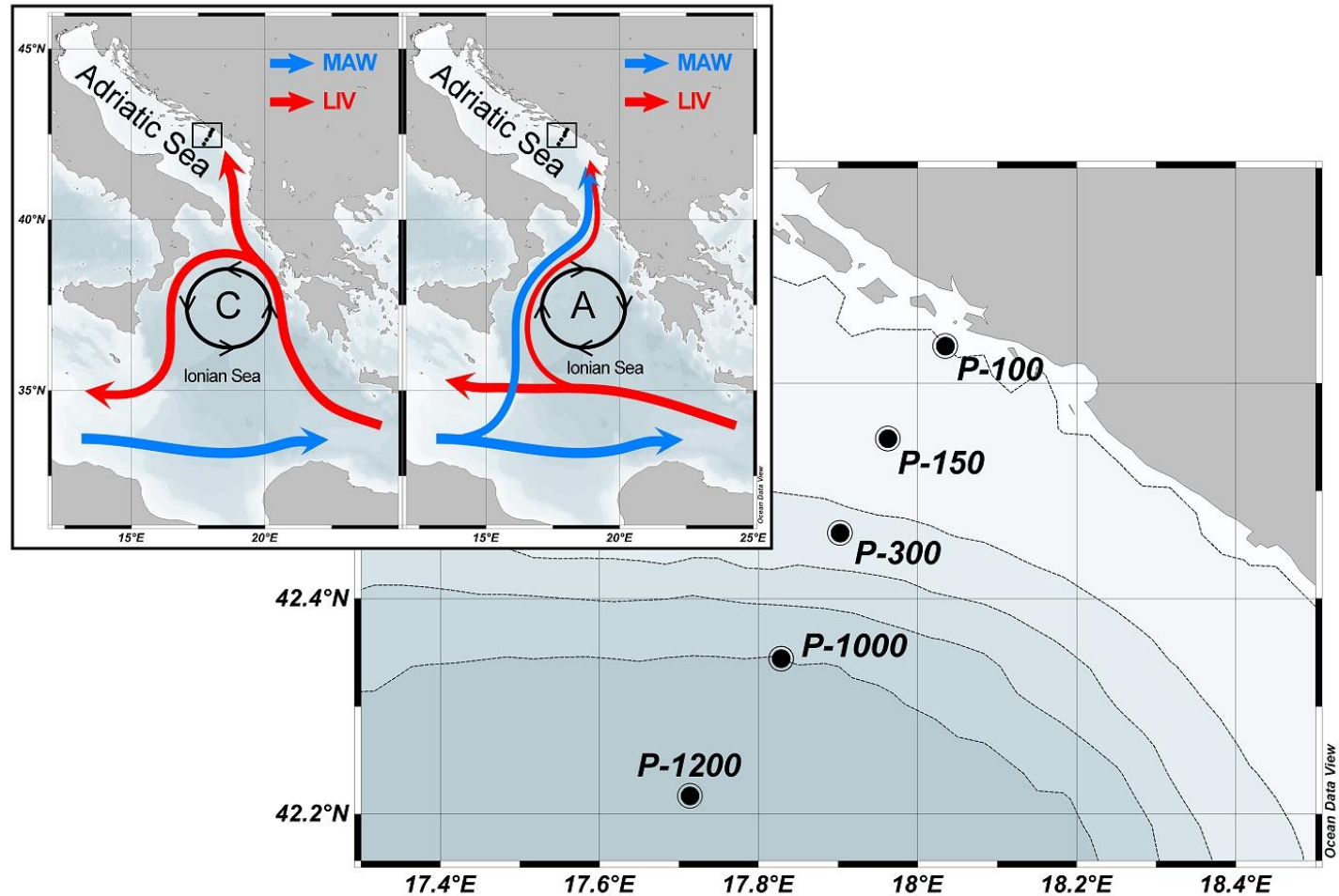


Changes in Adriatic non-crustacean zooplankton community - influence of hydroclimatic changes

Mirna Batistić, Rade Garić, Juan-Carlos Molinero



- 492 zooplankton samples were analyzed from 1993 to 2011.



Sampling stations with different circulation patterns in Ionian Sea, after Gačić et al. (2010)





salinity chart made after Civiterese et al. (2010)

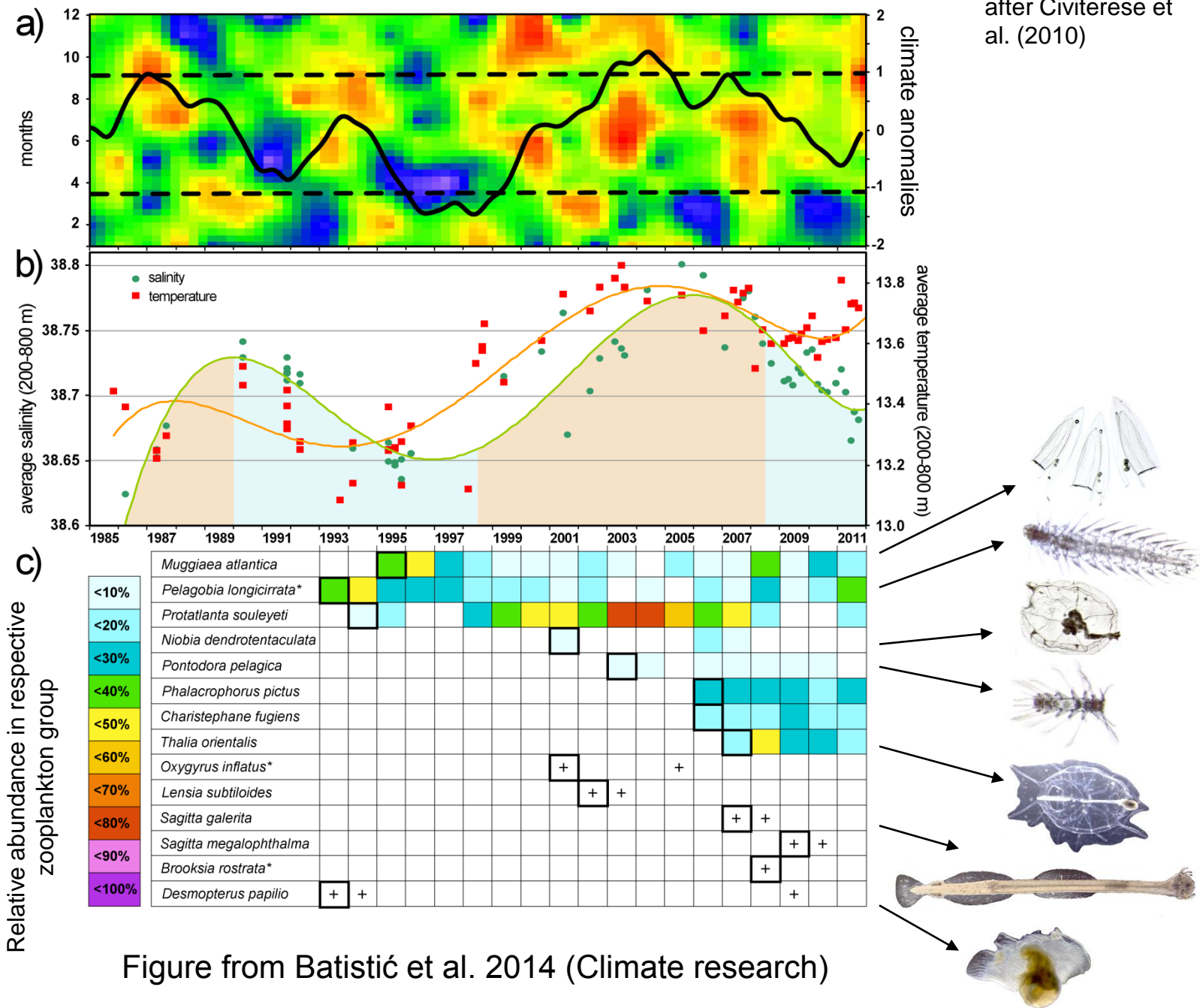
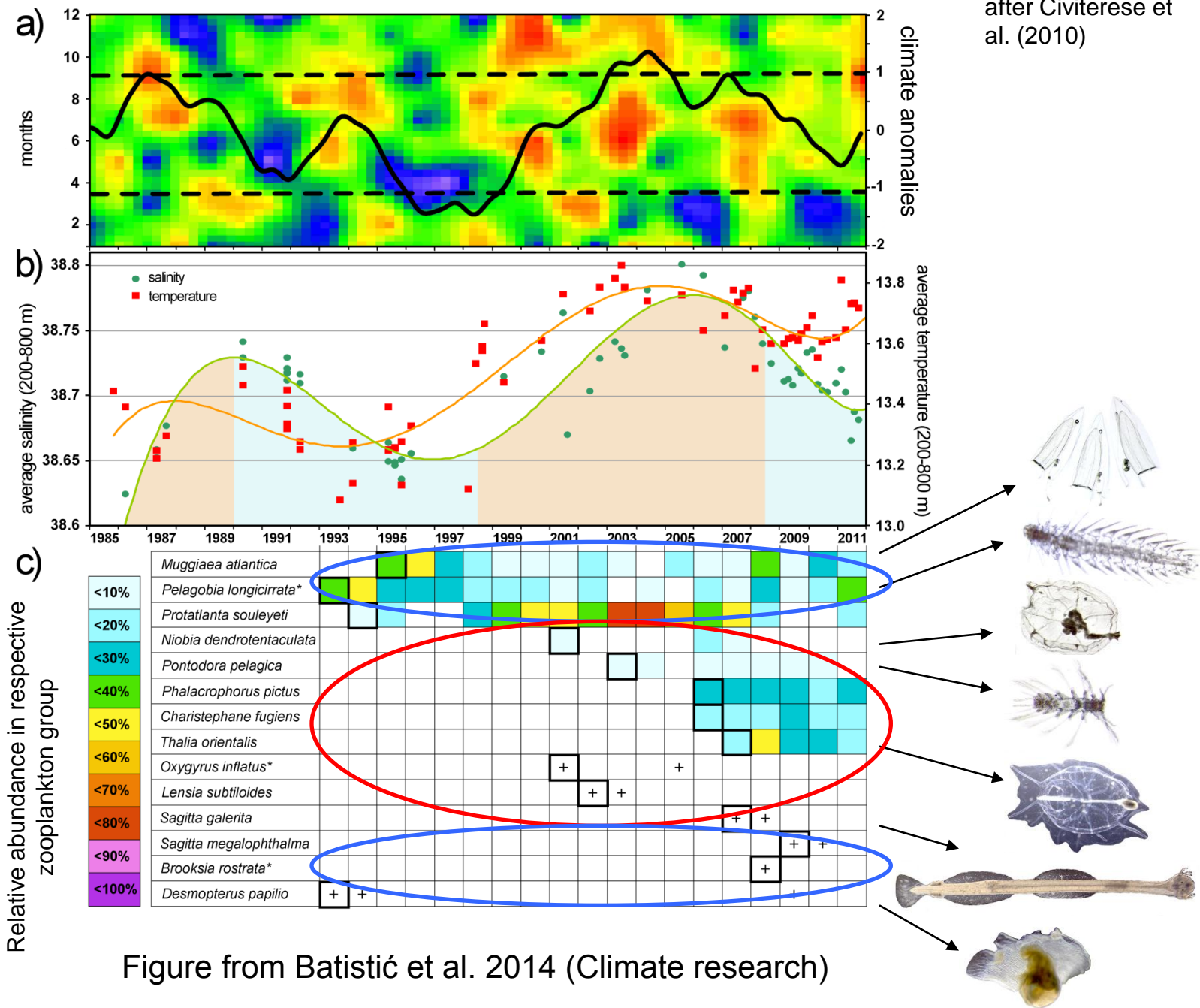


Figure from Batistić et al. 2014 (Climate research)



salinity chart made after Civiterese et al. (2010)





salinity chart made after Civiterese et al. (2010)

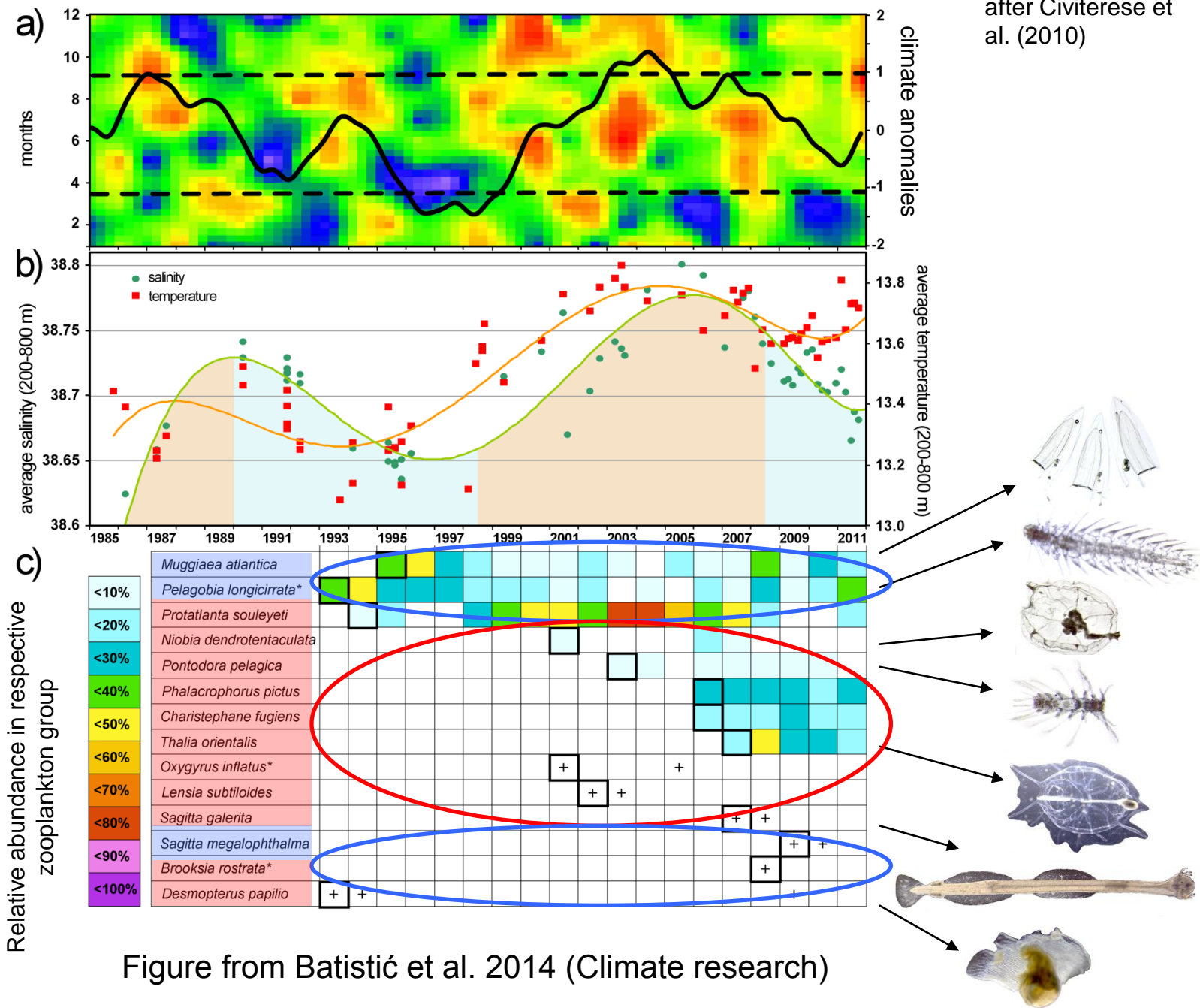
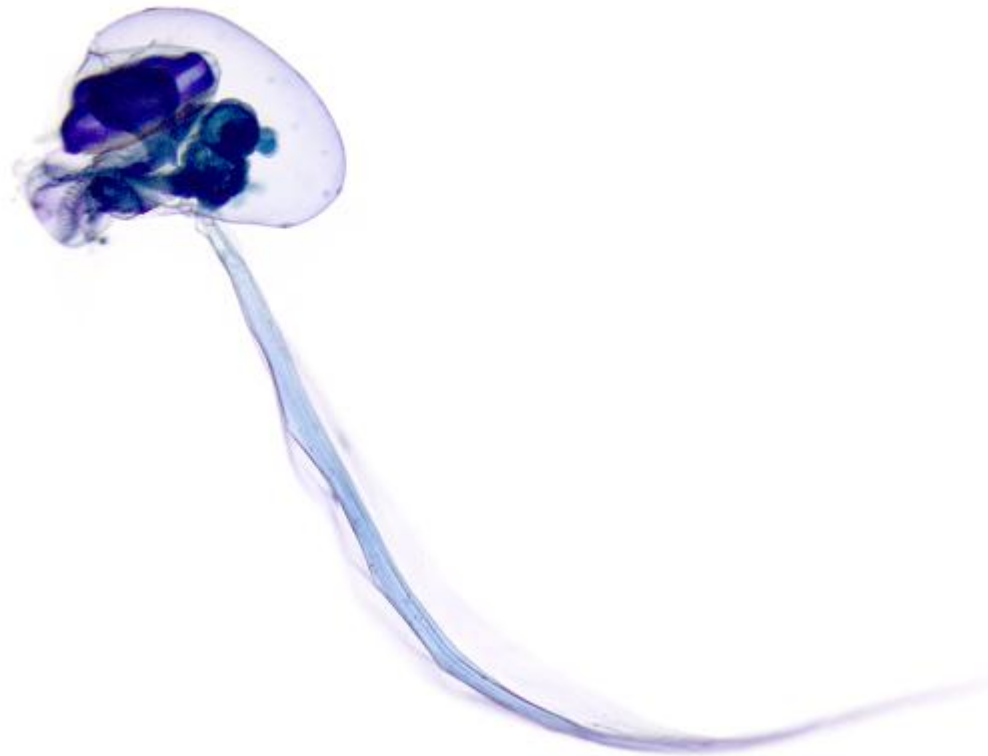


Figure from Batistić et al. 2014 (Climate research)

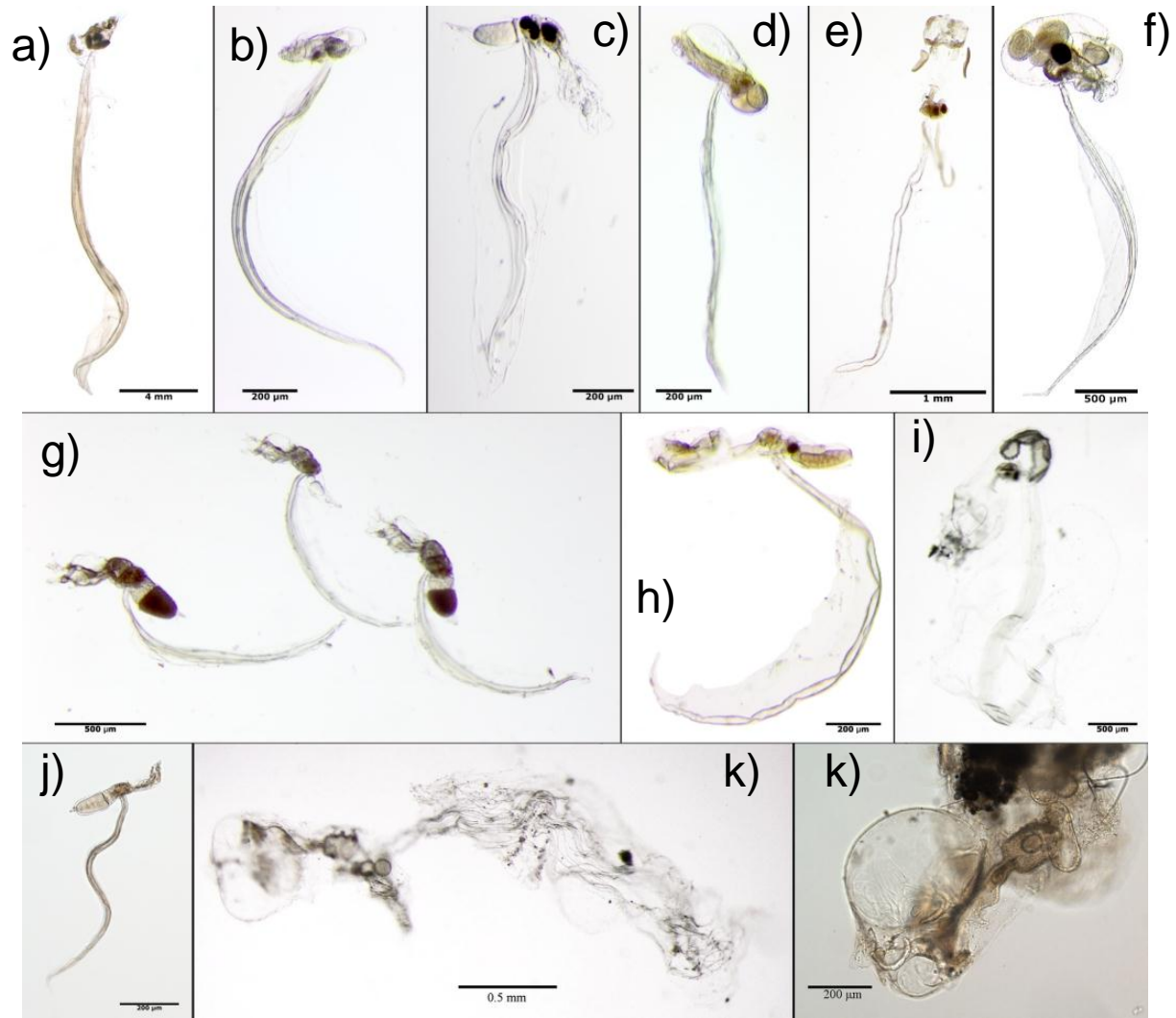
Appendicularian diversity in the Adriatic

- largely under-investigated group
- Last systematic investigation in the Adriatic was in late 1970s.
- Since 2007 twelve new species for the Adriatic were found (2 of those new to the science).





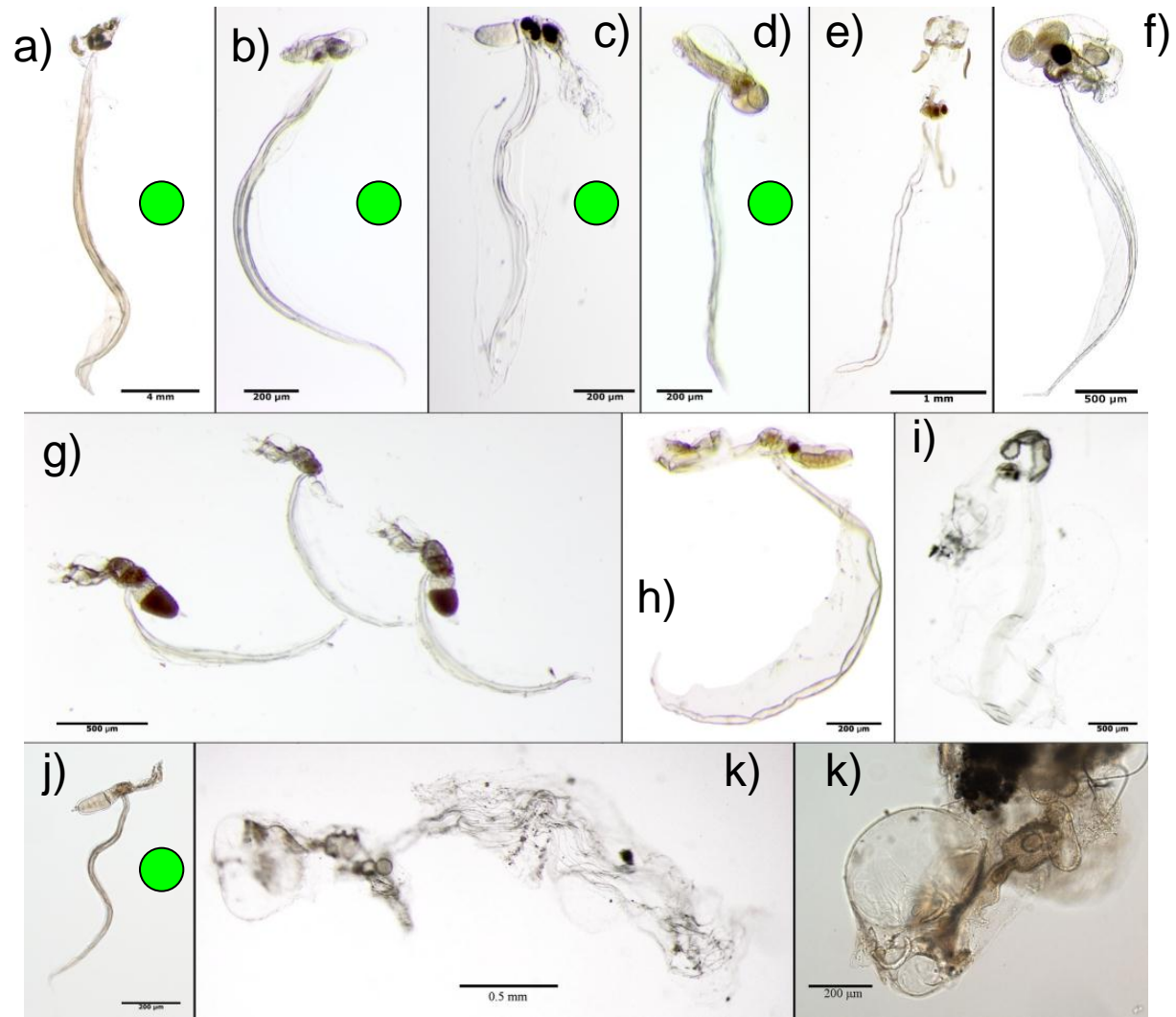
- Overlooked species
- Species overlooked in 90s, potential indicators of MAW
- Newly recorded species (from 2007 onwards), potential indicators of MAW
- New species to the science



a) *Oikopleura villafrancae*, b) *Folia gracilis*, c) *Fritillaria formica tuberculata*, d) *Appendicularia tregouboffi*, e) *Tectillaria fertilis*, f) *Kowalevskia oceanica*, g) *Fritillaria formica digitata*, h) *Fritillaria aequatorialis*, i) *Fritillaria charybdae*, j) *Fritillaria ragusina*, k) *Fritillaria lucifer* sp.



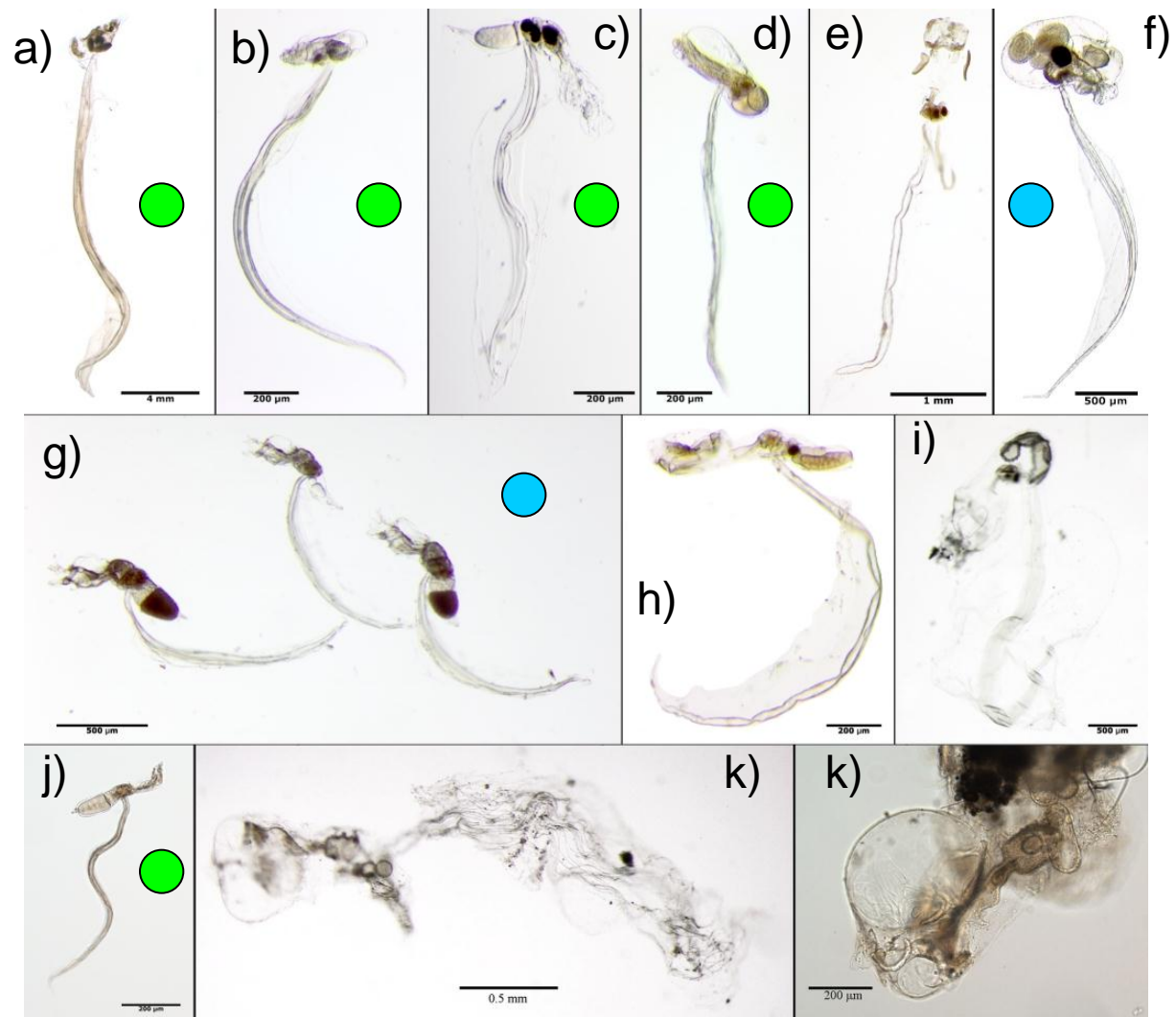
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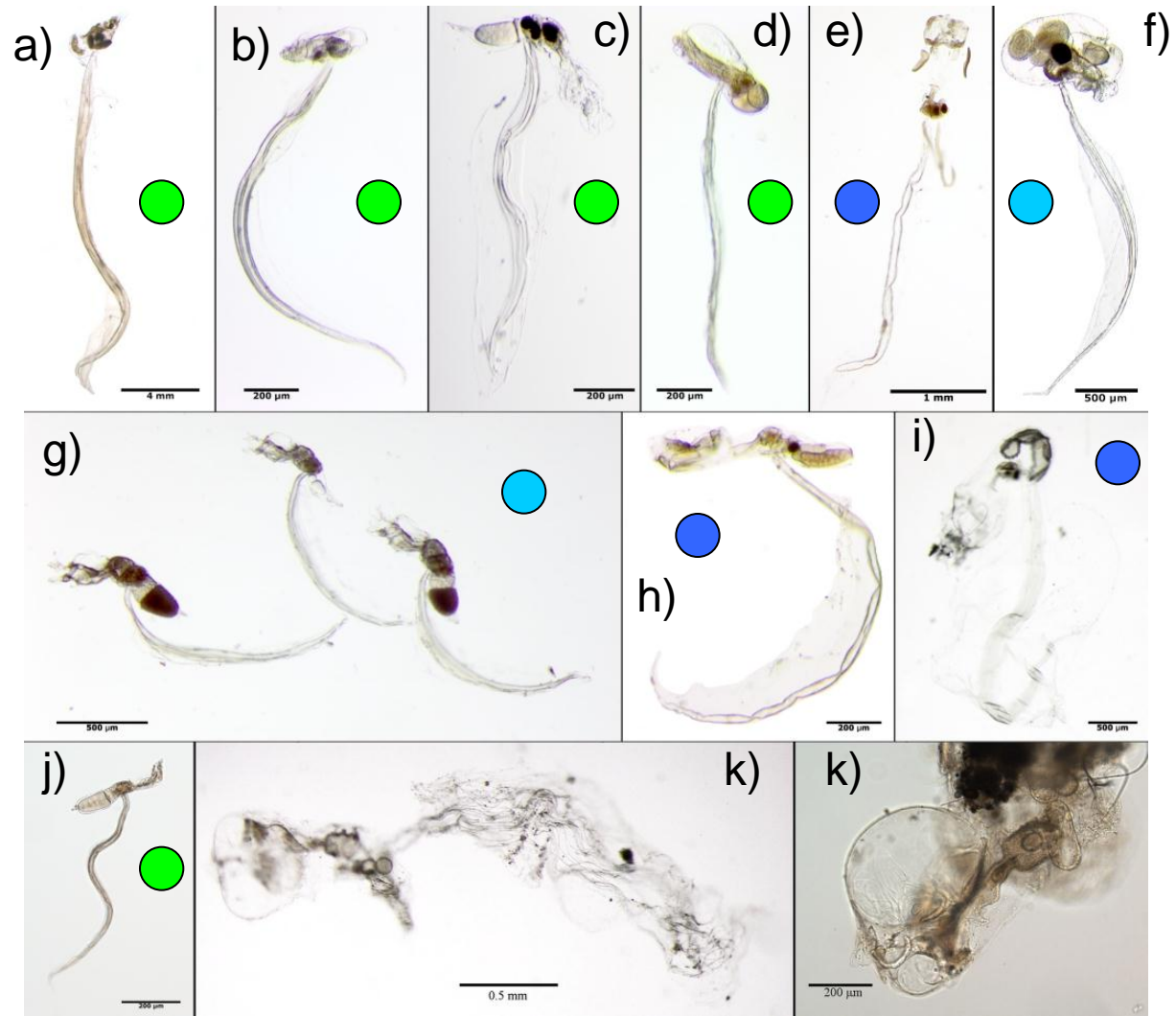


a) *Oikopleura villafrancae*, b) *Folia gracilis*, c) *Fritillaria formica tuberculata*, d) *Appendicularia tregouboffi*, e) *Tectillaria fertilis*, f) *Kowalevskia oceanica*, g) *Fritillaria formica digitata*, h) *Fritillaria aequatorialis*, i) *Fritillaria charybdae*, j) *Fritillaria ragusina*, k) *Fritillaria lucifer* sp.





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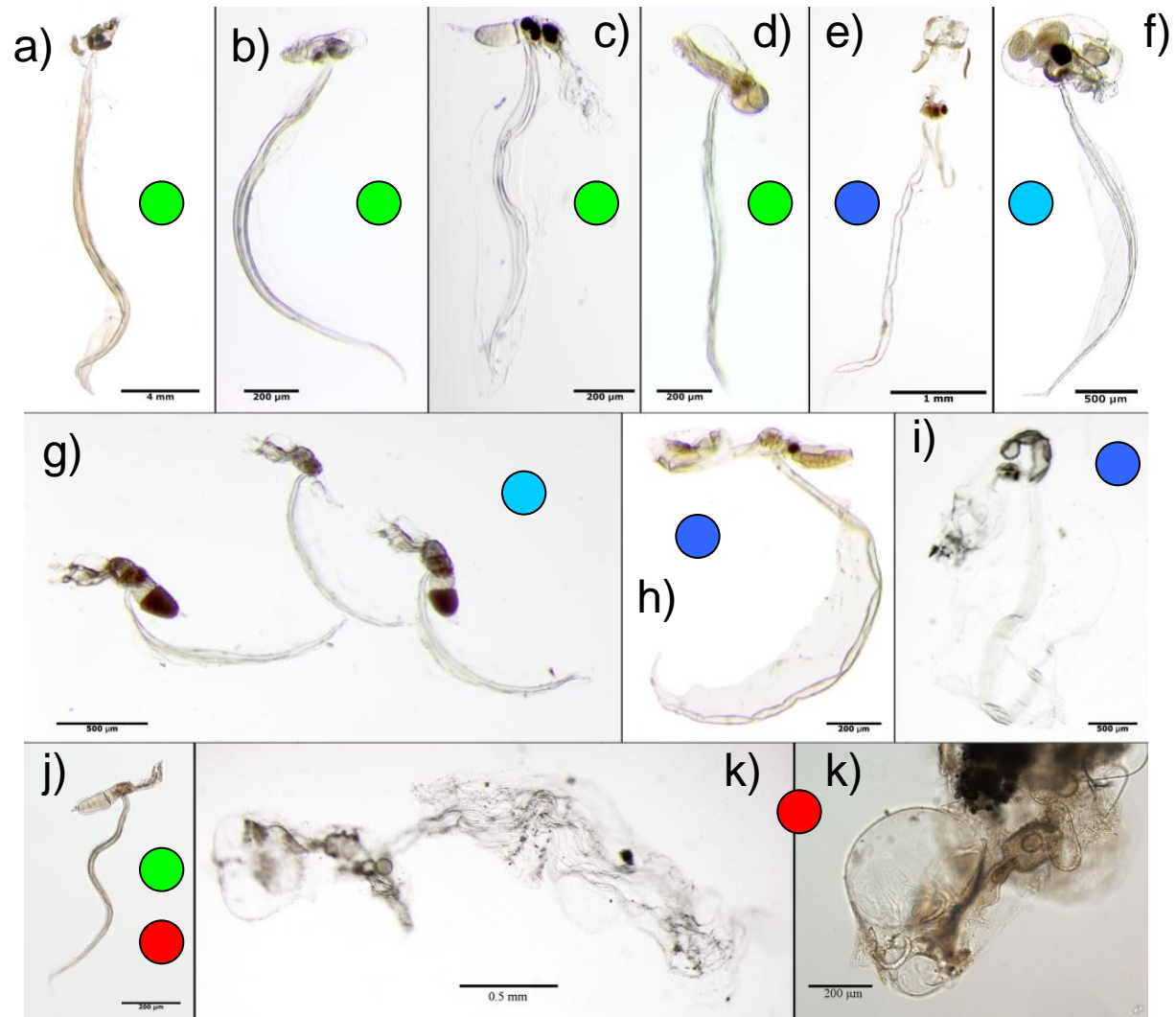


a) *Oikopleura villafrancae*, b) *Folia gracilis*, c) *Fritillaria formica tuberculata*, d) *Appendicularia tregouboffi*, e) *Tectillaria fertilis*, f) *Kowalevskia oceanica*, g) *Fritillaria formica digitata*, h) *Fritillaria aequatorialis*, i) *Fritillaria charybdae*, j) *Fritillaria ragusina*, k) *Fritillaria lucifer* sp.





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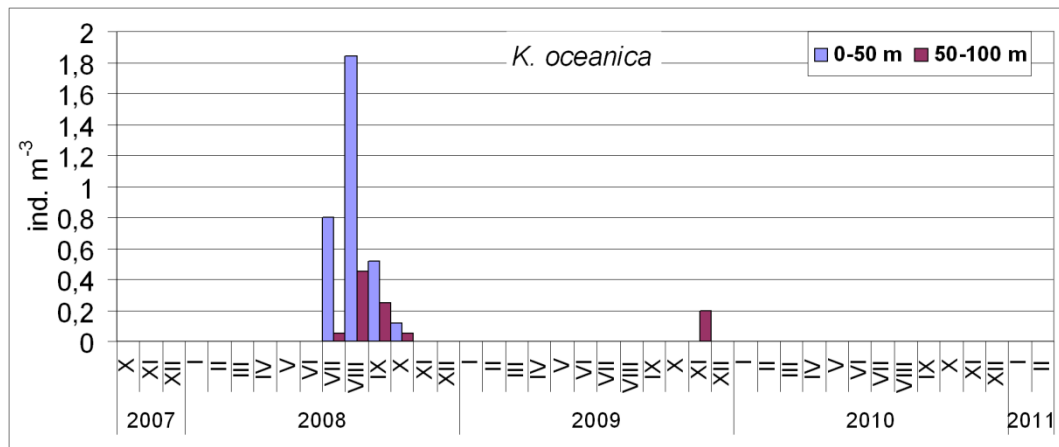
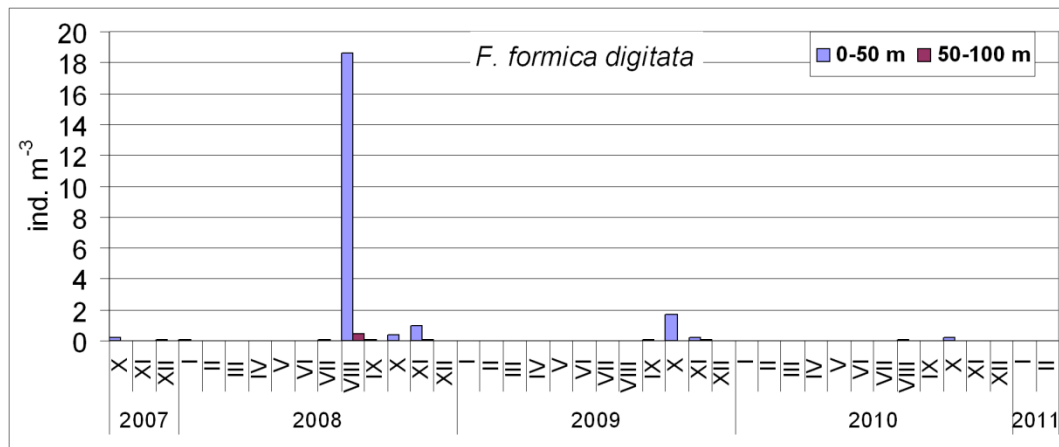
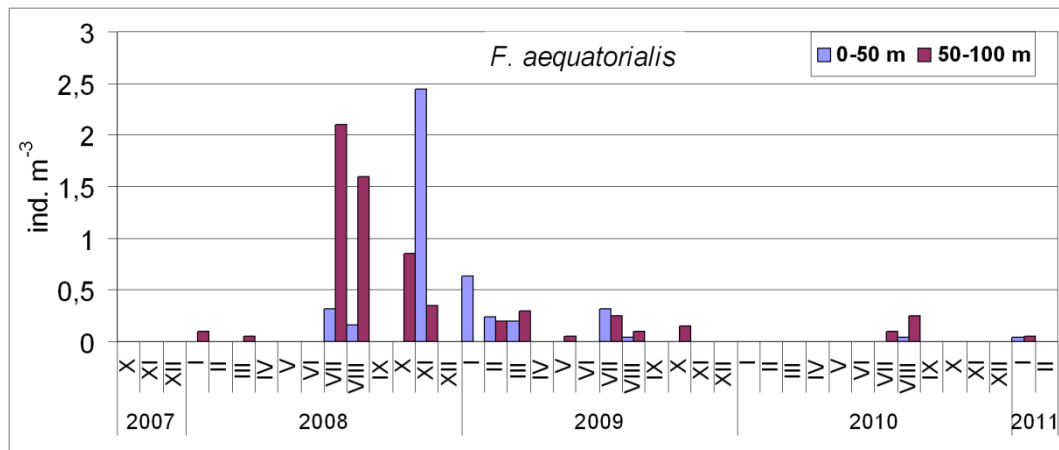
F. aequatorialis



F. formica digitata

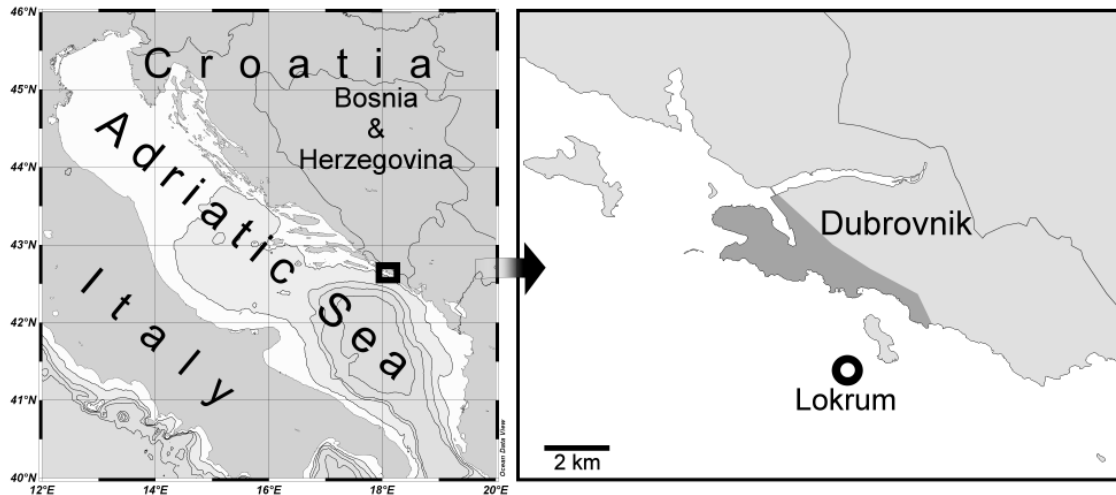
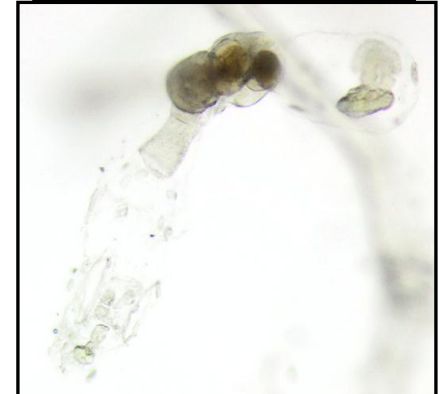


K. oceanica





- *Fritillaria helenae* was found in 2014
- First record after its description by Bückmann from the Atlantic in 1924
- found in the same samples as *Brooksia lacromae* sp. nov.

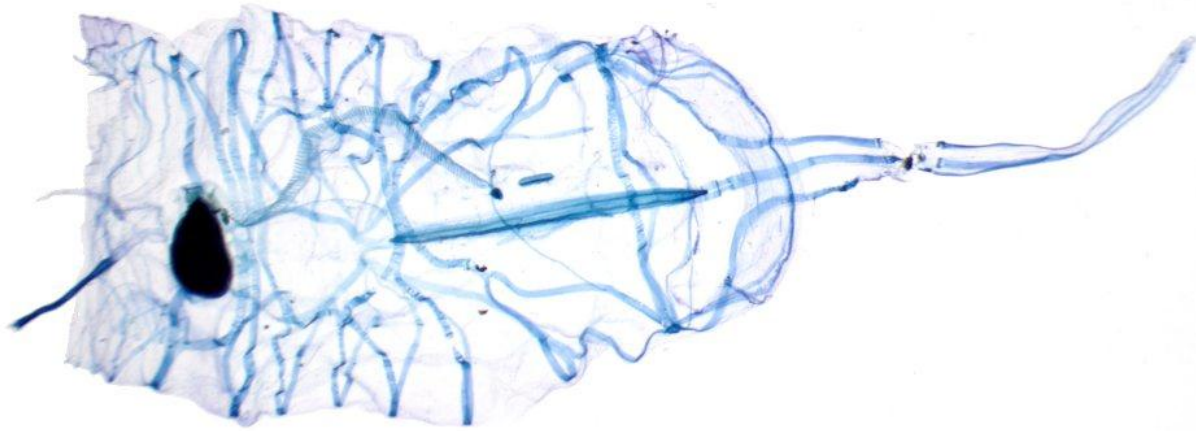


Position of Lokrum station

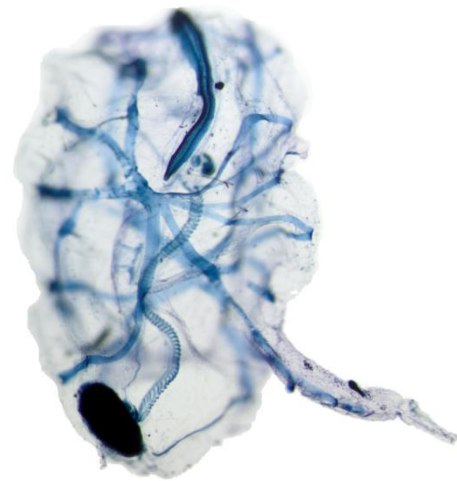


Description of *Brooksia lacromae* sp. nov. Garić & Batistić, 2016
(accepted for publication in European Journal of Taxonomy)

- Described from specimens found at Lokrum monitoring station in 2014.
- 1.5% uncorrected pairwise differences between *B. lacromae* and *B. rostrata* 18S rRNA sequence
- Both forms were sequenced (aggregate and solitary) to confirm identity



solitary form



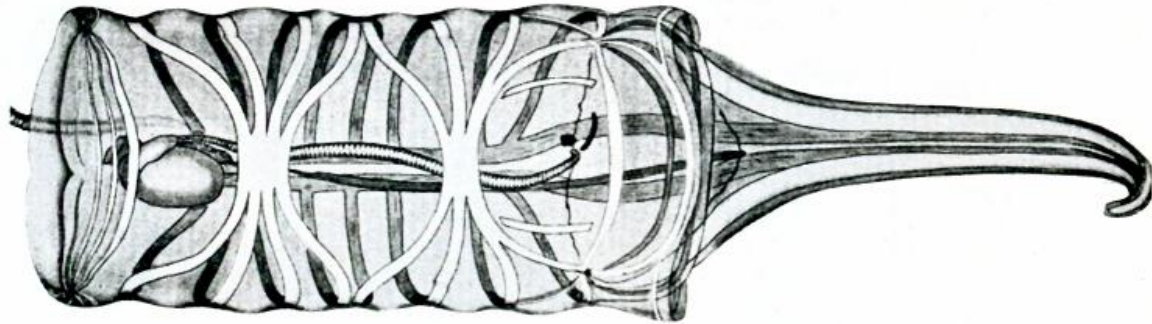
aggregate form

Brooksia lacromae sp. nov.

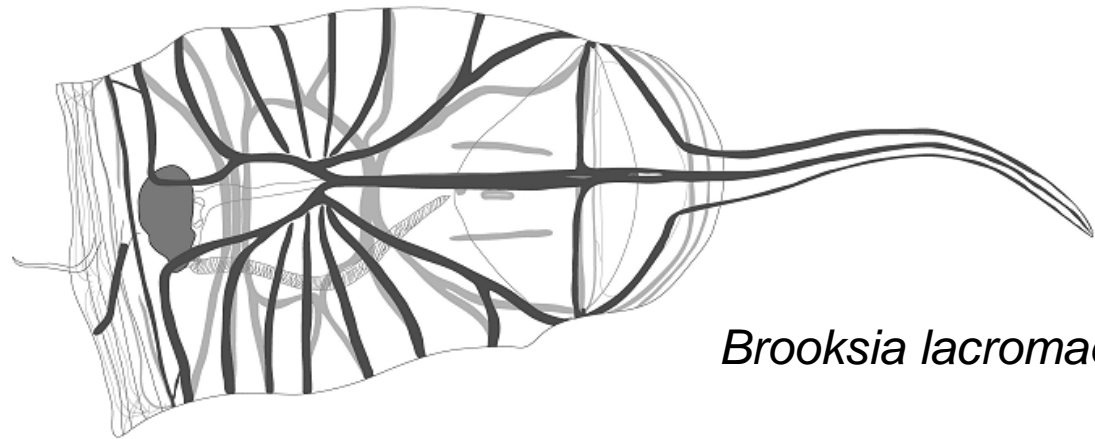
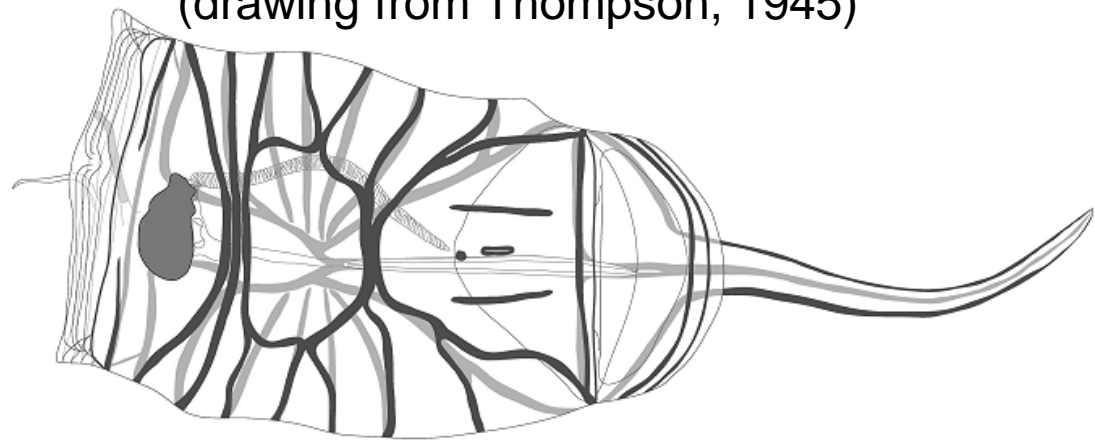




solitary generation (oozooids)

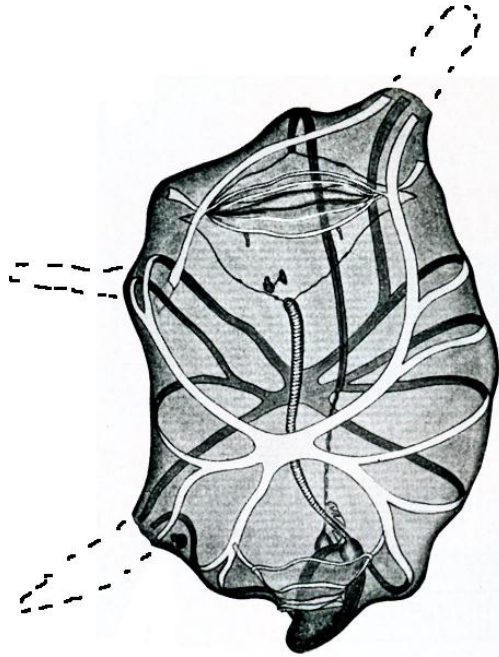


Brooksia rostrata
(drawing from Thompson, 1945)

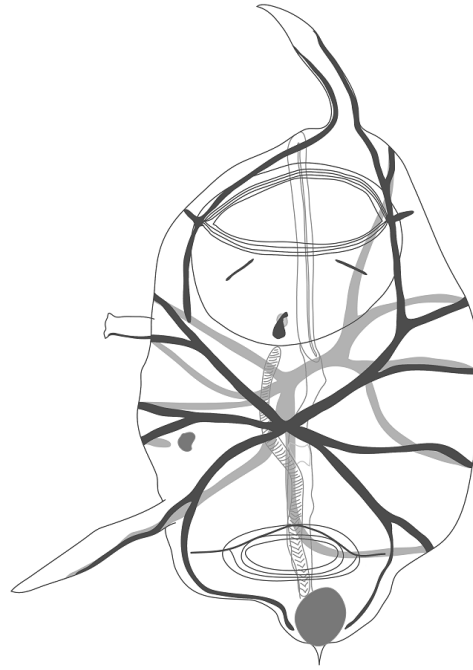


Brooksia lacromae sp. nov.

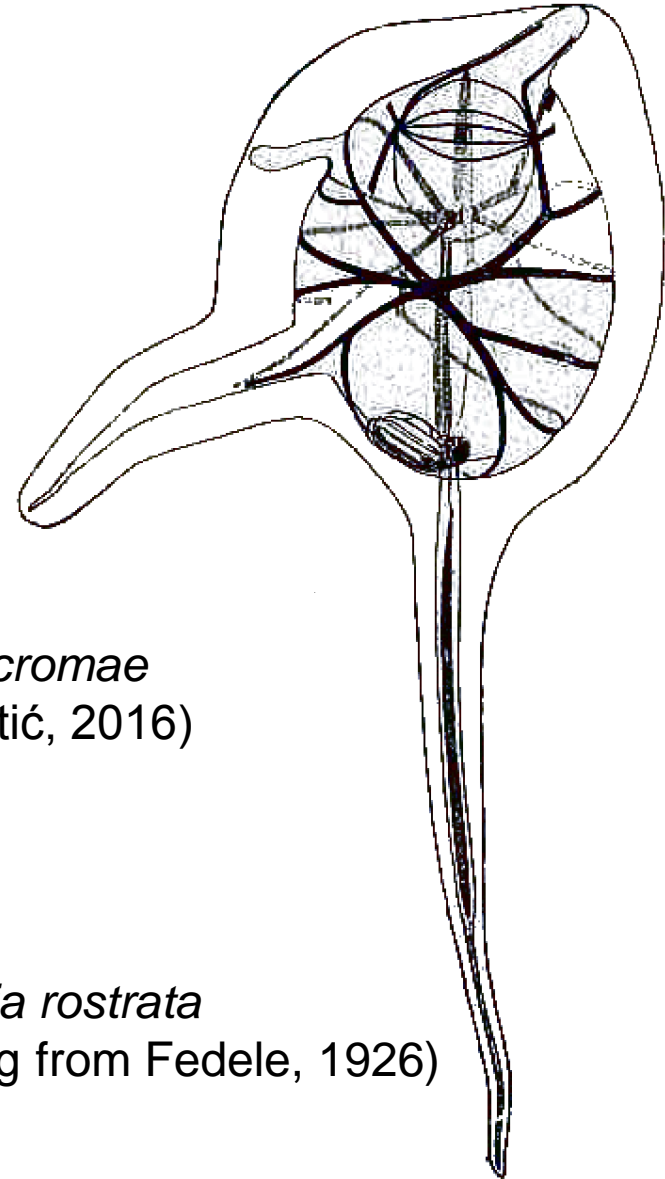
aggregate generation (blastozooids)



Brooksia rostrata
(drawing from Thompson, 1945)



Brooksia lacromae
(Garić & Batistić, 2016)

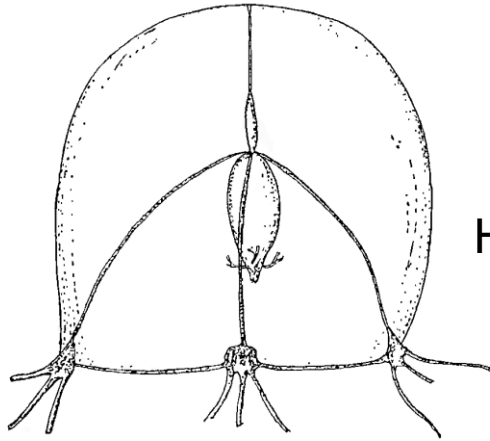


Brooksia rostrata
(drawing from Fedele, 1926)



Re-establishment of *Bougainvillia triestina* Hartlaub, 1911

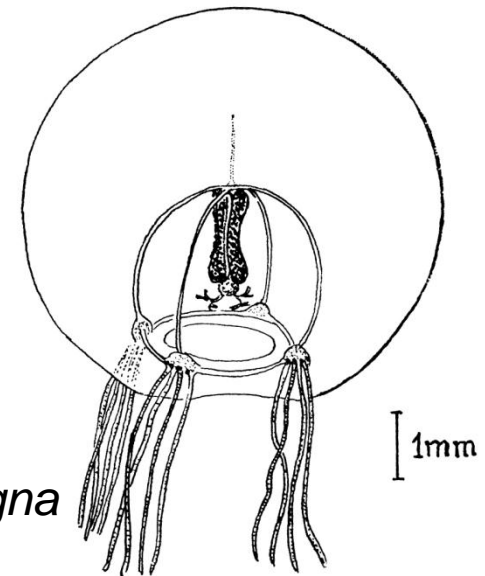
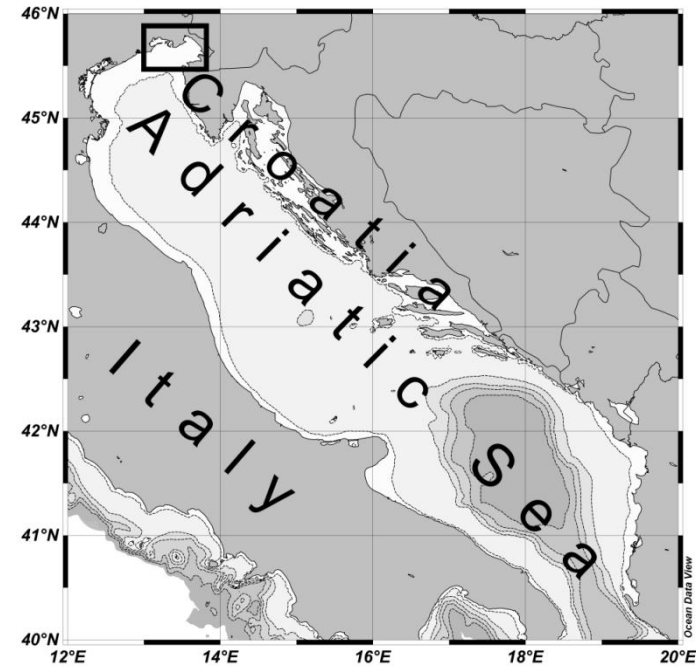
- Described by Hartlaub in 1911 from the Gulf of Trieste



B. triestina
Hartlaub, 1911

- In 1913 cancelled by Neppi & Stiasny
- In 1948 described by Babnik as *B. autumnalis* var. *magna*
- In 1977 cancelled again by Schmidt & Benović

- In 2016 re-established by Batistić & Garić in Marine ecology – an evolutionary perspective after morphological and genetic analysis

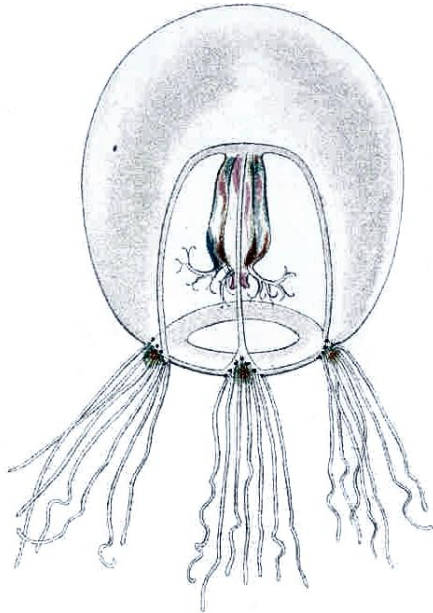
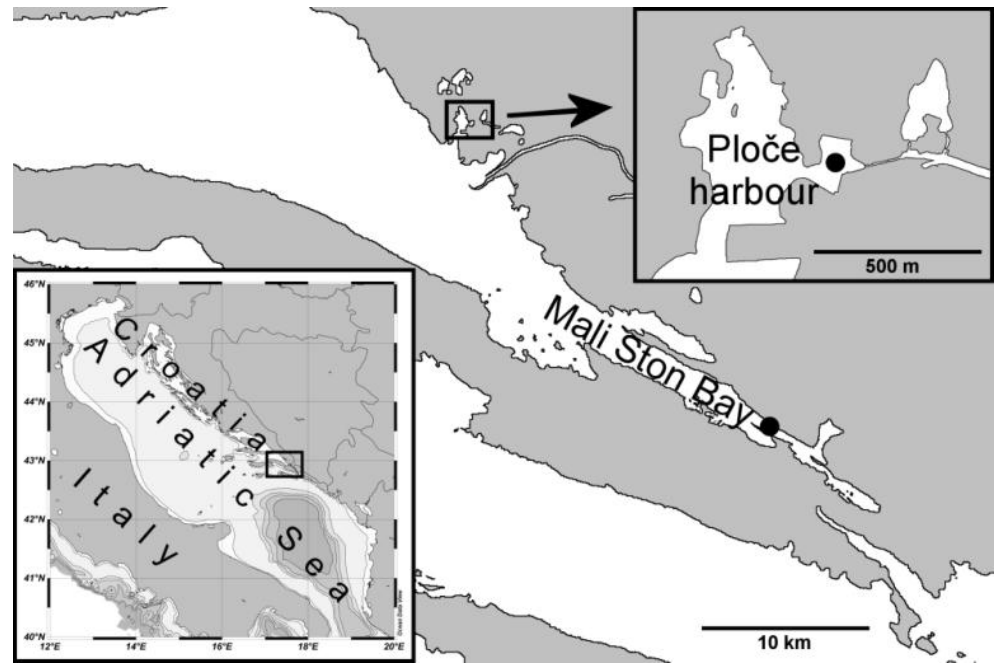


B. autumnalis var. *magna*
Babnik, 1948



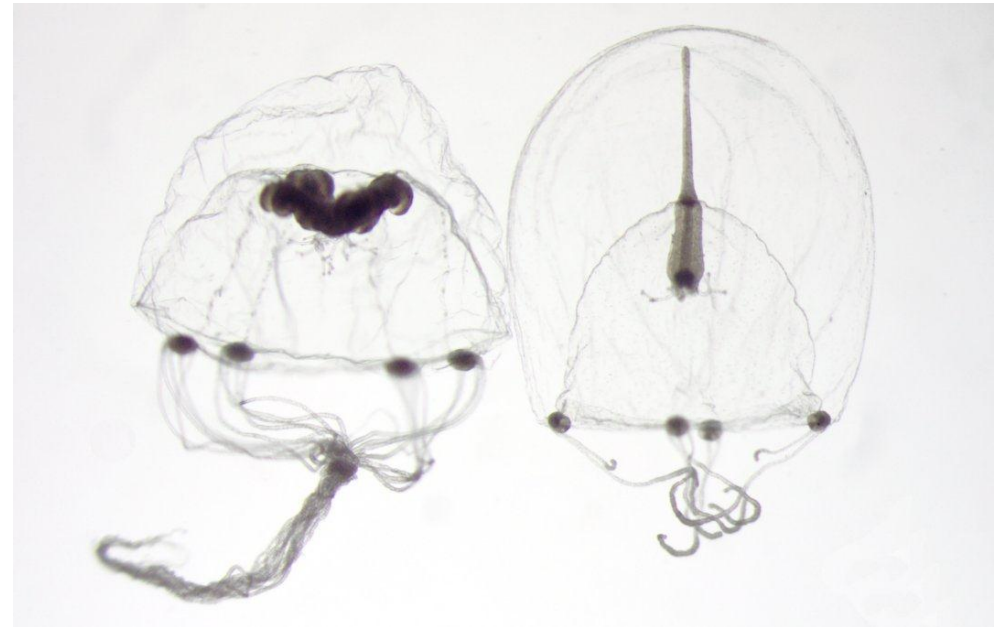


- Seems to prefer productive enclosed areas
- Possibly present in other parts of Mediterranean but confused with *B. muscus*
- closest to *B. carolinensis* which inhabits western Atlantic coasts (0.12 % uncorrected pairwise distance, based on 18S rRNA)



B. carolinensis

(drawing from Hargitt, 1905)



B. muscus

B. triestina



Discovery of *Pelagia benovici*

- Described in 2014 by Italian colleagues from North Adriatic waters



Pelagia benovici Piraino, Aglieri, Scorrano & Boero, 2014



Conclusions

- In the last 20 years there is a sharp increase of alien species
- The majority of the recorded alien species are warm/temperate water species
- For some tropical species, the Adriatic is still unsuitable environment
- Cold/temperate species arrive only during anticyclonic phase (or their within-group contribution increases)
- A pronounced influence of BiOS is detected in established alien species populations in the Adriatic
- The arrival and survival of aliens of different thermal preference is likely influenced by the BiOS and the thermal characteristics of particular year (and possibly the sea temperatures in Atlantic?)
- In order to detect changes in plankton communities the continuous species-level investigations are necessary
- Diversity of gelatinous zooplankton is still heavily under-investigated



