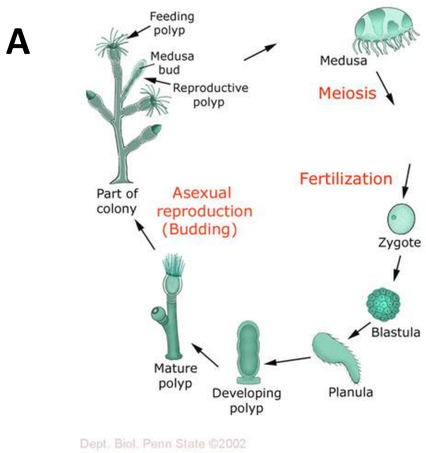
Determining *Obelia* spp. diversity and population dynamics in Thau lagoon (Northwestern Mediterranean Sea, France).

Bonnet Delphine[1], Raquel Marques[1], Juan Carlos Molinero[1], Solenn Soriano[2], Aude Ligier[3], Julien Constensoux[3], Sébastien Colantoni[4], Chérif Ensibi[5], Vanessa Macaluso[6], Valentina Torboli[6], Alberto Pallavicini[6], Massimo Avian[6].

[1] Laboratoire MARBEC, Université de Montpellier, France; [2] Station Marine de Sète, France; [3] Faculté des Sciences, Université de Montpellier, France; [4] Université de Poitiers, Poitiers, France; [5] Faculty of Sciences of Bizerte, Tunisia; [6] Department of Life Sciences, University of Trieste, Italy.

What do we know about *Obelia* spp.?



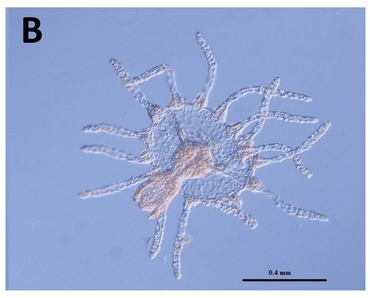


Fig. 1: A- *Obelia* sp. life cycle
B- Juvenile medusae
C- Mature medusae

The jellyfish *Obelia* belongs to the family Campanulariidae (Hydrozoa, Leptomedusae), an important and widely distributed family of hydrozoans. *Obelia* is a very popular and widespread medusa, however the first report on its complete life cycle was only published in the late nineties in Northern Japan. This is probably due to its size, as the medusa umbrella diameter is lower than 1mm.

This Hydrozoa presents a bentho-pelagic life cycle with both polyp and medusa stages. The genus *Obelia* currently includes up to five species within the Mediterranean Sea : *O. longissima*, *O. geniculata*, *O. dichotoma*, *O. bidentata* and *O. fimbriata*, the lastest being considered as species inquirenda (Boero and Bouillon, 1993).

Morphology

In Thau lagoon, Northwestern Mediterranean Sea, populations of *Obelia* spp. occur each year. Some polyps colonies were identified and sampled on *Zostera nana* leaves (Fig.1), indicating that the populations realise their entire development cycle within the lagoon.
As there are no specific caracters based on medusae morphology to identify the species, a morphological approach was conducted on polyps and revealed that main populations are composed by:

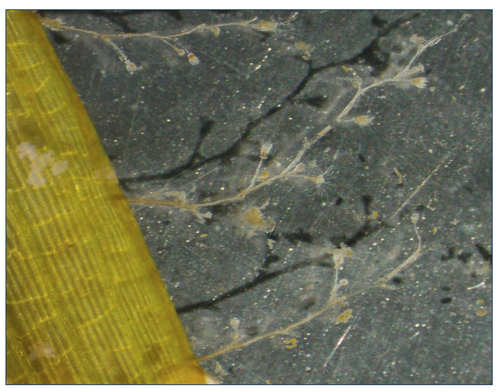


Fig. 2: *Obelia* spp. polyps colonies on a *Zostera nana* leave.

O. dichotoma

- Side branches typically irregular in length
- Hydroteca bell-shaped, usually not very deep, thin walled, often thrown into fine longitudinal folds
- Hydrotecal rim with smooth or with shallow cusps – crenate, slightly flared
- Diaphragm transverse to oblique

in 87.5% of the samples

O. bidentata

- Lateral branches roughly in right angles pairs on both sides
- Slightly oblique diaphragm
- Hydrotecal rim with bimucronate cusps

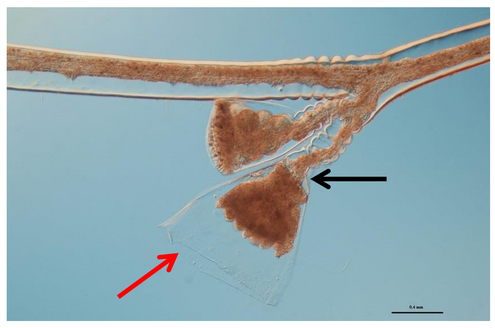
in 12.5% of the samples

Legends:

Hydrotecal rim →

Diaphragm →

Lateral branches →



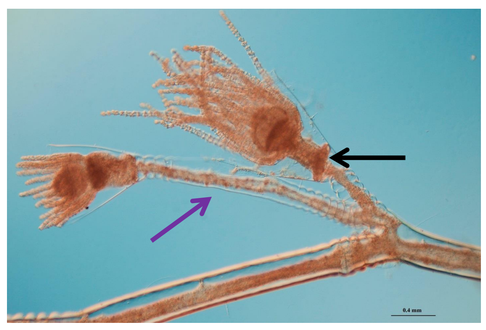


Fig. 3: *Obelia dichotoma* polyps

Fig. 4: *Obelia bidentata* polyps

Obelia spp. dynamics in Thau lagoon

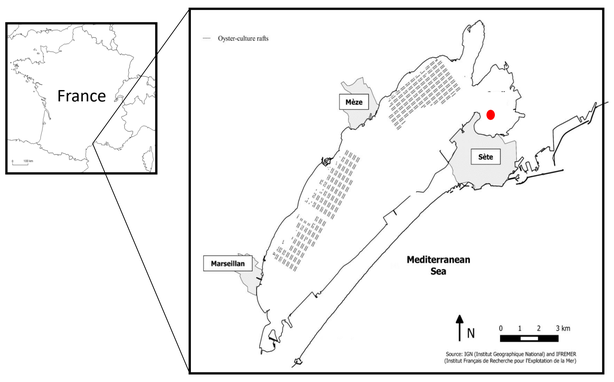


Fig. 5: Sampling site in Thau lagoon

An in situ pelagic monitoring was run every two weeks since 2008 in Thau lagoon using a WP2 plankton net (200µm mesh size) (Fig.5). This 8 years dataset was used to determine baseline information regarding seasonal cycles. *Obelia* spp. main peak of abundance occurs in May-June while a second peak is sometimes detected in October (Fig.6). During the study period, the medusae were found at very low densities with main abundances under 5 ind.m^{-3}, in accordance to previous reports around the world. Nevertheless, 2 exceptional events took place in June 2008 and May 2013 were blooms reached 1232 and 660 ind.m^{-3} respectively. *Obelia* spp. thermal niche ranges from 6 to 25°C with maximum abundances detected around 16°C (Fig.7).

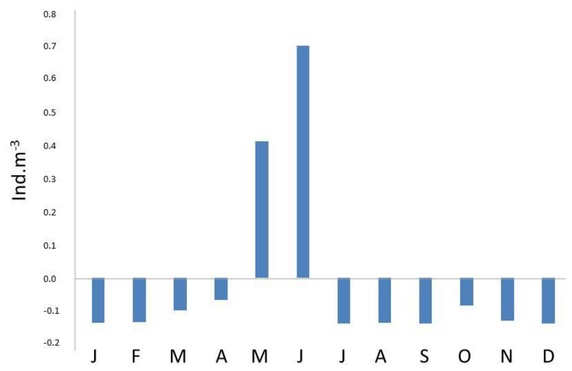


Fig. 6: Monthly anomalies of *Obelia* spp. abundance

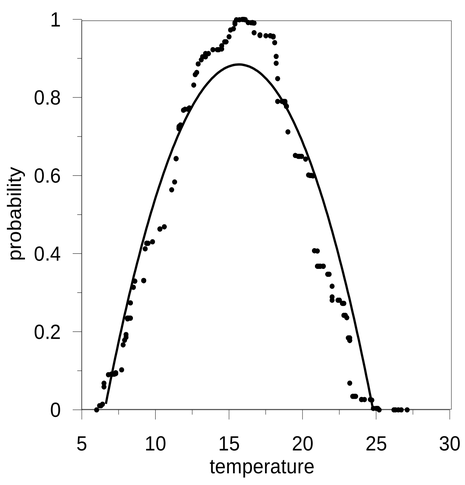


Fig. 7: *Obelia* spp. thermal niche

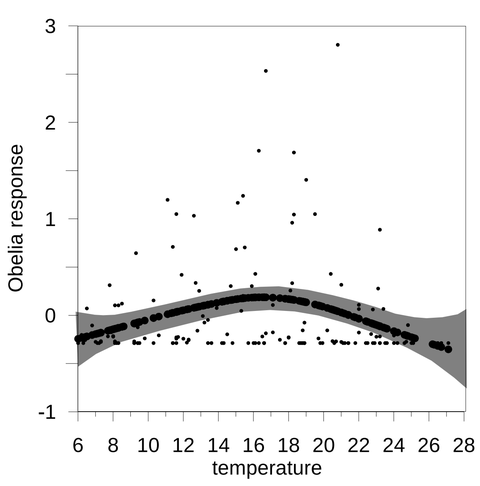


Fig. 8: GAM results showing the significant effect of temperature on *Obelia* spp. abundance

To elucidate the relative importance of environmental variables in determining *Obelia*' spp. abundance, we constructed a generalized additive model (GAM). Temperature was the only tested factor explaining significantly *Obelia* spp. population dynamics (Fig.8).

	Degree of Freedom	GAM coefficient	Standard error	P value
Intercept	1.00	-0.07	0.06	
Temperature	**3.99**	**0.02**	**0.01**	**0.01**
Salinity	4.00	-0.33	0.07	0.23
Chlorophyll a	4.00	0.01	0.07	0.45