

Within the framework of the Model Organism (MODO) project (PON Campania Region), the Syllidae *Syllis prolifera* Krohn, 1852 (Fig. 1) has been identified as possible new model organism for bio-ecological studies related to climate change, since this species has been found particularly abundant under naturally acidified conditions at the volcanic CO₂ vents off the Castello Aragonese of Ischia (Calosi et al., 2013; Ricevuto et al., 2014).

The main objectives of the project were:

- Develop a standard protocol to rear this model species in controlled laboratory conditions to use it for research purposes (Massa-Gallucci & Gambi, 2014).
- Study abundance pattern and population structure under different environmental conditions, and test the eco-physiological adaptation to climate change of this putative model species in laboratory and *in situ* experiments.



***Syllis prolifera* Krohn, 1852 (Annelida, Syllidae)**

Size: up to 25 mm, life span 1-2 years
 Ecology: littoral vegetated rocky reef, and seagrass meadows
 Trophic habit: mesograzer
 Reproductive biology: gonocoric, iteroparous, sexual stolons (Fig. 2), free spawner
 Geographic distribution: Mediterranean Sea and North Atlantic

Fig. 1. A specimen of *Syllis prolifera* without stolon.



Fig. 2. *Syllis prolifera*: left) Female specimen with mature stolon. Center) male specimen with mature stolon. Right) three-chaetiger hatched larva.

The island of Ischia, north of the Gulf of Naples (Tyrrhenian Sea, Italy), offers the unique opportunity of studying the effects of ocean acidification (OA) on the marine communities due to the presence of volcanic CO₂ vents in the area surrounding the Castello Aragonese, mostly constituted by CO₂ (90-95%) (Ricevuto et al., 2014). The emission of CO₂ generates naturally acidified sea waters on the south and north sides of the islet with a pH gradient from 7.0 and 8.10 (Fig. 3). The most acidified area on the south side includes the stations named as S2/S3 (Fig. 4).

A study aimed to investigate reproductive biology and population structure and dynamics of *S. prolifera* was conducted in two sites subjected to different pH conditions: the acidified area of the CO₂ vents (Castello stations S2/S3; pH range= 7.4 -7.9), and a Control site, S. Anna with normal pH conditions (pH= 8.10) (Fig. 4). Semi-quantitative samples of macroalgae (mainly *Halopteris scoparia* and *Cladophora* sp.; Fig. 4) were collected in both sites at 0.5-2 m depth every two months, from April 2014 to April 2015.

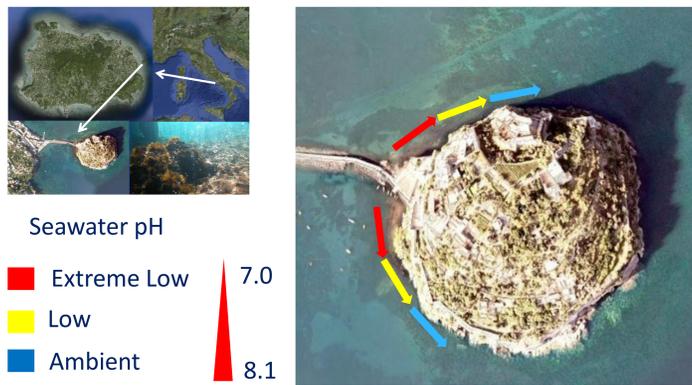


Fig. 3. Map of the Castello CO₂ vent's system at Ischia with the pH-gradient along the south and north coast of the volcanic islet.



Fig. 4. Left) Location of the sampling stations: acidified area of the Castello vent's system (S2/S3); and control zone at S. Anna (approx. 600 m from the vent's area). Right) Macroalgal cover at the acidified area of the Castello vents (*Halopteris scoparia*).

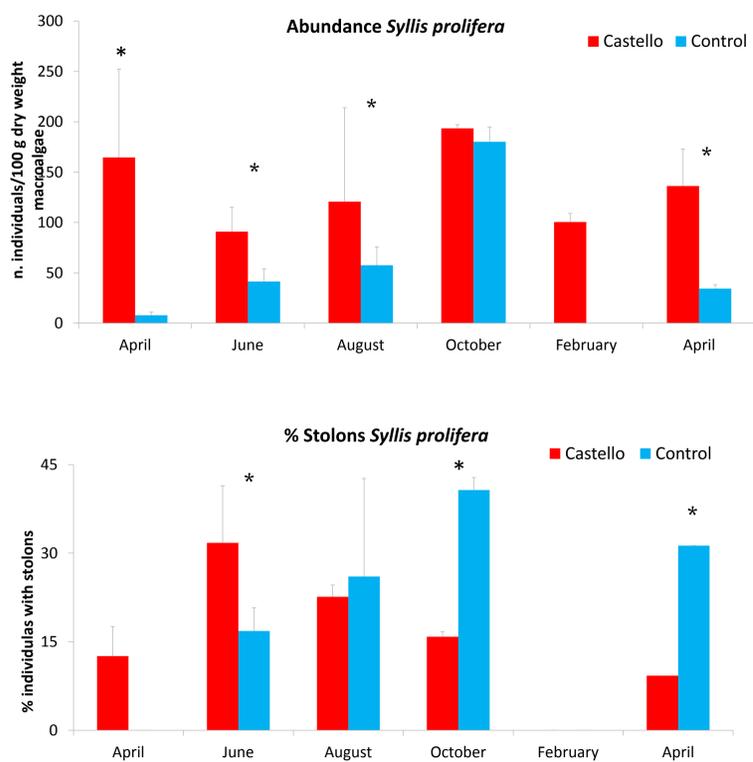


Fig. 5. Above) Trend of the abundance of *Syllis prolifera* in the studied stations and periods. Below) Trend of stolon's occurrence in *Syllis prolifera* in the studied stations and periods

S. prolifera resulted always present and more abundant in the acidified area (S2/S3) respect to the S. Anna control zone (Fig. 5 above), likely due to reduced competition with other species, and constant and higher presence of macroalgae for shelter and food occurring in the vent site.

Specimens bearing reproductive stolons were present all year round except in February (Fig. 5 below), and showed higher values in the S. Anna control site in August, October and April, while at the Castello site stolon occurrence was higher only in June (Fig. 5 below), indicating a reduced reproductive investment of the population under OA conditions.

The population structure analysis (Fig. 6) revealed a recruitment event in August in the control site, while in the acidified site a constant unimodal pattern in the size/frequency distribution was observed all year round year, suggesting the overlap of more cohorts.

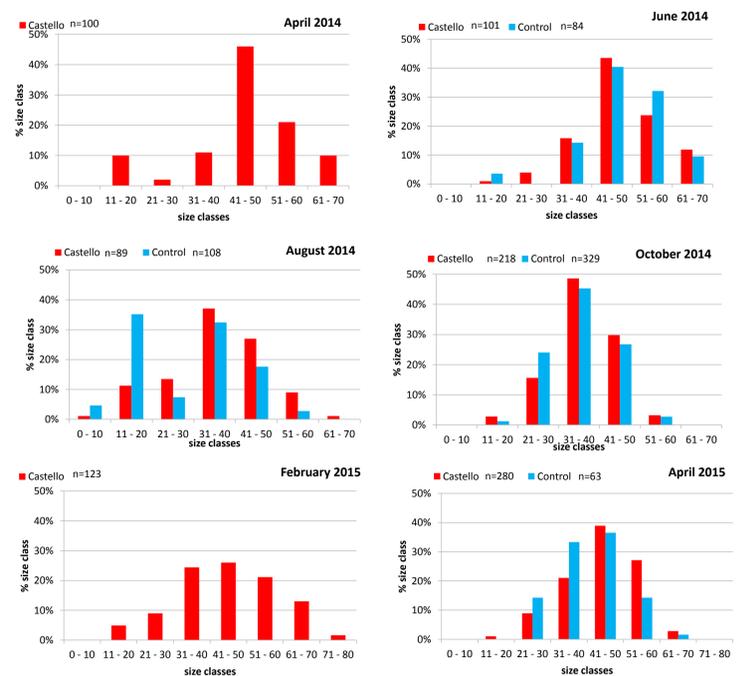


Fig. 6. % of Size/frequency distribution of *Syllis prolifera* in the studied stations and periods. Note the unimodal distribution of the population in most of the periods, except the bimodal pattern of the Control population in August.

References:

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