The impact of angel's wing on pteropod population in the Gulf of Naples (Western Mediterranean)

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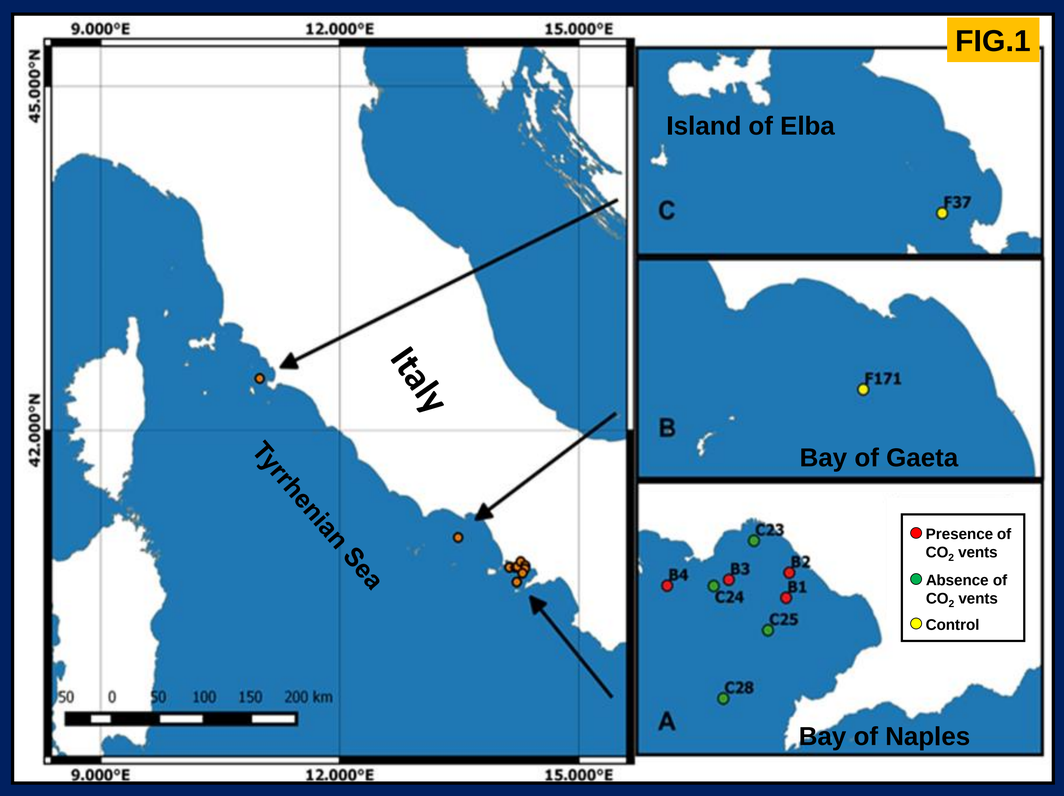


INTRODUCTION

Increasing anthropogenic CO_2 induce Ocean Acidification (OA), where pH and the concentration of carbonate ions decrease, resulting in shoaling of the calcium carbonate saturation horizon (Ω). Pteropods are planktonic gastropods particularly sensitive to seawater change of carbonate chemistry, due to their aragonite shell (a highly soluble form of Calcium Carbonate).

CO_2 vents (submarine CO_2 natural gas emissions) are powerful tools to study the effects of predicted OA on the marine calcifying organisms, since the water surrounding the CO_2 vent naturally lowered the pH of the water column. CO2 vents are abundant around Italy, especially in the Gulf of Naples (Tyrrhenian Sea), where local fishermen described the presence of "bubbling coming out from the sea bottom" already in the year 70's. They transmitted this phenomenon in the folklore as "The Angel's Wing".

All the CO_2 vent-marine organisms related studies, have been mainly focused on the response of the costal calcifying benthic organisms, while the impact of this natural environmental gradient on the planktonic calcifies (such as pteropods) is still not explored.

AIMS

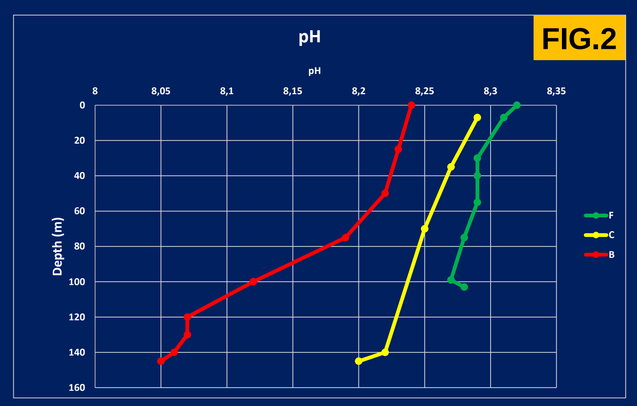
• QUANTIFY THE VARIABILITY IN ABUNDANCE AND BIODIVERSITY
• ESTIMATE THE SHELL DEGRADATION AND DISSOLUTION OF PTEROPODS ACROSS THE Ω_{AR} NATURAL GRADIENT ASSOCIATED TO THE CO_2 VENTS

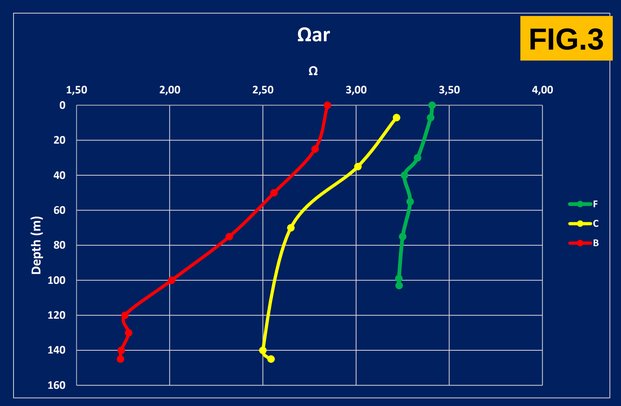
METHODS

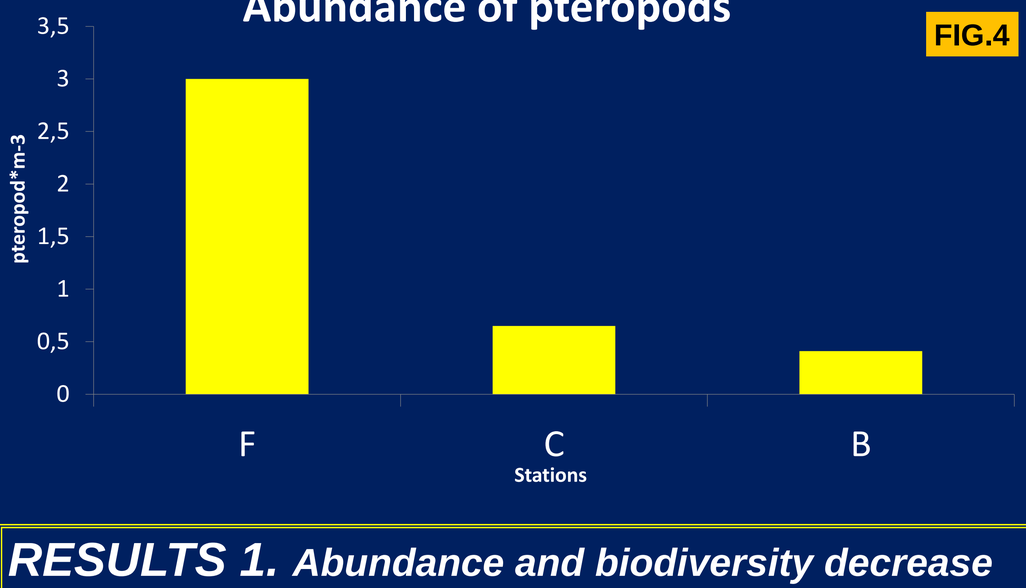
This study was performed in the frame of the Medias (Mediterranean International Acoustic Survey) project. In the Gulf of Naples, stations were sampled on the base of the presence (4 stations, group "B") and absence (4 stations, group "C") of natural submarine volcanic CO_2 emissions. In addition 2 more stations (group F), were also sampled outside the Gulf of Naples as control (fig.1).

Pteropods were collected using a Bongo-40 zooplankton net. Individuals were investigated in terms of specific abundance and shell degradation, through the use of the light and the Scanning Electron Microscope (SEM). In all the stations, Total Alkalinity (TA) and pH were determined long **the water column**. Aragonite saturation (Ωar) was indirectly calculated using-CO_2 SYS software.

To confirm the presence of CO_2 vents, we observed that pH (fig.2) and Ωar (fig.3) along the water column decrease consistently, from the surface to the depth in the group B compare to the group F. In general minimum, medium and maximum Ωar values were observed in B, C and F respectively resulting in a Ωar gradient



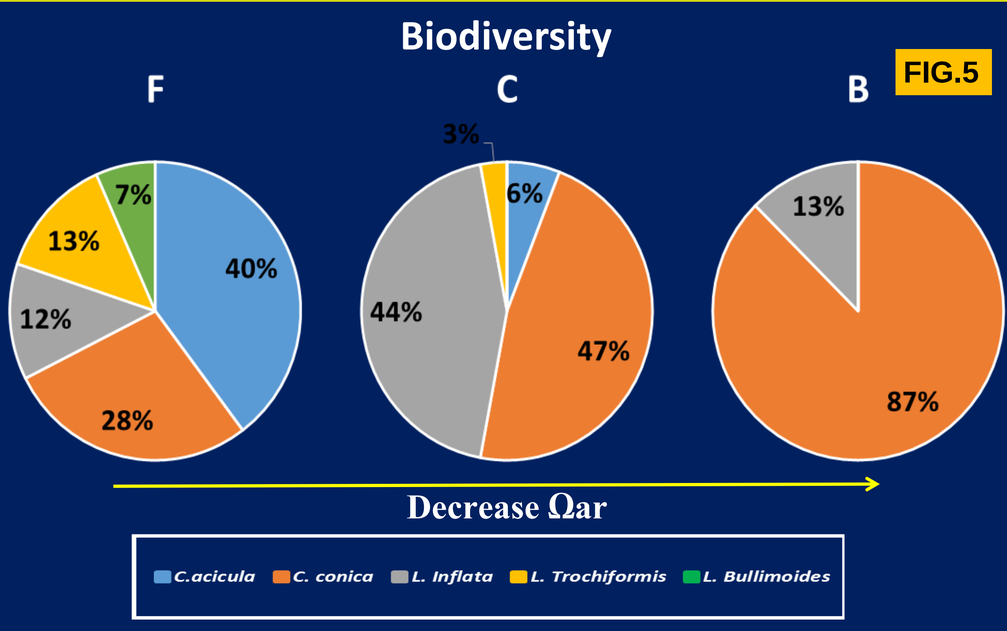




RESULTS 1. *Abundance and biodiversity decrease*

In general as Ωar decrease pteropods abundance decrease as well. In the CO_2 vent stations (group B), pteropod abundance was 64% lower than outside the Gulf of Naples (group F) (Fig 4).

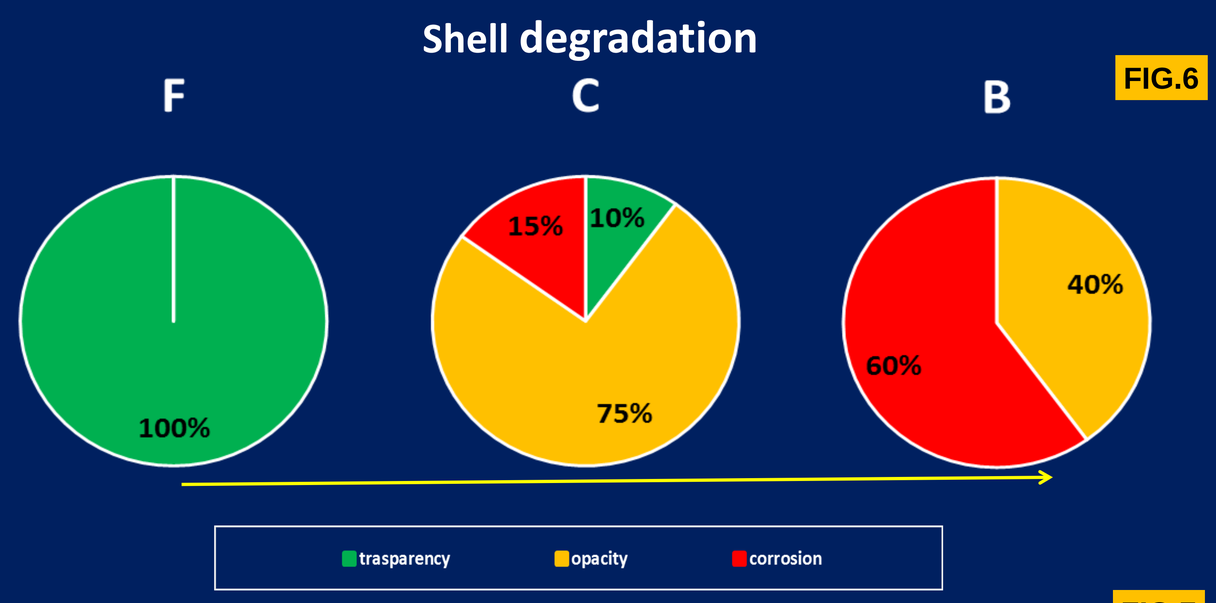
In the Gulf of Naples the dominant specie was the pteropod *C.conica.* Overall the biodiversity assemblage was maximum in the stations outside the Gulf of Naples (station F, 100% of identified species) and minimum at the CO_2 vents stations (group B, 60% of identified species) Fig.5.

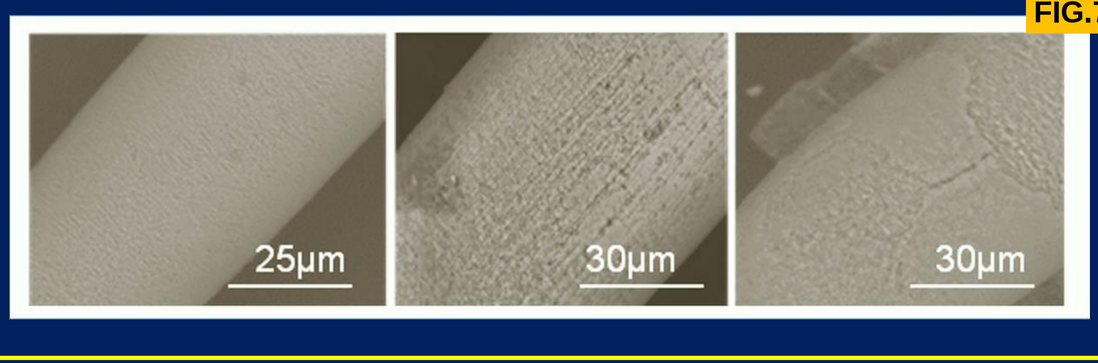


RESULTS 2. *Increase in shell degradation*

•Pteropods collected from the CO_2 vent stations (group B), presented a dissolution degree significantly higher (60%) than pteropods collected in the group C, while all the pteropods collected in the group F had a well preserved shells (fig 6).

•SEM pictures (fig. 7) are representative of the different degree of shell degradation observed in *C.conica* a), shell in perfect condition (group F); b) shell lustreless with sign of corrosion (group C and B); c) shell with high sign of corrosion where the first aragonite prismatic are partially missing (group B).





CONCLUSIONS

- This study documents, for the first time, the impact of natural CO_2 volcanic emissions on live pteropods extracted directly from the natural environment.
- We found that pteropods abundance and biodiversity decrease and shell degradation increase when the distance from the CO_2 vent stations decrease.
- In the future long term monitoring of the *in situ* population, across spatial CO_2 gradients, will be crucial to understand the plasticity- adaptive-defence of this "sentinel" organism to the predicted OA.