

LOW SETTLEMENT OF THE PACIFIC OYSTERS *CRASSOSTREA GIGAS* IN THE THAU LAGOON REFLECTS COMPETITION FOR SPACE AND FOOD

Context

Crassostrea gigas shows low settlement success in the Thau lagoon despite an elevated biomass of adults and a normal development of larvae.

Two hypotheses are tested in this study :

- **competition for food.** We analyzed the entire settler community harvested on four-month-old collectors deployed during the summer 2009 using stable carbon and nitrogen isotope ratios.
- **competition for space.** Sets of collectors were (1) maintained always underwater, which is normally the case in the Thau lagoon where tides are marginal, or (2) manually emerged every weeks to reduce the development of subtidal species. The presence-absence of oysters on collectors were analyzed.

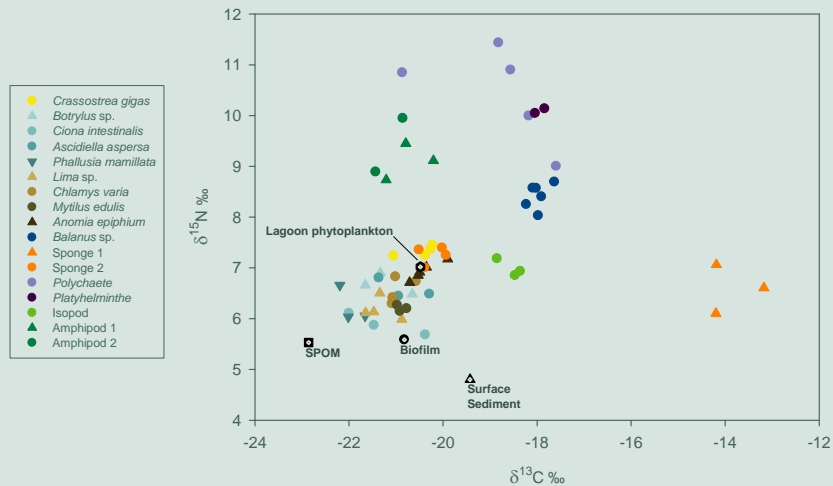
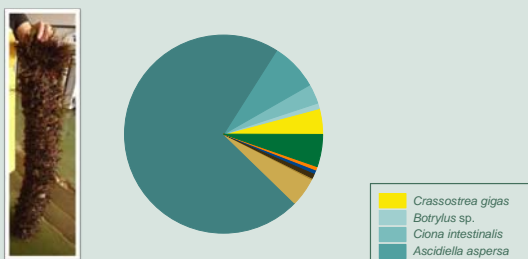


Figure 1 : Scatter plot of $\delta^{13}\text{C} \text{ ‰}$ vs. $\delta^{15}\text{N} \text{ ‰}$ of organisms and organic matter.

A - Permanent immersion (ADECOM, 2009)



B - Regular emersion (PRONAMED, 2010)

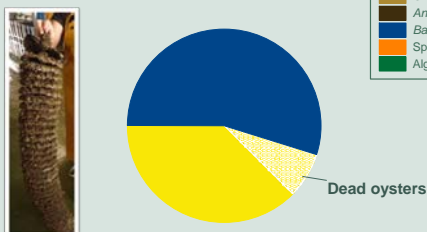


Figure 2 : Pie charts of mean organisms biomass (wet weight) on artificial collectors.

Results and discussion

After few weeks, the collectors maintained underwater were dominated by ascidians, algae and *Lima* sp. whereas the regularly emerged collectors were successfully colonized by oysters and barnacles.

Based on the isotopic on permanent immersion collectors, worms (polychaete and platyhelminthe), crustacean amphipods and barnacles as well as the first sponge species can be rejected as a direct food competitor of juvenile oysters because they are in an upper trophic level (ex : crustacean have the ability to capture small pelagic preys). An other crustacean taxon, the isopods, seems to be closer to the oysters with a similar trophic level. Moreover, bivalves such as *Mytilus* sp., *Anomia* sp., and the second sponge species seem to feed on the same diet composed by SPOM and pure phytoplankton. Also, it is clear that *Asciidiella aspersa* is the major food competitor of oysters followed by two other ascidians species feeding on SPOM and phytoplankton and the bivalve *Lima* sp. feeding on phytoplankton and biofilm (interface filter feeders). Coupling of the trophic levels and overlap of close diets observed with the community biomass structure reveals that the maximum of biomass derives its food from water column filtration.

The biomass on regularly emerged collectors was composed by 60% barnacles and 49% oysters in which 8% were dead at the time of sampling. It seems that the emersion of collectors is a good selective factor for intertidal species that are favored over subtidal species competing for food with oysters. The potential food sources of barnacles and oysters, belonging to different trophic levels, are different. So, competition for space is the main factor controlling the oyster settlement on emerged collectors.

This experiment clearly suggests that settlement of pacific oysters in the Thau lagoon is constrained by a combination of competition for space and food with other subtidal species (illustrated with the oyster rope photograph). From a practical standpoint, it seems that it is possible to enhance spat collection of oysters until attaining commercial profitability by regularly emerging the collectors.