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Paracentrotus lividus and Arbacia lixula recruitment: substrate effects in a global change scenario

Davide Privitera, Michela Noli, Carla Falugi, and Mariachiara Chiantore
Dip.Te.Ris., University of Genoa, Italy (davide.privitera@unige.it)

Recruitment is a principal controlling factor in population dynamics of marine species. In marine invertebrates with a planktonic larval stage, such as echinoids, recruitment is assured by larval supply, settlement and juvenile survival. Larval supply and juvenile survival are affected by a wide range of factors, including temperature, presence of predators, quality and quantity of food. Echinoid larval settlement is mainly conditioned by the finding of a suitable substrate to metamorphose.
The sea urchins Arbacia lixula and Paracentrotus lividus are considered key species of the Mediterranean infralittoral rocky shores. At high densities, the grazing activity of both species can produce and maintain barren grounds, a particular habitat condition characterized by extremely low cover values of erect algae with high presence of naked substrates and encrusting corallinales, poor in biodiversity and ecosystem functions. Conversely their absence also leads to dramatic losses in biodiversity and ecosystem structure. The primary aim of the present research was to test the metamorphosis induction power of different substrates on the two species competent larvae. Further, while rearing larvae, we obtained precious information about temperature effects on the two species larval development.
P. lividus larvae have been reared at 18°C while for A. lixula it was necessary to use higher temperatures (22°C), as in the 18°C set all larvae died in the first week. Both species larvae have been fed with Cricospharea elongata. Metamorphosis of competent larvae has been induced using different substrates: naked stones, Lithophyllum incrustans, Stypocaulon scoparium, Corallina elongata, turf forming algae and Posidonia oceanica. For P. lividus, influence of conspecific conditioning of hard substrates was further investigated. For each species, two larval batches were used for the experiments; for each larval batch two replicates/substrate were set up. Data on metamorphosis have been analyzed through ANOVA (Factors: Larval batch; Substrate).
No differences in metamorphosis rate over the tested substrates were observed for P. lividus, while A. lixula showed to prefer naked stones and encrusting coralline algae, substrate typically found exposed in barren areas. Further, our results suggest that the occurring enhancement of sea water temperature may favour A. lixula larval survival and inhibit P. lividus one. Considering that A. lixula population growth may trigger barren extension on rocky shores, this may lead to a positive feedback between barren extension and A. lixula population density.