

**NEW DATA ON THE ASSOCIATION BETWEEN SEA ANEMONES AND DECAPODS
ALONG THE ITALIAN SHORES: SYMBIONTS INSIDE, SYMBIONTS OUTSIDE?**

Rocco Rorandelli *, Fabrizio Bartolini, Marina Gomei, Stefano Cannicci

Dipartimento di Biologia Animale e Genetica "Leo Pardi", Università degli Studi Firenze, Italia

* rocco.rorandelli@unifi.it, fabriaran@yahoo.it, gomei@unifi.it, cannicci@dbag.unifi.it

Abstract

This work focuses on the association between decapods and some sea anemones. Previous studies mentioned fewer species of decapods associated with anemones than found in our work. Our surveys brought to the surface a more multifaceted and complex reality, and a discrete structure in their distribution and presence. Our goal is to concentrate on some of these species in order to learn more about the type and modes of this association: can it be considered a real symbiosis?

Keywords: decapod, association, anemone

The Actiniaria are often commensals of other organisms, best known are their relations with hermit crabs, which carry them on their shells. The study is centred on the association between two sea anemones, *Anemonia sulcata*, Pennant 1777 and *Aiptasia mutabilis*, Gravenhorst 1831, and decapod crustaceans. Previous studies showed that *Inachus phalangium*, *I. dorsettensis*, *Hyas araneus*, *Macropodia rostrata*, *Pisa armata* and *Periclimenes amethysteus* may be associated with *A. sulcata*, but only *I. phalangium* was known to be associated with *A. mutabilis* (4).

We collected data during several expeditions in coastal localities in southern and central Italy, in particular, northwestern Sicily and central and southern Tuscany. During the surveys each team of 2 divers covered a transect of 20 x 20 m² each in a restricted range of depths (0 to -10 meters), and for each encountered anemone the following information was recorded: species identity and dimension, depth, substratum, orientation. Anemones were closely analysed with non-invasive handling techniques in order to detect all the possible decapods living in association with them. Species, size, gender, and number of associates were recorded for a later analysis.

Our preliminary data, analysed by vigorous statistical methods, show the presence of never-seen-before crabs that dwell among or under anemone tentacles, in addition to a hierarchy in the incidence of associated species, demonstrating that the one offered by sea anemones is a multi-layer community with a real microhabitat structure, definitely more complex than previously thought (Table 1).

Future work will encompass two major issues: the ecology of the microhabitat, with particular attention to the mechanisms that enable them to share resources, to enable us to judge whether these decapods live in sympatry, hence in competition with one another, or else how they share their niche; and on the physiological and ethological bases of the decapod relationship with anemones. This will enable us to more specifically address the nature and the value of this mutualistic association.

References

- 1 - P. Castro – M. E. Huber, 1992. Marine Biology (ed), Mosby Year Book, St. Louis.
- 2 - S. R. Santos, D. J. Taylor, and M. A. Coffroth, 2001. Genetic comparisons of freshly isolated versus cultured symbiotic dinoflagellates: implications for extrapolating to the intact symbiosis. *J. Phycol.*, 37(5): 900 - 912.
- 3 - T. C. LaJeunesse, 2001. Investigating the biodiversity, ecology, and phylogeny of endosymbiotic dinoflagellates in the genus *Symbiodinium* using the ITS region: in search of a "species" level marker. *J. Phycol.*, October, 37(5): 866 - 880.
- 4 - Taylor DL., 1969. The nutritional relationship of *Anemonia sulcata* (Pennant) and its dinoflagellate symbiont. *J. Cell. Sci.*, 4(3): 751-62.
- 5 - P. Wirtz, R. Diesel, 1983. The social structure of *Inachus phalangium*, a spider crab associated with the sea anemone *Anemonia sulcata*. *Z. Tierpsychol.*, 62: 209-234.

Table.1. Decapods found in association with *Anemonia sulcata* and *Aiptasia mutabilis* in our sampling sites.

Sites number correspond to the following: Western Sicily, "Capo Gallo – Isola delle Femmine Marine Protected Area": Addura: Site 1; Avamposto: Site 2; Isola delle Femmine: Site 3; Barcarolo: Site 4. Central Tuscany: Castiglioncello – Calafuria: Site 1; Affrichella Island: Site 2. Southern Tuscany: Argentario: Site 3; Giglio Island: Site 4; Porto Santo Stefano – Scarlino: Site 5.

Anemone	Locality	Depth(m)	Associated species		
<i>Anemonia sulcata</i>	Site 1	3-5	<i>Inachus phalangium</i>		
		1-3	<i>Macropodia rostrata</i>		
		3	<i>Pilumnus hirtellus</i>		
	Tuscany	Site 2	2	<i>Pisa armata</i>	
			4-6	<i>Inachus phalangium</i>	
		Site 3	4-6	<i>Periclimenes amethysteus</i>	
			4-5	<i>Inachus phalangium</i>	
		Site 4	4-5	<i>Macropodia rostrata</i>	
			4-5	<i>Pilumnus hirtellus</i>	
			10-12	<i>Inachus phalangium</i>	
		Sicily	Site 4	10-12	<i>Pilumnus hirtellus</i>
				10-12	<i>Pisa armata</i>
				3-6	<i>Inachus phalangium</i>
			Site 5	3-6	<i>Macropodia rostrata</i>
				3-6	<i>Macropodia rostrata</i>
3-6	<i>Pisa armata</i>				
<i>Aiptasia mutabilis</i>	Site 2	3-4	<i>Inachus phalangium</i>		
		2-3	<i>Inachus phalangium</i>		
	Site 3	1.5-2.5	<i>Periclimenes amethysteus</i>		
		1.5	<i>Pilumnus hirtellus</i>		
		2-3	<i>Pisa armata</i>		
		1	<i>Acanthonyx lunulatus</i>		
		0.5-2	<i>Inachus phalangium</i>		
		1-2	<i>Pilumnus hirtellus</i>		
		0.5-1	<i>Pisa armata</i>		
		1-2	<i>Xantho poressa</i>		
Site 1	1.8	<i>Inachus phalangium</i>			
	1.5 – 2	<i>Pilumnus hirtellus</i>			
Site 2	5	<i>Inachus phalangium</i>			