Carlo Cerrano · Stefania Puce · Mariachiara Chiantore
Giorgio Bavestrello · Riccardo Cattaneo-Vietti

The influence of the epizoic hydroid *Hydractinia angusta* on the recruitment of the Antarctic scallop *Adamussium colbecki*

Accepted: 16 March 2001 / Published online: 12 June 2001
© Springer-Verlag 2001

**Abstract** An experiment and field study were carried out in order to investigate the epibiotic relationship between the hydroid *Hydractinia angusta* Hartlaub, 1904 and its host, the Antarctic scallop *Adamussium colbecki* (Smith, 1902), as well as the effect of *H. angusta* on the recruitment of scallop larvae, since both use the shells of adult *A. colbecki* as substratum. Four kinds of substrata, with and without epibionts, were exposed to the natural environment at 33 m depth. After 1 year, the analysis of substrata showed that: (1) the hydroid makes use of two substrate colonization strategies, depending on the presence/absence of other epibionts; (2) the settlement of *A. colbecki* larvae is strongly affected by substrate characteristics and by the presence of the hydroid. Hydroid colonies limit scallop recruitment on the upper valve of adults, where spats usually live for at least 3–5 years attached by means of byssus threads. In this way, the hydroid can affect *A. colbecki* life history in two ways: by defending, as is usually believed, adults from predators, as well as by limiting the recruitment of its own host.

**Introduction**

Hydroids can usually grow on mollusc shells, but the nature of such relationships is still under discussion. In many cases, the epibionts are believed to protect their hosts from predation, in turn receiving increased movement possibility, which means escape from predators and/or increased food supply (Chernoff 1987; Pitcher and Butler 1987). Many generalistic hydroids live on the bivalve shell rim in order to exploit its water currents (Boero 1981; Cerrano et al. 1997), while *Eugymnmonthea* spp. are obliged commensals of mussels (Kubota 1979, 1983), playing a protective role against parasites (Piraino et al. 1994). Rees (1967) also hypothesised a semi-parasitic behaviour for *Monobrachium* living on different high-Arctic bivalves, and being able to intercept the mollusc larvae flux, as occurs in the Mediterranean hydractiniids *Stylactis* and *Podocoryna*, which grow on hermit crabs (Bavestrello 1985; Cerrano et al. 1998b).

In Terra Nova Bay (Ross Sea, Antarctica), the common scallop *Adamussium colbecki* shows a rich epibiotic population, consisting of diatoms, forams, sponges, hydroids, gorgonians, bryozoans, ascidians and polychaetes (Berkman 1994; Cattaneo-Vietti et al. 1997). Other common epibionts are the spats of *A. colbecki* itself, which generally live for about 3–5 years attached to the adult shell by means of their byssus (Berkman et al. 1991; Chiantore et al. 2000). A similar larval strategy was also reported for the brachiopod *Liothyrella uva* by Barnes and Clark (1995). These authors investigated, for the first time in Antarctic waters, some epibiotic relationships with particular attention given to the brachiopod *L. uva* and to the limpet *Nucella concinna*. They found an opposite trend of the shell coverage in the two species with depth, and noticed that the overgrowth interactions between epibiotic taxa were hierarchical.

In the case of *A. colbecki*, the hydroid *Hydractinia angusta* forms colonies on adult scallops (shell diameter > 50 mm), preferentially colonising shell rims and scars. It displays a very wide trophic range: it can exploit preys several times its own size, such as tube feet and pedicellariae of echinoids, actively defending its host against grazing on its valves, but it can also feed on organic debris and diatoms (Cerrano et al. 2000). Its habitus is more similar to hydroids living on soft-bottom gastropods than to those living on bivalves, which
usually take advantage of filter-feeding activity by building a dense fringe around the shell rim (Boero 1981).

The aim of this work is to evaluate the likely role of the hydroid *H. angusta* on the settlement success of *Adamussium* larvae, its growth rate, and the impact of different substrates on both these processes.

**Materials and methods**

Scallopss were collected by scuba-divers during the 14th Italian Antarctic Expedition (1998–1999) close to the Italian base of Terra Nova Bay (Road Bay), at 33 m depth. In this area, the *A. colbecki* population reaches a density of about 60 ind./m² (Chiantore et al. 2001). In order to evaluate experimentally the influence of *H. angusta* inhabiting shells of adult *A. colbecki* on the settlement of *A. colbecki* spatss on these shells, 24 scallops were collected, 20 of which (height > 70 mm) hosted hydroid colonies, while 4 (height < 40 mm) were not infested.

From these, two series of ten valves of adults hosting hydroid colonies, four valves of younger specimens without hydroids, ten valves of adults (dried for 24 h at 100°C to remove epibionts) and three granitic slates (10x5x3 cm) collected in the same area were hung to two ropes (Fig. 1).

A distance of 10 cm was maintained between single valves and, to avoid any disturbance by grazers, the two necklaces were hung 30 cm from the bottom on iron holders and left in situ for 1 year, at 33 m depth, from 08.02.1999 to 06.02.2000.

In order to detect the growth rate of each colony of hydroid, its colonising pattern on the untreated valves was measured in the laboratory before placing it on site. Once retrieved, the newly produced stolons were measured, and polyps and the number of newly settled *A. colbecki* spats counted for each substrate.

In order to evaluate in a field study the interference of hydroid colonies on larvae settlement, three different populations of *Adamussium* were sampled by dredge at about 40 m depth, in Tethys Bay, Road Bay and Adelie Cove, each characterised by different environmental features (Chiantore et al. 2001). Morphometric data of about 200 shells per site, and the presence of both hydroid colonies and newly byssally attached spats were recorded.

**Results**

*Adamussium colbecki* settlement behaviour

In the experiment, the highest settlement rate of *A. colbecki* spats, about 0.05 spats/cm², was recorded on the valves without epibionts (both treated valves and young ones), whereas both valves with hydroids and granitic rocks recruited less than 0.01 spats/cm² (Fig. 2).

The field study of dredged scallops shows that in Tethys Bay (Fig. 3A) spats are poorly represented. In this station the occurrence of *H. angusta* starts on the 61- to 70-mm size class and decreases on the largest shells, never exceeding 35% presence. Spats show the opposite trend, increasing their presence on shells belonging to the 81- to 90-mm size class.

In Road Bay (Fig. 3B), spats are more frequent than in Tethys Bay: their presence occurs on a wide range of size classes, reaching a peak in the 51- to 60-mm size class. Their presence then decreases in relation to increased hydroid presence, which reaches 100% on the largest shells.

In Adelie Cove (Fig. 3C), the few observed spats are settled mainly on the 40- to 70-mm size classes. On greater size classes, where hydroids are present on 100% of the shells, no spats were observed.

*Hydractinia angusta* growth rate

In the 1-year-long experiment, hydroid colonies grew exclusively on *Adamussium* shells, where they were

**Fig. 1** Schematic drawing showing the two necklaces employed for the settlement experiment with different kinds of natural substrata

**Fig. 2** Histogram representing substrate selection by *Adamussium colbecki* spats. The values are average densities of spats (+ SE) per cm² of substrate