First evidence of a specific association between a stylasterid coral (Cnidaria: Hydrozoa: Stylasteridae) and a boring cyanobacterium

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Fig. 1 (a) Pink and white colonies of *Stylaster* sp. in a 20 m depth crevice of the coral reef of the Bunaken Marine Park (North Sulawesi, Indonesia). (b) A cyclosystem showing the dense mat of cyanobacterium filaments surrounding the pores. (c) Scanning electron microscope image of a branch partially dissolved with HCl showing the cyanobacterium filaments and the canals produced by their boring activity. Scale bars: a, 1 cm; b, 0.5 mm; c, 10 μ m

The association between living Stylasteridae and boring organisms have been hypothesized since 1942, when Broch (1942) observed in *Distichopora borealis* forma *japonica* and in *Distichopora foliacea* “numerous, streak-like, straight canals crossing the skeletal substance in all directions...much narrower than the normal coenenchym canals of the coenosteum” suggesting that these canals are probably due to some parasitic micro-boring organisms. Subsequently, Cairns (1988) hypothesized that the rose-violet colour of the Australian *Stylaster tenisonwoodsii* was due to an encrusting or a boring alga.

These observations are now confirmed by the study of numerous specimens of *Stylaster* sp. collected in the Bunaken Marine Park (North Sulawesi, Indonesia) from 10 to 70 m depth. The colonies showed two colours, white and pink, and lived in groups inside caves and crevices (Fig. 1a). The colour of the pink specimens was distributed mainly on the side of the colony exposed to light. The analysis at the microscope of branches partially decalcified with HCl 4% revealed the presence of a boring pink cyanobacterium producing a net of filaments that was especially dense around the cyclosystems (Fig. 1b). The scanning electron microscope showed the arrangement of the net of the cyanobacterium filaments and the existence of thin canals, about 5 μ m in diameter, inside the coenosteum (Fig. 1c). The canals were present in the entire transversal section of the branches, although their abundance was greater in the portions more exposed to light. Except for the colour, the colonies hosting the cyanobacterium were identical in size and morphology to the white specimens and showed no sign of disease or necrosis. The occurrence of cyanobacteria was very frequent in this species but was never observed in the coenosteum of other stylasterid corals living in the same habitat. These findings point towards the existence of a highly specific association between *Stylaster* sp. and a boring cyanobacterium. The higher concentration of the cyanobacterium filaments around the polyps is suggestive of a functional relationship between the two organisms that deserves further attention.

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