# Studies on high stress tolerance of larvae of the coral Pocillopora damicornis

Form 3

Abstract

Title **Studies on high stress tolerance of larvae of the coral *Pocillopora damicornis***
(ハナヤサイサンゴのプラヌラ幼生の高ストレス耐性に関する研究)


Reef-building corals are associated with algal symbionts, *Symbiodinium* spp. Algal symbionts are beneficial for coral hosts as they provide their host with photosynthetic products. However, under environmental stress, the algal symbiont might become a source of reactive oxygen species (ROS), which are harmful for the coral. The main objective of this study is to investigate whether symbiotic coral larvae are sensitive to thermal stress and, if not, how they acquire stress tolerance.

First, I compared the survivorship of symbiotic larvae of *Pocillopora damicornis* and non-symbiotic *Acropora tenuis* larvae. *Pocillopora damicornis* larvae with high amounts of *Symbiodinium* cells unexpectedly survived two-week of high temperature treatment even though they suffered a significant reduction in symbiont density. On the other hand, non-symbiotic *A. tenuis* larvae mortality increased over time, though there were no clear effects of temperature on the survivorship.

Second, I compared the respiration rate and its temperature dependence between symbiotic planulae of *P. damicornis* and non-symbiotic planulae of *A. tenuis*, as well as between larvae and adult branches within each species. Larvae and adult branches of both species had similar temperature dependency of respiration rate, with temperature coefficient ($Q_{10}$) values of about 2. Planula larvae of *P. damicornis* had a significantly lower respiration rate than that of *A. tenuis* larvae at 25–30 °C, but not at 32 °C, whereas adult branches of *P. damicornis* had a significantly higher respiration rate than that of *A. tenuis* branches at all temperatures. Thus, *P. damicornis* larvae appear to be capable of reducing their respiration rate to a greater extent than *A. tenuis* larvae, which might partly explain why *P. damicornis* larvae had high survivorship under thermal stress.

Lastly, I investigated fluorescent intensity and distribution pattern of the green fluorescent protein (GFP), as GFP has been proposed to have photoprotective or antioxidative functions in corals. GFP is distributed in the gastrodermis of *A. tenuis* larvae and in the epidermis of *P. damicornis* larvae. In *P. damicornis* primary polyps, GFP became localized to special anatomical structures such as tentacle tips and mouth. However, after two-week exposure to high temperature treatment, *P. damicornis* juveniles became bleached and increased their total and mean GFP fluorescence intensity per individual. The present study suggests that coral GFP might have multiple functions depending on the species and developmental stages. To understand the mechanisms of high stress tolerance of *P. damicornis larvae*, other defense systems against oxidative stress should also be studied.



Name Dwi Haryanti