Community ecology of epibionts on a gastropod host in subtropical intertidal habitats

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出版情報：Kyushu University, 2020, 博士（理学）, 課程博士
バージョン：

（様式３）

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論 文 名　：Community ecology of epibionts on a gastropod host in subtropical intertidal habitats（潮間帯巻貝の宿主殻上に付着する動物着生生物の群集生態学）

区　　分　：甲

論　文　内　容　の　要　旨

Interspecific interactions are examined in this study in the view of different niche relations among epibionts. At first, this thesis focused on the epibiont-host relationship through investigating the potential negative effects of epibiotic fouling. The shells of *Lunella coreensis* (Récluz, 1853), which are commonly infested by different epibionts including in particular an alga *Pseudocladophora conchopheria*, are often found to be physically damaged through abraded periostracum and numerous scars. The present study revealed that two epiphytes might be the potential causes of these damages. More specifically, individuals with abrasion damages tended to be larger in size and had a significantly lower coverage of *Pseudocladophora* compared with those without abrasion damages. Red algal biomass density (*Gelidium* spp.) was significantly higher in damaged than in non-damaged individuals. The result of GLM indicated that shell diameter and *Pseudocladophora* cover were strongly related to the levels of abrasion damage, and red algal biomass density might be related to increasing shell area with scar damages. As shell abrasion damage was relevant to the host size and *Pseudocladophora* cover, host growth and epibionts may change the microstructure of host shell surface.

Lunella's shell morphology greatly varied among shell parts, as apical was more complex, containing varied textures/structures including convex and concaves, than the basal region. The microstructure of apex/abraded area was covered by myriad-micropores with some ditches, while normal periostracum surface was smooth. Removal of periostracum in large individuals exposed the nacreous layer. Epiphytes colonization, including *Pseudocladophora* and crustose *Corallina*, might degrade host shells through removing periostracum and digging holes in the shell inner layer by perforating their rhizoid. *Pseudocladophora* was exclusively found on the host shell, while other epibionts could be found varied substrates, even on the *Pseudocladophora*'s meadow. These differences may indicate the variations of competitive abilities among epibionts.

In an attempt to enhance understanding of the niche relations among ecologically similar species in a space-limited environment, the patterns of microhabitat use were investigated in three coexisting epiphytes on *Lunella.* The present analysis of field-derived data revealed clear spatiotemporal partitioning of shell microhabitats by epiphytes with different

degrees of resource specialization. As a substrate-specialising, obligate epiphyte, *Pseudocladophora* occupied wider micro-niches on the host than facultative epiphytes (encrusting rhodophytes, crustose *Corallina* and *Gelidium*). While *Pseudocladophora* demonstrated uniform use of all shell microhabitats on hosts of all sizes, crustose *Corallina* and *Gelidium* showed more varied microhabitat use with shifting positions on hosts of different sizes. Further, in addition to slight differences in microhabitat use, crustose *Corallina* and *Gelidium* demonstrated differences in their interspecific relationship with *Pseudocladophora*. GLM analyses indicated that the occurrence/abundance of crustose *Corallina* was negatively affected by *Pseudocladophora* but that of *Gelidium* was positively affected, while *Pseudocladophora* appeared to be competitively inferior to both rhodophytes when they co-occurred on hosts of relatively large sizes.

Spatial niche partitioning was more obvious between epiphytes and epizoans, as upper regions were dominated by phototrophs and lower regions by filter feeders. Occurrence of rhodophytes and *Chthamalus* were skewed toward larger hosts, while *Dexiospira* exhibited the bimodal distribution among hosts of different sizes. The presence of epizoans was less effectively altered rhodophytes, as the latter did not virtually change the distribution patterns. Contrary, rhodophytes tended to affect epizoans' distribution and abundance negatively. The present study, therefore, points to the varied niches among epibionts even on a small spatial scale, which may result from complex interactions between substrate heterogeneity on a living host and interspecific interactions among epibionts.