SYMBIOSIS OF PLANKTONIC COPEPODS AND MYSIDS WITH EPIBIONTS AND PARASITES IN THE NORTH PACIFIC: DIVERSITY AND INTERACTIONS

BY

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ABSTRACT

Planktonic crustaceans such as copepods and mysids are two of the most abundant components of the marine zooplankton community and, although they harbor a diversity of symbionts, their real interactions have been poorly understood. We have been investigating planktonic symbiosis and briefly review the biology of symbionts on planktonic crustaceans based mainly on our research conducted in the North Pacific.

Symbiotic histophagous apostome ciliates probably have a significant negative impact on their coastal copepod hosts in view of their high prevalence and their worldwide distributions in the coastal ecosystems. Such symbionts are also likely to impact the populations of the copepod’s predators such as chaetognaths. In contrast, symbiosis between copepods and epibionts such as diatoms and suctorian ciliates may be more or less harmless to the host.

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Various endoparasitic alveolates have been discovered infecting from copepods, some of which could have evolved as parasitoids.

Epibiont peritrichians found on the body of gastrosaccid mysids are generally regarded as a commensal, and showed a remarkably high host-specificity to intertidal species as well as a distinct geographic cline with a preference for boreal waters. The sand-burrowing behavior of the mysids, coupled with the diversity and abundance of their preys possibly contributes substantially to the establishment of the symbiotic association with epibionts. A dajid isopod and a nicothoid copepod compete for the space and possibly, food within the marsupium of the mysid host *Siriella okadai*. The annual egg production of the host *S. okadai* seems to be significantly suppressed by these two parasites. Prior to the appearance of mature adults of each of these parasites within the host marsupium, immature individuals occupy particular microhabitats within the host dependent upon the state of maturity of the host. It is important to pay more attention to parasitoid protists on zooplankters in order to better understand the aquatic ecosystem.

**INTRODUCTION**

The study of marine plankton has paid more attention to prey-predator relationships than to symbiosis, in part because the impact of the latter had been improperly underestimated so that symbiosis was considered to play only a minor role in the ecological interactions structuring pelagic communities (Ohtsuka et al., 2007). Recent investigations have, however, clearly revealed that symbionts have more complex and significant impacts on the population dynamics of their host zooplankters. For example, alveolate parasitoids sometimes lead to mass mortalities of host zooplankters including tintinnids, copepods, and euphausiids (Cachon & Cachon, 1987; Coats & Heisler, 1989; Kimmerer & McKinnon, 1990; Capriulo et al., 1991; Gómez-Gutiérrez et al., 2003, 2006, 2009; Ohtsuka et al., 2004, 2007; Skovgaard & Saiz, 2006). Their interactions broadly range from phoresy, to mutualism through to commensalism and parasitism to parasitoidism (Bush et al., 2001; Rhode, 2005).

The present paper briefly reviews the symbiotic relationship of copepods and mysids with a variety of microscopic symbionts based mainly on our recent investigations carried out in Japanese waters. Symbiosis is generally defined as an association between two different organisms living together, and usually with a gradient of beneficial or deleterious consequences for at least one of them (Bush et al., 2001). However, we redefine this term considering the interspecific relationships in which usually large-sized “hosts” are infested or infected by symbionts.