

## Chapter 8

# Coevolution and speciation

Marine parasites have not ranked highly as evolutionary models. The only evolutionary aspect of marine parasites that has been studied in greater detail is coevolution. Much effort has gone into comparing evolution of some marine host groups, in particular various 'fishes', seabirds, and mammals, and of their parasites. The very detailed discussion of coevolution discusses these examples, but also points out that much work remains to be done: for most host and parasite taxa, information necessary to make inferences about coevolutionary patterns is insufficient. Much less is known about mechanisms of speciation. The author of the section on speciation and species delimitation stresses the importance of understanding 'what species are'. Such understanding is a prerequisite for addressing fundamental questions about biological processes and biodiversity. Various ways to delimit species are discussed, as are the few examples of studies of species delimitation and speciation in marine parasites.

## Coevolution in marine systems

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### Introduction

Parasite faunas characteristic of marine invertebrates and vertebrates have been assembled through an intricate interaction of history, ecology and geography, as the determinants of organismal evolution and distribution. Elucidation of pattern and process in the origin and maintenance of biodiversity in marine systems follows from studies that integrate phylogenetic approaches and an historical context for biogeography and ecology (e.g. Brooks 1985, Brooks and McLennan 1991, 1993, 2002, Hoberg 1996, 1997, Page and Charleston 1998, Brooks and Hoberg 2000, Hoberg and Klassen 2002, Page 2003, Brooks *et al.* 2004). Phylogeny-based approaches are powerful because hierarchical order constrains the range of explanations for faunal structure and history in a comparative context linking host and parasite taxa. Parasites constitute exquisite phylogenetic and historical ecological indicators that reveal substantial insights into the history of the marine biosphere. Phylogenetic hypotheses for hosts and parasites are the tapestry for revealing the interaction of coevolutionary processes in shaping patterns of biodiversity, faunal structure, ecological continuity and persistence across deep temporal and geographical scales in the marine environment (Brooks and McLennan 1993, Hoberg 1997, Brooks and Hoberg 2000, Hoberg and Adams 2000, Paterson and Poulin 1999, Hoberg and Klassen 2002).

Under assumptions of coevolutionary history, or association by descent (e.g. Mitter and Brooks 1983), studies have often focused on attempts to use parasites to reveal host evolutionary