

THE IMPACT OF A PARASITIC GILL COPEPOD ON THE  
DEMOGRAPHY OF A REEF FISH HOST

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## Abstract

Reef fish are plagued by a myriad of parasites, but the effects of parasites on demography of free-living reef fish populations are rarely investigated. I examined the demographic impacts of the parasitic copepod *Pharodes tortugensis* that infects the gill cavities of small reef-associated fish. Laboratory and observational field studies were both used to address questions concerning the distribution of the parasite in the British Virgin Islands, physical damage caused by the parasite, and differences in body condition, growth and mortality of parasitized and unparasitized hosts. Spatial analysis was used to examine transmission of the parasite the host population. The copepod was found infecting three congeneric gobies in the British Virgin Islands: bridled gobies, *Coryphopterus glaucofraenum*, colon gobies, *C. dicrus*, and palid gobies, *C. eidolon*. During 2001- 2004, the prevalence of the parasite in the host population was low at many sites in the British Virgin Islands. Parasitized gobies were common around Guana Island, but prevalence never reached over 30%. Typical of macroparasite infections, the copepod was aggregated in the host population with few individual hosts carrying a high infection intensity and most with a low infection intensity. Infections were most common in small juvenile, sub-adult and female gobies. Damage to the branchial chamber and gill filaments by the parasite was extensive, and infected gobies had higher respiration and lower feeding rates than uninfected. Parasitism dramatically affected body condition, growth and survival in bridled gobies: livers were larger, at a given body weight, in parasitized individuals while gonad size was smaller, somatic growth was reduced by 66%, and the instantaneous rate of mortality increased by a factor of 1.8. Direct transmission

between neighbors by way of short-lived planktonic nauplii was verified in tank experiments. Spatial analysis of the distribution of parasitized and unparasitized individuals when colon and bridled gobies were pooled as one host population showed patterns consistent with contagious transmission of the parasite, and weak evidence for density-dependent transmission was found in a time-lagged regression of goby density and the prevalence of infected individuals. The spread of the parasite through the host population was slow however, because the rate of reinfection was substantially higher than the rate at which new infections were established. The parasite uses multiple goby species within the reef population and there is evidence of unequal susceptibility to infection among individual hosts but not between host species. Susceptibility is most likely to be influenced by body condition or age of an individual, and not genetic in basis. The parasitic copepod does affect host demography through increased mortality and decreased fecundity, but is unlikely to contribute strongly to host population regulation because strong density-dependent transmission was not found.