



Parasites' Impact Goes Beyond Host To Affect Ecosystem

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DURHAM, N.H. – The good news, if you're grazing normally on algae in the rocky intertidal zone of the North Atlantic, is that you may not be infected by a parasite. But the better news is, according to new research from the University of New Hampshire, that you might have more to eat if plenty of your neighbors are infected.

The research, published in this week's Proceedings of the National Academy of Sciences Early Edition (<http://www.pnas.org/papbyrecent.shtml>), suggests that parasites can not only substantially affect their hosts – altering their growth, behavior, nutritional status, reproductive abilities, and even their mortality – but also the hosts' entire ecosystem.

In the article, "Parasites alter community structure," lead author Chelsea Wood, then a Dartmouth College undergraduate, and UNH associate professor of zoology James Byers, working at the Shoals Marine Lab off the coast of New Hampshire, looks at parasitism by the trematode *Cryptocotyle lingua* in *Littorina littorea*, a snail known as the common periwinkle and the dominant herbivore in the intertidal zone. "We wanted to find out what was this parasite's impact on the community," says Byers, who advised Wood during the research, which she conducted in summer 2005 as part of the highly competitive Research Experience for Undergraduates at the Shoals Marine Lab (SML).

Byers and Wood hypothesized that since *L. littorea* was the intertidal zone's most voracious eater of green, weedy algae, and the flatworm *C. lingua* infects *L. littorea* and damages its digestive system, then perhaps *C. lingua* infection could alter the abundance of this ephemeral macroalgae.

The Shoals Marine Laboratory, located seven miles off the coast of Portsmouth on Appledore Island and operated jointly by UNH and Cornell University, provided the ideal setting for such an experiment. While *C. lingua* infects approximately 10 percent of *L. littorea* living on the mainland, approximately half the snails on Appledore Island are infected. That's because *L. littorea* is just one of three hosts in the life cycle of *C. lingua*, which first lives in the snails' gonads then moves to a fish as its second host. Shorebirds – more prevalent on Appledore than on the mainland – are the final hosts, contracting infection by eating infected fish, then in their feces excreting the eggs of *C. lingua*, which are in turn eaten by the snails.

"The parasite's life cycle is a really amazing strategy for an organism that doesn't have a brain," says Byers, who predicts that anywhere gulls are prevalent, the *C. lingua* trematode would also be prevalent.

A laboratory experiment confirmed Wood's and Byers' hypothesis: snails infected with the parasite ate 40 percent less macroalgae than uninfected snails. In the field, where researchers

measured the macroalgae in three types of bottomless cages -- with no snails (control), uninfected snails, and infected snails -- they similarly saw less reduction of ephemeral algae by infected snails.

But when researchers isolated ephemeral, or edible, algae, "we saw dramatic change," says Byers. Edible algae account for a small proportion of macroalgae on rocky shorelines -- just about seven percent -- but they are an important food and habitat resource for a variety of organisms. Over the three-and-a-half-week field experiment, ephemeral algae increased 186 percent in the no-snails control cage and 59 percent in the cage of infected snails; it decreased by six percent in the uninfected snails treatment.

"Whatever controls that edible algae controls a lot," says Byers, noting that other snails, isopods, and possibly near-shore fish feed on ephemeral algae. "It's suggestive that these non-lethal impacts of parasites have influential effects that can trickle down to affect other residents of the ecosystem."

Byers' and Wood's study signals an increasing appreciation for parasites in ecological studies. "Parasitism is the most common lifestyle out there," says Byers. "It's playing a role in larger ecosystems."

Photos are available to download here:

<http://unh.edu/news/img/Fig1-P6200017-Llitt-grazing.jpg>

Caption: The intertidal periwinkle snail, *Littorina littorea*, amidst ephemeral algae it likes to graze and barnacles that capitalize on freed up bare space. Credit: Chelsea Wood.

<http://unh.edu/news/img/Fig2-P8190011-Cyrpto-many.jpg>

Caption: *Cryptocotyle lingua*, the dominant trematode parasite infecting the snail *Littorina littorea*. Infected snails graze less ephemeral algae with resultant effects on intertidal community composition. Credit: Chelsea Wood and James E. Byers

