

Feeding Ecology of Benthic Mobile Predators: Experimental Analysis of Their Influence in Rocky Subtidal Communities of the Gulf of Maine

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Abstract

The feeding ecology of mobile predators and their impact on benthic organisms inhabiting the rocky shallow subtidal zone off the coast of Maine, USA, was investigated. To determine diets and degree of prey selection we analyzed gut contents of lobsters (*Homarus americanus* Milne-Edwards), two species of crabs (*Cancer irroratus* Say and *C. borealis* Stimpson) and 13 fish species of which pollock (*Pollachius virens* (Linnaeus)), cunners (*Tautoglabrus adspersus* (Walbaum)), and sculpins (several species) were the most conspicuous species of this assemblage. Dietary data were compared with those on benthic prey availability. In the laboratory, we conducted experiments to test whether there is prey selection in relation to their energetic value. In the field, we conducted two experiments: (1) to test whether fish predators move into the intertidal zone during high tide for feeding purposes; and (2) to test the impact of increased predator abundance in these communities using artificial reefs made of concrete blocks.

Large fish and crustacean predators foraged both benthic (mainly invertebrates) and pelagic (mostly fishes) prey. Juveniles or small individuals of crustaceans, mollusks and fish were the most heavily preyed, crabs (*Cancer* spp.), mussels (*Mytilus edulis* Linnaeus), and herring (*Clupea harengus* Linnaeus) being the most common items. Juvenile sea urchins (*Strongylocentrotus droebachiensis* (Muller)) were important prey of cunners. In the laboratory, lobsters, cunners and sculpins exhibited strong preference for small crabs and mussels but not for echinoderms. These results were consistent with those obtained with a prey selection index, and were closely related to the energy value of prey, suggesting that these predators behave as energy maximizers.

13 pollock and four cunners were caught in the mid-intertidal zone. These specimens contained a variety of undigested benthic intertidal organisms indicating that they utilize intertidal zones as feeding grounds. These results suggest that fishes may play an important role on the structure and organization of intertidal sessile communities. A significant number of predators colonized the artificial reefs, indicating that the availability of living space is an important factor affecting the distribution and abundance of large mobile predators. These predators reduced the abundance of juvenile or small benthic species, particularly of green sea urchins, in the area surrounding the reefs, suggesting that size-selective predation is presumably the mechanism by which predators influence the structure and organization of benthic communities in these environments.