

Matt Brown
Exploratory 2
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Prey preference in *Cancer antennarius*, *Tegula funebris* or *Lottia digitalis*

Introduction

The mid-intertidal is inhabited by a wide array of species. With some familiarity, the different species become easier to find and identify. Patterns in species dispersal become apparent, such as the grouping of *Tegula funebris* (Black Turban Snail) and *Lottia digitalis* (Finger Limpet). These two species are usually found relatively close to each other. Often a tide pool that has *T. funebris* in the water will have *L. digitalis* clinging to the more vertical surface just above the pool. The two species are similar in size, both averaging around 20-30mm in length (Sept, 2004). These similarities in size and location would seem to make both susceptible to the same predators.

Cancer antennarius (Red Rock Crab) is commonly found from the mid intertidal to depths of over 100m (Carroll, 1989). It commonly resides in overhangs in rocks and deep crevices, which are both features of the environment *T. funebris* and *L. digitalis* share. For its body mass *C. antennarius* can exert more force with its chelipeds than almost any other organism (Taylor, 2000). It is easily able to remove *T. funebris* and *L. digitalis* from a substrate with this crushing power.

These two observations lead to a question, which species (*T. funebris* or *L. digitalis*) will *C. antennarius* prefer as prey? I hypothesize that *C. antennarius* will prefer *T. funebris* over *L. digitalis*. *L. digitalis* seems a more unlikely choice for the crab because it resides on more vertical surfaces, where as *T. funebris* resides on more flat surfaces. The crab's ability to climb steep rock is limited, and its ability to swim at

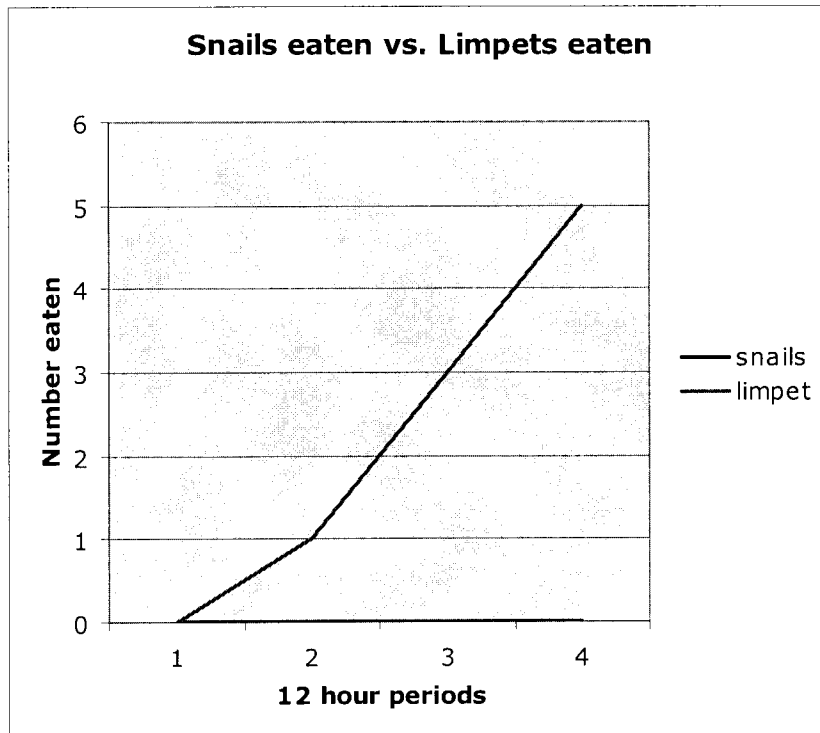
high tide is also limited, so its ability to always reach *L. digitalis* seems in question. Also, *T. funebris* has a much smaller foot for its size than *L. digitalis* does. This should make the snail much easier to remove from the rock or substrate than *L. digitalis*. While the crab clearly has enough power to remove either, it would seem that it would not spend more energy than necessary to remove a prey item.

Methods

To test the prey preference, five individuals of each species were collected from Cape Arago State Park, near Coos Bay, Oregon. The five *L. digitalis* were collected from a rock near Shell Island in the North Cove of Cape Arago, while the five *T. funebris* were collected near the trailhead in North Cove. Several *C. antennarius* was collected from the same area as *T. funebris*. Two of each prey were placed in a wooden and glass fish tank, measuring approximately .75m long by .25m tall by .25m wide. A large *C. antennarius* was placed in the tank with the prey. Seawater was run through the tank at a constant rate and a bubbler was added for oxygen saturation. The crab had been fasted for approximately 48 hours before being placed in the experiment. Progress was checked every twelve hours, with consumed prey being replaced each with each check. After the first check, it was apparent that *T. funebris* was climbing too high for the crab to reach, so a clear lexan plate was placed about 8cm above the bottom of the tank to keep all prey within reaching distance of the crab. Another *C. antennarius* was added after the first check also to make sure individual crab preference did not play as large a factor.

Results

The results of the experiment were not what I had hypothesized would happen. I thought that *T. funebris*' smaller footprint and more accessible location would make it an easier prey for the crab, which would make it prefer it. The results show that the crabs consumed no *T. funebris*, but all of the limpets were consumed within 48 hours.



During the first twelve-hour period no snails were expected to be eaten, since they had moved to a height above the reach of the crabs. The limpets did not move to a high point in the tank, and were accessible by the crabs for the entire 48 hours.

Conclusion

The results show fairly definitively that *C. antennarius* prefers *L. digitalis* over *T. funebris*. The crabs had no trouble at all removing *L. digitalis* from the wooden bottom of the tank. The crab would place the chelipeds tips around the base of the limpet and

squeeze, and the limpet would be detached. The crab would then hold the limpet to its maxillae and begin removing pieces of flesh from the limpet. The crab would also crush the shell of the limpet into small pieces while it consumed the limpet. At one of the twelve-hour intervals one of the crabs appeared to have a *T. funebris* in its grasp, but at the next twelve-hour interval the two snails were still whole and undamaged. For the most *T. funebris* seemed to avoid the crabs, staying on the opposite side of the tank. This is probably due to chemoreception by the snail (Geller, 1982), and may be a factor why the snails were not consumed. *L. digitalis* did not show such a response, often staying within a few inches of a crab for periods of time.

One of the crabs placed in the tank was not seen to have consumed any limpets, possibly due to an impending molt. Crabs generally do not feed for a short period before they molt (Carroll, 1989).

Another possibility in the prey preference is that the limpets provide a higher nutritional benefit to the crab than the snail does. This could explain why one of the crabs did not consume a snail that it had in its grasp. Perhaps the snail has evolved a chemical defense that the crab finds unpalatable. These topics should be further researched to find a better understanding about the prey/predator relation between mid-intertidal crabs and mollusks.

Reference:

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