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Adaptations of Marine Animals
Exploratory II: Feeding Preferences in *Tonicella Lineata* (the lined chiton)

Introduction

The lined chiton, *Tonicella lineata,* occurs in the low intertidal to subtidal waters along the west coast from Alaska to the Channel Islands in California. The range also extends to the Sea of Okhotsk and northern Japan. It is commonly found on rock faces covered by coralline algae, its primary food source. This chiton is distinctive in that its shells have sinuous or zigzag lines of contrasting, variable colors. Colors are often pink or purple, resembling the coralline algae which are a primary food source. This coloration is thought to be a defense against visual predators. Settlement of *T. lineata* has been shown to occur only in the presence of coralline algal substratum (Barnes, 1972). While the lined chiton occurs from the low intertidal zone to subtidal waters, it is found on narrow bands of coralline algae. The diet of *T. lineata* has been shown to consist largely of coralline algae of various species (Demopulos, 1975). This information shows that *T. lineata* is closely associated with coralline algae.

Many species of coralline algae occur along with *T. lineata.* These species of coralline algae could conceivably have different nutritional value for the lined chiton. At present, there is no available literature relating to the preference of specific coralline algae or the differential nutritional value of certain species of coralline algae in the lined chiton, *T. lineata.* This study aims to determine if any preference exists between encrusting coralline algae and branched coralline algae in *T. lineata.*

Methods

Ten *Tonicella lineata* individuals were collected from the mid-low intertidal at Cape Blanco State Park, on the southern Oregon coast. Individuals were collected randomly from rock faces where coralline algae were present. The specimens were placed in seawater and transported to the lab where they were placed in a sea table with adequate amounts of both branched and encrusting coralline algae for a food source. Individuals were allowed to graze freely for several days. Following a period where none of the chitons were harassed, a Y-maze experiment was conducted. This experiment was made up of three parts. The first was a Y-maze with encrusting coralline algae on the right hand side and nothing in the left hand side. Once the alga was placed in the maze fifteen minutes was allowed to pass to enable the system to come to equilibrium. Following this waiting period, a single chiton was placed one centimeter from the posterior of the maze and allowed ten minutes to move towards either side. At ten minutes, the chiton's chosen direction of travel was recorded, the chiton was measured, and the animal was removed from the system. Upon removal, five minutes were allowed to pass to flush the system of the previous chiton's presence. This process was repeated for all ten of the chitons.

In between parts, the algae were removed and the system was allowed to flush itself for an at least an hour. Part two of the experiment consisted of the same Y-maze set up with a branched coralline alga put in the left side and nothing put in the right side. The experiment was conducted as above. Parts one and two serve as the controls for the third part of the experiment.

Part three consisted of a Y-maze experiment with a branched coralline alga on the left hand side and an encrusting coralline alga on the right hand side. This part of the experiment was conducted using the same methods described above.

Results

Table 1

size(cm)	Part 1	Part 2	Part 3
3.75	encrusting	branching	branching
3.15	encrusting	branching	nr
2.35	encrusting	branching	nr
2.9	encrusting	branching	encrusting
2.35	encrusting	branching	branching
2.45	encrusting	branching	encrusting
2.35	encrusting	branching	branching
2.5	encrusting	nr	branching
2.55	encrusting	branching	branching
2.65	nr	branching	encrusting

Table 1: Size of chiton recorded along with path choice in Y-maze. Encrusting, Branching, No Response (nr). Results given for parts one, two and three.

Sizes were recorded in table 1 along with the animals chosen food source. Four animals throughout the study showed no response in the Y-maze and were recorded as such.

Discussion

The first two parts of the experiment were conducted to determine if the lined chiton possessed sensory structures capable of detecting coralline algae at a distance up stream. This was shown to be the case as nine out of ten of the individuals in parts one and two of the experiment chose the coralline algae arm of the Y-maze (Table 1). Based on the knowledge that *T. lineata* has sensory structures capable of detecting coralline algae from a distance, part three of the experiment was conducted to determine if the lined chiton prefers encrusting or branched coralline algae. The lined chiton *Tonicella lineata* was shown to exhibit a weak preference for branched coralline algae. This third part of the experiment was less conclusive than the previous two parts. Only five of the

ten individuals in the third section of the experiment chose branched coralline algae (Table 1). Only three of the individuals chose encrusting coralline algae with two individuals that were not responsive (Table 1). This weak preference for branched coralline algae could be a result of increased camouflaging from a visual predator. This idea is supported by the fact that *T. lineata* exhibits dorsal coloration that could be effective camouflaging against visual predators, and has been effective against this visual predator. These results could also be caused by a difference in nutritional value for the lined chiton. Further testing would be necessary in order to determine dietary value of the different species of coralline algae.

References

Barnes, J. R. 1972. *Ecology and reproductive biology of Tonicella lineata (Wood, 1815).* Ph. D. Dissertation, Department of Zoology Oregon State University 161 pp.; 47 figs.

Demopulos, P. A. 1975. *Diet, Activity and Feeding in Tonicella lineata (Wood, 1815).* The Veliger 18:42-46.