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NOTES, INFORMATION & NEWS

Some Preliminary Observations on the
Homing of the West Indian Chiton
Acanthopleura granulata

by

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The West Indian chiton *Acanthopleura granulata* (Gmelin, 1791) exhibits a marked homing behavior, especially on lower energy shorelines. Individuals generally remain stationary at their homes during the daylight hours and forage for their surficial and endolithic algal food during the night, returning to their homes by morning (Mook, 1983). The purpose of this preliminary study is to investigate some of the possible mechanisms that may be involved in the homing behavior of *A. granulata*.

Chitons and their homes along a low energy, limestone shoreline on northern San Salvador Island, Bahamas, were marked with fingernail polish. All marking of chitons and their homes was done during the day at low tide. Stations were located approximately 10 m apart to minimize the chances of marked chitons exchanging homes with adjacent marked chitons. Three experimental manipulations (scrubbing treatment, chopping treatment, and magnetic treatment) were done. Controls consisted of observing whether marked, unmanipulated chitons returned to their homes. In all cases, experimental manipulations were done at low tide during the night after marking, and the effects of the manipulation (whether the chitons homed or not) were observed at low tide the following day. Because all of the chitons did not leave their homes every night to forage, only chitons that were away from their homes at the time of nighttime observations were manipulated or used as controls. Each manipulation (treatment) was repeated (replicated) several times on different nights (2-4 nights). Results of each manipulation were compared to the controls (no manipulation) using a chi-square test.

To determine whether the chitons used their outward bound trail, old trails from previous excursions, or distant chemoreception to relocate their homes, the limestone substrate in and around the home (30 cm radius) was rinsed with 0.5 N HCl and scrubbed with a wire brush to remove and/or hydrolyze any traces of trails and/or pheromones (scrubbing treatment). After scrubbing with the acid, the scrubbed region was rinsed thoroughly with seawater to remove any traces of the acid.

To test whether terrain memorization was a factor in relocation of homes, all rock was removed to a depth of several centimeters below the original rock surface in a

Table 1

Number and percent of treated chitons homing, and chi-square values after various treatments.

Treatment	Total treated	Total homing	% homing	Chi-square	Replicates
Scrubbed	23	16	70	0.22	3
Chopped	16	13	81	0.65	2
Magnetic	31	24	77	0.21	4
Control	60	42	70	—	4

band approximately 15 cm in width around the home (chopping treatment). Care was taken to assure that no original rock surface remained and that the original relief of the rock surrounding the hole was totally changed.

Because magnetic fields may be used by some organisms for navigation (MARLER & HAMILTON, 1966), magnetic tape was epoxied onto the plates of chitons to disrupt the earth's magnetic field around the chiton (magnetic treatment). A simple test with a compass showed that the earth's magnetic field was disrupted in a radius of 2-3 cm around the chiton.

Chi-square values all indicate an alpha value of greater than 0.5, suggesting that neither trail removal (scrubbing treatment), terrain alteration (chopping treatment), nor disruption of the earth's magnetic field around the chiton (magnetic treatment) had any significant effect on the homing frequency of manipulated chitons (Table 1).

These observations suggest that the homing in chitons either (1) may not be a one mechanism system, such as trail following or terrain memorization alone, or (2) that the animals possess a more complex homing system, such as kinesthetic memory. Future, more rigorous experiments are necessary to determine the exact mechanism or mechanisms that *A. granulata* uses to home.

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