Arctonoe vittata Host Preference and Probability of Finding that Said Host

Jess Eberle

Introduction

Organisms that interact with one another and form a host/parasite relationship that is beneficial to them both is commensalism. *Actonoe vittata*, the red-banded commensal scaleworm, is a parasitic marine worm that has a variety of hosts (Sept 1999). The interactions between this parasite and its hosts is said to be commensal and there has been much study on how and why it is a commensal relationship. In this study were are not going to look at relationship itself but study the preference of the scaleworm to a certain host and the likelihood of attachment to each host. First, we must identify the host species of the scaleworm. The red-banded, as I said, has more than one host. It is mainly seen, although it has more, with three different species; the rough keyhole limpet, the gumboot/crypto chiton, and the leather sea star. The rough keyhole limpet is found along the west coast from southern California to Alaska and fairly low in the intertidal. The gumboot chiton is a very large chiton found along the west coast from California to Alaska in rocky low intertidal to subtidal regions. The leather sea star is a five rayed sea star that is found in Prince William Sound , Alaska to southern California in low rocky intertidal areas. All three species were used during this experiment. The scaleworms and its host were used in two separate tests. One test was setup for the probability of *Actonoe vittata* of finding a certain host and the other was mainly to see if there was a strict preference by *Actonoe vittata* when given a choice between two different hosts of different species. My hypothesis in this experiment wasn't a full one because as I got underway in this experiment I realized I was asking some different questions. I did predict that the leather star would be the most probable host for *Actonoe vittata* after the experiment was well underway but I could've predicted this by simply looking at the sample size of scaleworms collected and where they were collected from, which was from the leather star. To say that these scaleworms collected from the different leather

stars would have an individual preference for the leather star and would show a bias in the data collected might be true but possibly not as the later part of this paper will show. As with all experiments, this one yielded some helpful results and raised many, many new questions about future research.

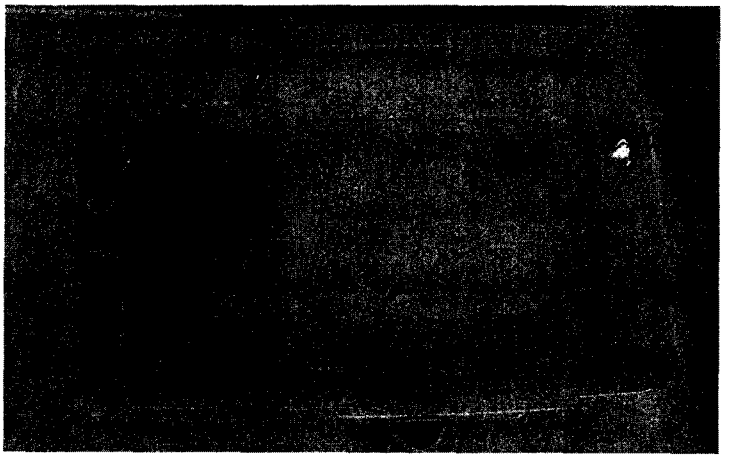
Materials and Methods

The animals were collected mostly from Coos Bay and Cape Arago locations with the exception of an unknown location, possibly Sunset Beach. Most of the scaleworms were collected from Hungry Man's cove inside of Coos Bay and all the leather stars were collected from this location. The gumboot chitons were collected on a separate day from Middle Cove out at Cape Arago. A few scaleworms were collected that day from the chitons but not as many as the day at Hungry Man's Cove. The keyhole limpets were collected from an unknown location, most likely Sunset Beach or Cape Arago. Three individual hosts of each species were collected. I tried to remove all the parasitic scaleworms from the host before putting them in the water table that was inside the lab. The scaleworms were placed in a small square container (the container was in the same water table as the hosts) with a lid near an air stone to keep them oxygenated. The container had a screen on both sides for aerated water to come in an out while keeping the scaleworms securely inside the container. The process of removing the scaleworms from their hosts was done in the lab and in the field but like I had stated earlier the many of the scaleworms were collected from the leather star and this was done in the field at Hungry Man's Cove. In the lab the actual removal of scaleworms was done by forceps, especially the keyhole's parasites which were too hard to remove by hand.

Once the hosts and parasites were separated the tests were prepared and conducted. The first test that was conducted was the probability and preference test. I had a large rectangular container in which I put three individuals of different host species inside with constant aerated water flow from a water tube and air stone, the host were

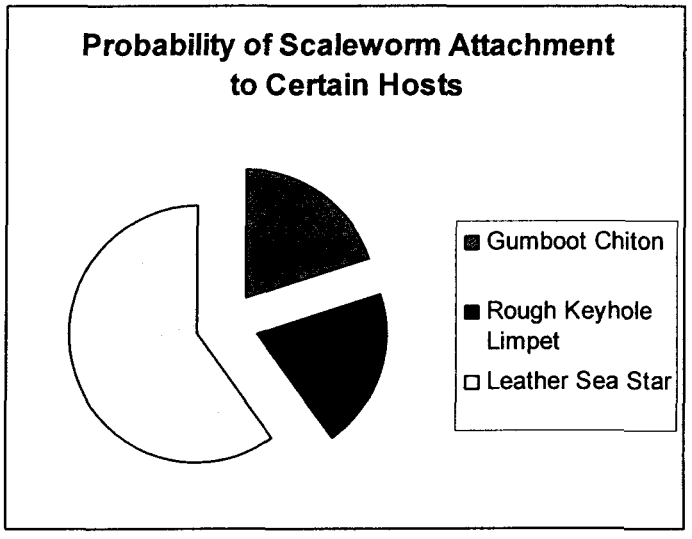
allowed to move around freely. I then place the hosts on one end of the container and the scaleworm at the other end, while each host was equidistant from the parasite and waited for the scaleworm to parasitize to one of the three hosts. I did ten trials of this with some trials lasting 3 minutes some 3 hrs. I was trying to get an idea how probable in nature it would be for the scaleworm to attach to each of these three hosts.

The second test was done to separate actual preference from what is just available at the given moment to the scaleworm or which host is the quickest to parasitize to because of its mobility and ability to come towards the scaleworm the fastest (Bryn 2005). The scaleworm was allowed to choose from two hosts of different species that weren't allowed to move toward the worm. For this a flow tank was constructed (see picture on next page). The host were restricted to an area on one side of the tank and separated from each other by a plastic lid acting as a wall. The hosts were separated from the scaleworm by a Plexiglas wall with holes to allow even water flow towards the scaleworm that was placed on the opposite side of the tank. The water flow was administered from a water tub at the end of the tank where the host species were located. The water was then released through a small hole near the opposite end of the tank. There were three combinations of species for the scaleworm to choose from; gumboot vs. leather star, gumboot vs. keyhole limpet, and leather star vs. keyhole limpet. Each combination had three trials. Each trial lasted 20 minutes. After 20 minutes was up the side to which the scaleworm moved to was the side that was said to have been preferred.



Results and Discussion

The results that were drawn from the two tests were good but with some flaws and reasons for future research. From the first test we can see in **Figure 1** that the leather star was the most likely host of the scaleworm and the keyhole limpet and the gumboot chiton were equal in terms of their probability of being a host. The leather star being the most likely host can be attributed to the fact that the leather star was by far the most mobile of the three host species (Swink 2003). It is not likely that the leather star was seeking out attachment from the scaleworm but this was not really tested.



The second test showed very good and interesting results that raised many new questions. We can see below in Table 1 what the exact results were. We see an interesting bias for keyhole limpet over the leather star in all three trials. It might be important to note that while the keyhole limpet may be the preferred species the sea star is the most probable for attachment. The reason why the keyhole would be preferred over the leather star is unclear and wasn't tested but I think it could be due to the fact that the limpet offers greater protection than the sea star because if we recall that it was very difficult to retrieve the scaleworm from the keyhole limpet but easier with the leather star. It is also very important to note that the scaleworms that showed a neutral

preference didn't seem very lively and were probably unhealthy due to long containment and long periods of time without a host.

Table 1

	Neutral Preference	Bias Preference	What Host
Gumboot vs. Leather Star	x	xx	Leather St.
Keyhole Limpet vs. Gumboot	xxx		
Leather Star vs. Keyhole Limpet		xxx	Keyhole

Things to Do Different

There were many things that could've been done in a different more efficient way but some one very important aspect that should've been change was larger sample sizes of scaleworms with an equal amount coming from each of the three host species. The scaleworms over time seemed less responsive due to their unhealthy nature. I also would've liked to calculate the time it took the scaleworms to attach to each host species and this could be factored in to calculate the energy and cost to get to each host, which would have something to do with adaptive preference. Overall the experiment raised good questions for further research and gave reasonably good results to get an understanding for host preference in the red-banded scaleworm.

Literature Cited

-J. Duane Sept, *The Beachcombers Guide to Seashore Life of the Pacific Northwest*, (1999) Harbout Publishing, pp 48, 61,62,131.

Primary Sources

-T. Bryn, *Host Preference of Arctonoe vittata found in Cryptochiton stelleri Diodora aspera, Dermasterias imbricate*, (2005).

-Nathan Swink, *Host Selection in Scale Worm, Arctonoe vittata as a Function of Original Host and Time*, (2003).