

Tube Substrate Preference of *Platynereis bicanaliculata*

Introduction:

Platynereis bicanaliculata is a tube dwelling polychaete found low to sub intertidally at depths of up to 35m (Morris *et al.*, 1980). It can reach lengths of up to 70cm and is composed of hundreds of segments lined with simple seta structures tipped with either a hook or a sickle used in attaching to substrates and for locomotion (Morris *et al.*, 1980). *P. bicanaliculata* posses long peristomial tentacles used for sensing its environment and an avertable proboscis bearing several transverse rows of teeth. This animal is a herbivore and so these teeth allow it to cut off small pieces of algae floating in the water column or surrounding its tube. A diagram of *P. bicanaliculata* is shown in Figs. 1-2. *P. bicanaliculata* utilizes a variety of substrates in building its tube including rock, shell, sand, mud and algae. This worm often covers the opening of its tube with algae providing protection and a source of food that is easily accessible (Rvesink, 2000). *P. bicanaliculata* can also construct a tube solely from mucus which it secretes from glands positioned on the dorsal lobe of each appendage (Morris *et al.*, 1980). One can often find these worms in a variety of locations in the low intertidal but they are most common among rocky tide pools (Baird, 1863). While in the field I observed these polychaetes in many different types of tubes, that is to say that the tubes were very rarely built from the same type of substrate even when the tubes were constructed right next to each other in the same tide pool. This observation lead me to question the advantages of building a tube from rock vs. shell vs. mud, sand or algae or if there were any advantages at all associated with tube material. Based upon the observation of *P. bicanaliculata*'s very inconsistent use of tube building material I hypothesized that there was in fact no distinct advantage of building a tube out of any of these substrates and consequently that *P. bicanaliculata* does not show preference in tube building material.

Methods:

To test the Hypothesis that *P. bicanaliculata* does not show preference over what kind of tube it builds I constructed a hypothetical tide pool consisting of algae, rock and shell. I separated these substrates with two sheets of black plastic mesh through which all of my specimens could freely pass but the substrates were prevented from mixing together. I alternated the position of each substrate, placing the algae, rock and shell in different sections of the tank for each test. I had two testing groups of *P. bicanaliculata*, A and B, each consisting of four individuals all about

5-6cm long with the exception of one 13-14cm individual in group A. It was observed that this

individual was able to pass through the plastic mesh divider into any of the

For both groups combined the average amount of tubes built from rock was 37%, from shell- 11%, from algae- 18%, from ½ shell- ½ rock -14% and tubes made from mucus made up 18% of the total number of tubes which was 27. Most of the tubes built with the algae did in fact have algae at either end of the tube and were comprised mostly of mucus. The tubes built with rock were completely covered in rock with no visible mucus and the tubes built out of the shell were also completely solid with no visible mucus. Diagrams of a rock, shell and algae tube are displayed in Fig. 3. Some of the tubes built by the worms would be composed of half rock- half shell and would be positioned between the plastic mesh, half the tube on one side, half on the other. The worms almost always built their tubes attached to the bottom of the larger rocks in the tank or I would find the tubes loosely covered in the sediment from which they were built and attached to the bottom of the container. The tubes were always well camouflaged by whatever sediment they were in. The worms never carried the one sediment to another section of the tanks so no tubes were built from all three sediments. The worm placed in the container with no sediment did in fact build a tube from mucus and the worm in the container with all three sediments utilized all three in building its tube.

Conclusion:

My hypothesis that *P. bicanaliculata* would not prefer any one substrate over another was not supported by the data collected. 37% of the tubes built by the *P. bicanaliculata* were built from rock despite the availability of two other substrates and their own mucus. It appeared that the tubes built by rock were more stable when handling them and would hold up better in certain situations such as a predator attack or a large wave surge. The worms may have also preferred to build tubes out of rock because there was plenty of rock to then cover the tube after it was completed. In the field I observed that most of the tubes were built out of among other things mostly mud and some rock but not solely rock. It appeared that the worms built tubes just as much for camouflage as for protection because in the lab they always either built their tube beneath a larger rock or they covered it with matching substrate and in the field they built tubes from mud which matched the rock that they were attached to and they were always found on the underside of rocks, never out in the open. Despite the number of tubes built from rock there was a significant amount of variation. Many of the individuals chose to forgo using sediment creating a mucus tube between a larger rock the bottom of the container which provided ample protection within the lab but the ability of such a tube to withstand heavy wave action in the wild is questionable. These tubes were easily broken when I removed the rock leaving the worm completely exposed with no protection. I suspect that this type of tube is very rare in the field as I did not observe any while out collecting. The mucus tube along with the algae tubes were

probably results of the ideal predator-free conditions of the lab as the worms that built algae tubes also relied heavily on the protection and camouflage provided by the larger rocks. There were several sources of error in my lab. First of all the worms were presented with conditions that were unlike their original habitat (no wave action or predators) and so they probably built differently than in the wild. Also they were able to build their tubes out of two substrates at a time by building between the black mesh. Ideally the substrates would have been completely separate in order to avoid this type of cross over. In group A, the larger animal did not build a tube the first several times and I suspect that this was because I was not giving it enough time. I did notice that when I went to collect this individual after a trial it appeared to have started “gluing” some pieced of substrate, either rock or shell, together but it was unable to complete a tube in a single 24 hour period. Also some of the shell pieces were too big for the size of the worms that I had and perhaps this is why they did not chose to build out of shell very many times. In conclusion, the polychaete *P. bicanaliculata* does show preference for tube building material but it is widely based on the physical availability of the substrate and the physical make up of the environment in which the animal lives.

Reference:

1. Baird, A.. 1863. *Platynereis bicanaliculata* – Native.
<http://www.calcademy.org/research/izg/SFBay2K/SPRP/Plantynereis%20bicaniculata>.
Accessed: 7/28/2005.
2. Morris, H., Abbott, D.P., Haderlie, E.C.. 1980. *Intertidal Invertebrates of California*. Stanford University Press. Stanford, CA. pp. 458.
3. Ruesink, J.L. 2000. Intertidal mesograzers in field microorganisms: linking laboratory feeding rates to community dynamics. *J. Exp. Mar. Biol. Ecol.* **248**: 163-176.

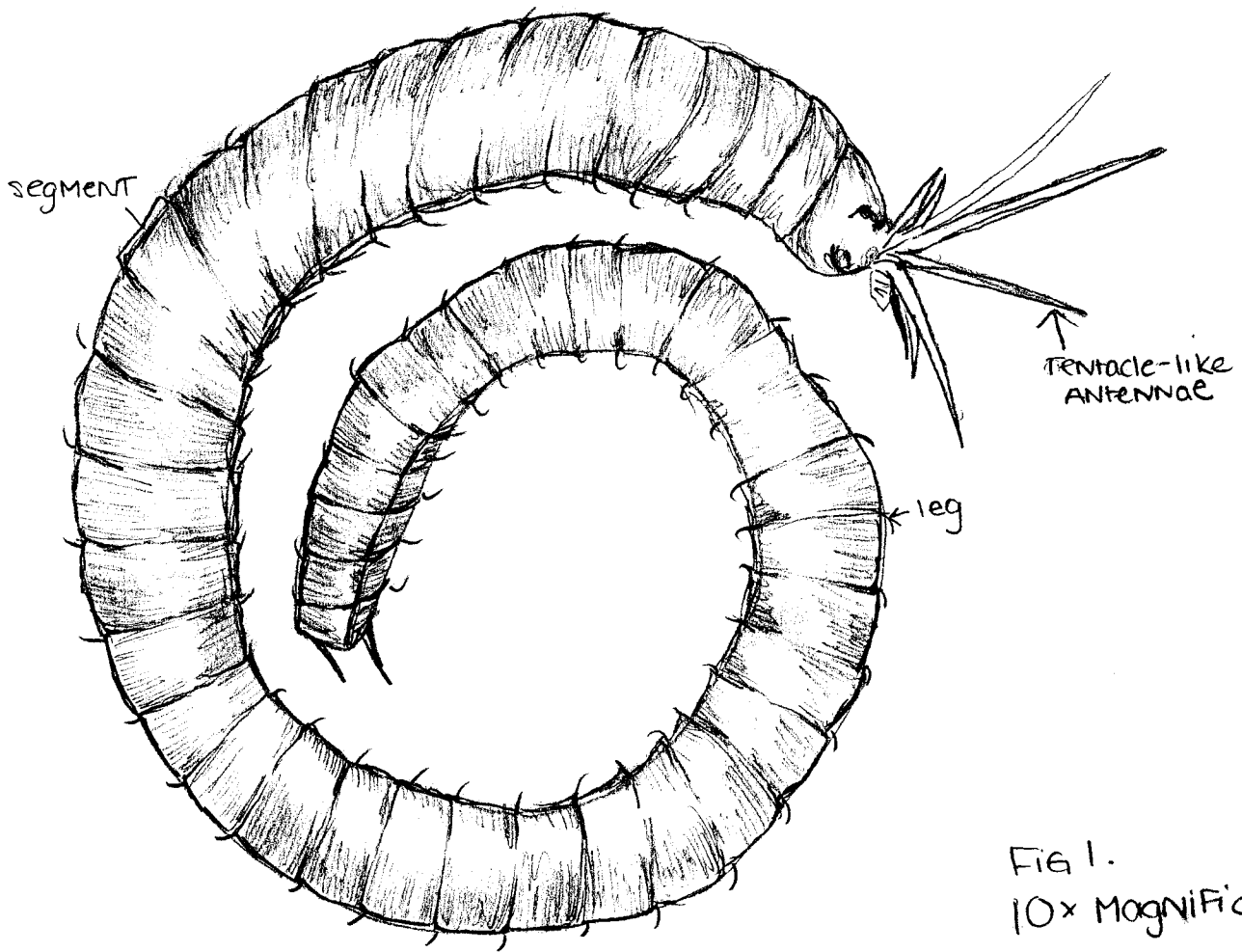


FIG 1.
10x Magnification

Platynereis Bicanaliculata -

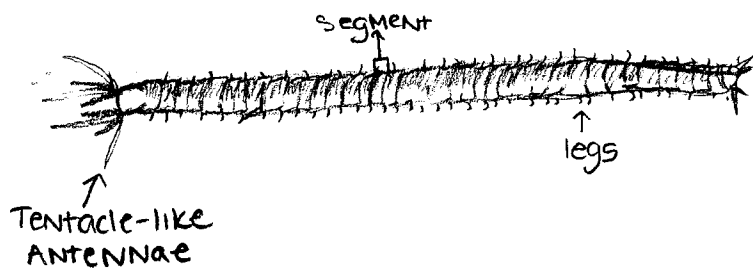


FIG 2.
1x Magnification

Rock Tube



Shell &
Mucus Tube



Algae &
Mucus Tube



MUCUS Tube



FIG 3.

X Magnification of Tubes
Built by *Platynereis bicanaliculata*