Sarah Streit
Brendan Coffin
BI 457 Adaptations
Hunter

Exploratory #1: Sea Anemone Mobility In Different Species

Introduction:

Sea anemones are small circular sacs attached to the surface via an adhesive foot called a basal disc with a rising column terminating at an oral disc flanked with small tentacles. While sea anemones tend to stay anchored to one spot, they do carry the ability to detach themselves and move should conditions get bad, and the different species have differing rates of mobility and attachment dependent on the species. We wished to compare the rate of mobility between 3 species of sea anemones, *Epiactis Lizbetha, Epiactis Prolifera,* and *Anthropleura Elegantissima.* We believed that *E. prolifera* moves faster than *E. lizbetha,* which both move faster than the higher tidal sea anemone, *A. elegantissima.* Also, we wished to know about the structure of the basal disc and if there was any relationship between the basal disc and the sea anemone's rate of mobility and attachment. According to Ottoway (1978), a "well differentiated" basal disk may allow for faster movement in sea anemones (Ottoway, 1978). Dunn (1977) describes Epiactis locomotion as involving the detachment, extension, and reattachment of the basal disc's leading edge, followed by the detachment, retraction, and reattachment of the basal disc's trailing edge (Dunn, 1977). Such movement may be easier to accomplish with a wider basal disc. Therefore, it is our hypothesis that sea anemones with a shorter column height relative to the diameter of their basal disc will be more mobile than those with a relatively larger column height, and that *E. prolifera* will have the lowest column height / basal diameter ratio.

Materials & Methods:

Our three sea anemones were retrieved from the tidal pools of Middle Cove along Cape Arago in Coos County, OR by removing them from their substrates with a scraper and placing them in a plastic bag with various species of seaweed for up to a couple hours before transporting them back to our lab in Charleston, OR. The nine sea anemones were they placed in water-filled basins that are consistently recycling its water among other tide pool retrievals.

To begin the experiment, a 61 x 30 cm rectangular plastic grid had its midpoints marked and was placed in one of the basins. Three *E. lizbetha* were placed along the y-axis 2 cm apart front one another (numbered 1-3 going down), centered, followed by three *E. prolifera* placed in the same spots 2 cm to the left of *E. lizbetha* (see diagram).

The stopwatch was started, and the first part of the experiment, time to attachment, began. After the sea anemones were attached, their movement was to be closely watched every few hours excluding during the night hours between 10 pm and 8 am. All movement would be recorded from initial point of attachment.

Sea anemone dimensions were measured in millimeters; column height was measured for the tallest portion of the column, and basal disc diameter was measured for the widest portion of the basal disc. The column height was then divided by the basal disc diameter to yield the anemone's column height / basal disc diameter ratio.

Results:

Attachment times and traveling distances for individual anemones, as well as averages for each species, are shown in Table 1. Column height to basal disc diameter (H/D) ratios for individuals (as well as species averages) are shown in Table 2. H/D ratios (Fig. 1) were highest

for *A. elegantissima*, intermediate for *E. lizbetha*, and lowest for *E. prolifera*. *A. elegantissima* was more mobile than *E. lizbetha*, and *E. prolifera* was the most mobile of the three species (Fig. 2).

Discussion:

E. prolifera was the quickest to attach out of all three species of sea anemone by a large margin, though the data was inconclusive for *E. lizbetha*, as out of the three *E. lizbetha* placed, one was eaten, and the other two attached at two far different times. The reasons for why the two *E. lizbetha* attached at very different times remains unknown.

Comparing the H/D ratio on all three species was as we expected, with *A. elegantissima* having the largest H/D ratio and *E. lizbetha* having the smallest. We hypothesized that the larger the H/D ratio, the slower the sea anemone would attach and move, and for *A. elegantissima* and *E. lizbetha* this was true. However, when comparing all three species, no direct correlation was found between average H/D ratios and mobility (Fig. 3). Because of the inconclusiveness of movement data on *E. lizbetha*, the data collected provided an anomaly. More research with larger numbers of each sea anemone would be needed to resolve this anomaly and either confirm or refute our hypothesis.

References:

1. Dunn, D.F. (1977). Locomotion by *Epiactis Prolifera*. *Marine Biology*. 39, 67-70.
2. Houtman, R, Paul, L.R., Ungemach, R.V., & Ydenberg, R.C. (1997). Feeding and predator-avoidance by the rose anemone Urticina piscivora. Marine Biology, 128, 225-229.
3. Ottaway, J.R. (1978). Population Ecology of the Intertidal Anemone *Actinia tenebrosa*. *Aust. J. Mar. Freshwater Res.* 29, 787-802.

Table 1

Epiactis prolifera

Anemone #	Time to Attachment (min)	Distance Moved (cm)
1	25	6.3
2	35	32
3	25	0.7
Average:	*28*	*13*

Epiactis lizbetha

Anemone #	Time to Attachment (min)	Distance Moved (cm)
2	960	0
3	95	2.3
Average:	*528*	*1.15*

Anthopleura elegantissima

Anemone #	Time to Attachment (min)	Distance Moved (cm)
1	1200	0
2	690	4.2
3	690	0
Average:	*860*	*1.4*

Table 2

Epiactis Prolifera

Anemone #	Column Height (mm)	Basal disc diameter (mm)	H/D ratio
1	2	12	0.17
2	10	22	0.45
3	3	11	0.27
4	10	24	0.42
Average:			*0.33*

Epiactis lizbetha

Anemone #	Column Height (mm)	Basal disc diameter (mm)	H/D ratio
1	9	22	0.41
2	10	20	0.50
3	4	14	0.29
4	3	7	0.43
Average:			*0.41*

Anthopleura elegantissima

Anemone #	Column Height (mm)	Basal disc diameter (mm)	H/D ratio
1	12	20	0.60
2	11	21	0.52
3	14	32	0.44
4	11	29	0.38
Average:			*0.49*

Fig. 1: Species vs. Average H/D ratio

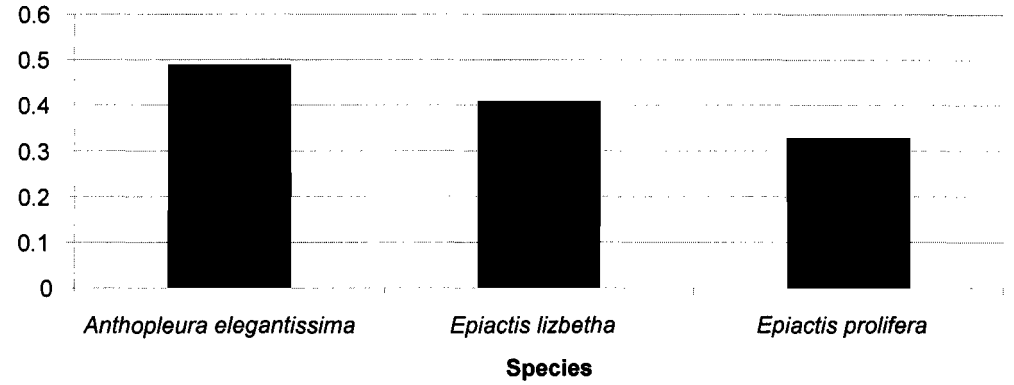


Fig. 2: Species vs. Average Distance Traveled (cm)

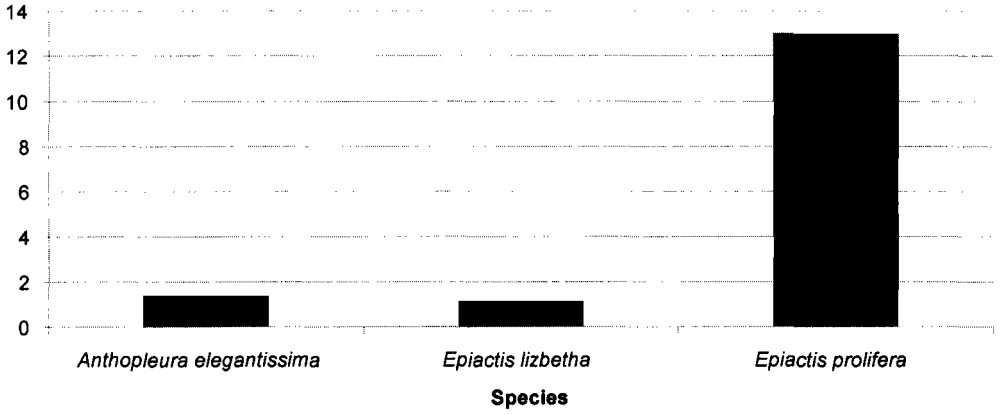
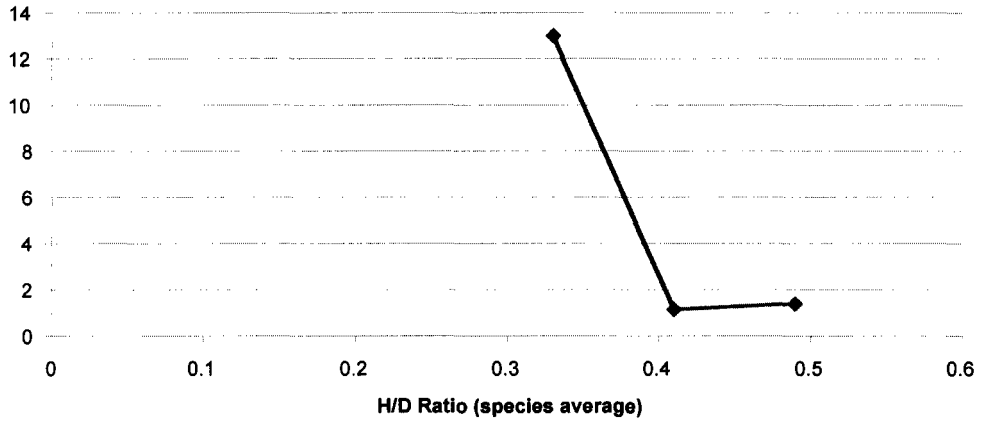
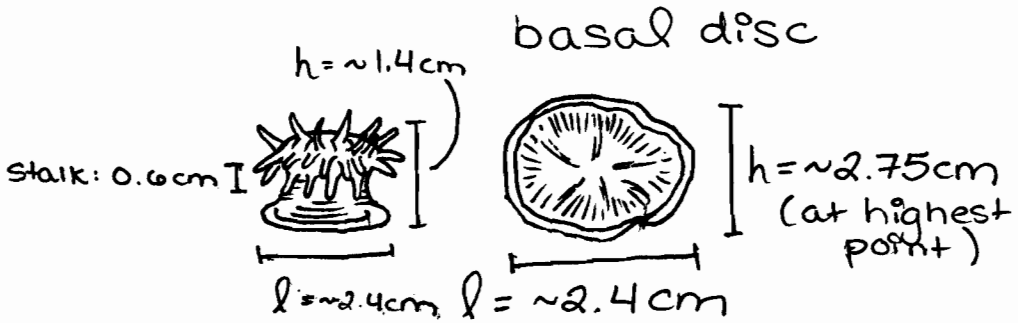


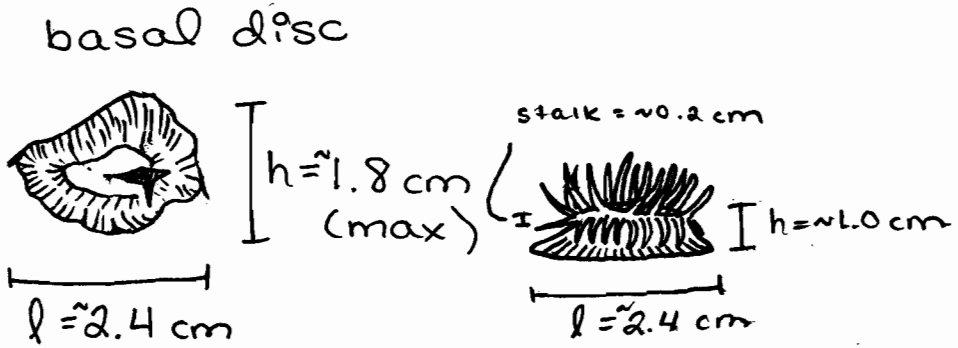
Fig. 3: H/D Ratio vs. Movement



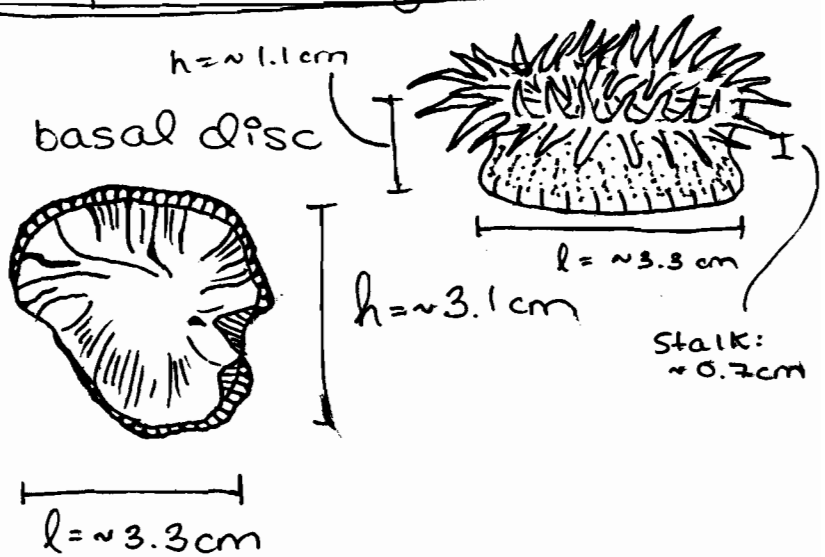
Epiactus Prolifera



Epiactus Lizbetha



Anthropleura Elegantissima

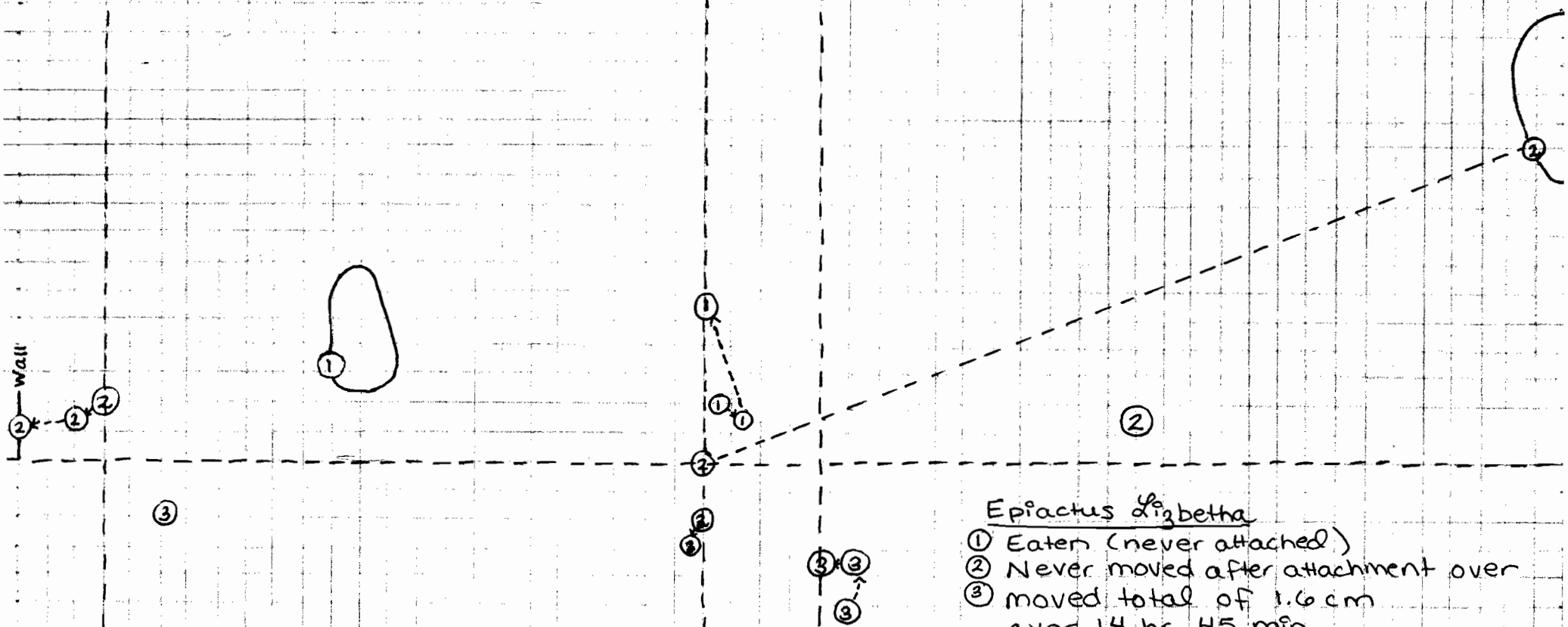


Anthropleura Elegantissima

① Never moved after attachment over ~16 hr
② moved 2.1 cm (total) over ~16 hr
③ Never moved after attachment over ~16 hr

Epiactus Prolifera

① moved total of 1.1 cm over 15 hr. 20 min
② moved total of 32.0 cm over 15 hr. 10 min
③ moved total of 0.7 cm over 15 hr. 20 min.



Epiactus Lizbetha

① Eaten (never attached)
② Never moved after attachment over
③ moved total of 1.6 cm over 14 hr. 45 min.