Righting Behavior Between Echinoderms

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Introduction:

Jennings (1907), Moore (1910a, 1910b, 1939), Cole (1913), Kjerschow-Agersborg (1918), Russell (1919), Ohshima (1940) and Rodenhouse and Guberlet (1946) are just a few of the many scientists that have preformed tests on righting behavior.

The study being presented here is not about sea stars in specific, but more about the entire phylum of echinoderms. I compared the sea star *Asterina miniata* and the sea urchin *Strongylocentrotus purpuratus*. I believe that an echinoderm that has arms will be able to right itself more readily than an echinoderm without arms.

Methods:

One of each species was collected and kept in the lab under the same conditions. When testing, I would flip either the sea star or the sea urchin and record the amount of time it took to right itself. I would then give the animal a two minute break, and repeat the test. Each day, both animals were tested equal number of times. There were three days of testing. I would also record if the animal was observed feeding before the test was preformed.

Results:

For every test preformed, the sea urchin was able to right itself quicker than the sea star was. The average time required for the urchin to flip was 2 minutes and 28 seconds, whereas the average amount of time required for the star to flip was 8 minutes and 27 seconds. That is a result of a 6 minute difference. The urchin had a radius of 2.7cm and a tube foot length of 1.7 cm. The star had a radius of 7.2 cm and a tube foot length of 0.7 cm.

Discussion:

My original thought was that arms would allow more flexibility which in turn would make it so the star was able to right itself more readily, however, the results clearly state otherwise. The reason I believe this occurred is due to the tube foot length. Since this structure is what gives each animal the ability to flip, this would be the most crucial thing to look at. *Strongylocentrotus purpuratus* has a much longer tube foot than *Asterina miniata* does, therefore it is able to flip better. I also believe that the spherical shape of *S. purpuratus* allows for easier roll once the animal has gotten itself to the halfway point. During testing, it seemed that the urchin struggled the most during the first portion of righting, when it had to get the bulk of its mass off the ground.

For *Asterina miniata*, the arms seemed hinder more than help. It would roll a combination of its arms over, and then proceed to roll the rest of its body after that. This is known as the "folding over" technique (Polls and Gonor 1975). When the star did this, sometimes it seemed that it would succeed well, and other times, it seemed like there was miscommunication between the arms because one arm would be twisting clockwise, and the other arms would be twisting counterclockwise. This mistake on the stars part is what led to some of the longer (15 minute plus) righting times.

The major errors are most likely from the lack of replication in my experiment. I only used one of each species and did a limited number of tests. Given more time, I would suggest that more species from each group (sea stars and sea urchins) as well as more individuals of each species would be needed. Also, doing more trials would be extremely helpful.

REFERENCES

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