Title

What is the geometric probability of mating success in flatworms, *Platyhelminthes*?

Author

Danh Nguyen
Abstract

“The tiger flatworm, *Maritigrella crozieri* (Platyhelminthes, Polycladida, Cotylea), a new combination, is redescribed from eastern Florida and the Florida Keys. This marine flatworm is one of the most common polyclads within warm temperate to tropical West Atlantic, yet it has been misidentified consistently as a pseudocerotid. Animals were kept alive in the laboratory for 3 weeks for biological observations. Findings indicated that these euryleptids employ hypodermic insemination, with multiple copulations occurring over several days. Sperm was transferred in sperm bundles bilaterally with little apparent damage to the epidermis of the copulating worms. Copulation sessions were variable and lasted an average of 15.4 min. *In situ* and laboratory observations indicated that *M. crozieri* fed exclusively on the mangrove ascidian *Ecteinascidia turbinata* Herdman, 1880, an individual consuming one prey zooid in an average of 17 min and an average of 19 zooids over 24h,” (Hyman, 1939).
Introduction

Flatworms are sea dwelling worms that navigate our oceans. Flatworms actually have several ways to choose from when they feel the urge to reproduce. One way is through asexual reproduction, which is just simple mitosis in cells. Another way would be through sexual reproduction. What makes sexual reproduction in flatworm unique is that they carry both female and male reproductive systems. The courtship ritual of the flatworm also adds uniqueness to their sexual feature. In order for flatworms to sexually reproduce they search for another flatworm. When a flatworm is found an extraordinary event occurs. First, their penises retract from under their epidermis, and the flatworms begin to penis fence with the other. Penis fencing is successful whenever the first flatworm is able to jab their penis into their contender making them the victor. Once the penis has penetrated the epidermis, sperm is released under the other flatworm’s skin. Penis fencing can last up a few minutes or up to a few hours. A big part of penis fencing depends on which flatworm tires out first. The flatworm jabbed by the penis turns into a female. Therefore, the flatworm that was jabbed is bestowed the burden of motherhood.

Method

An image of a flatworm was obtained from Google Images at http://richard-seaman.com/Underwater/Philippines/Nudibranchs/. A large rectangular shape was drawn to represent the surface area of the flatworm. The rectangle is measured in units of centimeters. The triangles were measured to help calculate surface area more accurately. Random mating success was calculated as the penis of a flatworm penetrated by another flatworm.
Results

Flatworm target area: $11.5 \times 4.5 = 51.75 - 9 = 42.75$ cm squared

Area of triangle: $4.5 + 4.5 = 9$

Bull’s-eye (penis insertion): $11.5 \times 4.5 = 51.75 - 9 = 42.75$ cm squared

Random probability of mating success (bull’s-eye / target): $42.75 / 42.75 = 1 \times 100 = 100\%$
According to my geometric calculations, the likelihood that the flatworm penis will penetrate another flatworm is 100%. Thus, meaning the flatworm has a very efficient style of reproducing.

**Conclusion**

Flatworms can reproduce in many ways. One of their unique ways of reproduction is through sexual reproduction. Sexual reproduction occurs when two flatworms encounter one another and begin penis fencing. A flatworm is only inseminated whenever one flatworm is able to stab the other with their penis. The random probability of mating success in flatworms is 100% successful which is far greater than other species. Random probability of mating success is at such a high percentage because the flatworm can stab their penis anywhere on to the flatworm, unlike mammals where the penis must be inserted in a vaginal opening. Mating success is also positively influenced by the fact that flatworms can mate with any other flatworm because they are hermaphrodites. They contain both male and female organs for reproduction. Depending on their size and endurance, a flatworm can overtake another flatworm during penis fencing rather easily (in a matter of hours). In the end, after a penis fencing encounter with another flatworm, there is a 100% chance that the flatworm will jab its penis into another.
References


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