**Functional Response of the Venus flytrap**

(Dionaea muscipula)

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**Introduction**

- Venus fly traps (Dionaea muscipula) are carnivorous plants endemic to coastal North and South Carolina. The unique carnivorous nature of the Venus' flytrap has made it the subject of numerous studies; however, its ecological role as a predator has received little attention.

- C.S. Holling (1959) classified three types of functional responses, or ways in which predators respond to increased numbers or prey:
  1. Type I, in which the predator feeding rate increases linearly with prey density up to a saturation point where the feeding rate levels off.
  2. Type II, in which the predator must spend time searching for and processing each prey item creating a response that increases at a decreasing rate.
  3. Type III, in which the predator's rate will not increase until a certain prey density is reached and then will not slow until saturation.

- The purpose of this study was to determine the functional response of Dionaea muscipula to changes in prey density.

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**Methods**

- Venus fly traps were purchased from the Fly Trap Farm in Supply, North Carolina. Forty Venus' flytraps were grown individually in containers (diameter of 3 in., height of 2 ½ in) containing peat moss, sphagnum, and sand.

- The plants were distributed into trays inside a covered greenhouse at CCU, and each tray was filled with at least 1 cm of distilled water to maintain moisture.

**Functional Response:**

- Eight flytraps were assigned to each of five feeding levels: 0 crickets, 3 crickets, 5 crickets, 8 crickets, and 10 crickets.

- For standardization purposes, each plant was trimmed to have five traps. Plants with fewer than five traps were used for the 0-cricket level.

- Plants were distributed in trays within a plant growth chamber (Fig. 1). Lighting was controlled to 12 hours of lightness and 12 hours of darkness.

- Transparent cups covered each plant (Fig. 2). Each cup had a small square cut out from the side to ease prey insertion, and this square was covered with tape to avoid prey escape (Fig. 3).

- After each plant received the assigned amount of crickets, the following observations were made: number of open traps, percent of successfully closed traps, percent of unsuccessfully closed traps, number of prey alive, number of prey dead, and number of prey captured.

**Handling Time:**

- Twenty-one plants with open traps were divided into three groups of seven. Each group was assigned a form of prey introduction: manual placement of a live cricket into an open trap, manual false closure of an open trap, and a natural introduction.

- The time it took for the cricket, if available, to be captured was recorded. The observed handling time was considered complete once the distance between lobes returned to the original length.

**Primary Results from First Run**

- Each symbol may represent more than one plant.

**Primary Results from Second Run**

- Each symbol may represent more than one plant.

**Conclusions**

- Based on data from the first run (Fig. 4), we thought that the functional response could be a Type I or a Type II curve.

- The second run showed a linear or Type I response (Fig. 5).

- We concluded that predation increases linearly as long as there are open traps available for prey capture.

- Similarly, Jeschke et al. (2003) concluded that all filter feeders, including carnivorous plants, exhibit a Type I response.

- The observed handling time ranged from 9 to 11 days. Lloyd (1942) estimated that after prey capture, the lobes reopen over ten days.

- Traps manually closed without a prey item inside reopened within 24 hours.

- A Type I functional response ultimately suggests that although Venus flytraps cannot control a prey’s population, this predator is capable of keeping up with an increase of prey density up to a certain level. On a wider scale, the entire population of Venus flytraps in an area is more effective as a predator when prey densities are at low to intermediate levels.

**Works Cited**

