Interspecies Competition of Prawns in the Checkhall River

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Abstract:

Fifty food competition trials of four prawn species (*Xiphocaris elongata*, *Macrobrachium heterochirus*, *Macrobrachium crenulatum*, and *Macrobrachium carcinus*) were made over five nights at different locations along the Checkhall River, Commonwealth of Dominica. Observations were made regarding relative size of participants, species of winner, and relative proportions of species. A significant association was found between relative size of an individual and its ability to win a contest. A similar association was not found when comparing different species of the same size.

Introduction:

There are five species of prawns found in the Checkhall River near the Springfield Plantation (Augustine et al, 2000). One, *Atya innocous*, was omitted from this study due to the small number of individuals present. Only one *Atya innocous* was observed over the period of study.

Xiphocaris elongata is the smallest and most abundant species. They are easily identified by their translucent coloring, and are usually found swimming rather than resting on the bottom. During this experiment only the larger members of this species participated in competition, as the smaller specimens were uninterested in the food.

Macrobrachium heterochirus are characterized by the dark, transverse stripes across their abdomen. On average individuals of this species are larger than *Xiphocaris elongata* and are found less frequently.

Macrobrachium crenulatum are more solidly colored than *Macrobrachium heterochirus*, and those observed in this study were often slightly larger than *heterochirus*. They are identified by their darker coloring and large pincher on the second pair of pereiopods.

Macrobrachium carcinus are characterized by dark longitudinal stripes on the abdomen. In this study they were observed less frequently than all other species, and the individuals were larger in size.

In this experiment food was introduced into a population and the participants were observed until a definite winner was determined. The null hypothesis is that certain species would have an advantage independent of size, and the alternate hypothesis is that size is a more important factor than species.

Materials:

Various lengths of “kite” string
Bright flashlight
Fish, chicken, and coconut

Methods:

The Checkhall is a brisk moving river found near the Springfield Plantation. It is no more than three feet deep in most places and contains a very large population of prawns. The vegetation around the river is primarily secondary rainforest. Sites were chosen in pools along the edge of the river where the flow of water was relatively slow to allow clear observation. Upon entering a site rough estimates of relative proportions of species were made. A portion of food was then tied to a string and placed in the river in the vicinity of a prawn population. A competition for the food was then observed until a clear victor was determined. Observations were made regarding relative size of participants and result of competition. The food was then removed and moved to another location.

Results:

Winner

	Macrobrachium carcinus	***Macrobrachium crenulatum***	***Macrobrachium heterochirus***	***Xiphocaris elongata***
Macrobrachium carcinus	X	0	N.O.	N.O.
Macrobrachium crenulatum	5	X	6	N.O.
Macrobrachium heterochirus	N.O.	13	X	0
Xiphocaris elongata	N.O.	N.O.	5	X

N.O.= not observed

Macrobrachium crenulatum vs. Macrobrachium heterochirus

crenulatum victories

Larger *Macrobrachium crenulatum*	**9**
Smaller *Macrobrachium crenulatum*	**0**
Equal sized *Macrobrachium crenulatum*	**4**

heterochirus victories

Larger *Macrobrachium heterochirus*	**1**
Smaller *Macrobrachium heterochirus*	**1**
Equal sized *Macrobrachium heterochirus*	**4**

Macrobrachium heterochirus vs. Xiphocaris elongata

heterochirus victories

Larger *Macrobrachium heterochirus*	**3**
Smaller *Macrobrachium heterochirus*	**N.O.**
Equal sized *Macrobrachium heterochirus*	**2**

xiphocaris victories

Larger *Xiphocaris elongata*	**N.O.**
Smaller *Xiphocaris elongata*	**0**
Equal sized *Xiphocaris elongata*	**0**

Macrobrachium crenulatum vs. Macrobrachium carcinus

crenulatum victories

Larger *Macrobrachium crenulatum*	**N.O.**
Smaller *Macrobrachium crenulatum*	**0**
Equal sized *Macrobrachium crenulatum*	**N.O.**

carcinus victories

Larger *Macrobrachium carcinus*	**5**
Smaller *Macrobrachium carcinus*	**N.O**
Equal sized *Macrobrachium carcinus*	**N.O**

Totals

Total larger prawn over smaller prawn = 33
Total smaller prawn over larger prawn = 3
Total interspecies larger prawn over smaller prawn = 19
Total interspecies smaller prawn over larger prawn = 1
Total intraspecies larger prawn over smaller prawn = 15
Total intraspecies smaller prawn over larger prawn = 3

Discussion:

A distinct association is seen between relative size of a participant and its ability to win a contest, however, same-sized prawns of different species appear to win approximately equal proportions of contests. The data suggests that size is a more important factor than species, which is not consistent with the null hypothesis that certain species have an advantage independent of size. The suggestion that a *carcinus-crenulatum-heterochirus-xiphocaris* hierarchy is apparent can be attributed to the fact that, in this study, the relative sizes of individuals roughly followed this hierarchy. It should be noted that the estimated relative proportions of species were roughly equal and not suggestive of bias by population. Additional miscellaneous observations were made during the course of the study that are of interest.

- *Macrobrachium crenulatum* were more protective of their food and preferred to take it to a safe place before eating it, whereas *Macrobrachium heterochirus* were comfortable eating in the open.
- *Macrobrachium heterochirus* were able to swim faster than *Macrobrachium crenulatum*, and in most of the instances where a smaller *heterochirus* defeated a larger *crenulatum* it did so by swimming away. *Macrobrachium crenulatum* rarely swam and preferred to walk on the river floor.
- Only larger *Xiphocaris elongata* participated in the study. The smaller individuals were not interested in the food presented.

References:

Augustine, Sarah, Autumn Griffith, Charlie Johnson, and Hee Kim. 2000. *Field Guide to Prawns of the Check Hall River.* TAMU Study Abroad.