

Hygroreception in Relation to Aggregation Behavior in *Oniscus asellus*



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Introduction

The woodlice *Oniscus asellus* belongs to the only suborder of strictly terrestrial crustaceans (Isopoda: Oniscidea)

Woodlice require moist environments to survive, and have evolved unique social behaviors as means to survive harsh climates.

Aggregation, for example, is used to prevent desiccation during dry periods. This gregarious behavior is one of the most basic social phenomena and is a proximal prerequisite for the development of other forms of cooperation.

Studying aggregation behavior by woodlice will give insight to the evolutionary mechanisms that allowed for terrestrial life as well as the development of basic social behaviors in response to fluctuations in environmental gradients

Behavioral changes in response to humidity were observed:

- Individual response to fluctuations in humidity
- Aggregate size in relation to fluctuations in humidity



Methods

50+ specimens of *Oniscus asellus* were gathered in Eau Claire, WI during early October.

Sample size of 20 adult individuals were gathered at random from terrarium enclosure and split into groups of 10. Each group was tested twice.

Experimental setup consisted of a 30 x 15 x 20cm aquarium with white aragonite sand substrate with no features except for an egg carton cell to be used as the point of aggregation.

Light exposure (15 W indirect incandescent lamp), temperature ($18.3 \pm 1^\circ \text{C}$), and duration of experiment (20 minutes) remained constant, while seven different humidity levels: 30, 40, 50, 60, 70, 80, 90% were tested to observe any changes in aggregation behavior.

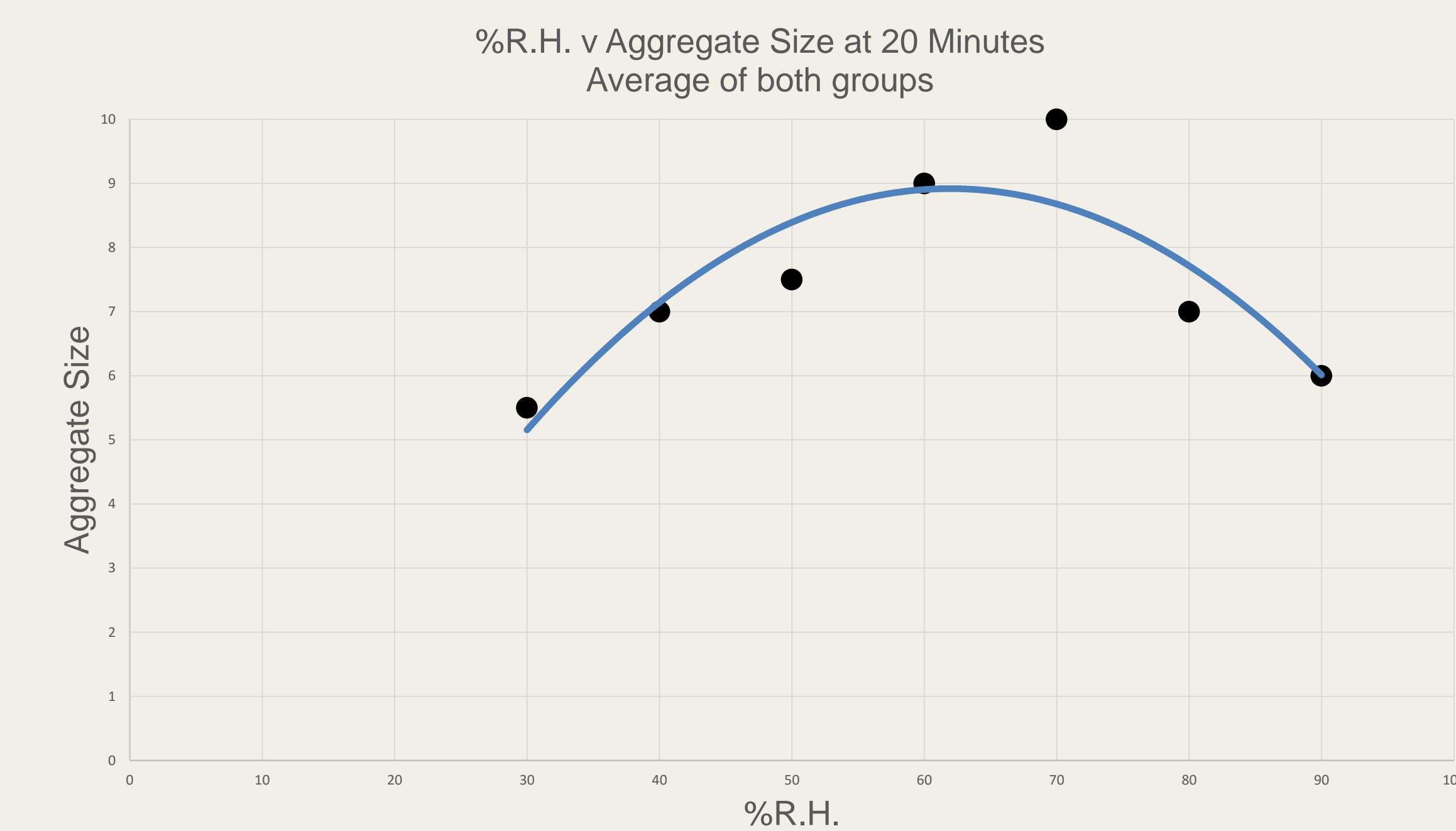
Humidity was manipulated by a warm mist humidifier, water atomizers, and fans and were maintained for the duration of experiment.

10 specimens were placed at one end of the experimental enclosure, while the source of shelter was at the other end. Each trial lasted 20 minutes, and the aggregate size at 5 minute intervals were recorded.

Trials were replicated 4 times for each humidity gradient.

Aggregate size at 20 minutes was recorded for each tested humidity and placed on a scatter plot graph with a 2nd order polynomial regression used to visualize data trend.

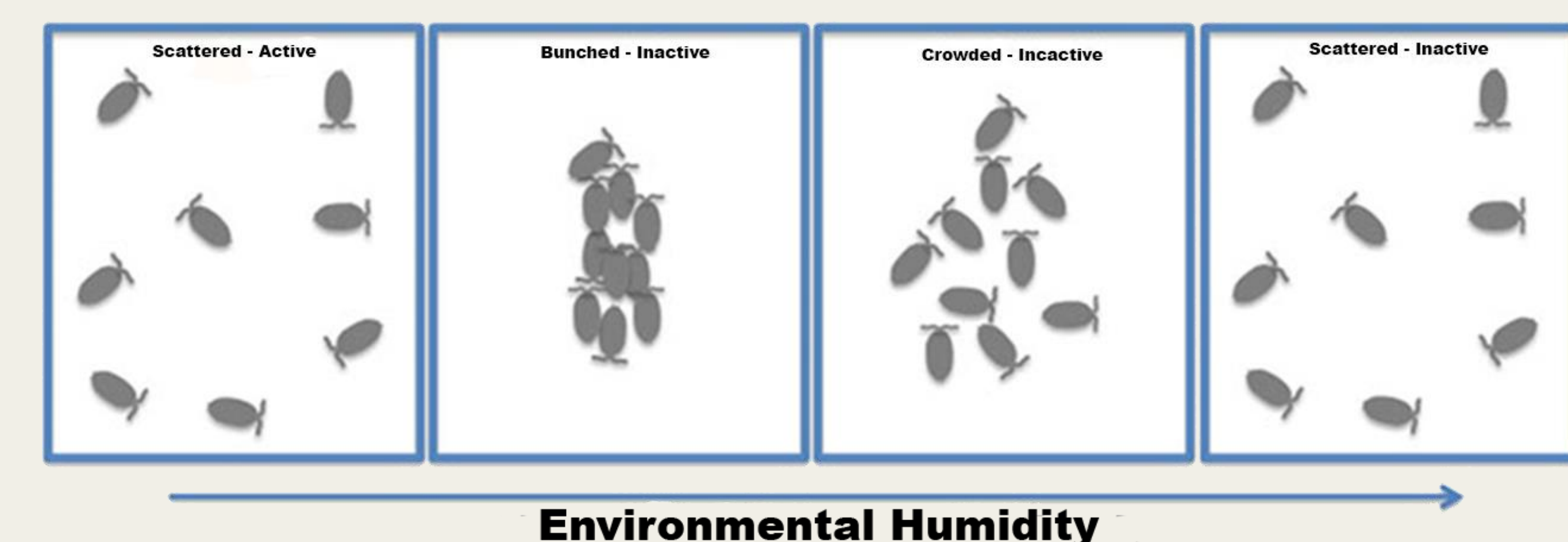
Aggregate size is dependent on variable humidity levels; water availability ultimately dictating woodlice action.



Bar Graphs illustrate aggregation size at five minute intervals for each relative humidity level tested. Each group was tested twice and the average aggregate size for each group was plotted. The scatterplot graph illustrates the relationship between average aggregate size for both experimental groups and relative humidity.

Results & Discussion

- Aggregate size increased with increasing humidity up to approximately 60 – 70%, decreasing with humidity levels higher than 80%
- Low humidity (<50%), scattered and active
- High humidity (>80%), scattered and less active
- Humidity levels ranging between 50 – 80%, woodlice are more crowded and inactive



Woodlice require saturated air or moist substrate in their permanent habitats but differ as regards to tolerance of sub-optimal conditions during their wanderings.

As time progressed during the experiment, desiccation also increased, so aggregates were expected to form.

Aggregation-humidity relationship became negative after mid-levels of humidity, presumably because of a lack of need for water preservation among individuals, as aggregate formation is mostly a response to lack of water and moisture.

The mechanism by which these isopods remain in a favorable humid environment is a klinokinesis (an increases frequency of turning in low humidity).

In addition to humidity, other factors influence aggregation such as rates of oxygen consumption and body growth, biotic stimuli for reproduction, mate availability, predation risk, food requirements, presence of cover, and the need to acquire internal symbionts.

Aggregation behavior appears to be an individual's response to desiccation, although they often traveled in groups and remained cohesive throughout experimentation.

Acknowledgments

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