

Phoretic Midges on Hellgrammites (*Corydalus cornutus*: Megaloptera) from the Susquehanna River

Abstract

Aquatic midge larvae (Chironomidae) have been observed living phoretically on various aquatic organisms, including members of the Order Megaloptera. While this relationship has been reported in various locations, documentation of geographic variation within the same system is limited. We collected hellgrammites (*Corydalus cornutus*, n=363) from seven sites along the Susquehanna River in Pennsylvania from July through September of 2010. In general, 24% of all hellgrammites collected hosted at least one midge case, but the incidence of phoresy ranged from 4.3% to 52.7% at the individual sampling sites. Many hellgrammites had multiple midge cases attached to them, but smaller hellgrammites hosted few or none. The maximum number of cases found on a single hellgrammite was 55, with an average of 2.9 cases per host. Most cases were observed attached to the abdomen (77%), followed by the thorax (22%), legs (3%) and head (1%). The cases were almost evenly divided among the dorsal and ventral surfaces at 54% and 42%, respectively.

Introduction

Phoresy is generally defined as the commensalistic transportation of a symbiont on a larger host of another species. Some species of midges (Chironomidae) commonly exhibit a phoretic relationship on the exterior of megalopterans. Incidence and frequency of phoresy on Megaloptera have been recorded in some states and a few locations outside of the U.S, but it has not been documented in Pennsylvania. Therefore, our objective was to determine the incidence of chironomid phoresy on larval dobsonflies (*Corydalus cornutus*) in a large northeastern river.

Methods

From July through September of 2010, hellgrammites were collected from seven sites in the Susquehanna River from Pittston to Halifax, Pennsylvania. Collection took place in riffle areas of the river, and a kick net was used to collect hellgrammites dislodged from substrate that was vigorously moved. Large cobbles and small boulders were most commonly targeted to obtain hellgrammites. Specimens were immediately placed in a plastic container filled with river water. After collection, the river water was replaced with 70% ethyl alcohol. At the laboratory all specimens were measured for head capsule width and total body length to the nearest 0.1 mm. A dissecting scope was used to identify chironomid cases on air-dried specimens, and the number of midge cases and their distribution on the hellgrammites were recorded.

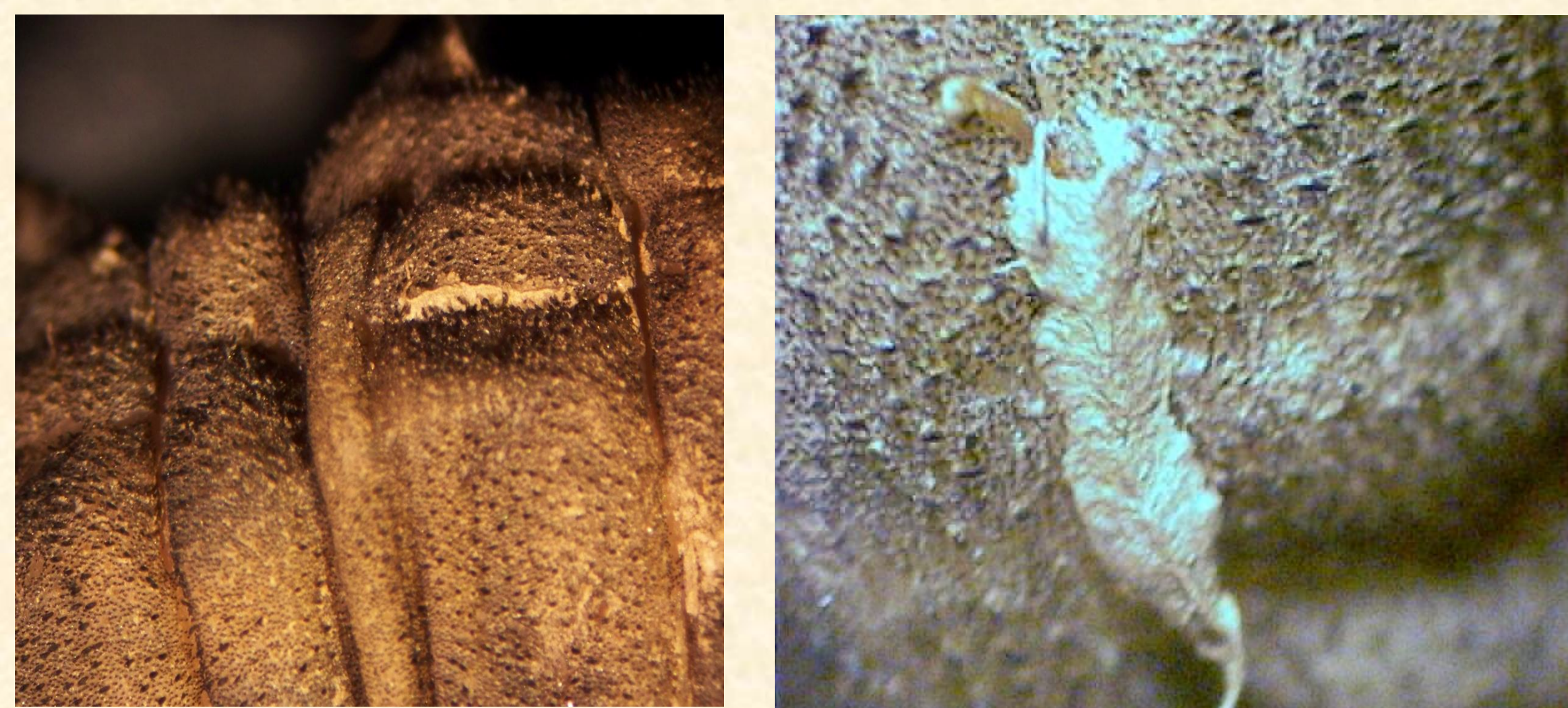


Figure 1. Chironomid case on dorsal surfaces of the 3rd (left) and 7th (right) abdominal segments.

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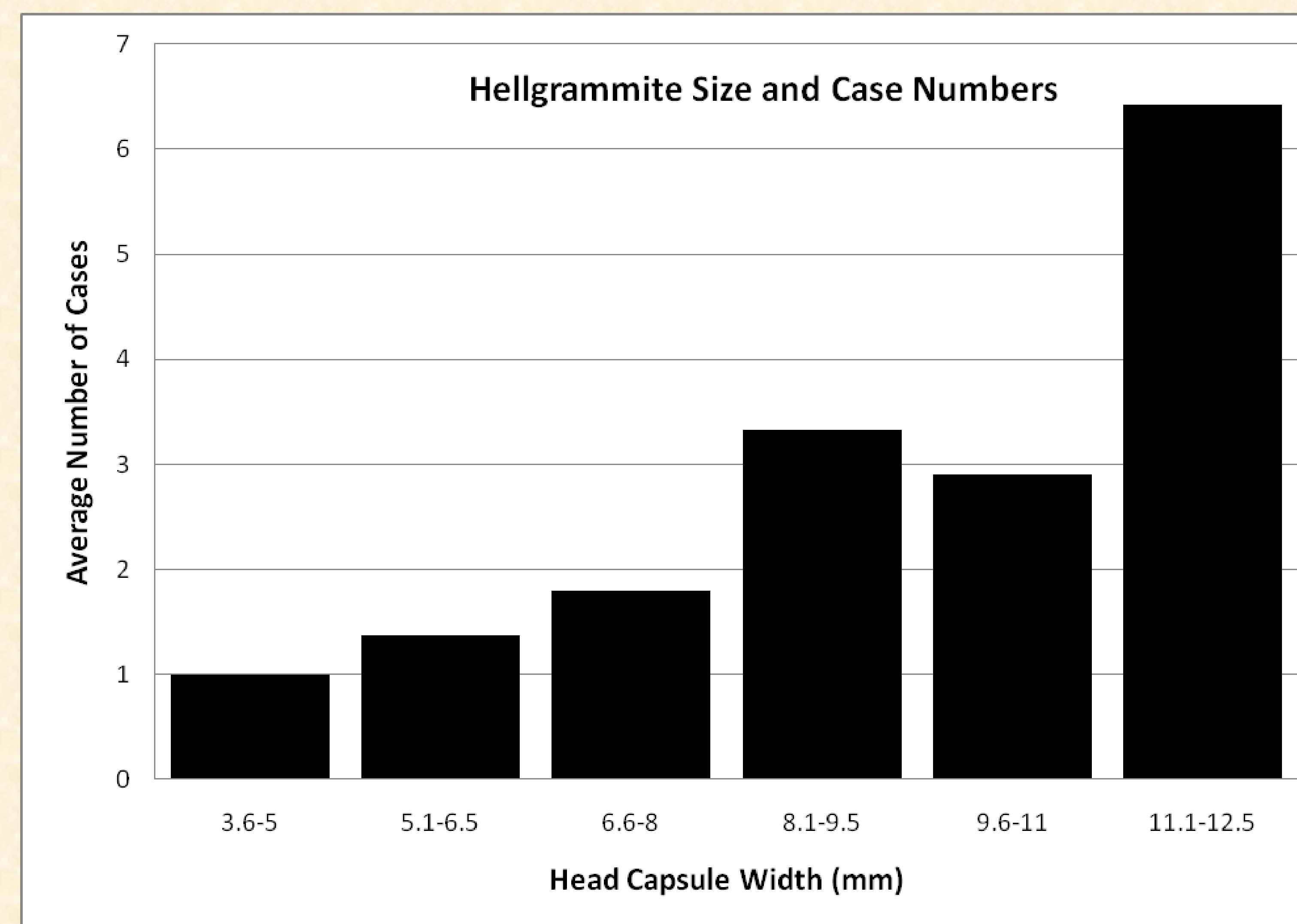


Figure 2. The average number of cases observed on hellgrammites relative to host size (head capsule width).

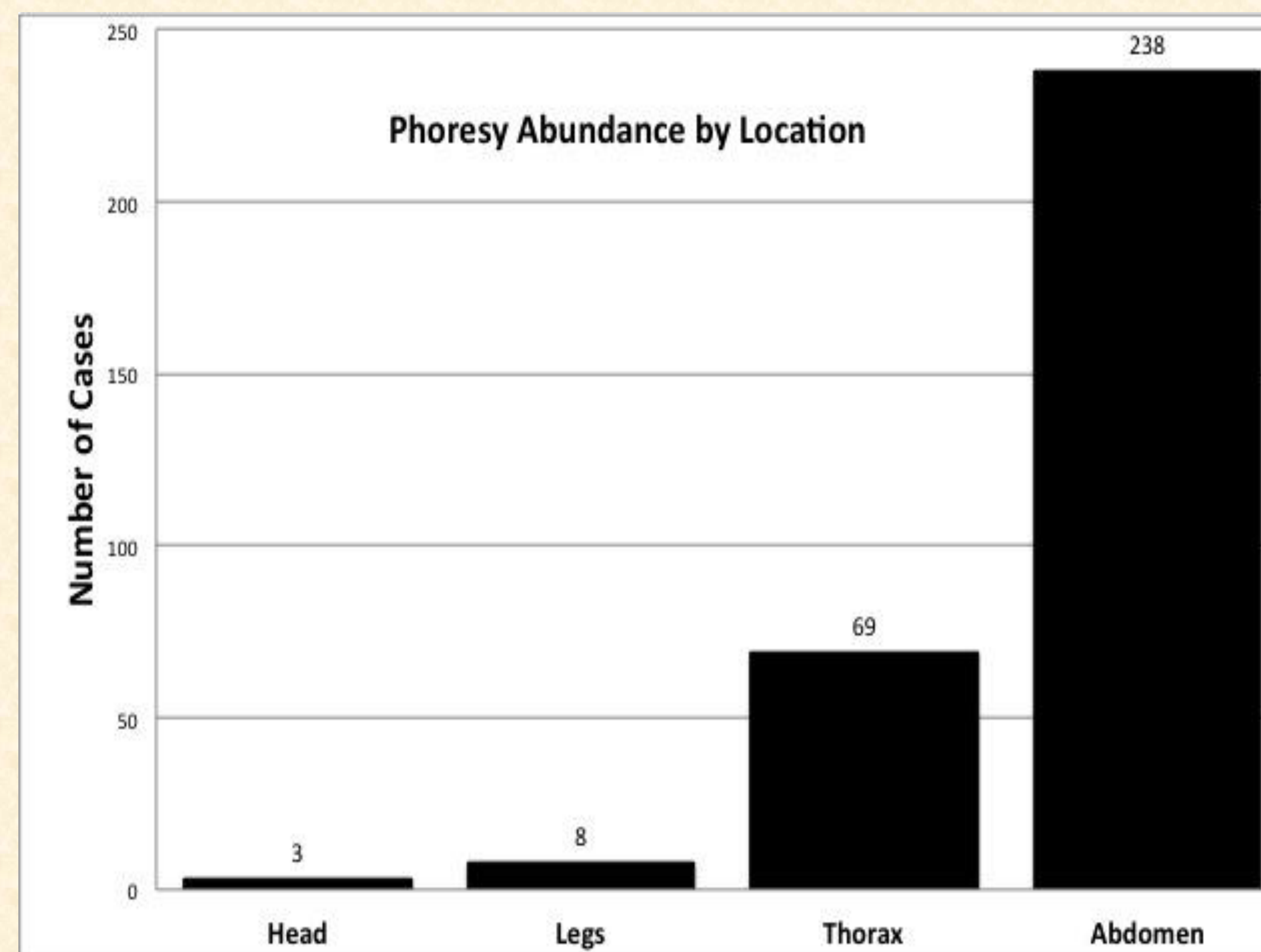


Figure 3. The distribution of cases (n = 310) among major segments of hellgrammite anatomy.



Figure 4. Examples of cases located on the head and legs of hellgrammites.

Results and Discussion

Three hundred sixty three hellgrammites were collected among the seven sampling sites and the range of hellgrammites captured from among the sites was 19-92. Overall, 24% of the hellgrammites hosted midges, but the phoresy rates among the sites ranged from 4.3% to 52.7%.

We observed both intact cases and the remnants of cases on the hellgrammites. In some instances chironomid larvae were resident in the cases or found clinging to the hellgrammites outside of the cases (Figure 1). On average there were 2.9 cases on hellgrammite hosts. Among the sites, the average number of cases per host ranged from 1.25 - 9.0. Most hellgrammites carried only one case. However, one hellgrammite from the Pittston site carried 55 cases. Compared to the other sites, the Pittston hellgrammites carried more cases, but this was likely a function of their larger sizes.

The head capsule width of all hellgrammites captured ranged from 1.7 to 12.7 mm (avg.=6.5) and total length ranged from 10 to 94 mm (avg.=42.7). Host hellgrammites ranged from 3.6 to 12.5 mm (avg.=8.9) and total length ranged from 20.9 to 94 mm (avg.=61.1). In general, larger hellgrammites hosted more cases and there is likely a minimum-size threshold for hosting any cases (Figure 2).

The abdomen was the favored attachment site for chironomids (Figure 3). This could simply be a function of the fact that this is the largest portion of the hellgrammites anatomy. However, no specific abdominal segment was favored for case location. The thorax was the second site of choice for cases. In addition, the prothorax was occupied more than twice as much as the meso- and metathoraces combined.

The number of dorsal cases (54%) outnumbered ventral cases (42%), but there was no significant statistical difference between them ($p>0.05$). However, we noted more ventrally located cases on hellgrammites hosting only one case. Other researchers have speculated that ventral locations, particularly on the thorax, are preferred case sites when site territoriality is not in play for case locations. We also observed cases on the heads and legs of some hellgrammites (Figure 4). We believe that this may be the first documentation of cases in these locations.

Overall, the phoresy rates we observed were comparable to rates previously reported for megalopteran hosts. However, attachment site preferences reported among researchers differ. Further research is required to determine the factors that influence case location on hellgrammites and geographic variation in the incidence of phoresy.

Acknowledgements

We thank JohnRyan Polascik for his assistance in the field work and in the lab.