

ORGANIZATION OF BOG LAKE
ZOOPLANKTON COMMUNITIES: FACTORS
AFFECTING THE DISTRIBUTION OF FOUR
CHAOBORUS SPECIES (DIPTERA:CHAOBORIDAE)

A Dissertation

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by

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Abstract

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The phantom midge, Chaoborus, is a common member of the benthic and zooplankton communities of most lakes. From previous studies reported in the literature, it was observed that Chaoborus americanus was rarely found in lakes, and when present, it often occurred alone. To determine the reasons for this, the zooplankton communities of four bog lakes in the Upper Peninsula of Michigan were studied. These zooplankton communities are relatively simple, and have as a major invertebrate predator, Chaoborus. Four Chaoborus species are found in these bogs in the following combinations: Tender Bog, C. americanus; Forest Service Bog, C. americanus, C. trivittatus; Hummingbird Bog, C. punctipennis, C. flavicans, C. trivittatus; and North Gate Bog, C. punctipennis. Hummingbird and North Gate bogs have fish, whereas Tender and Forest Service bogs have none.

It is proposed that the major differences in the combinations of Chaoborus species present in these lakes can be explained by considering the following factors: (1) the presence or absence of fish in a particular lake, (2) the diurnal, vertical migratory behavior of the individual Chaoborus species, (3) the seasonal patterns of recruitment of the different Chaoborus species, and (4) predation by larvae of one species on those of another species.

Field experiments indicate that C. americanus larvae can survive in those lakes with fish, when isolated, in containers with other zooplankton species, from fish. However, when fish are added to a lake which has C. americanus, but no fish, C. americanus is eliminated. Similar in situ container experiments indicate that C. punctipennis larvae can survive on the prey available in Tender Bog, but are excluded from Tender because of predation by later instars of C. americanus on early instars of C. punctipennis. Evidence is presented to show that C. flavicans and C. trivittatus are probably excluded from Tender Bog for the same reasons as C. punctipennis. An explanation for the coexistence of C. americanus and C. trivittatus in Forest Service Bog is presented. The dynamics of Chaoborus species distributions are discussed in terms of extinction and migration rates in a patchy environment.