



Langmuir circulations disturb the low-oxygen refuge of phantom midge larvae

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ABSTRACT: The previously unknown effects of wind-induced Langmuir circulations on the distribution of phantom midge larvae (*Chaoborus i-bvicans*) were studied by echosounding. The study was carried out in the eutrophic Lake Hiidenvesi, where chaoborids use a metalimnetic oxygen minimum as a daytime refuge against i-[]sh predation. At a wind velocity of 8-9 m s⁻¹, the upwelling water circulations snatched clouds of chaoborids from the metalimnion (12-15 m depth) to the more oxygenated epilimnion. The average density of *C. i-bvicans* in the clouds was 790 ind. m⁻², whereas, elsewhere in the epilimnion, it was 380 ind. m⁻². Planktivorous i-[]sh (smelt *Osmerus eperlanus*) were actively aggregated in the upwellings. When the wind velocity decreased to 3 m s⁻¹, chaoborids disappeared from the epilimnion. The results suggest that Langmuir circulations may affect the abundance of chaoborids by disturbing their low-oxygen refuges.

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