The drift of zooplankton in a lake-outlet (Glatt) in a day-night-rhythm depending from the water level

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Manuscript received on 3 September 1987

ABSTRACT

To give an indication on the influence of the dynamics and behavior of lake plankton on the seston composition in the outlet, four 24-hour sampling sessions were made in the Greifensee (situated near Zürich, Switzerland) and its outlet (River Glatt). The most important crustacean species studied were Eudiaptomus gracilis, Cyclops abyssorum, Cyclops vicinus, Mesocyclops leuckarti and Daphnia spp. Leptodora kindtii was found during one sampling only. No evidence of shore avoidance was found. The vertical migration in the lake especially in the upper layer (0–6 m) is believed to have an influence on the amount of plankton which is flushed into the outlet.

Although the composition and concentration of the plankton at the deepest point of the lake have been known, no accurate predictions on the quality of the plankton close to shore or in the outlet were possible.

Introduction

A lake-outlet, the transition reach between lake and river, is influenced by both of these very distinct aquatic environments. It carries for instance waterborne material, like plankton, which originates mainly from the lake. This material represents the most important nutrient load in the lake-outlet maintaining the benthic organisms and fishes. Whatever the reaction of the drifting plankton in the river might be, it is left to its fate without the possibility of a feedback to the lake plankton.

The purpose of this study was to give an indication on how the dynamics and the behavior (such as diurnal vertical migration and shore avoidance) of the lake-plankton might influence the composition in the outlet. Such informations are necessary to simulate the load of particles in the outlet in connection with analysis of plankton at the deepest point of the lake.
Site of study

The Greifensee is a relatively small, eutrophic lake east of Zürich (Switzerland). [Some morphometric parameters of Greifensee: Area of whole lake: 8.49 km²; max depth: 32.6 m; mean depth: 17.7 m; τw: 1.1 y] The outlet (River Glatt) has its origin at the north-westerly end of the lake, with a weir located right at its beginning. Three sampling stations were located in the river; the farthest being at 60 m from the weir. Furthermore three stations were placed near the shore of the lake in front of the outlet. The bottom of the reedy shore down to 7 m depth at these stations is composed of sand and mud without submerged macrophyte vegetation. At the surface no current which might have been due to the outflowing water was observed. The last station was located in a distance of 1600 m from the lake outlet at the deepest point of the lake. The lake stations were marked with buoys for better relocation.

Methods and materials

The measurements and the samples were taken in 1986 during four 24-hour sampling sessions which took place on April 25/26, on June 10/11, on June 30/July 1 and on July 28/29 respectively. During the first session seven series of measurements were taken, while during the following three, only four series were taken: one at noon, one at sunset, one at midnight and one at sunrise.

The plankton in the outflow was sampled with a 101 bucket at the surface (0–40 cm). From each sampling station in the river 601 of water were filtered through a 95 μm plankton-net. In the same manner a sample from the surface of the sampling station NS2 (near shore, directly located before the outlet), therefore called “NS2”, was taken. The lake plankton samples (including the near shore stations) were caught by taking vertical net hauls from 6 m to the surface with a double plankton-net with tilt closing mechanism (Burgi, 1983). This net was towed at the constant speed of 0.5 m/sec to prevent clogging and changing in the filtration efficiencies. During each tow 1201 of water were filtered. At the station DP (deepest point), four additional net hauls were made to gather information on the vertical migration of the zooplankton: 30–24 m, 24–18 m, 18–12 m, 12–6 m deep.

Each zooplankton sample was rinsed into a 100 ml bottle and fixed with 35 % formol (resulting in a final concentration of approximately 3 %). In the laboratory the samples were washed and filled up to a volume of 40 ml with distilled water. Subsamples were then taken with a 2 ml “Stempel pipette” and analyzed under a dissecting microscope with 25- to 50-fold magnification because of time restrictions, only adult crustaceans were counted.

Results and discussion

The weir was closed February 18, 1986 and its position remained unchanged until September 5, 1986. This parameter remained therefore constant throughout the time of the study.