A Description of a new Zooplankton Counter

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SUMMARY

The new plankton-counting cell is an annular groove machined in a circular plate of lucite. The plate is mounted on a turntable and driven at a rate of about one revolution in six minutes. Counting is done by observation of the rotating sample as it moves through the field of a microscope. This apparatus provides the convenience of the trough and flow systems currently used and has the advantage of being a more compact unit.

IN the conventional method of phytoplankton enumeration the standard Sedgwick Rafter counting cell has long been used to hold a definite fractional volume of the sample. Cells of this general type modified, particularly with respect to dimensions, have also been commonly used for both total and fractional counts of zooplankton samples. Although these cells are somewhat inconvenient to use a more important criticism is that, even when ruled lines are used to subdivide the area, errors in counting are possible. These may arise through the overlapping of the fields of view used in scanning the cell, and through movement of the cell on the microscope stage which usually disturbs the distribution of the organisms to some extent, decreasing the accuracy of the count. In order to minimize the error, and to increase the convenience of the counting method, a rotating counting cell has been developed which passes the sample slowly under the objective of the microscope with no disturbance to the distribution of organisms. The organisms are maintained in a groove which has the same width as the field of view so that lateral overlap of fields is obviated.

The counting cell proper, as shown in fig. 1, is made of a circular plate of lucite $\frac{1}{2}$ inch in thickness and $6\frac{1}{2}$ inches in diameter. A groove $\frac{3}{16}$ inch deep with sides sloping outwards at an angle of 30 degrees is machined in the upper face near the periphery and the surface of the groove and the outer edge of the plate are polished. The width of the bottom of the groove is slightly less than the diameter of the field of the optical system used in enumeration. In the present apparatus the groove is 4·5 mm. wide for use with 3× objective and 12·5× oculars on a Leitz-Greenough binocular microscope. The slope of the sides of the groove allows complete settling of the organisms and prevents the meniscus from interfering with accurate focusing. Neither the slope of the groove nor dimensions other than the width of the bottom are critical.

The mounting for the cell is the hub and axle of the front wheel of a bicycle. This is firmly bolted in a vertical position to the base plate of the counter. A

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lucite pulley 5 inches in diameter is fixed to the upper rim of the hub. The counting cell proper has a concentric recessed depression by which it is centred on this pulley. The cell is easily removed for draining the sample yet quite stable, resting as it does on the face of the 5-inch pulley. The base plate is provided with three levelling screws for adjustment of the counting cell.

An electric timer motor with a speed of one r.p.m. provides the motive

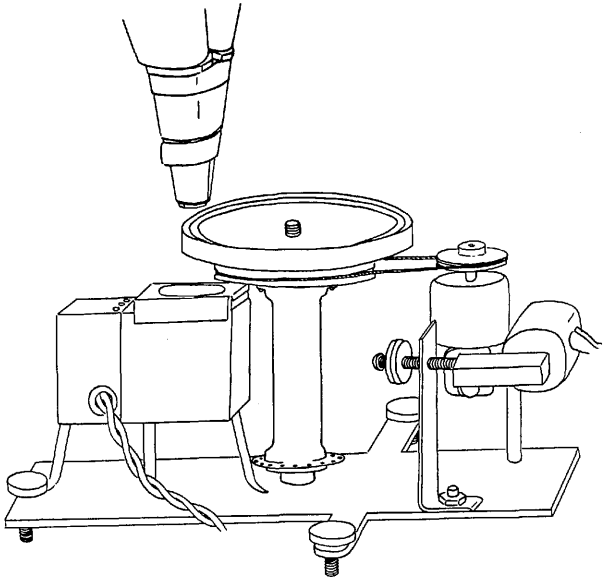

FIG. 1. Side view of counter with working position of microscope objective indicated. The circular counting cell, which rests concentrically on the pulley, is easily removed from the shaft.

power for the counting cell. Suitable drive pulleys are used to give a rate of rotation to the cell of 0·17 r.p.m. and 0·25 r.p.m. respectively. A foot pedal switch is used on the power line to the motor so that the counter can be stopped at will during the count. The motor is hinged to allow adjustment of the tension on the belt when different drive pulleys are used.

The light source is a small microscope lamp fitted with ground glass and blue filter which rests directly under the groove of the cell.

In making total counts of zooplankton most of the supernatant liquid is removed from the sample vial and the organisms washed into the groove of the cell. Sufficient supernatant fluid is used to rinse the vial and to fill the

groove about three-quarters full. The organisms are stirred with a plastic rod to distribute them fairly uniformly about the circumference of the groove and then allowed to settle. The count is begun and terminated at an index mark scratched on the floor of the groove. Evenly spaced transverse scratches about the circumference aid as points of reference as the organisms pass the field of view. When organisms are not too abundant the higher speed of rotation may be used. When more concentrated the slow speed is used and when organisms are clumped the motor can be stopped while individuals in a group are counted. Stopping and starting the cell does not affect the distribution of the organisms in the groove. Counts are recorded on two nine-unit blood counters operated with one hand, the other being left free for focusing. The sample may be removed by pouring it out, this being facilitated by a pouring lip filed in the outer edge of the groove, but it is more convenient to suck the sample up by means of a small lucite pipette with rubber bulb.

Fractional counts may be made by counting the organisms in a definite fraction of the segments marked off in the groove or by counting the organisms in one-half or one-quarter of the circumference. Uneven distribution of the organisms about the circumference and the overlapping of organisms in adjacent segments lead to some error in such counts. Hence when high accuracy is requisite it has been found advisable to subdivide the original sample and count all zooplankters in each sub-sample rather than rely on fractional counts.

This rotating counter has been used by Mrs. E. Jermolajev for some months and has been found to be considerably more convenient than the rectangular cell previously used. The time required to complete a total enumeration of a 10-litre trap sample is reduced and it is believed that the accuracy of the count has also been improved. The apparatus also has the advantage of being more compact than the trough or flow systems used in some laboratories.