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A Simple Apparatus for Routine Zooplankton Counts

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As part of an investigation on the ctenophore *Pleurobrachia pileus* (O. F. Müller), a simple apparatus was designed to facilitate the rapid handling of large numbers of this species for counting and examination of stomodeal contents under the low-power binocular microscope. The apparatus is shown in Figure 1, and involves the flow of a controllable current of water carrying the specimens through a suitably illuminated counting cell beneath the microscope objective.

Procedure

The whole system is first filled with sea water and the preserved plankton catch to be counted is introduced into bulb 4. A portion of it is then allowed to pass into the system by opening tap C and momentarily pressing spring-clip 11. Tap C is then closed and tap B opened, after which the organisms can be made to flow along in a current of water through counting cell 6 and to accumulate in container 9. From this container, the water passes on via funnel 10 and spring-clip 11 into reservoir 12. When the latter is full, reservoir 1 is empty and the two are simply interchanged, siphon branch 3 being used to eliminate any air bubbles which may have entered siphon 2 during the interchange. Speed of flow is controlled by manual pressure on spring-clip 11, and if any specimens should overshoot the field of vision of the microscope before being counted, they are brought back into view by releasing spring-clip 11 (i.e., stopping the flow) and pressing on rubber squeeze bulb 8. Both 11 and 8 are so placed as to be within easy reach of the observer's left hand, the right hand being used for focusing.

When the whole catch has been counted, portion by portion, and has thereby accumulated in container 9, the latter is detached, emptied, refilled with sea water, and refitted. Outflow 14 is used during this operation to eliminate any bubbles of air. Should a catch have to be left partly counted for any length of time, a little formalin can be run into container 9 from formalin reservoir 13 if desired.

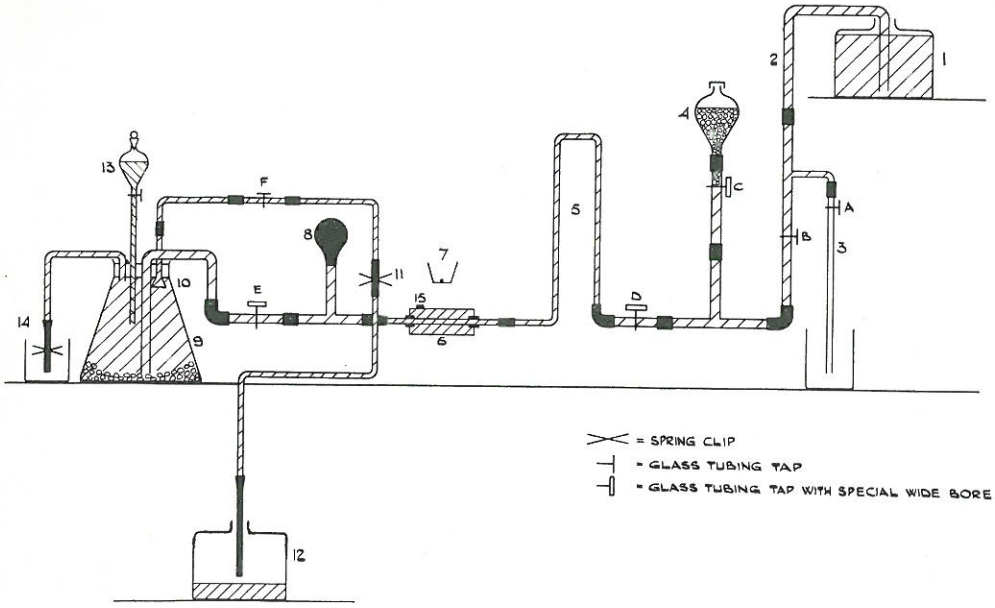

Figure 1. Counting apparatus for *Pleurobrachia pileus* and other common plankton organisms.
(1) Reservoir with sea water. (2) Siphon. (3) Siphon branch. (4) Bulb containing sample. (5) Loop of narrow glass tubing. (6) Perspex counting cell. (7) Objective of binocular microscope. (8) Rubber squeeze bulb. (9) Container receiving counted specimens. (10) Small gauze-covered funnel. (11) Control spring-clip. (12) Low reservoir for used sea water. (13) Formalin reservoir. (14) Alternative outflow from receiving container with spring-clip. (15) Stopper on counting cell.
Receiving container 9 considerably enlarged for clarity. Bench clamp stands supporting the apparatus, and microscope, omitted for clarity. Glass tubing taps labelled with letters. Taps C, D, and E with special wide bore.

All tubes and taps through which organisms have to pass are of wide bore to prevent blockage, with the exception of the tube in counting cell 6. This is as narrow as feasible to ensure that the organisms pass below the microscope objective in as nearly as possible single file. With *Pleurobrachia*, an additional length of such narrow tubing (loop 5) was found to be helpful for the same purpose.

Tap F is only closed when the apparatus is out of use for a period so that spring-clip 11 can be removed to preserve the rubber tubing.

Suitability for Zooplankton

Although the apparatus was designed and has largely been used for *Pleurobrachia*, it was also found very useful for counting *Calanus finmarchicus* (Gunnerus), various smaller copepods, and other common zooplankton forms which can be identified at sight and all of which travelled through the apparatus without difficulty. It is, however, obviously unsuitable in cases where manipulation of specimens or removal of appendages with needles is necessary for identi-

fication or other purposes and which consequently require an open counting tray or dish.

After a little practice, it was found possible to count the number, and record the stomodeal food content, of *Pleurobrachia pileus* at the rate of approximately 20 per minute. Details noted included number, presence or absence of food in stomodeum, the type of food organism if recognizable, e.g., "amphipod", "*Evadne*", etc., and whether there were few or many food organisms present.

Acknowledgement

The apparatus described was made and used whilst I was on the staff of the Dove Marine Laboratory at Cullercoats, and I am much indebted to Dr. H. O. BULL, Assistant Director of the Laboratory, for his help and advice in connexion with it.

Summary

A simple apparatus to facilitate routine counts of large numbers of *Pleurobrachia pileus*, common Copepoda, and other easily identifiable zooplanktonic forms is described, together with its practical operation. It involves the flow of a controllable current of water carrying the preserved organisms through a suitably illuminated counting cell beneath the microscope objective.