Designation: D4134 – 82 (Reapproved 2012)

Standard Practice for Sampling Phytoplankton with a Clarke-Bumpus Plankton Sampler[1]

This standard is issued under the fixed designation D4134; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the procedures for obtaining semiquantitative samples of a phytoplankton community by use of a Clarke-Bumpus plankton sampler.

1.2 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Document

2.1 *ASTM Standards:*[2]

D4137 Practice for Preserving Phytoplankton Samples

3. Summary of Practice

3.1 The sampler is towed from a moving boat at a specified depth. The sampler uses a net for the concentration of organisms and, as such, may be considered to be a semiquantitative sampler. It is quantitative in that the actual volume of water entering the sampler is measured by a calibrated flow meter. The phytoplankton are preserved as dictated by the objectives of the study.

4. Significance and Use

4.1 The *advantages* of the Clarke-Bumpus plankton sampler are as follows:

4.1.1 It will sample a discrete depth or multiple depths, depending upon the sampling design.

4.1.2 It is a slow to medium speed sampler requiring a towing speed of 3 to 5 knots.

4.1.3 The sample size can be easily controlled.

4.1.4 The sampler is light-weight and can be used without auxiliary equipment.

4.1.5 It has a relatively high filtration efficiency factor of 0.88.

4.1.6 It is a versatile sampler and can be used in all but the shallowest waters.

4.1.7 The flowmeter records the amount of water that passes into the net.

4.1.8 Overspill of water at the mouth of the net due to excess speed of towing is of minimal consequence.

4.2 The *disadvantages* of the Clarke-Bumpus plankton sampler are as follows:

4.2.1 The flowmeter requires frequent maintenance including calibration and lubrication.

4.2.2 It is not suitable for use in very small areas or shallow waters.

4.2.3 Because of the use of a net as a filtration material, the sample is semiquantitative.

4.3 There are several *special considerations* that shall be observed when using a Clarke-Bumpus sampler. They are as follows:

4.3.1 The flowmeter should be calibrated and serviced frequently to ensure efficient and accurate operation.

4.3.2 The sampler is relatively fragile, particularly the closing device and flowmeter. This necessitates careful deployment and recovery procedures.

4.3.3 Following each collection, the net must be thoroughly washed.

4.3.4 Special attention must be given to the strength of the cable and its attachment to avoid loss of the sampler.

4.3.5 The sampler should not be used in beds of macrophytes, in waters containing submerged objects, or close to the bottom.

4.3.6 The net should be inspected frequently for pin-size holes, tears, net deterioration, and other anomalies.

4.3.7 Following use, the wet net should be suspended full length in air and in subdued light and allowed to dry.

5. Apparatus

5.1 The Clarke-Bumpus plankton sampler, Fig. 1, consists of a metal frame in which a plankton net is attached at the mouth and at the cod end. The sampler is available in three sizes: 120 mm, 200 mm, and 300 mm. The most widely used size is the 200-mm diameter net, which reportedly has more

[1] This practice is under the jurisdiction of ASTM Committee D19 on Water and is the direct responsibility of Subcommittee D19.24 on Water Microbiology.

Current edition approved Sept. 1, 2012. Published October 2012. Originally approved in 1982. Last previous edition approved in 2004 as D4134 – 82 (2004). DOI: 10.1520/D4134-82R12.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

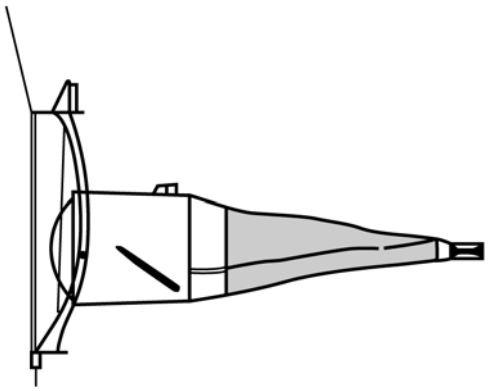

FIG. 1 Clarke-Bumpus Plankton Sampler (Illustration by J. W. Steiner and W. G. Hester, U.S. Geological Survey, Doraville, GA)

efficient trapping characteristics. A metal tube at the mouth of the net is fitted with a digital flowmeter from which the volume of water filtered can be calculated. The mouth also contains a shutter device that effectively opens and closes the net permitting the collection of samples from discrete depths. The shutter is opened by a messenger, and closed by a second messenger. The sampler usually is attached to a towing cable and its horizontal orientation is maintained by positioning veins attached to the side of the sampler frame. Several samplers can be strung on a single cable for simultaneous sampling at various depths. The frame generally is constructed of stainless steel and the entire sampler weighs about 14 kg.

6. Procedure

6.1 Under steady forward movement, the depth (D) of tow can be determined by the following equation:

$$D = L\cos a \quad (1)$$

where:

L = length of the tow line from the surface of the water to the sampler, and
$\cos a$ = cosine of the cable angle.

Once the prescribed depth is reached the duration of the tow should be determined experimentally, and will be dependent upon the density of phytoplankton, depth of tow, and size of net. When the sampling depth and length or time of tow have been achieved, release the messenger to close the opening to the net and retrieve the sample, being careful to wash phytoplankton off the sides of the net into the sample collector. Preserve the plankton as described in Practice D4137.