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Standard Practice for Collecting Benthic Macroinvertebrates With Drift Nets[1]

This standard is issued under the fixed designation D 4558; 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 Drift nets are useful for collecting macroinvertebrates that actively or passively enter the water column or that are dislodged from the substrate; naturally or by stress. They are particularly well-suited for synoptic surveys because they are light weight and easily transported.

1.2 Thousands of organisms, including larvae of stoneflies, mayflies, caddisflies, and midges and other Diptera, may be collected in a sampling period of only a few hours.

1.3 The drift net efficiently collects organisms originating from all types of substrates and a wide spectrum of microhabitats in lotic (flowing) waters.

1.4 The device is restricted to flowing rivers or streams with a current velocity of more than 0.05 m/s.

1.5 *This standard does not purport to address all of the safety concerns, 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 Documents

2.1 *ASTM Standards:*

D 4387 Guide for Selecting Grab Sampling Devices for Collecting Benthic Macroinvertebrates[2]

D 4556 Guide for Selecting Stream-Net Sampling Devices for Collecting Benthic Macroinvertebrates[2]

3. Summary of Practice

3.1 The typical drift net consists of a bag of nylon or nylon monofilament; a variety of mesh sizes can be used depending on the objectives of the study. The U.S. Standard No. 30 (0.595-mm mesh openings) net is often used for collecting macroinvertebrates.

3.2 The frame typically consists of a 0.045-m^2(15 by 30-cm) brass rod structure anchored into the stream bed by a pair of steel rods.

3.3 Cable clamps are used to secure the nets to the rods.

3.4 The average volume of water passing through the net is determined by measuring the water velocity at the mouth of the drift net with a Pygmy Price Current Meter[3] (or equivalent) several times, and recording the total time the drift net is set in the water column. Several readings are taken, and the mean is used.

3.5 The efficiency of the net is determined by the simultaneous measurement of the water velocity passing by the set drift net.

3.6 The drift net frame can be fitted anteriorly with a mouth reducing rectangular plexiglass enclosure (Rutter and Ettinger **(1)**[4]) to increase filtration efficiency.

3.7 The type of drift net and mesh size utilized will depend on the objectives of the study and the physical characteristics of the flowing water.

3.8 Alternatives to the typical drift net include the waterwheel drift sampler (Pearson and Kramer, **(2)**) which might be useful in large rivers or streams which can be reached by automobile.

3.9 An automatic drift sampler (Muller, **(3)**) can be constructed that eliminates the need for an attendant at the sampling site during collection of as many as eight consecutive samples.

3.10 A modified emergence-trap drift sampler (Mundie, **(4)**; Cushing, **(5)**) is useful in streams with extremely high drift, where water is very turbid, or where a long sampling period is desired without clogging.

3.11 The drift collection usually represents a wide spectrum of the habitats found in a stream.

3.12 A benthic sample shows only what taxa were existing in the particular area (usually some fraction of a square metre, etc.) that was sampled.

3.13 The great variation among benthic samples, even in a limited area, illustrates the necessity of several samples and the influence of selecting the collecting sites.

3.14 One drift sample might be adequate for collecting the majority of invertebrate taxa in a stream reach, whereas a large number of benthic samples would be needed to cover the variety of bottom habitats even in a uniform reach of the stream.

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[1] This practice is under the jurisdiction of ASTM Committee E47 on Biological Effects and Environmental Fate and is the direct responsibility of Subcommittee E47.03 on Sediment Assessment and Toxicology.

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[2] *Annual Book of ASTM Standards*, Vol 11.05.

[3] The Pygmy Price Current Meter, or its equivalent, has been found satisfactory. Available from Kahl Scientific Instrument Corp., P.O. Box 1166, El Cajon, CA 92022-1166.

[4] The boldface numbers in parentheses refer to the list of references at the end of this practice.

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3.15 Quantitative benthic sampling is seldom extended to include stream banks, organic substrates (logs, etc.), and areas of dense vegetation.

3.16 The drift net collects organisms from all these areas.

3.17 Drift net collections often require much less sorting work than a series of benthic samples.

3.18 Nets are light-weight and easy to set up in a stream and usually yield a light-weight sample.

3.19 Benthic sampling in flowing water often procures samples heavy with inorganic materials.

3.20 Drift samples of organic materials do not require the laborious, time-consuming job of washing out silts and clays and sorting and picking through much of the debris for the organisms in the samples.

3.21 A drift net is inexpensive to construct, whereas bottom samplers are often costly and more than one kind may be required to adequately sample the multiple habitat types present in a stream or river.

3.22 Drift collections can be used to determine drift density, rate, and periodicity of drift organisms, and interesting aspects of the organisms' life histories, for example, period of transformation.

3.23 Drift collections often include terrestrial organisms that have fallen into the stream and which contribute to the food supplies of fish.

3.24 Certain aquatic organisms enter the drift only sporadically and might be missed even though common in the benthos.

3.25 The relative abundance of macroinvertebrates in a drift sample often differs significantly from their relative abundance on the stream bottom.

3.26 A slight current is necessary if a drift collection is to be taken (greater than 0.05 m/s).

3.27 Most species and number of organisms drift more abundantly at night, so that the best collections are usually taken in the dark.

3.28 There is a waiting period while the drifting organisms accumulate in the net.

3.29 Tree leaves in the autumn, floating and anchor ice in the winter, and heavy debris (logs) during floods may interfere with drift net collecting and make processing difficult.

3.30 The abundance and composition of drift changes daily, hourly, or seasonally and might prevent direct comparison of collections taken at different times. At times certain life stages of an organism might not be fairly represented in the drift.

3.31 Drift collections give little precise habitat information for individual organisms, since the exact source of the individual is not known.

3.32 Collections of drift, with the organisms originating an indefinite distance above the collecting site, may not show local or temporary deleterious effects imposed on an aquatic community, whereas bottom samples might reveal the destruction or reduction of benthos in a small area.

4. Significance and Use

4.1 The drift net sampler is used to collect qualitative and quantitative samples of drifting benthic macroinvertebrates in flowing waters.**(6,7)**

4.2 The organisms in the sample are used to define macroinvertebrate community characteristics in water quality studies and ecological assessments.

4.3 The drift net generally preferred is the simple rectangular net which is light-weight, easy to install, and gives an adequate sample of the drifting macroinvertebrates.

4.4 Macroinvertebrate drift is a normal feature of flowing waters. Two functions are ascribed to drift: (*1*) distributes aquatic larvae over the whole stream and (*2*) provides a food supply for fish and invertebrates.

4.5 Drift of organisms may be used to assess environmental stress or pollution in some situations.

4.6 Stress, fluctuations in water level, changes in light intensity, and changes in temperature are the basic factors that influence the extent of macroinvertebrate drift.

4.7 Denuded and underpopulated areas of small streams and shallow rivers can be repopulated by numerous drifting organisms.

4.8 These organisms may move an indefinite distance downstream where they again attach to the bottom substrate.

4.9 A second source of drifting macroinvertebrates is the immature insects in the final stages of metamorphosis that actively seek to reach the water surface where emergence to the adult stage occurs.

4.10 Regular periodic downstream drift rate of immature insects and other macroinvertebrate fauna in slow-moving streams or rivers is markedly reduced in comparison to lotic habitats with rapidly flowing water.

5. Procedure

5.1 Because the performance and sampling efficiency of a drift net sampler varies with local stream conditions, seasonal changes, and water level, make a preliminary test before the start of regular drift sampling in order to determine the best sampling stations, best sampling interval, number of nets needed, mesh size, and best sampling depth.

5.2 For synoptic surveys, one net set above each of the major areas of population concentrations is usually adequate; but for definitive studies, locate stations so that drift from above a pollution source, drift from the polluted reach, and drift from the zone of clean water downstream from the recovery zone will be sampled.

5.3 Take into consideration the fact that the drift net will collect drifting organisms that may have entered the drift from an indefinite distance upstream.

5.4 Nets located 80 to 100 m below the effluent will generally sample the polluted reach efficiently. A drift net below a riffle collects more animals than one below a pool.

5.5 Drift insects are about evenly distributed at all levels in a stream, but in large rivers drift is more abundant near the bottom in the shoreline zone.

5.6 It is generally found that there are pulses of drift organisms that move from top to bottom of the water column, at least during periods of low flow.

5.7 For definitive studies, install two nets at each station—one about 25 cm from the bottom and one about 10 cm below the surface in water not exceeding 3 m in depth.

5.8 If the objective of the study is to relate pupal exuviae to pollution, or to collect terrestrial organisms that may float on the surface, then extend slightly one net above the surface.

5.9 Ideally, collect 24-h drift samples; but this is usually not