Designation: ~~E1201 – 87 (Reapproved 2012)~~ E1201 – 19

Standard Practice for Sampling Zooplankton with Conical Tow Nets[1]

This standard is issued under the fixed designation E1201; 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 procedure for obtaining qualitative samples of a zooplankton community by use of conical tow nets. Nets will collect most zooplankton, but some forms will avoid nets.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

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

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Summary of Practice

2.1 The net is attached to a tow line and towed at the desired depth, using a cable depressor if necessary. After a specified distance or period of time, the net is retrieved, and the captured zooplankton are removed from the net. The zooplankton may be preserved as dictated by the objective of the study.

3. Significance and Use

3.1 The *advantages* of using conical tow nets are as follows:

3.1.1 They are relatively inexpensive and highly versatile in a variety of inland, estuarine, coastal, and marine waters.

3.1.2 They can be used from a small or large powered boat with a minimum of auxiliary equipment.

3.1.3 They can be used to collect qualitative samples and semiquantitative samples when fitted with a flowmeter and even better samples when fitted with a companion meter on the outside of the hoop to monitor filtering efficiency.

3.2 The *disadvantages* of conical tow nets are as follows:

3.2.1 When equipped with a flowmeter they require frequent maintenance including calibration and, in some types, lubrication.

3.2.2 They are effective only where drawn through a stream of water having considerable thickness. They are not suitable for collecting samples from a small or restricted region.

3.2.3 They are not suitable for collecting in very shallow water.

3.2.4 They are clogged by grass beds, coelenterates, and filamentous algae.

3.2.5 When used with a flowmeter, they collect only qualitative samples, or semiquantitative samples.

3.2.6 When sampling discrete depths using a horizontal tow, the sample can be contaminated from other depths during the deployment and retrieval of the samples if opening and closing devices are not used.

3.3 There are several *special considerations* that shall be observed when using conical tow nets. They are:

3.3.1 Conical tow net samplers are designed to be towed at speeds less than three knots; however, greater speeds have been used for the larger nets with a concomitant increase in capture.[2]

3.3.2 A conical tow net 0.5 m in diameter or larger shall be used to reduce avoidance by organisms.[2]

3.3.3 The nets shall be washed frequently and inspected for pin-size holes, tears, net deterioration, and other anomalies.

3.3.4 Nets should be allowed to dry while suspended full length in air and in subdued light prior to storage.

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[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.

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[2] Schwoerbel, J., *Methods of Hydrobiology (Freshwater Biology)*, Pergamon Press, New York, NY, 1968, p. 200~~200~~.

3.3.5 Lower catches per sample may result when collections are made during the day. These are particularly noted in the larger zooplanktons.

4. Procedure

4.1 The conical net samplers are designed to be towed at speeds of approximately three knots. However, greater speeds of up to five knots have been used with a concomitant increase in organisms captured per unit volume of water filter.[3]

TABLE 1 Size of Common Zooplankton[A]

Species	Fresh		Marine	
	Habitat	Size Range	Habitat	Size Range
~~Protozoans (single cells)~~		~~6 to 1,000 µ~~		~~–2.0 mm~~
Protozoans (single cells)		6 to 1000 µ		–2.0 mm
Ciliophora (ciliated single cells)	few fresh	22 to 600 µ		
Coelenterata	few fresh (Hydras)	<20 mm		
Ctenophora				10 to 121 mm
Platyhelminthes (flatworms)		1 to 30 mm	inland waters	0.5 to 40 mm
Nemertea (Proboscus worms)		<20 mm	great variation	5 mm to 6.5 m
Nematoda (Round worms)		<2.3 mm		7 mm
~~Nematomorpha (horsehair worms)~~	~~pools, slow brooks~~	~~10 to 70 cm~~		
Nematomorpha (horsehair worms)	pools, slow brooks	10 to 70 cm		
Gastrotricha	most fresh (shallow)	70 µ–615 µ		
~~Rotifera~~	~~90 percent fresh~~	~~80 µ–1,500 µ~~		
Rotifera	90 percent fresh	80 µ–1500 µ		
Bryozoa (moss animals)	some fresh;		most species encrusting	
	~~statoblasts~~	~~0.4 to >1.0 mm~~	~~statoblasts~~	
	statoblasts	0.4 to >1.0 mm	statoblasts	
Chaetognatha (arrowworms)			high salinity	up to 40 mm
Annelida (segmented worms)				
Oligochaeta	most fresh	0.5 to 5 mm	very few	
Polychaeta	few fresh		most spp. small except *Nereis*	up to 50 cm
Hirundinea	most fresh (standing waters) ~~waters)~~	adults 5 mm to 45.7 cm	few marine	
Arthropoda				
Crustacea				
Branchlopoda	most fresh	3 mm to 30 mm	some marine	10 mm
Cladocerans	most fresh (lenthic waters)	up to 3 mm; 0.2 to 18.0 mm	few marine	
~~Cladocerans~~	~~mostfresh~~	~~up to 3 mm; 0.2 to 18.0 mm~~	~~fewmarine~~	
	~~(lenthic waters)~~	~~0.6, 0.3, 0.4 mm; 1.7, 1.0, 0.9 mm~~	~~most estuarine/marine in top of bottom sediment~~	
		0.6, 0.3, 0.4 mm; 1.7, 1.0, 0.9 mm	most estuarine/marine in top of bottom sediment	
Ostracoda				
Copepoda				
Calenoida		nauplius—<4.0 mm		0.5 to 10.0 mm
Cyclopoida		nauplius—<3.0 mm		<0.5 to 1.0 mm
Harpacticoid		nauplius—1.0 mm		<0.5 to 1.0 m
Ectoparasites	some fresh	5 to 25 mm	some estuarine	5.5 to 25 mm
Cirripedia			estuarine/marine:nauplii	
Mysidacea	few in cold lakes	8 to 30 mm		
Amphipoda	some fresh	5 to 25 mm		5 to 30 mm
Decapoda	some associated with debris	15 to 200 mm		2.0 mm to 20 to 40 cm
Insecta (aquatic)	most fresh			
Mollusca				
Gastropoda		adults <2 to 70 mm		8 to 80 mm trochophore
Pelecypoda	some fresh	adults 2 to 250 mm	most have free swimming larvae	
Echinodermata				
Fish eggs/larvae	eggs 0.75 to 3 mm larvae 1.5 mm	400 µ to 505 µ		

[A] Sage, L. E., "*Zooplankton*," ~~In:~~In *Methods for the Assessment and Prediction of Mineral Mining Impacts on Aquatic Communities: A Review and Analysis*, Fish Wildlife Service/Office of Biological Services, Vol ~~78/No.~~ 78, No. 30, April 1978, ~~pppp.~~ 55–65.

[3] Clutter, R. I., and Anraku, M., ~~"~~"Avoidance~~Avoidance of Samplers,"~~ of Samplers," *UNESCO Monograph on Oceanographic Methodology*, No. 2, 1968, pp. 57–76.