

Sampling Gears and other method

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A) Sampling of fish larvae and eggs from nature

Sampling of specimens from nature can be done by various methods depending on objectives of a study and characteristics of an ecosystem/study site. According to sampling equipment, it can be categorized into 2 methods which are sampling by **plankton net** and sampling by **others equipment**



1) Sampling by plankton net

Sampling by plankton net has been started in 1828 when Dr. J. Vaughan Thompson sampled crab larvae and barnacles. Thereafter, the sampling method has been modified. There are many types of plankton net that is used in the study of larval fish as follow:

Plankton net with coverage



Plankton net without coverage



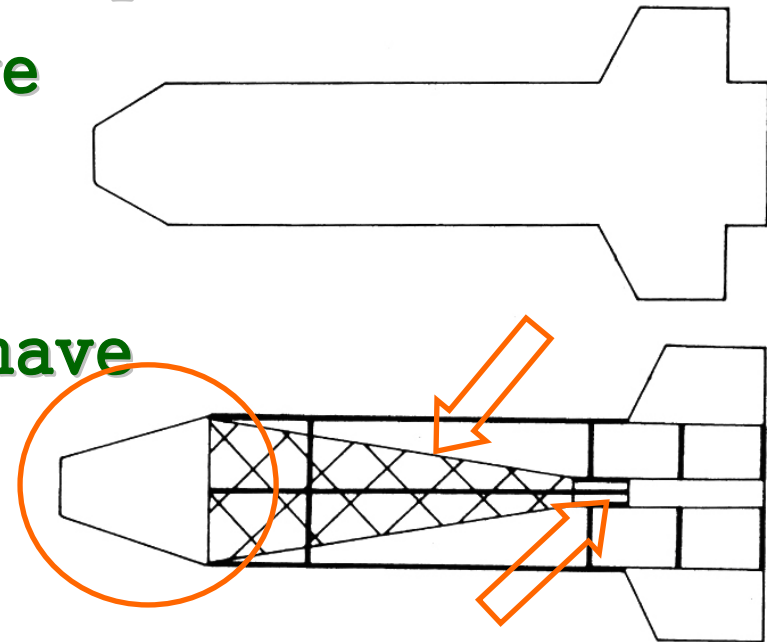
1.1 Plankton net with coverage

Gulf III sampler

Gulf III sampler has a cylindrical shape which is made of rust-resistant metal with a plankton net inside. The rear consists of a flow meter to estimate water that flows out of the net.

This equipment is relatively hard to use as it has a large size and heavy weight.

The survey vessel must have winch with a large area to operate the equipment.

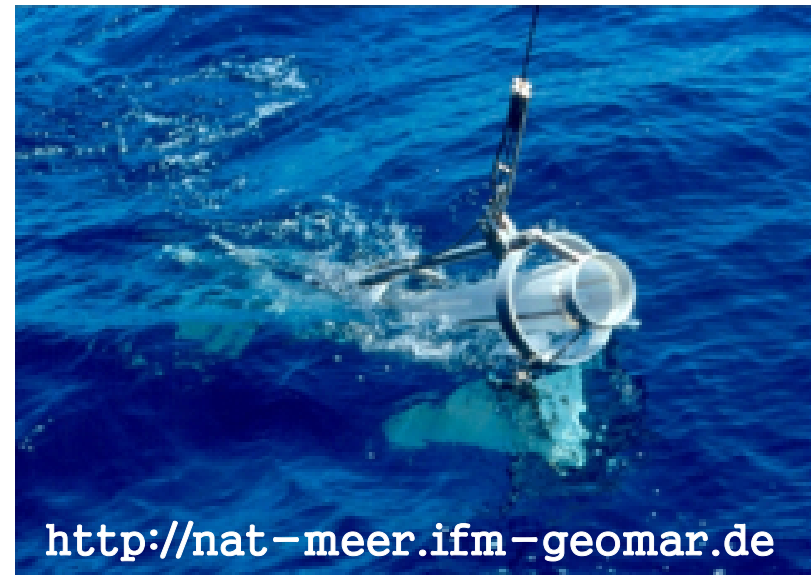


1.1 Plankton net with coverage

Gulf V sampler



The Gulf V sampler, which is a modified Gulf III sampler, is an effective sample for ichthyoplankton and macrozooplankton



<http://nat-meer.ifm-geomar.de>

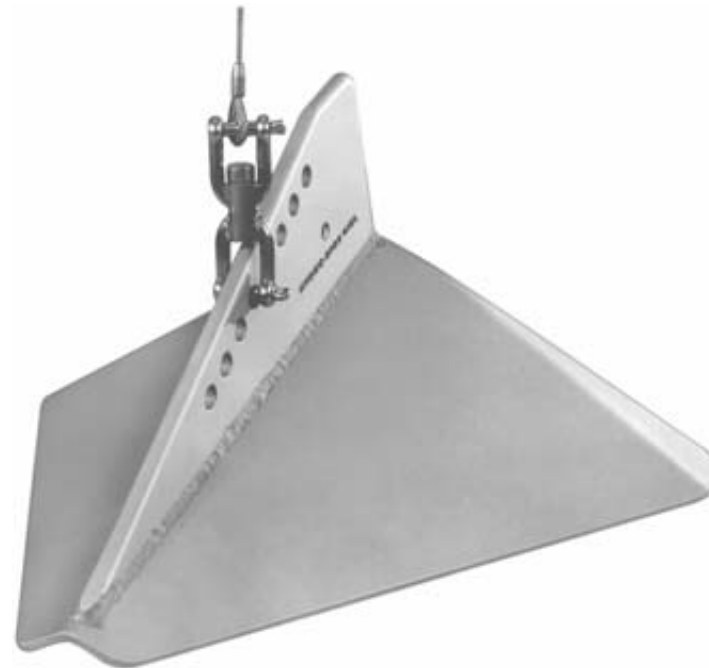
1.2 Plankton net without coverage

This type of plankton net has a cone shape or cone shape with cylinder shape. The opening part of a net consisted of canvas or tarpaulin with net ring of stainless steel and it should have a flow meter to gauge an amount of water that passes through the net for a quantitative study.



1.2 Plankton net without coverage

The rear consisted of a net bucket, normally made of Polypropylene tubing, with a plastic draining tap. This type of plankton net has light weight so it must be attached with a weight or equipment to aid in sinking of the net such as V-Fin Depressor



from catalog of Sampling Sea and Ocean,2006 of HYDRO-BIOS

1.2 Plankton net without coverage

ring net

The standard plankton net



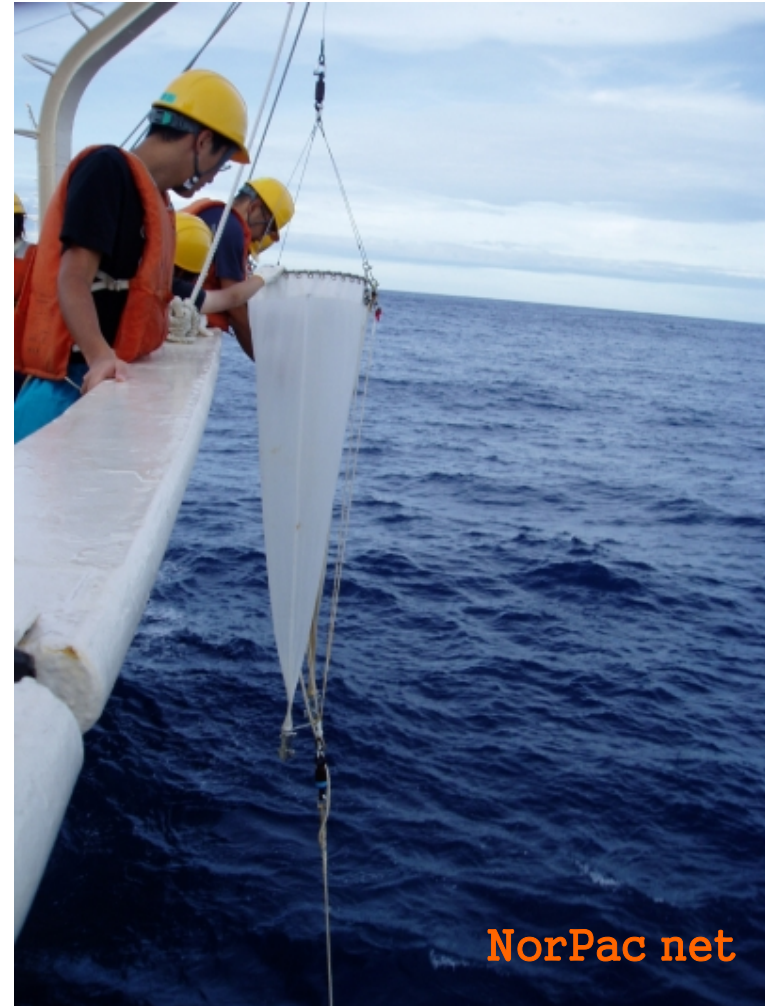
1.2 Plankton net without coverage

ring net

The standard plankton net



CalCoFi net from catalog of Sampling Sea and Ocean, 2006 of HYDRO-BIOS

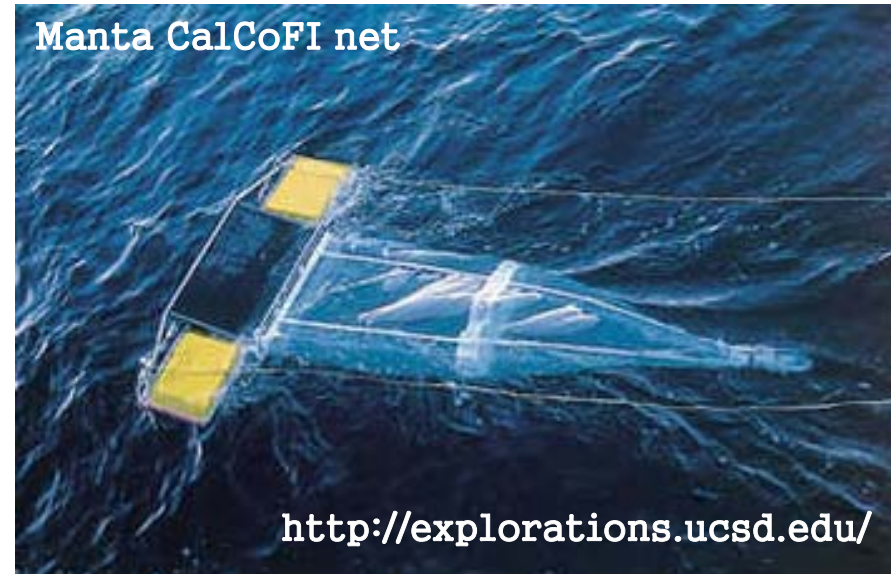
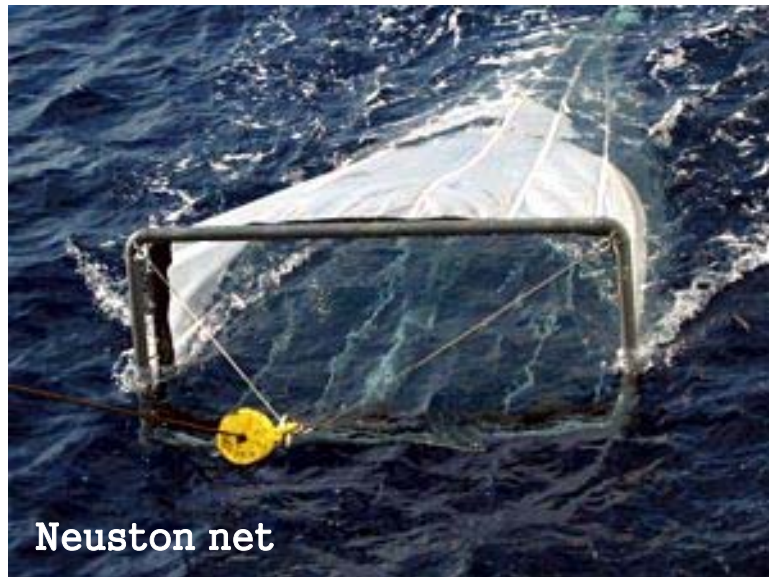


NorPac net

1.2 Plankton net without coverage

ring net

The standard plankton net



1.2 Plankton net without coverage

ring net

Plankton net for fish larvae study

438 455 Hensen-Egg Net

1. Bridle of Nylon rope, with thimble and shackle
2. Conical Headpiece of glass-fibre reinforced plastic dismountable in 3 segments; with zip fastener to attach to the Net Part 3.

Measurements:

Diameter of opening.....70 cm
Diameter of lower ring.....100 cm
Height of cone.....60 cm

3. Net Part of synthetic material, mesh 300 microns (meshes from 100 to 1000 microns can be supplied on request without alteration in price), zip fastener to attach to Conical Headpiece (2.).

Measurements:

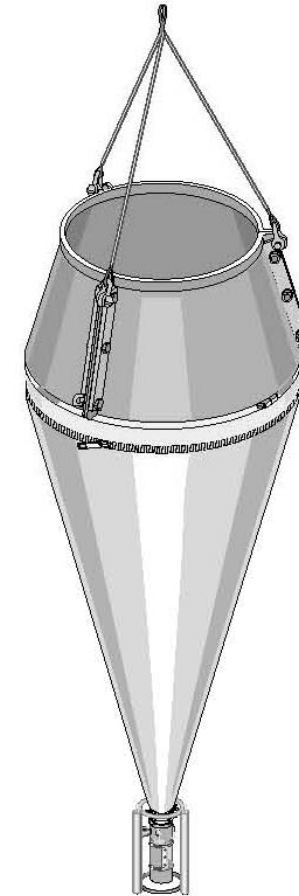
Net diameter, upper.....100 cm
Net diameter, lower.....11 cm
Length of net.....130 cm

4. Vertical Net Bucket consisting of:

- a) Fixing Ring with overcentre fasteners
- b) PVC Net Bucket with side windows covered with net gauze
- c) Net Bucket Frame made of stainless steel for vertical operation, weight approx. 16 kg

438 457 Spare Net Part of synthetic material, as described under point 3.

438 975 Spare Vertical Net Bucket, as described under point 4.



from catalog of Sampling Sea and Ocean,
2006 of HYDRO-BIOS

1.2 Plankton net without coverage

ring net

Plankton net for fish larvae study

438 435 Heligoland Larva Net

1. Bridle of Nylon rope, with thimble and shackle
2. Conical Headpiece of glass-fibre reinforced plastic dismountable in 3 segments; with zip fastener to attach to the Net Part 3.

Measurements:

Diameter of opening.....143 cm

Diameter of lower ring.....160 cm

Height of cone.....60 cm

3. Net Part of synthetic material, mesh 500 microns (meshes from 100 to 1000 microns can be supplied on request without alteration in price), zip fastener to attach to Conical Headpiece (2.)

Measurements:

Net diameter, upper.....160 cm

Net diameter, lower.....11 cm

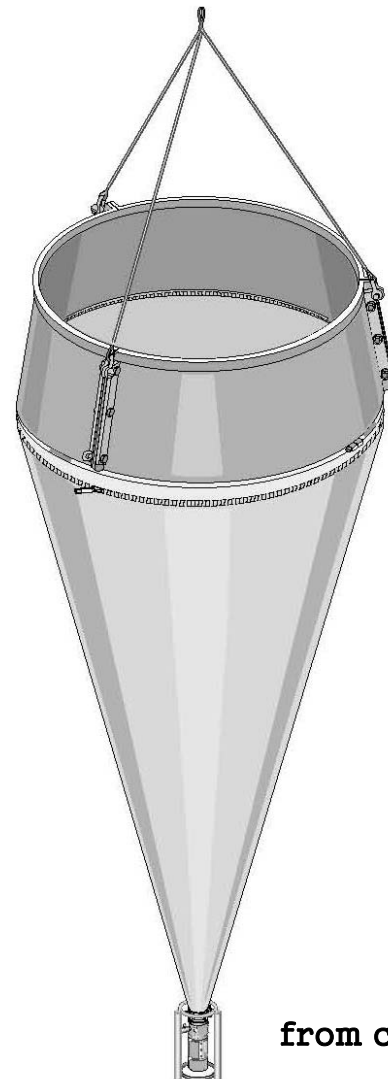
Length of net.....223 cm

4. Vertical Net Bucket consisting of:

- a) Fixing Ring with overcentre fasteners
- b) PVC Net Bucket with side windows covered with net gauze
- c) Net Bucket Frame made of stainless steel for vertical operation, weight approx. 16 kg

438 437 Spare Net Part of synthetic material, as described under point 3.

438 975 Spare Vertical Net Bucket, as described under point 4.



from catalog of Sampling Sea and Ocean,
2006 of HYDRO-BIOS

1.2 Plankton net without coverage

ring net

Plankton net for fish larvae study

The screenshot shows the website for Tanaka Sanjiro Co., Ltd. The header includes the company logo, name, and 'SINCE 1887'. Navigation links include 'HOME', 'About Us', 'Aquaculture Equipment', and 'Fish and Wildlife Tagging and Monitoring'. A search bar is located on the left, and a 'Product' banner is on the right. The main content area is titled 'Nets >> Plankton Nets' and features a section for 'Larval Net' with a product image, descriptive text, and a table of specifications.

● Larval Net

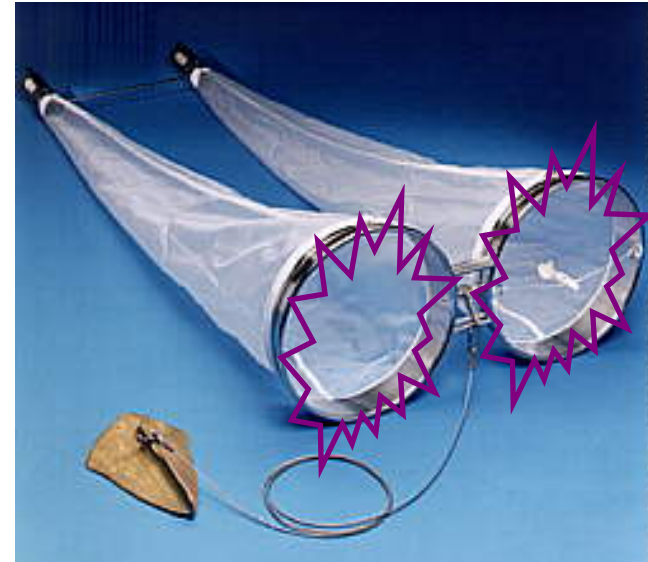
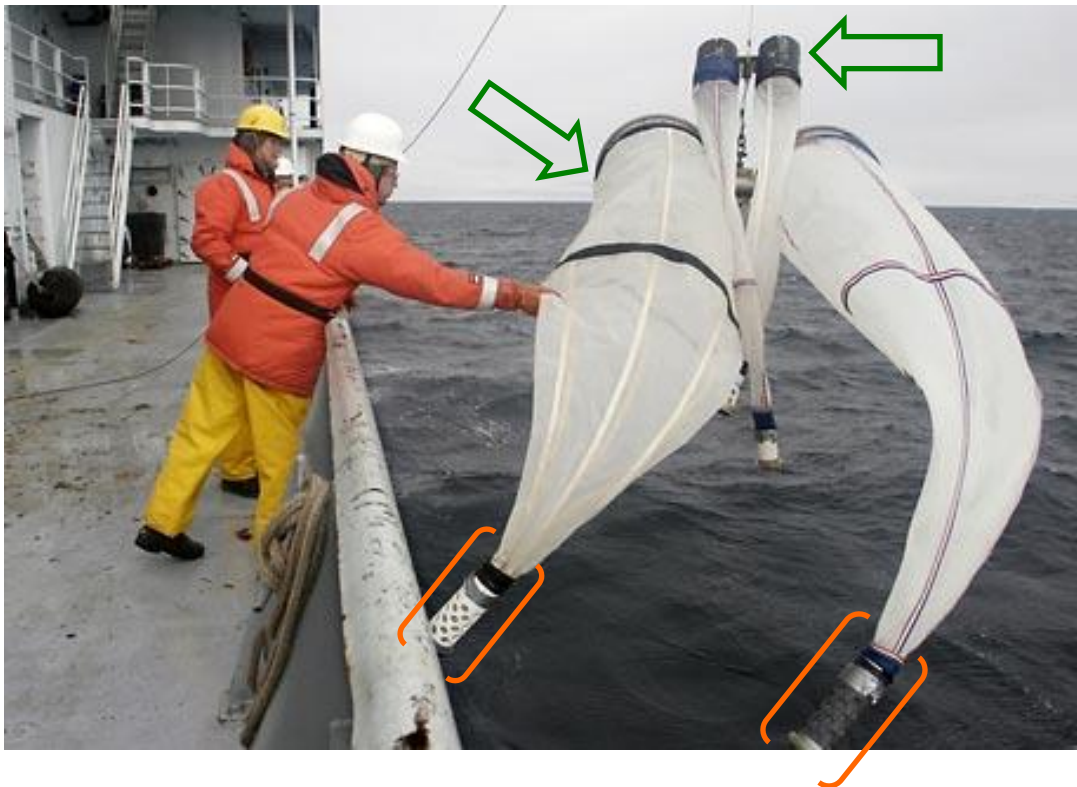


* Most suitable for slow-towing while collecting planktons and small fishes distributed in surface layer.
* It can also be towed vertically or in slope by using winch.

Opening (cm)	Lateral length (cm)	Length of Leno woven net (cm)	Length of net (cm)	Net material	
45 (0.16m ²)	98	18	80	54GG (315μ)	Add to Inquiry Basket

1.2 Plankton net without coverage

Bongo net

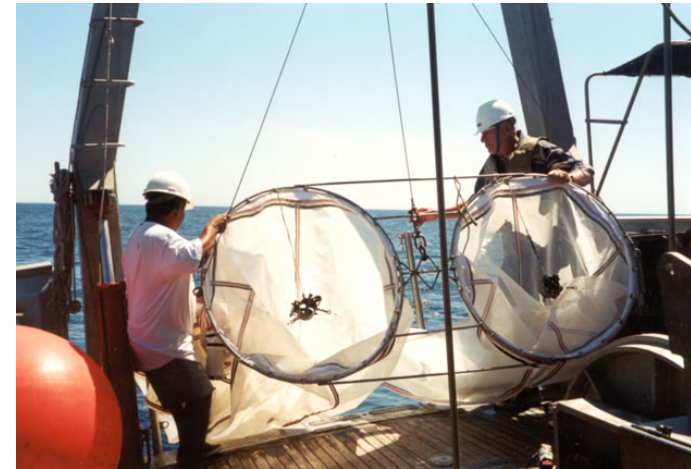


1.2 Plankton net without coverage

Bongo net

It is plankton net that has been modified for a suitability of zooplankton sampling. The research found that large-sized zooplankton often escapes an opening during towing, especially when towing with low speed.

Therefore, the opening has been modified to have 2 attached net to increase an efficiency of the sampling. Bongo net can also be used as a repeat sampling.



1.2 Plankton net without coverage

Bongo net

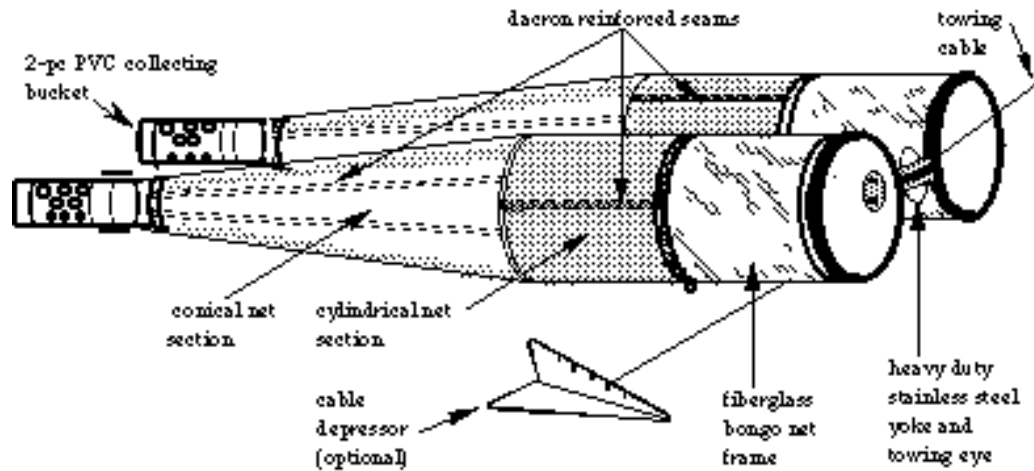


Finally, the advantages of bongo nets are that there is no bridle or other obstruction in front of the net as it is being towed,

Hydrodynamic disturbances generated by the hydro wire could also lead to enhanced net avoidance.

1.2 Plankton net without coverage

Bongo net



Source <http://www.aquaticresearch.com>

MARMAP Bongo net



Source <http://access.afsc.noaa.gov>

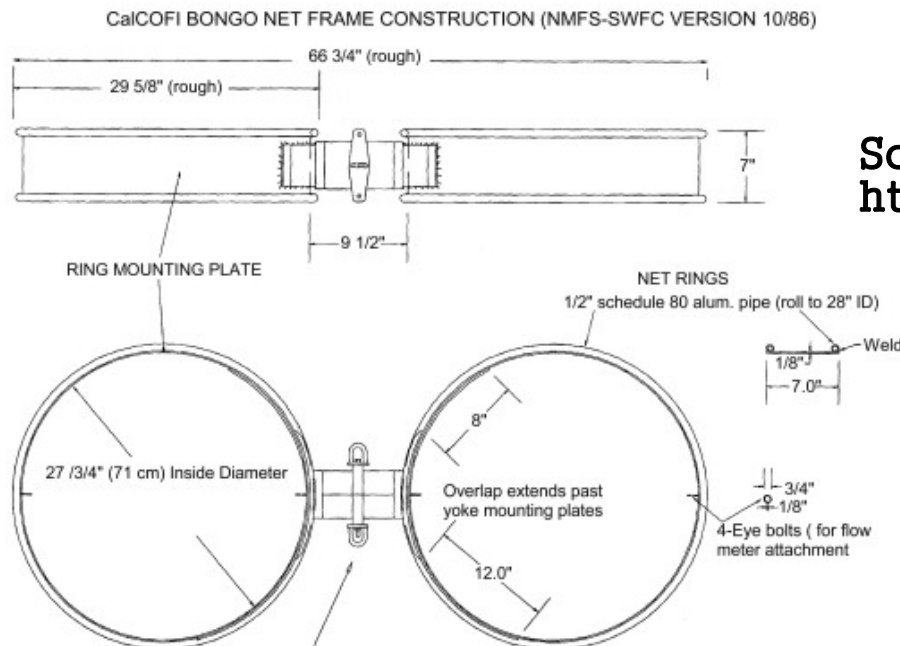
1.2 Plankton net without coverage

Bongo net

CalCoFI Bongo net



Source <http://celebrating200years.noaa.gov>



THE YOKE ASSEMBLY MUST BE WELDED TO THE RING MOUNTING PLATES BEFORE THE NET RINGS ARE WELDED TO THE RING MOUNTING PLATES. THE DETAILS OF THE YOKE ASSEMBLY ARE SHOWN ON CONSTRUCTION SHEET 2.

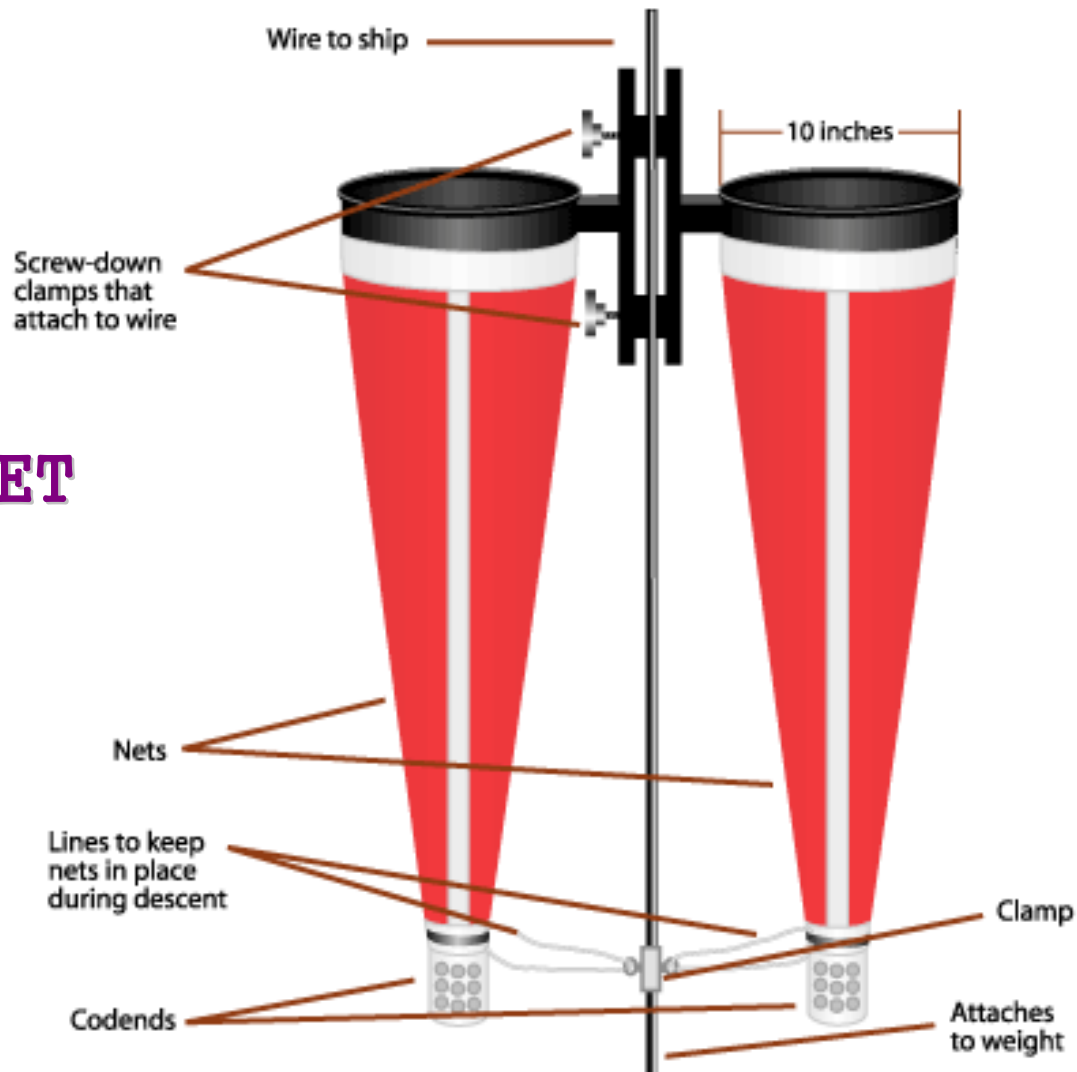
LIST OF MATERIALS (PART 1 OF 2)		
DESCRIPTION	MATERIAL	REQ'D
1. Net Rings	1/2" sched. 80 Alum. pipe	4
2. Ring mounting plates	1/8" x 7 x 120 Alum. sheet	2
3. Eye bolt	1/8" dia. x 3/4 x 1 1/2" s.s.	4

Source <http://www.aquaticresearch.com>

1.2 Plankton net without coverage

Bongo net

CalVET



Source <http://access.afsc.noaa.gov>

Comparative zooplankton sampling efficiency of a ring net and bongo net.

Brinton, E., and A. W. Townsend. 1981. A comparison of euphausiid abundances from bongo and 1-m CalCOFI nets. Calif. Coop. Oceanic Fish. Invest. Rep. 22:111-125.

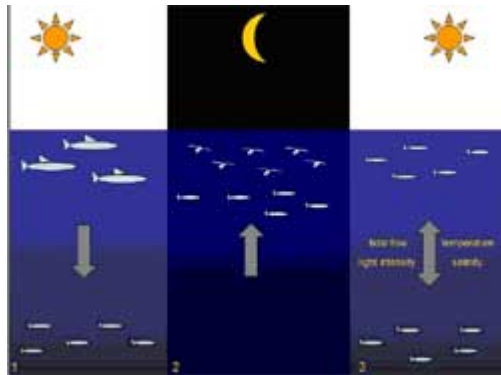
Ohman, M. D., and P. E. Smith. 1995. A comparison of zooplankton sampling methods in the CalCOFI time series. Calif. Coop. Oceanic Fish. Invest. Rep. 36:153-158.

Ohman, M. D. and Bertha, E. Lavaniegos. 2002: Comparative zooplankton sampling efficiency of a ring net and bongo net. CalCOFI Rep., Vol. 43: 162-173

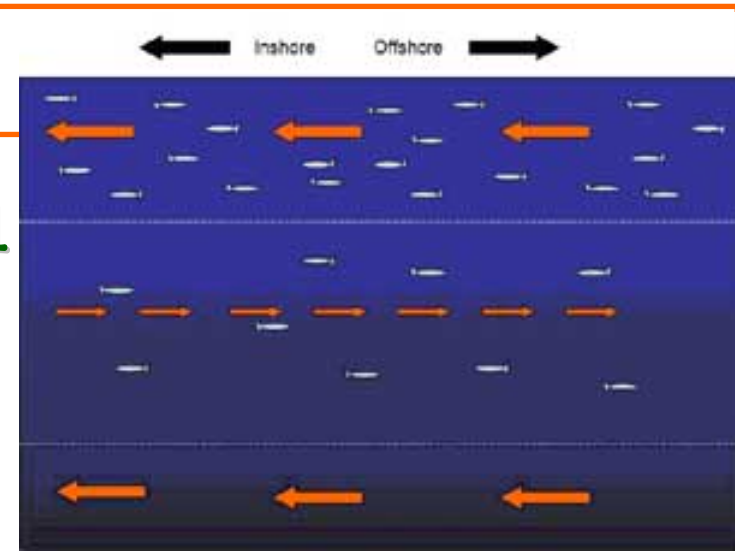
1.3 Plankton towing

surface horizontal haul

different level horizontal haul



Horizontal tow

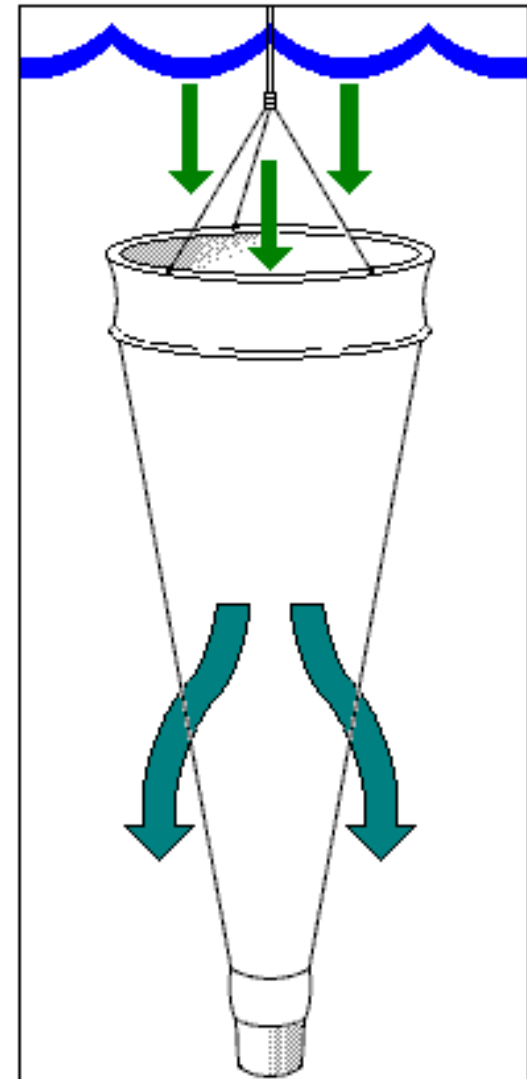


Horizontal tow is done when a boat is operating by attaching a weight to the net to ensure that the net is in a horizontal pattern. The length of the wire, boat speed and winch speed used for control the depth of the plankton net.

1.3 Plankton towing

For Ichthyoplankton, this type of tow is usually used to study a particular spot and is mostly used to study fish egg and small fish larvae by plankton net such as Hensen–Egg Net, Heligoland Larva Net and CalVET Net. It is usually done when a boat is stationed and it is not suitable for an area with current or strong wind current as well as in a very deep area.

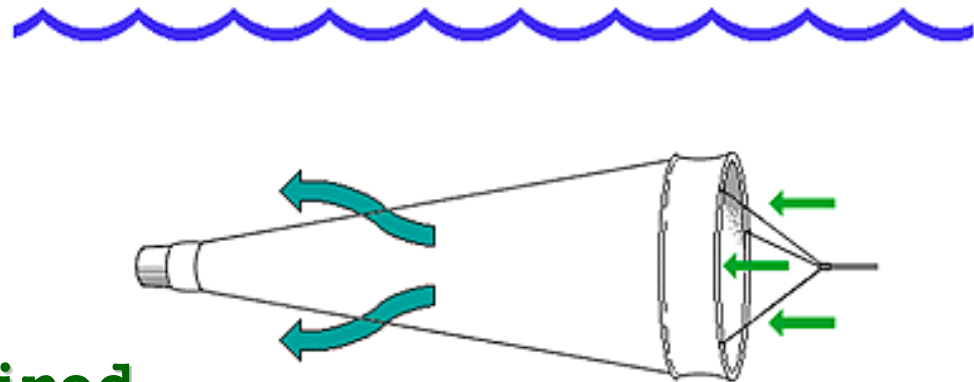
Vertical tow



1.3 Plankton towing

Oblique tow

The net were towed obliquely from a desired depth towards water surface during a boat is running.



It is done by slowly releasing plankton net from water surface to the given depth and then tow at that depth for a while before pulling the net towards the water surface.

1.4 Recommendation for the selection of plankton net

Bucket to collect samples

There are many shapes and they are made of various materials. According to a UNESCO guidebook of sampling however, it is recommended to use bucket with window that has plankton gauze with a small mesh size (equal to the net) attached to it. This type of bucket has the better efficiency to filter samples at the rear of the net.



1.4 Recommendation for the selection of plankton net

Nylon Nitex®	Swiss Silk Cloth Standard Methods (APHA, AWWA and WEF,2000)	Mesh size
Mesh size (µm)	Mesh size (µm)	Silk Cloth Number
315	318	4 STD
335	333	3 STD
560	524	0XX
1000	980	000XXX

1.4 Recommendation for the selection of plankton net

Plankton gauze

The plankton gauze that is commonly used nowadays is mono filament fabric. This is because it has high flexibility, heat resistant, and a constant mesh size even though it has been used for a long period of time. Moreover, it is easy to clean.

1.4 Recommendation for the selection of plankton net

Ratio of the mouth area to the open-mesh-filtering areas

The research by plankton net designers revealed that the ratio of the mouth area to the open-mesh-filtering areas should be at least 1:3 (APHA, AWWA, and WEF, 2000).

2) Sampling by other equipment

Fishing gears



Benthic Sleds



Light trap

2.1 Fishing gears

Seine Net (Beach seine)

The simple gear consists of two long wing nets with or without a bag. The net with a bag resembles a trawl net with two wings, the body and the bag or cod-end. The beach seine without a bag has a specialized construction in the central part with more slack and smaller meshes.



For an application for the study of juvenile fish, a mesh size of about 10 mm with about 25–30 meters in length might be used.



2.1 Fishing gears

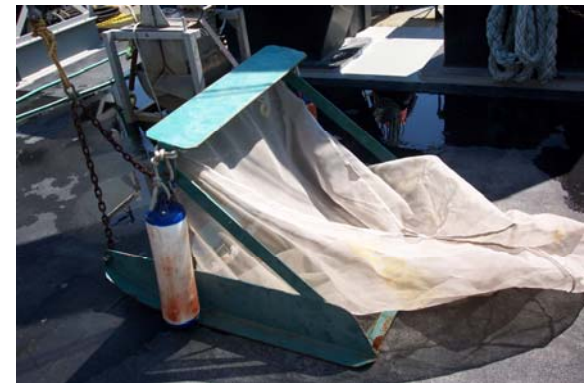
Men push net

The men push net is simple, consisting of triangular net forming a bag shape, its two sides fixed to scissors-like crossed bamboo sticks. The gear is pushed forward in shallow water either by hand. The gear is used near the shore and in muddy areas. The main species of fish caught by push net fishing are small miscellaneous fish and shrimp.



2.2 Benthic Sleds

Benthic sleds are commonly used gear to collect fish larvae. Sampling with a sled enables capture of fish larvae on or just above bottom; this space is not effectively sampled with ordinary plankton net. Sleds have been developed by several researchers to collect demersal fish larvae from shallow water areas.



Comparison of sleds versus plankton nets for sampling fish larvae and eggs.

Jude, D. J. and C. P. Madenjian. 1985. Comparison of sleds versus plankton nets for sampling fish larvae and eggs. *Hydrobiologia* 124, 275–281 (1985).

2.3 Light trap

The light trap samples complemented those taken by the plankton net. Both sampling methods could be combined in a sampling procedure to provide a more comprehensive picture of inshore ichthyoplankton assemblages.



B). Sampling from a culture

The small scale laboratory culture is one of the best ways to obtain a taxonomic series. Pelagic fish eggs can be obtained from plankton tows, by catching ripe fish and fertilizing the eggs, and by introduction of spawning of aquaculture brood stock.

Stage (Time)

1(hatching)	2 (6 hours)	3 (12 hours)	
4 (1 day)	5 (2 days)	6 (3 days)	7 (4 days)
8 (5 days)	9 (7 days)	10 (9 days)	11 (12 days)
12 (15 days)	13 (19 days)	14 (23 days)	
15 (27 days)	16 (31 days)	17 (35 days)	
18 (40 days)	19 (45 days)	20 (50 days)	