Proceedings of the Summer Institute in Recent Advances on the Study of Marine Fish Eggs and Larvae

14 JUNE to 3 JULY, 1989

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

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Practical guide lines

5. COLLECTION OF PLANKTON

WORK ON BOARD RESEARCH VESSEL

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5.1 Aim: To collect zooplankton from the sea using plankton nets for the study of icthyoplankton.

5.2 Materials required:

1. Zooplankton net with collecting bucket and weight
2. Meter block
3. Flow meter
4. Inclinometer
5. Rubber hose for washing the net
6. Wide mouthed polythene jars of 500 ml capacity
7. Concentrated formaldehyde solution
8. Measuring cylinder (50 ml capacity)
9. Polythene funnel of 15 cm mouth diameter
10. Labels
11. Log sheets
12. Field diary
13. Lead pencil
14. Permanent ink marker pen
15. Stop watch

5.3 Methodology

5.3.1 Procedure for conducting icthyoplankton surveys

5.3.1.1 The planning stage

The planning stage is likely to be the most important part of the survey for this is where the objectives of the survey are compared with monetary and personnel resources.

5.3.1.2 Field operations

Field operations can be conducted from ships of 15-100 m in length which are equipped to make plankton tows and hydrographic observations.

5.3.1.3. Cruise plan

A cruise plan to satisfy the objectives of the survey may be made in advance. The station positions are to be determined beforehand.

5.3.1.4. Log sheets

The log sheets in which all particulars with regard to the plankton haul are to be entered have to be prepared (see model log sheet given below).

Name of vessel	Cruise No.	Station No.	Date

Time		Position		Flow meter reading		
Net into water	Net out of water	Lat.	Long.	Initial	Final	Difference

Depth at station	Type of haul	Depth of haul	Warp released

Net used	Mesh size	Wire angle	Ship speed

5.3.1.5. Sampling system

The recommended sampling system requires that the ship be equipped with a hydrographic winch with more than 400 m of standard hydrographic wire of 4.8 mm, a meter block or a metering system and an angle indicator to measure the wire angle.

5.3.1.6. The sampler

The Bongo net is recommended as the best type of sampler for icthyoplankton surveys. Nets of either 20 cm or 60 cm diameter are usually used. The mesh size selected is 0.505 mm.

A flowmeter is mounted in the mouth of one of the net frames to provide data on the volume of water filtered during each tow.

5.3.2.1. The towing procedure and data records

First of all the net may be examined for any cuts or holes and if present may be mended. Ensure that the plankton collecting buckets are securedly attached to the net and have no gaps through which plankton may escape. Shackle the towing line to one of the loops at the centre of the yoke of the net assemply. Also shackle the depressor to the other loop on the yoke.

After the gear is assembled and the preshooting data are entered in the log sheet the tow is ready to begin. The tow is made off either side of the ship.

The ship is stopped at the station. After determining the bottom depth the tow depth is decided. To lower the net to 210 m with a wire angle of 45° requires that 300 m of wire be let out (wire angle is defined as deviation from vertical).

Length of wire out X cosine 45° = Net depth
ie. 300 X 0.707 = 210 m (net depth)

The initial reading on the flow meter is to be noted down in the log sheet before shooting the net.

The weight is lowered below the surface of the water. The winch meter is zeroed. The ship is set underway at two knots speed. Now the net is lowered into the water. If the net is set properly in the water release wire at the rate of 50 m/minute. The stop watch is started as soon the flow meter is seen to sink below the surface of water. The stop watch is used to record the sinking time and towing time in seconds. The duration of tow is used for calculation of mean velocity of towing. When the desired amount of wire has been paid out the stop watch is stopped. The sinking time is recorded in seconds. The stop watch is zeroed and restarted immediately. (Since the net is fishing on the way down, sinking time is as important as that of retrieval). When the stop watch is restarted, the nets are left at the desired depth for 30 seconds. At the end of 30 seconds the wire angle is recorded for that depth and retrieval is begun at the rate of 10 m per 30 seconds. Ship speed during sinking, during times at depth and during retrieval is maintained to keep the wire angle at $45° \pm 3°$ wire angle. Normally 2 knots per hour would maintain this wire angle. (Fig. 5.1.1. Flow meter).

The nets are brought directly out of the water at a steady rate. It is important not to allow the net to fish too long at the surface because of the bias that results from over sampling surface waters. When the flow meter breaks the water surface, the stop watch is stopped and its reading in seconds is recorded as the towing time.

The nets are washed down from the outside using a water jet. After all the plankton has been washed into the cod ends, the nets are brought aboard. The plankton collecting buckets at the cod ends are carefully removed without spilling and taken to the wet laboratory of the ship for preservation.

Before leaving the station, the flow meter is read and recorded as the final readings. The difference between the initial and final readings is calculated and recorded.

Total towing time is recorded. For a 300 m tow total time should be about 21 minutes and 30 seconds (6 minutes sinking time, 30 seconds settling time and 15 minutes retrieval time). Before every haul the net has to be examined for any cut or hole.

5.3.3. Handling the sample at sea

Fish and larvae are fragile and easily damaged. Proper care is needed in all stages of preservation and handling aboard the ship.

5.3.3.1 Preserving the sample

The plankton sample should be preserved immediately especially in tropical waters. The storage container in which the sample is preserved should be of sufficient size so that when filled the preserving fluid (5% formaldehyde solution) will occupy at least three times the volume of the plankton. Wide mouthed polythene jars of 500 ml capacity can be used as container.

The plankton collection is carefully poured from the collecting bucket into the container. The collecting bucket is then rinsed down to gather the last of the plankton. The har containing the plankton is then filled three fourths full with sea water before adding the preservative. To obtain the recommended 5 % solution of formalin in ½ l jar, 25 ml of concentrated formaldehyde is to be added. The sample jar is then filled almost to the top with sea water, capped and shaken lightly to obtain immediate uniform preservation. While plankton fixing is done in 5% formalin, for prolonged storage 3% is enough.

5.3.3.2 Labeling

It is essential that samples are properly labelled. Information contained on the labels should be sufficient to identify the sample with certainity. One label is put inside the jar while a second one placed on the inner lid of the jar

both written with lead pencil and the jar is screw capped with the outer lid. Besides, the details are written outside the jar with a permanent ink marker pen. The labels are made with cartridge paper.

5.3.4. Laboratory procedures

5.3.4.1. Plankton volume determination

A measurement of wet plankton volume, determined by displacement is made for each plankton sample soon after the samples are taken ashore. The zooplankton volume measurement provides a rough measure of zooplankton biomass (Ahlstom et al., 1969). Larger samples may have to be aliquoted for sorting and the size of the aliquot will often depend on sample size.

The process of determining wet plankton volume by displacement is rather simple. It is done using a specially designed volume determiner. It is a cylinderical apparatus of at least 75 ml capacity and 12 cm height made of perpex whose both ends are open. To one end is attached a piece of plankton netting of the mesh size of .505 mm. The plankton along with the fluid is poured into this apparatus. While the fluid is filtered out, the plankton will remain inside. When the fluid is completely drained off, the apparatus is tightly locked into a special frame so that the netted end becomes leak proof. The open top portion of the apparatus is then covered with a lid having a small hope on one side and a screw-adjusted needle hanging from the centre of the lid. The needle may be adjusted in such a way that its free tip will reach the 50 cc level of the apparatus. A 50 cc burette fixed on a stand is now filled with 5% formalin. The nozle of the burette is inserted into the volume determiner through the hole on the lid and the fluid is poured along the inner side of the apparatus without bubbling. Continue pouring untill the water level touches the tip of the needle. Now note the burette

reading. The water remaining in the burette will be equal to the volume of zooplankton in the volume determiner.(Fig.5.1.2)

5.3.4.2. Percentage of plankton to be sorted

It is recommended that total sample be sorted for fish eggs and larvae whenever possible and that fractioning of sample be limited to those containing exceptionally large numbers of eggs and larvae. The Folsom splitter (McEwen, Johnson and Folsom, 1954) is a standard apparatus for dividing plankton samples into aliquot portions. Normally a minimum of 5 cc sample has to be sorted. (Fig.5.1.3 Folsom splitter and Fig. 5.1.4 whirling splitter)

5.3.4.3. Sorting fish eggs and larvae

Before a sample is sorted, the preserving liquid should be drained off to avoid irritation to eyes and lungs. The sample can be sorted in a very weak formalin solution. If a sample has not been completely sorted out during the day it was started, the unsorted plankton should be put back into 5% formalin. Rough sorting can be done in a 15 cm diameter glass petridish but for finer sorting a counting chamber can be effectively used under a dissecting microscope. The sorted eggs and larvae are preserved in glass tubes. One label has to go into each tube giving the details of the plankton collection. The tubes are filled with preservative to the brim and plugged with cotton. Each tube will contain eggs and larvae collected from one station. All the tubes belonging to a particular cruise can be put together in a large container of either glass or polythene. Enough packing with cottom has to be given to ensure that the tubes do not rub each other and break. Enough cotton should be placed also at the bottom of the jar. Finally the remaining space in the jar can be filled with cotton so that the tubes will not displace even while transportation. The jars containing tubes also are to be filled with preservative ie. 3% formaldehyde solution.. (Fig.5.1.5 Counting chamber).

5.3.5 REFERENCES

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