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QUANTITATIVE STUDIES AND PROJECTIONS OF MARINE FISH EGGS AND LARVAE

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Regular sampling of fish eggs and larvae is essential for locating shoals of adult fishes and their spawning and nursery grounds. The implication of such studies in the estimation of spawning biomass is well stressed and documented by various authors (Ahlstrom, 1968; Tanaka, 1973; Smith and Richardson 1977; Regner et al., 1981). The following techniques are used for estimation of the number (quantity) of eggs and larvae in space and time as well as for their projections for fisheries research and developmental programmes.

Sampling for estimation:

Fish eggs and larval surveys have to be designed to overcome problems arising from spatial and temporal variations. Hence surveys have to be planned to cover all the spawning areas and seasons of the target species. With this in view, the Chief Scientist, the Captain and the technicians of the Ship plan the cruise and fix the stations. There are a lot of ways to distribute the stations over the survey area. From the statistical point of view, the random distribution of the stations will give best results, but this will consume a lot of ship's time. Colebrook (1973) has examined the different sampling patterns and he emphasizes that the evenly spaced grid in time and space has many advantages. It has been found by Switzer (1967) that a 2:1 rectangular grid is the most

convenient one for estimations and projections of the availability and abundance of fish eggs and larvae. After the plankton samples are taken ashore a measurement of the wet plankton volume, determined by displacement method is made. For this, the preserving liquid is removed from the plankton by pouring the sample through a calibrated filtering cone (Volume determiner) made of 0.33 mm Nitex. The plankton is retained in the cone until the drainage of liquid from the cone diminishes to an occasional drop. The volume of the drained plankton is then determined by using an automated burette. It is recommended to sort out total samples for fish eggs and larval studies. Only in the case of very large numbers of eggs and larvae, samples can be divided into subsamples and one or more of them sorted. In that case samples can be fractioned into aliquots using plankton splitters, such as Folsom splitter (Mc Ewen et. al., 1954). The Bogorov's counting tray is one of the best type of containers used for sorting and counting ichthyoplankton (Newell and Newell, 1963). A small quantity of sample to be sorted is poured into the counting tray and its contents are closely observed under the dissecting microscope. All the fish eggs and larvae are removed with a dropper and forceps, counted and placed in appropriately labelled dishes. After the eggs and larvae have been sorted out, its remaining contents are poured into a beaker labelled 'sorted'. This process is repeated until the entire sample or aliquot has been completely sorted. The total number of fish eggs and larvae removed from the plankton sample is recorded on the 'Ichthyoplankton Sorter's Work Sheet' which gives a list of all the genus/species likely to occur in the sample on one side of the page. For this, all that is needed is to tick in the appropriate column of the identified egg or larvae and then to finally count the

ticks when the sample has been worked over completely. Technicians who sort fish eggs and larvae must be trained to identify and separate eggs and larvae of the common families of fishes. It is advisable to establish a reference collection of identified fish eggs and larvae of important species in order to facilitate easy identification by comparison. Once the eggs and larvae of selected species are identified at the sorter's level, these can be enumerated and recorded separately. Before bottling, eggs or larvae of the selected species may be measured and the lengths recorded in data sheets. After the data are recorded the eggs and larvae are bottled for storage with appropriate labels. Identifications made at sorting level are rechecked by experts. After sorting all the samples from a cruise, a plankton sorter's sheet is prepared.

The purpose of the above studies is to estimate the number of eggs and larvae in each plankton haul to the number under a unit area of sea surface and for this the following formula is used.

$$C = 10\ (a^{-1}b^{-1}c\ d)$$

where 'C' is the number of eggs or larvae beneath a unit surface area (10 square metres in this case); 'a' is the area of the mouth of the bongo net in square metres; 'b' is the length of the tow path in metres; 'c' is the number of eggs or larvae in the sample; and 'd' is the maximum depth of tow in metres.

The value 'a' is derived from the equation:

$$a = \pi r^2$$

The value 'b' is derived from the calibrated flowmeter:

$$b = fr$$

where 'f' is the calibration factor in metres per revolution (m/rev) for a given flowmeter at a given number of revolutions per second; and 'r' is the number of revolutions of the flowmeter during the tow. The value 'd' is determined from the tow data by the equation:

$$d = W \cos (\tan^{-1} \bar{T})$$

Where 'W' is the maximum length of wire out in metres (m); '$\bar{T}$' is the average tangent of the wire angle taken at 30 seconds intervals during the recovery phase of the plankton tow.

Thus, for an example where 'a' is 0.2827; 'b' is 773; 'd' is 199 and if 50 larvae (c = 50) were taken in the sample, the solution to the equation would be:

$$C = 10 \left(\frac{1}{0.2827} \times \frac{1}{773} \times 50 \times 199\right)$$

$$= 455 \text{ larvae per } 10m^2 \text{ sea surface.}$$

The data so estimated may be compiled by area or station and time, with regard to the number of eggs and larvae per unit area (such as $1m^2$ or $1m^3$ water filtered). Apart from the general information concerning the station such as longitude, latitude, depth, time, weather, etc., the hydrological parameters at different depths may also be noted.

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