

**Zooplankton Methodology,
Collection & Identification -
- a field manual**

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First Edition : March 2004

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Financial Support

Ministry of Environment & Forests, New Delhi

FOREWORD

Since its inception in 1966 the National Institute of Oceanography is involved in taxonomic classification of marine phytoplankton, zooplankton, benthos and other flora and fauna under the Project “ Measurement and Mapping of Marine Resources”. Although the mandate of the project has been diversified with changing times, the taxonomic identification continues to remain the thrust area for all biological projects, especially those dealing with baseline studies on ecobiology and environmental pollution. Visiting post-graduate and post-doctorate students constantly look for information on taxonomic identification which is spread over several books and journals.

The project “Survey and Inventionisation of Coastal Biodiversity (West coast) funded by Ministry of Environment and Forests (MoEF), New Delhi, provided an opportunity to bring together taxonomic experts from various disciplines. Their efforts have resulted in preparation of this manual. This manual provides details of taxonomic classification and description of the concerned organisms /species. All the figures are well illustrated and detailed identification key is provided. This should surely guide even a beginner to understand the identification procedure.

A handwritten signature in black ink, reading "S. P. Shetye", written over a horizontal line.

Director. NIO

PREFACE

Zooplankton encompass an array of macro and microscopic animals and comprise representatives of almost all major taxa particularly the invertebrates. They play a vital role in the marine food chain. The herbivorous zooplankton feed on phytoplankton and in turn constitute an important food item to animals in higher trophic level including fish. The pelagic fishes such as sardines, mackerels and silver bellies consume mostly the plankton. The occurrence and abundance of ichthyoplankton (fish eggs and fish larvae) facilitate the location of probable spawning and nursery ground of fishes. The zooplankton are ubiquitous. The most characteristic feature is their variability over space and time in any aquatic ecosystem. The success of zooplankton estimation and productivity would largely depend upon the use of correct methodology which involves collection of samples, fixation, preservation, analysis and computation of data. The detailed procedures on all these aspects are given in this manual.

I do hope that the manual on zooplankton methodology will be useful to research scholars, teachers and planktonologists.

S.C. Goswami

CONTENTS

1. Introduction
2. Methods of collection
 - 2.1 Bottles/ water samplers
 - 2.2 Pumps
 - 2.3 Nets
3. Fixation
4. Preservation
5. Analysis
 - 5.1 Biomass
 - 5.1.1 Volumetric method
 - 5.1.2 Gravimetric method
 - 5.1.3 Chemical method
 - 5.2 Faunal enumeration
 - 5.2.1 Subsample (aliquot)
 - 5.2.2 Counting
 - 5.3 Species identification
 - 5.3.1 Narcotisation
 - 5.3.2 Clearing
 - 5.3.3 Staining and dissection
 - 5.3.4 Mounting
 - 5.4 Species diversity
6. Data computation
 - 6.1 Biomass (standing stock)
 - 6.2 Faunal composition
7. References and further reading
8. Appendices I to IV

1. Introduction:

Zooplankton (Greek: Zoon, animal; planktos, wandering) are myriads of diverse floating and drifting animals with limited power of locomotion. Majority of them are microscopic, unicellular or multicellular forms with size ranging from a few microns to a millimeter or more. In addition to size variations, there are differences in morphological features and taxonomic position.

The zooplankton play an important role to study the faunal bio-diversity of aquatic ecosystems. They include representatives of almost every taxon of the animal kingdom and occur in the pelagic environment either as adults (holoplankton) or eggs and larvae (meroplankton). By sheer abundance of both types and their presence at varying depths, the zooplankton are utilized to assess energy transfer at secondary trophic level. They feed on phytoplankton and facilitate the conversion of plant material into animal tissue and in turn constitute the basic food for higher animals including fishes, particularly their larvae. The zooplankton occurrence and distribution influence pelagic fishery potentials. The fishes mostly breed in areas where the planktonic organisms are plenty so that their young ones could get sufficient food for survival and growth. Certain planktonic organisms are capable of concentrating radioisotopes and can act as indicator of certain pollutants, the study of which is important to marine environmental science.

The planktonic forms with calcareous or siliceous shells or tests contribute to the bottom sediments. The zooplankton are more varied as compared to phytoplankton, their variability in any aquatic ecosystem is influenced mainly by patchiness, diurnal vertical migration and seasons. Evaluation of zooplankton production in any particular area will largely depend on use of correct zooplankton methodology that involves collection of samples, fixation, preservation, analysis and computation of data.

2. Methods of collection.

The zooplankton collection involves primarily the filtration of water by net, collecting the water in bottles/ water samplers or by pumps. The sampling success will largely depend on the selection of a suitable gear; mesh size of netting material, time of collection, water depth of the study area and sampling strategy. The gear should be used keeping in view the objectives of the investigation. There are three main methods of zooplankton collection, which are as follows:

2.1 Bottles / water samplers

This method is used mainly for collecting smaller forms or microzooplankton. The water is collected at the sampling site in bottles or water samplers of 5 to 20 litre capacity. The sterile bottles should be preferred. Surface water can be collected by scooping water into the bottle of suitable size. While collecting the water samples, there should be minimum disturbance of water to prevent avoidance reaction by plankton. The Von Dorn bottles or water samplers with closing mechanisms are commonly used for obtaining samples from the desired depths. The microzooplankton are then concentrated by allowing them to settle, centrifuging or fine filtration. The advantage of this method is that it is easy to operate and sampling depths are accurately known. The disadvantage is that the amount of water filtered is less. The bigger or macrozooplankton and rare forms are usually not collected by this method and so it is unsuitable for qualitative and quantitative estimations.

2.2 Pumps

The gear is normally used on board the vessel/boat. The sampling can also be carried out from a pier. In this method, the inlet pipe is lowered into the water and the outlet pipe is connected to a net of suitable meshsize. The net is particularly submerged in a tank of a known volume. This prevents damage to the organisms. The zooplankton is filtered through the net. A meter scale on the pump records the volume of water filtered. This method is used for quantitative estimation and to study the small scale distribution of plankton. The frictional resistance of the sampled water in the hose can cause turbulence; damaging the larger plankton especially the gelatinous forms viz. medusae, ctenophores and siphonophores etc. The advantage of the method is that the volume of the water pumped is known. Again the continuous sampling is possible. However, the sampling depth is limited to a few meters and it is difficult to obtain samples from deeper layers.



2.3 Nets

The most common method of zooplankton collection is by a net. The amount of

water filtered is more and the gear is suitable both for qualitative and quantitative studies. The plankton nets used are of various sizes and types. The different nets can broadly be put into two categories, the open type used mainly for horizontal and oblique hauls and the closed nets with messengers for collecting vertical samples from desired depths.

Despite minor variations, the plankton net is conical in shape and consists of ring (rigid/flexible and round/square), the filtering cone and the collecting bucket for collection of organisms (Fig. 1).

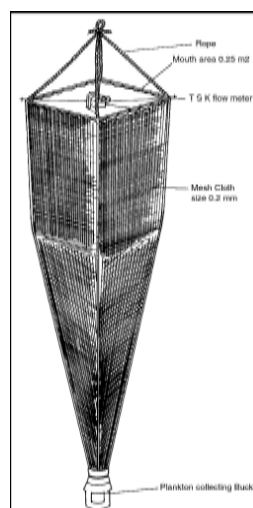
The collecting bucket should be strong and easy to remove from the net. The netting of the filtering cone is made of bolting silk, nylon or other synthetic material. The material should be durable with accurate and fixed pore size. The mesh should be square and aperture uniform. The mesh size of the netting material will influence the type of zooplankton collected by a net. The nets with finer mesh will capture smaller organisms, larval stages and eggs of planktonic forms and fish eggs while those with coarse netting material are used for collecting bigger plankton and fish larvae.

Sometimes combinations of nets with mesh of different pore sizes are used. There is a great variety of mesh available from the finest to the coarse pore sizes.

The mesh size of 0.2 mm of monofilament nylon is usually used for collecting zooplankton for taxonomic and productivity studies. In addition to the mesh size, the type, length and mouth area of the net, towing speed, time of collection and type of haul will determine the quality and quantity of zooplankton collected.

The zooplankton collections can be made by horizontal, oblique and vertical hauls. In the horizontal sampling the net is towed at a slow speed usually for 5 to 10 minutes. The towing speed of the net should be such that the maximum amount of water enters through the mouth of the net for better filtration and gear used can withstand the strain. The towing speed of the net recommended for horizontal samples is 1.5 to 2.0 knots. When the towing speed is more, a static cone of water develops thus diverting water outside the net and consequently reducing the effective filtration. The net may also be damaged. Most of the

(Fig. 1)



zooplankters migrate vertically in response to light conditions. Their occurrence is poor in upper layers during daytime. For better quantitative and qualitative zooplankton collections, the suitable time for horizontal zooplankton sampling would be before dawn, after dusk or night. The net should be submerged in water. When the currents are strong the depressors are used to keep the nets in desired position. The horizontal collections are mostly carried out for the surface and subsurface layers. In oblique hauls, the net is usually towed above the bottom. The disadvantage of this method is that the sampling depth may not be accurately known. The net may be damaged if it touches the substratum. The vertical haul is made to sample the water column. The net is lowered to the desired depth and hauled slowly upwards. The zooplankton sample collected is from the water column transversed by the net. Closing mechanisms are used to sample a specific body of water. The samples taken with closing nets are analysed to study zooplankton abundance at different depths.

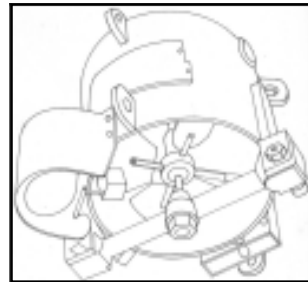
Various types of nets are available to collect zooplankton samples. The most commonly used is Heron-Tranter (HT) net. It has a square frame and the filtering cone of mesh size of 0.2 mm. The mouth area of the net is 0.25 m². The net is used mainly for collecting horizontal and oblique zooplankton samples. For vertical hauls, the nets used are Nansen Vertical Closing Net, Indian Ocean Standard Net (IOSN) and the Clark Bumpus Sampler. These nets are with closing mechanism and are employed to sample at a particular depth. To sample the whole vertical column in the oceanic waters requires a series of hauls which is tedious and time consuming. To avoid this, a Multiple Opening and Closing Sampler with 5-10 nets is used. This gear is used for zooplankton collections simultaneously at different depths. The nets are closed by means of messengers before retrieval of samplers. A high speed sampler called Hardy's Continuous Plankton Recorder is towed behind the ships or vessels to take continuous samples over a long distance.

The choice of net and type of haul to be taken should be determined by the objectives of the study. Whatever type of net is used for sampling, it should be thoroughly washed after each tow so that any planktonic material adhering to the mesh of the filtering cone or other part of the plankton net should be pushed into the collecting bucket to prevent contamination of samples with collections from the previous hauls. The washing of the nets will also prevent clogging especially when there is a bloom or the finer mesh is used for obtaining the samples. The nets should also be checked for tears or holes through which the plankton can

escape resulting in the loss of sample. After each haul the zooplankton sample is transferred into a cleaned and dried glass beaker of half to one litre capacity. The debris or extraneous material should be removed. Replicate hauls are made whenever possible.

For quantitative plankton sampling it is imperative to know the actual amount of water passed through the net. For this purpose, an instrument called flow meter is used. It should not be mistaken for current meter. The flow meter (Fig. 2) has a multi bladed propeller, which is rotated by the flow of water.

There is a counter, which records the number of revolutions. The flow meter should be positioned in such a way so that it records the actual flow of water passing through the net. The volume of the water filtered is normally expressed in cubic meters. It is calculated as follows.



(Fig. 2)

$$V = \frac{A \times R}{K}$$

Where

K = Calibration constant

A = Mouth area of the net

R = Flow meter reading and

V = Volume of water filtered.

When the net traverses through a water column, the volume is

$$V = A \times d$$

Where A = Mouth area of the net and

d = Depth of haul.

When a circular net is used, the volume of water filtered can be calculated by the formula given below:

$$V = \pi r^2 d$$

Where $V =$ Volume of water filtered

$r =$ The radius of the mouth of the net

$d =$ Length of the water column traversed by the net.

In case of a square net, calculation is as follows

$$V = S^2 d$$

Where $S =$ Length of the side of the frame.

$d =$ Depth of haul.

The collection of zooplankton samples particularly from the deeper waters is expensive as it involves proper gear, considerable time and expertise. Records of the sampling procedures, prevailing environmental conditions and other information should be maintained in the field log sheet (Appendix I). Observation on live plankton could be made in the field for their colouration, abundance and composition prior to fixation and subsequently analysis in the laboratory. The samples should be transported with care otherwise their durability and usefulness would be seriously jeopardized.

3. Fixation

The necessity of proper fixation and preservation of zooplankton needs no emphasis. The poorly fixed and preserved samples would render their subsequent analysis difficult. The whitish precipitate and ruptured exoskeletons can be seen in the improperly fixed samples. The zooplankton deteriorates rapidly in tropics. After the sampling, the fixation of samples should be carried out, as early as possible, at least within 5 minutes after the collection to avoid damage to animal tissue by bacterial action and autolysis. An ideal fixative should be cheap and which kills the animals quickly. Again it should be non-corrosive or toxic in nature. The most common fixing and preserving reagent is (4-5%) formaldehyde

(formalin). It is the cheapest fixative and the zooplankton samples can be stored for number of years. The other fixatives occasionally used are ethanol, picric acid, acetic acid etc. Analytical grade formalin should be used for fixation as the commercial formalin is often contaminated with iron compounds which produce a brown precipitate of iron hydroxide which renders the zooplankton identification difficult. The concentrated formalin should be diluted with fresh water, seawater or preferably with water from the sampling area to avoid undesirable osmotic effects. The dilution is in the ratio of 1 part formalin and 9 parts of fresh water or seawater. The pH of the fixative should be around 8.0. It is advisable to use buffered formalin. The commonly used buffers are borax (sodium tetraborate) or hexamethylenetetramine. The buffers are added in an amount of 200 g to one litre of concentrated formalin. The fixative usually renders the zooplankton body tissues hard and brittle. The additives viz. propylene phenoxetol and propylene glycerol (2 to 5 %) are added to fixatives for flexibility of specimens, resistance to bacteria and moulds.

4. Preservation

Allow 10 days as the minimum fixation periods. After fixation, the zooplankton are transferred and stored in airtight containers with sufficient quantity of preservative. While transferring, due care should be taken so that no part of the zooplankton sample is lost. Various types of preservatives are available. The buffered formalin (4 to 5%) is mostly used both as fixative and as the preservative. The other preservative used is 70% ethanol or 40% isopropanol. The ethanol is used for preserving museum specimens but it is costly and volatile. Glycerin is often added to formalin to prevent shrinkage of specimens, drying of the material and to facilitate retaining colours of zooplankters. For better shelf life of the zooplankton samples, the preservative should be changed within the first 6 months.

It would be better to store the preserved zooplankton samples in well ventilated room at temperature less than 25°C. The samples should be kept in the wide mouth glass jars. A good quality preprinted labels, on which the collector's name, fixative and preservative used and other field information are written should be put into the jars for ready reference at the time of sample analysis.

5. Analysis of the samples.

The basic analysis consists of measurements of biomass (standing stock), enumeration of common taxa and species.

5.1 Biomass

The term biomass denotes the live weight or the amount of living matter present in the zooplankton sample. The value obtained is used to evaluate the secondary productivity and fishery potentials of the study area. The biomass is estimated by the following methods.

1. Volumetric (displacement volume and settling volume) method
2. Gravimetric (wet weight, dry weight and ash free dry weight) method
3. Chemical method

Prior to determination of biomass, larger zooplankters such as medusae, ctenophores, salps, siphonophores and fish larvae should be separated from the zooplankton sample and their biomass taken separately. The total biomass would be the biomass of bigger forms plus the biomass of the rest of the zooplankton. It should be indicated under remark as given on the analysis sheet. (Appendix - II).

5.1.1 Volumetric method:

The volume measurements are easy to make in the field or laboratory. The total zooplankton volume is determined by the displacement volume method. In this method the zooplankton sample is filtered through a piece of clean, dried netting material. The mesh size of netting material should be the same or smaller than the mesh size of the net used for collecting the samples. The interstitial water between the organisms is removed with the blotting paper. The filtered zooplankton is then transferred with a spatula to a measuring cylinder with a known volume of 4 % buffered formalin. The displacement volume is obtained by recording the volume of fixative in the measuring jar displaced by the zooplankton. The settled volume is obtained by making the sample to a known volume in the measuring jar. The plankton is allowed to settle for at least 24 hours before recording the settled volume.

5.1.2 Gravimetric method:

The weight measurement should be done preferably in laboratory. It is carried out by filtering the zooplankton. The interstitial water is usually removed by blotting paper. While blotting, due care should be taken not to exert too much pressure as to damage the delicate organisms or specimens. The zooplankton weight is

taken on predetermined or weighed filter paper or aluminum foil. The wet weight is expressed in grams. The dry weight method is dependable as the values indicate the organic content of the plankton. Analysis such as the dry weight is determined by drying an aliquot of the zooplankton sample in an electric oven at a constant temperature of 60°C. The whole or total sample shouldn't be dried because the subsequent analysis such as enumeration of common taxa and identification of their species wouldn't be possible after drying the sample. The dried aliquot is kept in a desiccator until weighing. The values are expressed in milligram. Ash free dry weight method is also occasionally used for biomass estimation.

5.1.3 Chemical method:

In this method, the live zooplankton samples are dry frozen. Before analysis, the samples are rinsed with distilled water. Measurement of constituent elements such as carbon, nitrogen, phosphorus and biochemical elements viz. protein, lipid and carbohydrates are made. Sometimes the biochemical values of a particular taxon and species are undertaken to evaluate food energy transfer at higher trophic levels. The calorific content of the plankton can be used as an index of zooplankton biomass.

5.2 Faunal enumeration

Information on the faunal composition and the relative abundance of different zooplankton taxa and their species is obtained by counting the plankters present in the samples. The enumeration of specimens in the total sample is laborious, time consuming and mostly impractical. The number of common zooplankton groups and their species observed in the samples may vary from tens to thousands. For enumeration it is recommended that the subsample or an aliquot is taken for the common taxa. However, for the rare groups, the total counts of the specimens in the samples should be made. For enumeration of zooplankton the subsample or aliquot of 10 to 25% is usually examined. However, the percentage of aliquot can be increased or decreased depending on the abundance of zooplankton in the sample.

5.2.1 Subsample (aliquot)

Instruments are available for splitting the sample into the fractions (Fig. 3).

These are generally made of plastic with internal partitions. Folsom plankton

splitter is widely used. The zooplankton sample to be subsampled is poured into the drum and the drum is rotated slowly back and forth. Internal partitions divide the samples into equal fractions.

The fraction may be poured again into the drum for further splitting. The process is repeated until a suitable subsample is obtained for counting. The splitter is thoroughly rinsed to recover the organisms, which may be sticking onto the wall of the drum.

The sample is usually splitted into 4 subsamples. One of the subsamples is used for estimation of dry weight, the second for counting the specimens of common taxa, the third for relative abundance of species and the fourth fraction is kept as reference collection. Plastic or glass pipettes are also used to take the subsample for counting. The stempel pipette is used to obtain a certain volume (0.1 to 10 ml). The zooplankton sample in a glass container is diluted to a known volume and is stirred gently. The stampel pipette is then used to remove the subsample or aliquot for counting.

5.2.2 Counting:

After splitting, the next step in the analysis is to sort and count the specimens. There is a primary and secondary sorting. In the former type the sample is separated into 30 to 40 taxonomic groups (Appendix II). Whereas in the secondary stage the important groups of organisms or specimens are further separated or sorted into their respective families and genera.

The zooplankton groups diversity is higher in the marine environment. In the fresh or limnetic waters the number of groups is less. The common taxa observed there are protozoans, cladocerans, copepods (adults and lifehistory stages),decapods larvae, mysids etc. The counting should be done under the microscope and when the specimen of a particular group is seen, a tally mark is made on the sheet. When different groups are to be counted simultaneously the multiple counter is used. All the specimens present in the subsample are counted with proper records on the data sheet. The total number of specimens are later calculated for the whole sample depending on the percentage of subsamples examined. Image analysis systems are being tried for rapid counting of common taxa and their species. The illustrations of common groups occurring in fresh and marine waters are usually given in the introductory books on Limnology and Marine Biology. For sorting, the help of illustrations could be taken. The impor-

tant characters of some zooplankton groups are given in Appendix III.

5.3 Species identification

Species is defined as a group of individuals capable of interbreeding. Correct species identification is prerequisite for understanding distributional pattern, seasonal variability and community structure of zooplankton in an aquatic ecosystem. It is a specialized work and requires patience, experience and sufficient published literature. The initial identification of common species could be done with the help of illustrated checklists. The taxonomic experts should later confirm the identification. The identified and labelled specimens should be kept properly for further reference. For identification of species a stereoscopic dissecting microscope, good quality glass slides, coverslips, stainless steel fine forceps, dissecting needles, pipettes and chemical reagents are required. It involves various steps such as cleaning of specimens, staining, dissection and slide preparation. For identification of very common and abundant forms from a particular area, the live specimens are put in a drop of distilled water and examined under the microscope. To control the movements of the specimens narcotisation is done.

5.3.1 Narcotisation:

The initial reactions of zooplankters to any fixative and preservative are rapid and jerky movements, contraction of body and appendages. This can hinder species identification. This is controlled by temporarily anaesthetizing the specimens and allowing their recovery after necessary observations. The narcotizing solutions recommended are carbonated water, chloroform, methyl alcohol and magnesium chloride (about 7g of magnesium chloride dissolved in 100 ml of distilled water). The carbonated water (1 : 20 by volume) is usually used as it is cheap and easy to use in the field. The specimens should not be transferred directly to narcotizing solution. The narcotizing fluid is added drop by drop to the water containing the specimens. It should be remembered that the specimens are not kept there for a long period to avoid any damage. As soon as the morphological characters are observed the specimens are washed with distilled water and put back into the fixative.

5.3.2 Clearing:

The fixed specimens must be cleared of any attached material such as detritus

or precipitate. This can be done by removing the extraneous substances with fine forceps/needles without damaging the specimens. The specimens are immersed in clearing fluids such as lactic acid, glycerin and propylene glycol. The lactic acid is commonly used as a clearing agent and care should be taken that specimens are not left in the lactic acid for a long period which would result in the disintegration of body tissues of zooplankton. Examination of external features becomes easier after clearing the specimens. To study the internal structures staining of specimen is required.

5.3.3 Staining and dissection:

Light staining of the specimens is carried out by adding a few drops of rose Bengal, lignin pink, chlorazol black E and methylene blue added to the lactic acid. Borax carmine is used for staining small zooplankton, larval stages of crustaceans and ichthyoplankton (fish eggs and fish larvae). The lignin pink and chlorazol black E can penetrate the chitin and stain the internal tissues and facilitate dissection. Rose Bengal is usually added to the internal tissues and facilitate dissection. Rose Bengal is usually added to the zooplankton samples when the preservation is done. The dissection of stained specimens is carried out under stereoscopic dissecting microscope with fine needles on the cavity slides. Two dissecting needles should be used, with one needle the specimen is held firmly and with the other body somites are cut. One should be careful while dissecting the delicate mouthparts. The dissected mouthparts and other structures are immersed in glycerin or lactic acid before putting in the mounting medium.

5.3.4 Mounting:

Permanent glass slides are made by using the natural or synthetic resins. Canada balsam, gum chloral, glycerin jelly and lactophenol are used as mounting agents. The Canada balsam dissolved in xylene or benzene is used for whole mounts. The disadvantage with balsam is that the mounts become dark with time. The lactophenol is widely used. This can be kept for a long time. Before mounting the whole specimen or the dissected parts, the slides and coverslips are thoroughly cleaned with ethanol and dried. A few drops of mountants are placed on the glass slide and then the specimens or their dissected structures are transferred. The coverslip is supported by fragments of broken cover slip or wax. The slides should be completely dried and stored in a slide box for subsequent examination for species identification.

Species identification characters vary in different taxa, families and genera. For Copepoda which is the dominant group of zooplankton population in most of the aquatic ecosystems, the species could be identified on the basis of size, integumental structures, shape of the mouth parts, absence or presence of fifth paired legs etc. Sexes are separate. Males are smaller. In the males there is geniculation of the antennules. The fifth paired legs are complicated. In females the antennules are straight, the first urosome (genital) segment is swollen and the fifth paired legs may be simple or absent. The species under different taxa should be identified and enumerated. Data on faunal and species occurrence and abundance is useful to evaluate the biodiversity of any ecosystem or area. List of some of the zooplankton species recorded from the Mandovi-Zuari estuarine system and the coastal waters off Goa, west coast of India is given (Appendix IV).

5.4 Species diversity:

Species diversity is defined as the number of species present in an area. The values can be used to assess the health of the environments. The members of species are less in the polluted areas. The species diversity is calculated by the method given by.

Shannon and Weaver (1949)

$$H' = - \sum_{i=1}^n P_i \log_2 P_i$$

Where P_i = proportion of the number of individuals of species i to the total number of individuals ($P_i = n_i / N$)

n = total number of species.

N = total number of individuals and

n^1 & n^2 are the respective number of individuals of each species

Margalef (1968)

$$D = \frac{S - 1}{\log_e N}$$

Where S = is number of species and

N = the total number of individuals

Pielou (1966)

$$\text{Evenness } E = H' / \log_2 S$$

Where H' = is the Shannon Weaver's index

S = the total number of species

6. Data Computation

6.1 Biomass (standing stock)

After estimation of zooplankton biomass the standing stock values are converted into per cubic meter and is calculated as follows:

a. Volume of zooplankton $\frac{\text{Total volume of zooplankton}}{\text{Volume of water filtered (V)}}$
(ml/m³)

b. Wet weight of zooplankton $\frac{\text{Total wet weight of zooplankton}}{\text{Volume of water filtered (V)}}$
(g/m³)

c. Dry weight of zooplankton $\frac{\text{Total dry weight of zooplankton}}{\text{Volume of water filtered (V)}}$
(mg/m³)

6.2 Faunal Composition

a. Total number of zooplankton specimens/ individuals of all groups

$$\frac{\text{Total counts of the specimens (say x)}}{\text{Volume of water filtered (V)}}$$

No/m³ = x/y (No. can also be expressed/ 100 m⁻³ or 1000 m⁻³)

b. Total number of specimens of a particular zooplankton taxon

$$\frac{\text{Total counts (x)}}{\text{Volume of water filtered (Y)}}$$

$$\text{No/m}^3 = x / y$$

To conclude, it can be stated that zooplankton play an important role in aquatic food chain. Plankton net with flow meter, plastic containers, good quality markers and labels are needed for zooplankton collections. The samples are usually fixed and preserved in 4 to 5% buffered formaldehyde. The zooplankton samples are analysed for estimation of biomass (standing stock), enumeration of common taxa and their species. Data obtained is utilized for computation of productivity and faunal and species biodiversity of the study area or ecosystem.

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