Plankton and preserving specimens of plankton

Posted by Anonymous on Wed, 2016-06-08 15:00

Plankton and preserving specimens of plankton: We catch live plankton weekly and would like to preserve the specimens. We would like to collect a long term sequence we can use as a data set.

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7
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Laboratory Technicians

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Plankton

Submitted by sat on 12 July 2016

Answer reviewed 24th January 2023

Plankton collection samples are usually fixed and preserved before they are analysed for estimation of biomass, enumeration (counting) and identification of plankton genus/species. Data obtained is used for estimation of faunal and species biodiversity of the study area or

ecosystem.

Science ASSIST recommends 70% alcohol for use in schools for the preservation of plankton. Under these conditions, without prior fixation with formaldehyde, it should be noted that the shelf life of the specimens will be expected to be in the order of 1-2 years. **Science ASSIST does not recommend formaldehyde for use in schools.**

Ethanol[1] (Ethyl alcohol) usually comes in the 95% concentrated form. It is also a suitable preservative and method of choice for long-term preservation and storage for most plankton. It is usually diluted with distilled water to 70-75% strength. This is the lowest concentration at which preservation will be maintained. Samples will become a bit brittle in alcohol, a lot of the pigment will be extracted and there are evaporation issues. Some reports state that the addition of 1% glycerol aids in maintaining some flexibility of the samples and helps retard evaporation[2]. Alcohol is highly flammable, usually safe to handle, but can cause irritation to the skin in cases of prolonged contact.

Simple 2 stage method using 70% ethanol for the preservation of plankton in schools[3]

(Note: % v/v is used for concentrations of solutions of liquids and is calculated as [(volume solute)/(volume of final solution)] x 100%. For example, 70% v/v means that 100 mL of solution contains 70 mL of the solute.)

Stage 1: At the collection site, add 95% ethanol to the sample of seawater/zooplankton in a ratio of 50:50. You will initially get a white milky colouration of the solution but this will slowly disappear.

This first stage is done fairly quickly after collection as the zooplankton will start to eat each other and begin to rot.

Stage 2: Back in the lab carefully tip off the solution and replace with fresh 70% ethanol solution and store in wide mouthed clear glass jars so students can see the specimens clearly. It is important to use tight fitting lids to prevent evaporation. The use of Parafilm or some silicone sealant can be used to provide a good seal. **Note:** You need to be careful if using plastic containers. Some become very brittle and craze with the alcohol.

Concentrations higher than 70% alcohol are not recommended, as they can excessively dehydrate the tissue. At 70%, ethanol is an effective biocide and specimens will not become overly dehydrated. The preservative should be changed within the first 6 months for better shelf life of samples.

Store under conditions to prevent any deterioration i.e., a cool dry place in low light levels and out of direct sunlight. There are evaporation and flammability issues with the use of alcohol, so the specimens should be monitored regularly and topped up as needed. They should be sealed with Parafilm and stored in the flammable liquids cabinet[4].

Note: A good activity is to encourage students to look at the zooplankton live as they are very interesting to examine. Many can survive for 24hrs in a bucket if kept in the dark.

Additional information:

The chemicals used to fix and preserve specimens can be hazardous. Science ASSIST recommends you refer to the specific SDS for any chemicals being used and conduct a site-specific risk assessment to assess and control any risks. You will need to make sure that all chemicals are approved for use in your jurisdiction and educational sector and are disposed of appropriately following local guidelines.

Fixation: should be carried out as soon as possible after collection or narcotising (if required) to avoid damage to tissue. The choice of fixative should preserve the tissue against microbial activity, osmotic damage and autolysis. It should also allow the structure of the tissue to remain as close as possible to its original state. Some plankton react to the fixative used, by contracting and distorting, which can leave them in an unidentifiable state.

Formaldehyde[5] is toxic, carcinogenic, highly irritating and acts as a potent sensitiser. Whilst formaldehyde at a concentration of 4-5% in distilled water is regarded as the best fixative to maintain taxonomic and morphological characters of mixed marine plankton, it is toxic by all routes of exposure, has irritating fumes to the eyes, skin and mucous membranes and is a known human carcinogen[6,7]. It is for these reasons that **Science ASSIST does not recommend formaldehyde for use in schools.** See Science ASSIST List of recommended chemicals for science in Australian schools.[8]

Narcotisation: Some specimens require narcotising to relax the specimen allowing them to be fixed without any distortion.[9,10] Narcotising is not usually done in schools unless you specifically want to do some specialised work on some of the zooplankton sample, e.g. histology.

If narcotising specimens is required, samples are concentrated into sample buckets and then transferred to 500 ml plastic sample storage bottles. Samples should be refrigerated as soon as possible after collection[9,10]. The narcotising solution is added drop by drop to the water containing the specimens and left to stand for up to 30 minutes in the refrigerator.

The following narcotising solutions are recommended for use [10,11]

- 70% ethyl alcohol – add the alcohol drop by drop to the sample water concentrate.
- Carbonated water (soda water) 1:20 by volume – combine 1 part soda water with 19 parts of sample water concentrate.
- Clove oil – place tip of pipette with clove oil just under the surface of the sample water concentrate and add 1 to 2 drops at a time.
- Magnesium sulphate (Epsom salts) 20-30% aqueous solution – slowly add the solution drop by drop to the sample water concentrate.

Labels

Label the container to include collectors name, type of specimen, type and date of preservative and any other field information. Label both inside and outside of the storage container. This will lessen the likelihood of the specimen and label being separated. It is important to use paper intended for long-term preservation in fluids. There are a several papers that will do, including laundry tag paper. Soft lead pencil can be used to write on the paper and there are certain inks or ink pens that can be used as well. Any inks used should

be of archival quality, resistant to fading and smearing, and be insoluble in the preservative solution. Suitable inks and ink pens can be found in some art or office supply stores and museum supply companies. It is recommended to allow the ink to completely dry before placing the label into the storage solution. Ordinary ballpoint pens should not be used for labelling as they generally dissolve in most preservative solutions.

Plankton

Plankton is a diverse group of small and microscopic organisms (phytoplankton – plants and zooplankton – animals) drifting or floating in the sea or fresh water. Plankton consists mainly of diatoms, protozoans, small crustaceans, and the eggs and larval stages of larger animals[12]. Many animals are adapted to feed on plankton, especially by filtering the water. Plankton play a vital role in the marine food chain and an important role in the study of the biodiversity of aquatic ecosystems.

Zooplankton includes a wide range of macro and microscopic invertebrate animals. They feed on phytoplankton and in turn, represent an important food source to animals higher up in the food chain, including fish. Zooplankton are ubiquitous and are found in any aquatic ecosystem. The majority are microscopic unicellular or multicellular forms ranging in size from a few microns to a millimetre or more.

Phytoplankton are photosynthesising microscopic organisms that inhabit the upper sunlit layer of almost all oceans and bodies of fresh water. They include self-feeding, single celled algae that live near the water surface where there is sufficient light to support photosynthesis. Among the more important groups are the diatoms, cyanobacteria and dinoflagellates.

Further reading:

Science ASSIST previously answered a similar question see: biological preserved specimens

The list of references below, contain much recommended reading on this topic.

References:

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