



PISCES LECTURE RESOURCES

The Ecology of Freshwaters

LECTURE 2 - Sampling methods for ponds, lakes, streams and rivers

Introductory remarks

For the ecologist, aquatic environments pose particular hazards. All types of biological sampling have some inherent risks, but where water is involved, extra care must be taken. The slides that follow illustrate the main methods of collecting plants and animals from freshwaters but personal safety must always be at the top of the agenda when undertaking any of them.

Slide One: Title slide.

Slide Two: According to RoSPA, 217 people drowned in lakes and rivers in the UK in 2002. These weren't all ecologists, but this statistic does highlight how dangerous being in or near water can be. The slide gives the basic message, never work alone and always wear a buoyancy aid. Remember, you can drown in a few inches of water if you slip and knock your head on a rock.

Slide Three: Lists the usual ways in which freshwater sampling is done. If you are trying to obtain a comprehensive species list for a water body, you will need to use more than one of these methods.

Slide Four: Simple hand nets. Note that one of these has been constructed from a kitchen strainer taped to a piece of wood. It is also important to have handy some white sorting trays such as these, so that animals can be easily sorted and counted. The sweep of the net should be smooth and unidirectional, even through vegetation. Such methods are regularly used by professional ecologists and children alike.

Slide Five: You may catch all, or none of these. Some animals are much more difficult to catch than others and your catch will, of course depend on the mesh of your net. A 1mm mesh should be satisfactory for the majority of invertebrates.

Slide Six: Kick-netting. This is a standard bottom fauna method in streams and small shallow rivers. The key to consistent sampling between sites is to agitate to the same degree for the same period of time. Be careful not to 'over-agitate' and destroy the habitat. In running water agitate upstream of the net to catch animals as they flow downstream.

Slide Seven: For even more consistency it may be preferable to use a Surber sampler, so that the area to be agitated is clearly delineated, although it will not always be easy to get a foot into every corner of the quadrat. It may be preferable to use a stick to agitate the substrate.

Slide Eight: Some of the animals released by kick or Surber sampling are shown here. Again, some are more difficult to catch than others.

Slide Nine: For plankton sampling, a much finer net is required, typically about 25 meshes per cm for animals and 50 meshes per cm for algae. A very fine mesh will tend to clog as it is used and it will need cleaning after a short period. For quantitative work you will need to have a method of establishing how much water has passed through the net.



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Slide Ten: For soft lake- or river-beds, a grab sampler will be required. Some grabs present no resistance to the water as they are lowered, i.e. the water flows through them. This ensures that very fine sediment is not swept away by the approach of the grab. The Van Veen grab is not of this type and is therefore best used on coarser types of bed.

Slide Eleven: Simple core samplers can be used to extract samples of the lake or river bed. They are not easy to use in stony substrates but in muddy or sandy bottoms can be very effective. Make sure that no material falls from the bottom of the core as it is removed.

Slide Twelve: For measuring the rate of colonisation of a pristine substrate use a tray of the material (previously inspected to ensure that it contains no animals) placed on the river or lake bed. After some weeks the tray will become colonised and can be carefully removed and inspected.

Slide Thirteen: A wide variety of artificial substrates can be set in water and allowed to colonise. The material and its properties will depend on the type of animals and plants you are interested in. A matrix of nylon fibres such as this pan scourer provides an ideal substrate for algae and small invertebrates such as chironomids. A wide variety of encrusting organisms like this diatom will be found after a few weeks.

Slide Fourteen: Fish, of course, come in a very large variety of shapes, behaviours and sizes, and different techniques will be required to catch them. This *Apistogramma* is a very small leaf litter species from the Amazon. A fine mesh net or minnow trap would be appropriate for this species.

Slide Fifteen: Gill netting is an effective method of trapping fish, but has the disadvantage that most fish die when entangled in them for any period of time.

Slide Sixteen: Seine netting simply encircles the fish in a given body of water with a net that reduces in size as it is brought ashore.

Slide Seventeen: Seine netting is used from gently sloping beaches in water with few underwater obstructions. The aim is to encircle an area of water and pull the net to the shore while keeping the bottom of the net in contact with the lake or riverbed. As you can see, it requires good planning and plenty of helpers to manage this effort properly.

Slide Eighteen: If done quickly, fish can be removed weighed, measured etc, without damage.

Slide Nineteen: Using a seine net to sample floating vegetation. This is not easy but it can be done with sufficient manpower and plenty of time if the volume of vegetation is large.

Slide Twenty: Our ecologist is looking suitably pleased; this type of sampling is not to be undertaken lightly. The catch can include snakes and caiman.

Slide Twenty-one: Trawling is unlikely to feature in the student's usual set of sampling techniques but it is obviously one method by which large areas of lake can be sampled. Beam trawling relies on the dragging of a heavy chain or beam ahead of the net to disturb the animals off the bed, which are then trapped in the net. It can therefore be highly damaging to some types of lakebed if repeated regularly.



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Slide Twenty-two: Electric fishing is a good method for sampling fixed stretches of river or ponds. Fish positioned between the cathode and anode (the exposed electrodes of the system), experience a potential difference (p.d.) across their muscles causing them to go into spasm and move towards the anode or float to the surface. The p.d. experienced is proportional to the size of the fish and therefore small fish may be unaffected and therefore escape. This method is used with removal sampling techniques to produce quantitative estimates of fish density.

Slide Twenty-three: Trapping methods – A plastic soft drink bottle with the neck removed, inverted and reinserted makes a good trap for small fish. Other types of trap are available for larger fish or other animals. The traps used by ecologists are often based on local traditional fishing methods.

Take home message:

Very many sampling methods are available to the aquatic ecologist, but to be effective and accurate, they need to be appropriate for the species under investigation. Personal safety must, however, be the primary consideration.