

ENVIRONMENT

Indicator Species – Part 2

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LAST week I looked at a group of organisms referred to as indicator species. The presence and/or health of these organisms can be used as an indication of the health of the ecology of an ecosystem.

Last week I focused on terrestrial ecosystems and this week I will be devoting this article to their aquatic counterparts. There are five types of aquatic indicator species; Phytoplankton, submerged aquatic vegetation, zooplankton, benthos, and fish. Additionally, specific species of ocean bird can also be used for this purpose. In this article I will look at each group in detail.

The first class of aquatic indicators is phytoplankton, which are microscopic floating plants, usually algae. An example is Periphyton, which are benthic algae that grow on the surfaces of large rocks or plants. They are good indicators of lotic or flowing water ecosystems like rivers and streams. Qualities of this group that make them good indicators include a high number of species and sampling can be taken with ease using few people, thus reducing the cost of sampling. They are sensitive to specific changes in the environment, as is the case for many species.

The second group of indicator species include Macrophytes; larger

aquatic plants that grow in or near the water. These plants either float on or below the water's surface, or their roots are at the bottom and the top part emerge through the water's surface. This group of plants are usually found in or around lakes. They are important as they provide oxygen for the other organisms in this ecosystem. They are also a food source for some fish species and other organisms like water fowl. Organisms that depend on it will migrate away from the area when they are depleted.

They are sensitive to conditions like turbidity, herbicide and salination which affect their ability to carry out photosynthesis and growth. Unfortunately too many macrophytes can be a result of eutrophication from nutrient rich fertilisers contained in run-off from cultivated land. This causes an abundance of these plants which in turn takes away oxygen from other organisms in the ecosystem. This abundance also interferes with recreational activities like fishing, swimming and boating, and takes away from the aesthetics of the area. Their ease of sampling and lack of laboratory analysis makes them good indicator organisms.

When it comes to animal indicator species, they can be microscopic like zooplankton and macroscopic like aquatic invertebrates, also referred to as benthic macroinvertebrates as they live on the bottom of our water courses and oceans. Some qualities that make these good indicator organisms include the ease with which they can be collect-

ed and identified. They live in the water all their life and their low mobility means that they stay in areas with the most suitable conditions. They have a life span of usually a year and this coupled with their low mobility give a good indication of the conditions in an area for approximately a year, based on the age of the organisms collected. Also different species have differing levels of tolerance to different types and intensities of pollution. Some factors that affect these organisms include oxygen levels, nutrients, toxic chemicals and habitat qualities. Polychaetes or worms are an excellent example of benthic macroinvertebrates, as they are one of the most tolerant marine organisms, when it comes to biological stress factors, such as, low oxygen levels, sewerage pollution and contamination of the water by sediment.

Like the previous groups of organisms, fish spend all their lives in this ecosystem. Their ease of collection (provided the correct equipment is used), and ease of identification coupled with their relatively long lifespan, therefore they gives a prolonged idea of the health of the ecosystem. Their long life span compared to benthic invertebrates means that they can be used to indicate long-term and current water quality. Fish populations recover quickly from natural disturbances and are also good indicators of regional and macrohabitat differences since they have large distribution ranges and are less sensitive and thus less affected than smaller organisms by natural differences in micro-

habitats.

As I mentioned earlier, birds served as good indicator organisms for both estuarine and marine ecosystems. In the first type of ecosystem, the presence or absence of wetland bird species in that area reflects the conditions present. This status is helped by their ease of identification, well known behaviour, ecology and biology. In a marine ecosystem, pelagic birds that is, those that frequent coastal waters and open seas, can also be used as bioindicators. An excellent example is the Atlantic Puffin (*Fratercula arctica*). This is because it is near the top of the food web so anything that affects its food source which is mainly fish, in turn affects these birds. The degree to which this affect is felt in this species can be determined by examining the amount of contaminant contained in their eggs, feathers or in the case of dead individuals - their internal organs. This bird species gets its food from diving into the ocean rather than flying so that environmental factors that affect the condition of the water, such as tidal cycles also affect them.

Therefore we see that biological indicators can be either microscopic or macroscopic but they share some common features, such as, the ease with which they are collected and identified, and their natural history which includes, behaviour, ecology and biology must be well known. All of these requirements are necessary if scientists are to detect changes that correspond to changes in the environment.