

Waterbirds

Bio-indicators of the Ecosystem

Vaithianathan Kannan



Source: indianwetlands.in

MONITORING the ecosystem's health and quality is a long-term process as these are complex and change slowly. Although it can be costly and time-consuming, the long-term trends help us gain new knowledge and understanding about the environment. One of the aims of monitoring is to get information that can provide early warning of the changes that could negatively affect species or the ecosystem.

However, considering how impractical it is to monitor all of the ecosystem components, a few have been used as indicators for more comprehensive conditions. These representative components are known as bio-indicators.

Bio-indicators are representative of particular ecosystems. They are also simple and inexpensive to measure, clearly interpretable and predictable by validated quantitative models and internationally applicable and relevant for the

environmental threat. Birds, in many cases, appear to be more sensitive to environmental contaminants than other vertebrates. In particular, the waterbirds have served as sentinel species for various environmental toxicological problems and are expected to continue as one in the foreseeable future.

The term 'waterbirds' encompasses many bird species that feed near or in water. These include shorebirds that forage primarily in saltwater habitats and wading birds that utilise freshwater and brackish habitats. Wading birds, particularly, have been increasingly highlighted due to their decreasing pattern worldwide. Since their presence and abundance can influence both local and regional scales, they are continuously being subjected to increasing threats.

The loss of inter-tidal habitats or reduction in their size is a common issue waterbirds face. It alters their ecology, causing a decrease in the distribution and abundance of dependent species. In addition, waterbirds that are dependent



Source: indianwetlands.in

on coastal habitats are subjected to continuous exposure to pollutants and habitat degradation.

Waterbirds are viewed as important bio-indicators because they exhibit conspicuous and meaningful responses to the changes in wetland habitats. These responses serve as vital signs of contamination and deterioration of ecosystem quality.

Moreover, by being directly or indirectly exploited by humans for hunting and fisheries, they indicate their productivity in the nesting area and may also reflect the fish stocks. Therefore, there is a continuous need to develop an effective monitoring system using the waterbird species to provide early warning of the possible dangers that may affect our environment, particularly our wetland ecosystem.

One way to do such an assessment is to monitor the birds' presence and activities in a specific habitat. Several keys make them a good indicator of habitat health and quality. These include, but are not limited to, being long-lived, top predators and able to integrate pollutants over an extensive area through bio-accumulation, as well as to have a wide range of diet selection and habitat utilisation. Moreover, their dependency on local resources during migration and breeding has made them a valuable tool for monitoring deteriorating habitat quality worldwide, contributing to one of the oldest established methods to assess environmental health and quality.

Both local and regional scales may affect waterbirds' presence and abundance. On a larger scale, variations in bird abundance can be due to population processes (e.g. birth and death rates) and migration. Waterbirds' abundance can also be localised depending on the habitat characteristics such as water depth, physical and chemical conditions and water body size. For example, a study found that wetlands with high nutrient levels or eutrophic features tend to have higher bird abundance and species richness.

Other natural processes that can shape bird populations include density dependence, environmental stochasticity and competition. It is essential to identify these factors to manage and control the population of waterbirds. Waterbirds have long been the attention and subject of global research due to the ease of assessing the population.

Waterbirds are not only used to monitor local food webs. Migratory waterbirds can also be used to compare exposure in different regions. Because large amounts of data have

been collected for the waterbird population, monitoring the environment has become more accessible. Coastal birds like egrets, herons, storks and pelicans can be good bio-indicators because they reveal current environmental exposure and respond relatively rapidly to contamination. The species has been reported to depend on the mangroves exclusively for nesting, but they can forage elsewhere. Several studies suggest that habitat health and quality improvement will attract more waterbirds to the area.

Importance of Wetlands for Waterbirds

Wetlands are transitional areas between the aquatic and terrestrial zones with diverse flora and fauna species and a biologically highly productive ecosystem. There are two types of wetlands: coastal or tidal wetlands and inland or non-tidal wetland. The tidal actions influence the plants and animals in the coastal wetlands. The high salinity and fluctuation in water level make it hard for most living organisms to live in the area. As a result, the coastal wetland has a low diversity of species because many species are not salt tolerant, mainly plant species. Mudflats and sandy flats are the two common examples of coastal wetlands.

Meanwhile, inland wetland is located in the riparian zone where rivers, streams, lakes and ponds are the main water bodies for the habitat. Marshes and wet meadows are the two examples. Environmental factors are also crucial for shaping the waterbird population. The waterbird community may be affected directly or indirectly depending on the factor's scale, intensity or magnitude. Examples of immediate changes include alteration of nesting and foraging behaviour by climate.

Climate changes indirectly affect the population of waterbirds by altering or reducing the available habitat for the birds. Due to the distinctive and observable responses to environmental changes, waterbirds have been proposed as bio-indicators for both seasonal and climatic changes. Some changes that occur due to climate variability include the loss of inter-tidal habitats and increased salinity of coastal freshwater habitats as sea levels rise, reduction in the extent of wetlands and duration of flooding in arid and semi-arid areas. As temperatures increase, the loss of breeding habitats in Arctic and sub-Arctic regions expands boreal forests (taiga) and forest fires. This is where waterbirds can play the role of a monitoring agent so that swift action can be taken to minimise the impacts.

Important information on the biology and ecology of waterbirds is therefore critical to make an informed decision to conserve them and their habitats better. However, in India there have been few studies focused on waterbirds. There is a need to encourage young scientists to take up this challenge. The government and local authorities should also consider proper planning and funding and focus on maximising the impact of the country's conservation effort.

Dr Vaithianathan Kannan, Scientist, Gujarat Institute of Desert Ecology, Bhuj-Kachchh, Gujarat.
Email: kannan.vaithianathan@gmail.com