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Surveys and Wildlife Conservation

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The recent butterfly survey in the Periyar Tiger reserve indicated that indicator species are as important to the health of the ecosystem as large mammals. The author takes stock of surveys conducted in India and why they are often skewed towards large animals.

A butterfly survey was conducted in the Periyar Tiger Reserve (PTR) in Kerala in October 2014 by the Periyar Tiger Conservation Foundation, an autonomous body under PTR, and Travancore Natural History Society (TNHS), a Thiruvananthapuram-based non-profit organisation. While the survey itself, was no doubt, conducted well and produced valuable data, the reporting of the event provided no useful information to people in general. The media reports had, as usual, a mishmash of information – that the survey recorded 246 butterfly species; spotting of the Baby Five Ring, a rare butterfly, whose presence had been recorded in the Reserve only thrice in the last 100 years; that the last survey was conducted 22 years ago in 1992, when 162 species were recorded; and that butterflies are indicator species, that is they indicate an ecosystem's health. From the information provided, a layperson would probably conclude there are now more butterfly species in the reserve; and that there are several rare species, so, presumably, they must be protected.

But what purpose do such surveys serve? Why count other fauna (not to mention flora) if butterflies are indicators of ecosystem health? Does the increase in the number of species recorded, indicate that the ecosystem is healthier? Are there exactly 246 species in the PTR? Not 245 or 247, but exactly 246? It is astonishing how people accept the census data as infallible. When the tiger census in 2008 put out the number 1,411, some people thought there were exactly that many tigers in the country. But this is a median number, and there is always a range and a margin of error. Since census by definition is an estimate, one cannot be sure that all individual animals have been counted.

Surveys in Practice

Now most surveys provide two kinds of basic numbers – the number of species (within a given group – like butterflies) and the abundance, that is the number of individuals of each species. So how do researchers conduct these surveys? Within a given region, different kinds of habitats are picked – because of variation in flora assemblages – and surveyed.

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Since every square inch of the forest cannot be covered, some kind of transect is plotted. A transect is the path that the researcher walks to survey species. It can be a line transect or a belt or a point and so on – it depends on what one is surveying. Often for plants, belt transects are used. These are rectangles that are marked off and all the plants within are sampled. In line transects, a commonly used method, lines are charted parallel to each other and separated by a certain distance, and the transects are walked at the same time. The reason is that when surveying animals like elephants, there is a high likelihood of the same animal being counted more than once. Obviously, this messes up the data. So the transects are walked together, and when an animal (say an elephant) is spotted, the researcher notes not just its presence but also its gender and age (if possible), direction of movement and the time of spotting it. When the data is analysed, the biases are factored in, so as to improve accuracy. When estimating the population of a species, since the census would cover only a percentage of the entire forest, it is assumed that the surveyed area is representative of the entire forest and thus population is extrapolated.

Surveys need to be repeated at regular intervals (the tiger census is done once in 4 years) and the same methodology has to be followed each time. If the method changes, as it did in 2008 for tigers, with the old pugmark system being replaced with camera traps, then the new numbers are not comparable with numbers from earlier surveys. Considering the number of species of both flora and fauna and various ecosystems (forest, coral reefs, grasslands and so on) which need to be regularly surveyed, a fair amount of resources would be needed on a long-term basis. So are such surveys of any value? What do they accomplish? Can these resources not be put to better use?

Surveys provide baselines; without knowing what is there and in what numbers, one cannot go forward with conservation plans. To know whether a species needs protection, one needs to know their population status, which is exactly what a survey provides. The International Union for Conservation of Nature's (IUCN) red list is based on such surveys and studies. Surveys also indicate potential areas to be protected and help identify potential threats to a species. For example, if during a census, fewer butterfly species are found in a certain habitat where there is logging and intensive farming, we can assume that these activities could have had an adverse impact on the butterfly population in the area. While one may not be able to state this with a great degree of certainty, at least it can be noted as a possibility. It also opens the door for more focused research to confirm these hypotheses. And with greater understanding of how species interact with each other (both plants and animals), a better management of ecosystems can be contemplated.

But surveying every taxon in every ecosystem regularly is difficult. Insects, birds, mammals, plants, fungi – the list of species is endless. Yet, biologists have made a fair stab at it if one looks at the literature. Of course, they survey sample plots that are representational of a certain ecosystem in a certain region. However, there is always a possibility or even likelihood of missing out on some species. The answer would be to keep on sampling more areas, but at some point one has to stop.

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Skewed Nature of Surveys

In India, surveys have been biased in their coverage of different groups. Large mammals are well-covered. Rarely do other smaller and more difficult to work with groups, get surveyed. And if they do, the frequency of these surveys is low. The order, in terms of maximum coverage, would be mammals, birds, plants, followed by reptiles, butterflies, insects, and fungi. Even fish are not as well covered, though there has been pioneering work by the British in documenting fish (in fresh and marine waters) in India.

While there are studies on marine fisheries (including stock assessments), far less work has been done on freshwater species. There are a few government institutes and researchers conducting research in this area, but a lot of work still needs to be done. There is limited data on the ecosystem health of freshwater bodies. Little data is available on the impact of exotic species that are introduced in these water bodies, how agricultural and industrial runoffs affect their biodiversity, how a dam might affect them and the impact of using these for irrigation, power generation, industrial and domestic use.

And then there are the poor cousins (groups like fungi, lichens, bryophytes), which have only a handful of dedicated researchers studying them. So the extent of species diversity, population data etc are not known. To add to the difficulties faced in keeping tabs on the country's biodiversity, is the upheaval in recent years in the taxonomy of these groups. Fungi and lichens are notoriously difficult to identify. Many of these species are identified using their fruiting bodies (the reproductive stage – mushrooms are an example). The vegetative state – consisting of hyphae (thread-like strands) are almost impossible to use for identification.

However, there has always been a problem with identifying fungi by their fruiting bodies. In different environmental situations, the same fungal species will put out very different fruiting bodies! However, international research programmes are now using molecular tools to redraw the lichen and fungal trees. As one can imagine, this has meant quite an upheaval in taxonomy, and this has a direct impact on the kind of data surveys collect.

Indicator and Keystone Species

Since surveying all groups of organisms is so hard, often a certain species is chosen, as it is considered indicative of the larger ecosystem or a symbol for that particular ecosystem. The assumption is that by conserving that particular species, other species that share the same habitat, and may be vulnerable to similar threats, will be protected. This is the flagship or umbrella species concept which is quite popular in wildlife management, though in recent years this idea has received its share of criticism.

Similarly, there is the keystone species concept, wherein a keystone species is the one that plays a crucial role in the ecosystem's functioning, structure etc. Without this species, the ecosystem would be out of whack. Then there are indicator species (such as butterflies,

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amphibians, fungi, or corals) that are said to reflect the health of an ecosystem. Certain lichens are considered air pollution indicators and some lichens are sensitive to specific pollutants—either they thrive in such polluted conditions or die out. These concepts essentially try to find a short cut to manage a habitat by monitoring these species or groups more intensely in the assumption that they reflect the well-being of the larger system. Of course, biologists have developed methods and criteria to pinpoint indicator/keystone/umbrella species for a given habitat; it is not a random choice.

Conclusions

Though traditionally surveys are conducted by researchers, today a growing number of amateurs is participating in them. In many countries, bird counts have become very popular and are done by amateur birders. The Asian Waterfowl Census is one such example. Though organised by researchers and environmental groups, the survey is primarily carried out by a large number of volunteers in each country. Such programmes are called citizen science projects. MigrantWatch, SeasonWatch and Asian Waterfowl Census are examples of such projects in India. These projects have managed to generate information at much lower costs while simultaneously increasing awareness of environmental issues among people.