

Common biases that plague conservation assessments in the Western Ghats

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Conservation assessments are critical to the long-term survival of species, communities, ecosystems, landscapes and vast ecological regions. The Western Ghats is amongst the globally recognized biodiversity hotspots that are in dire need of a regional conservation plan. The ecological region is known for high levels of endemism, especially amongst vertebrate animals. Not less than 35% of the 1,282 species of vertebrates known in the region are endemic (Table 1). In fact, the proportion of endemic vertebrates is likely to increase further with the current rates of species discoveries and taxonomic updates^{1,2}.

The Western Ghats eco-region is rather vast and spread north to south between 8°N and 21°N lat. Its estimated area however varies due to differences in drawing the boundaries; as a result it ranges from 136,800 sq. km (ref. 3) to 260,962 sq. km (ref. 4). Based on the underlying rocks, the entire eco-region may be classified into nine geological landscapes^{5,6}. What is interesting, however, is that the present distribution of primary vegetation types (and associated plant communities), particularly in the wet zones, is not apparently influenced by the underlying geology, but by the length of the dry season, human interference and the ecological resilience of the landscape^{5,6}. It is also of interest to note that the Western Ghats southwards from around 13°N lat. that experiences the shortest dry seasons has the highest number of species of endemic vertebrates (Figure 1).

Given that, amongst animals, the present knowledge of species distribution, endemism and diversity (Table 1) is more complete for vertebrates than other animal phyla, conservation assessments tend to place undue emphasis on these organisms. Whereas there are studies (in the past 20 years) that have covered districts⁷ and states⁸, to my knowledge there are only four conservation assessment exercises that have covered the entire Western Ghats. The first two focused on birds and concluded that in the Western Ghats, most species of birds are ubiquitous occupying all available habitats, the

exception being restricted habitats like the high-altitude shola forests and grasslands^{9,10}. The studies also highlighted the fact that, even though such restricted habitats have comparatively lower species richness, the bird communities therein are more cohesive and comprised of species with narrower geographic distribution and higher conservation value^{9,10}. However, while recommending the results for wider adoption in conservation and development planning, the authors have cautioned that the reliance on birds alone for conservation assessment may be an obvious shortcoming¹⁰.

Almost ten years later another attempt to comprehensively assess the conservation value of different landscapes in the Western Ghats had shown, amongst others, that amphibian species were the best predictors of richness of threatened and endemic vertebrates¹¹. The study used the distribution of endemic plants, amphibians, birds and mammals to

evaluate the conservation value of different landscapes and identify those that are irreplaceable. The study had not, however, taken into consideration the distribution, endemism and diversity in reptiles and fishes due to paucity of information which although justifiable, had inadvertently biased the results.

In the absence of two classes that contribute nearly 60% of the endemic vertebrate species richness in the Western Ghats (Table 1), amphibians would naturally emerge as a significant 'surrogate' (Figure 2). Further, even if fishes alone had been left out (considering their totally aquatic niche), still, one in two of the endemic vertebrates would be an amphibian. Endemic species richness in amphibians far exceeds mammals or birds that, in the Western Ghats, out of every 10 species of amphibians, 8–9 are endemic. Also, as evident from Figure 2, the overall pattern of distribution of endemic vertebrates is highly influenced

Table 1. Species richness and endemism in the different classes of vertebrate animals in the Western Ghats

| Class | No. of species | No. of endemic species | Endemism (%) |
|------------|----------------|------------------------|--------------|
| Fishes | 293 | 159 | 54.26 |
| Amphibians | 171 | 147 | 85.56 |
| Reptiles | 187 | 109 | 58.29 |
| Birds | 511 | 27 | 5.28 |
| Mammals | 120 | 13 | 10.83 |
| Total | 1,282 | 455 | 35.49 |

Source: Care Earth database^{1,2}, updated till 30 September 2011.

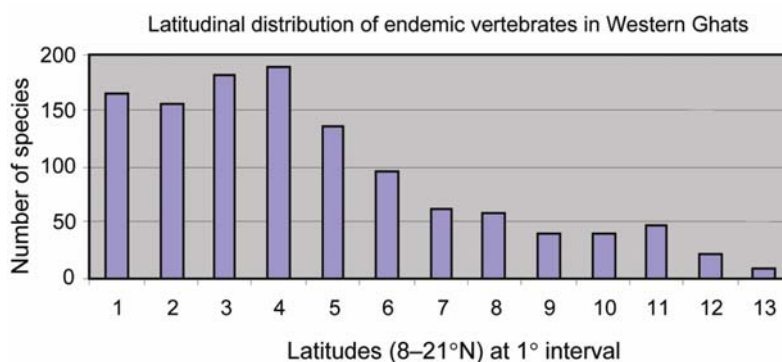


Figure 1. South-to-north variations in the species richness of endemic vertebrates in the Western Ghats.

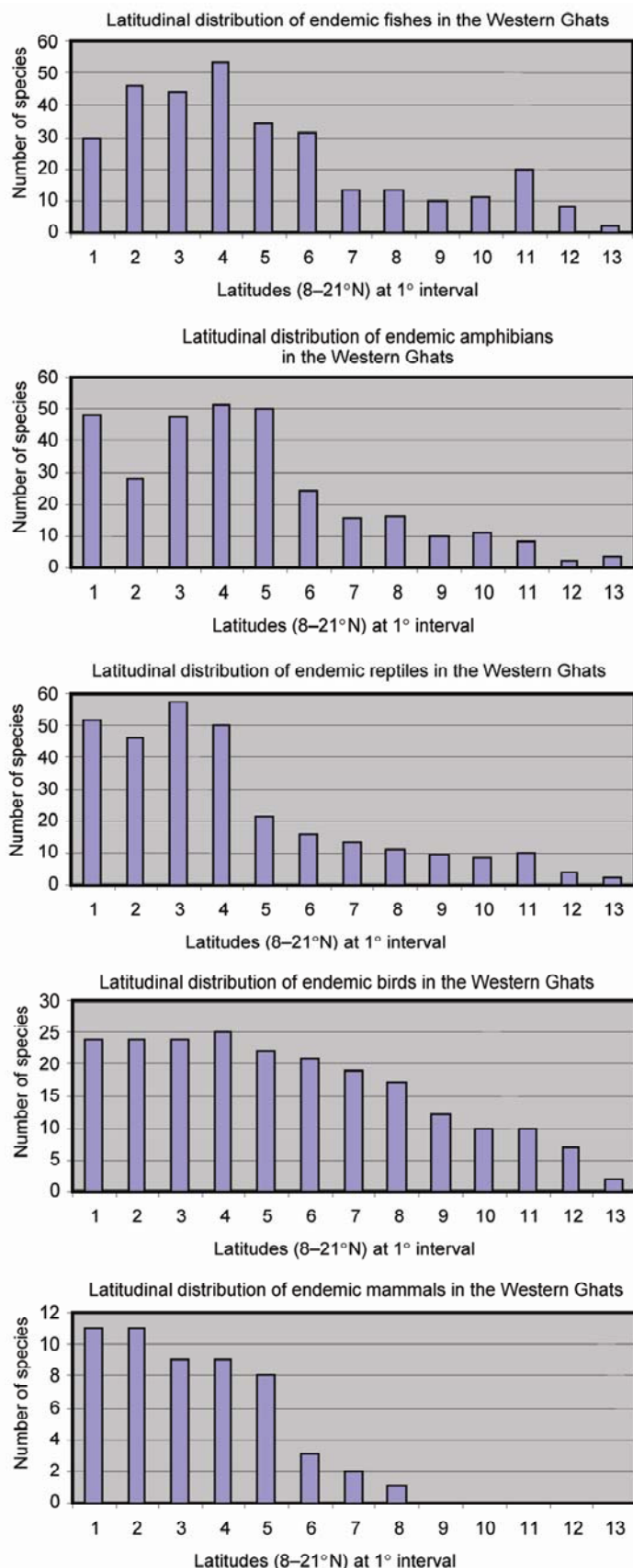


Figure 2. South-to-north variations in the class-wise species richness of endemic vertebrates in the Western Ghats.

by just three classes, fishes, amphibians and reptiles (collectively treated as lower vertebrates). Although endemic birds show a different pattern of distribution, they are too insignificant, in terms of numbers that might change the inference, unless they are used exclusively in conservation assessments.

As another case, the results of a recent effort to evaluate the status and distribution of aquatic biodiversity in the Western Ghats are of interest³. The assessment has focused on 1,146 species, including fishes, molluscs, dragonflies (and damselflies) and aquatic plants, and concluded that the southern Western Ghats region has the highest species richness. Interestingly, the study has recommended, amongst others, 'a thorough taxonomic review and monitoring of all freshwater groups in the Western Ghats'. And, elsewhere under recommendations for 'habitat restoration' are: (i) protection of key habitats such as fast-flowing streams and rivers; (ii) where possible, prevention of flow modifications; (iii) conservation of specialized ecosystems such as *Myristica* swamps, high-altitude peat bogs, and lateritic plateaus; (iv) prevention of the use of pesticides and other agrochemicals in the upper catchments, and (v) regulation of tourism in critical habitats³.

The five recommendations for habitat restoration are no different from the most general statements frequently made leaving a lot of questions unanswered. The main questions, especially those which have been posed by the Government of India, are that given the present status of biodiversity and, acknowledging the fact that all taxa are not equally well studied, how can the Western Ghats be conserved, and how can certain degraded landscapes be restored? It is in this context, that the Ministry of Environment and Forests (MoEF), Government of India set up the Western Ghats Ecology Expert Panel to assess the levels of ecological sensitivity in the eco-region and recommend landscape-specific actions for long-term conservation.

While the recently published study of IUCN and Zoo Outreach Organization has identified key freshwater biodiversity areas³, little has been said about the levels of resilience in the landscape or whether the threat status of certain aquatic organisms alone is an indication of further ecological degradation in the landscape. The authors may well argue

that a discussion on ecological resilience was not within the scope of the assessment. Nevertheless, the concern is, assessments focused on species belonging to a specific guild or class often fail to reflect or highlight the larger ecological context that led to the habitat degradation and the consequent threatened status of the concerned organisms.

One common excuse that all species-centred assessment exercises come up with is of 'taxonomic uncertainties'. For the purpose of discussion, we may consider fishes as the example, as they tend to influence the overall pattern of distribution of endemic vertebrates in the Western Ghats (Figures 1 and 2). The IUCN and Zoo Outreach study report has concluded that 'there is an urgent need to undertake a thorough taxonomic review of several genera and species of freshwater fishes'³. What does this mean? Does this mean that conservation efforts are obsolete till such time the disputes over taxonomic status of all species are resolved? Or, does the study indirectly imply the need for more fish collections from the already fragile habitats?

Having to deal with taxonomic uncertainties in conservation assessment of the Western Ghats is nothing new¹². In fact, the Convention on Biological Diversity in its preamble has clearly addressed the issue of 'uncertainties' as follows¹³: 'Noting also that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such threat.'

The recently published assessment of freshwater biodiversity has also failed to highlight the landscape-specific threats that the aquatic habitats are faced with due to its overall lack of understanding of the Western Ghats, its complex ecosystems and associated species, especially fishes³. The study has stated that there are 290 species of freshwater fishes in the Western Ghats, 189 of which are endemic. And then it goes further to state that this is a gross underestimate³. Evidently, these numbers are ad hoc as would emerge from the following discussion.

Classifying fishes as freshwater, brackish water and saltwater is one of the most difficult exercises faced by all fish biologists¹⁴. As a result, there is always an element of subjectivity in assigning fishes to any category by their present distribution. This is particularly the case

in the Western Ghats, as in many parts along the coast tidal influences are felt and often far upstream. While the figure of 290 comes close to the generally accepted number of species of fishes in the Western Ghats^{15,16} (Table 1), to state that this is an underestimate is far from being prudent. Further, that there are 189 species endemic to the region is evidently an artifact of the way in which the limits of the Western Ghats have been drawn. Or, more appropriately, it is that these numbers have been borrowed, without scrutiny, from an obscure publication authored by scientists of the Zoological Survey of India, where it is stated 'it is observed that there are 290 freshwater species including saltwater dispersants reported from the Western Ghats and among these 187 species (55.86%) are endemic to India'¹⁵. Endemic to India and endemic to the Western Ghats are quite different. The Bonnet macaque is endemic to India and also occurs in the Western Ghats. It is, however, not treated at par with the endemic Lion-tailed macaque!

Another limitation of the assessment³ is that it has adopted a recent international classification of the world's 'biogeographic units for freshwater biodiversity conservation' that has divided the Western Ghats into five unrealistic eco-regions¹⁷. To start with, the term eco-region has been in use in India since the year 2000 when the MoEF launched the countrywide National Biodiversity Strategy and Action Plan¹ and it represents an extensive geographical sub-unit of the country. The Action Plan thus designated the entire Western Ghats as a single eco-region. The five eco-regions that have been used in the present assessment³ – Narmada–Tapi, Northern Deccan Plateau (excluding the Mahanadi Basin), Southern Deccan Plateau, the Western Ghats and the southern Eastern Ghats, are far from apt in dealing with the Western Ghats, and in fact misleading as Deccan and the Eastern Ghats are traditionally treated as distinct biogeographic provinces.

According to the classification of the assessment, the Western Ghats eco-region includes all the west-flowing rivers (between 8°N and 21°N), and the southern Eastern Ghats eco-region covers all the east-flowing rivers southwards from the Cauvery. In such a scheme, it is not surprising that a recently described fish, *Puntius rohani*, that is endemic to

the west-flowing rivers of Kanyakumari District, Tamil Nadu¹⁸, is placed in the southern Eastern Ghats eco-region³. Those familiar with the rivers of peninsular India would very well agree with this that the only major tributary of River Cauvery that may be considered as one that drains parts of the Eastern Ghats is the Bhavani. It barely touches the southern limit of the Eastern Ghats.

The proposed goal of the publication is to 'expand' the freshwater species assessments across the globe so that it contributes to a foundation of scientific understanding of the current status as well as the priority areas for action³. While global systems of bio-geographic classification¹⁷ as that adopted in the IUCN and Zoo Outreach Organization's assessment³ have their merits, they may not automatically influence policy-decisions at the regional level, especially in India, as the eco-regions identified are more appropriately river basins of the entire peninsular India. Further, the inference that species richness is highest in the southern Western Ghats is gross and misleading, as in the same report it has been shown that mollusc species richness is higher in the northern Western Ghats (p. 54), species richness in odonata is highest around the Nilgiris (p. 68) and that in aquatic plants is rather spread out (p. 79)³.

Conservation of biodiversity in the Western Ghats is a major challenge¹. The Government of India (MoEF) hence established the Western Ghats Ecology Expert Panel to address the issue in a scientific manner and evolve protocols for designating in part or full, the entire eco-region as an ecologically sensitive area so that landscape-specific conservation actions are planned and implemented. The rigorous exercise that recently concluded (the final report is not yet available) has proposed a preliminary methodology for conservation assessment¹⁹. In the proposed scheme, mapping ecological resilience takes the centre-stage. Species richness, endemism and levels of threats to biodiversity, when superimposed on geographical units that are designated as 'ecologically sensitive', complement and enhance the conservation value of such landscapes¹⁹. It is in this regard that conservation assessments such as the one completed recently³, become quite difficult to adopt.

It is rather convincing that the best indicators of landscape-level resilience in

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the Western Ghats are the primary vegetation types⁵. The present spatial distribution of the primary vegetation types and the beta diversity in the associated plant communities suggest that the landscapes of the Western Ghats northwards from 13°N are the least resilient⁶. However, taxa-specific conservation assessments have all placed a higher conservation value on landscapes in the southern Western Ghats^{3,9-11}. Sixty-three per cent of the 651 species of lower vertebrates are endemic and majority of these are confined to the southern Western Ghats (Figure 2). Conservation assessments that focus primarily on these animals, especially on the levels of endemism and threat status, are therefore likely to bias conservation planning in the Western Ghats.

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