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TO STUDY ABOUT THE IDENTIFICATION AND MANAGEMENT OF CONSERVATION OF BIODIVERSITY

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ABSTRACT

Conservation of biodiversity is a long-term process that has been contested for decades. What should be conserved and how should it be conserved are the questions. Previously, traditional biodiversity protection approaches relied mostly on an island-centric approach involving the notification of protected areas. Rodgers and Panwar, who worked in India in 1988, employed a biogeographic strategy to construct a protected area network. However, because much of the Western Ghats biodiversity is found outside of protected areas, effective conservation measures must be put in place to connect the network of recognized wildlife sanctuaries and national parks. Given the current human challenges and rapid changes in landuse patterns, the old patch-based approach cannot be employed as a comprehensive strategy for maintaining biodiversity in forest landscapes outside of protected areas. This has been discussed for the past two or three decades because a major amount of biodiversity lives outside of formally declared protected areas in natural or semi-natural cultural landscapes. This has sparked a shift in thinking about huge protected areas as islands within a matrix of other heavily exploited landuse aspects, in favour of a landscape-focused approach. This would help to preserve the biodiversity found in even small fragmented habitats surrounded by a mosaic of semi-natural landscape characteristics in the matrix of land beyond protected zones. There are also debates over damaged forest ecosystems' potential to conserve biodiversity. The fragmentation process has an impact on numerous forest settings around the world. The 35 biodiversity-rich regions around the world are the most severely harmed by anthropogenic activity.

KEY WORDS: Conservation of biodiversity, Forest, Biodiversity hotspots.

INTRODUCTION

Discussions with regional and district planners, as well as forest officials involved with Forest Working Plans in the Western Ghats, have served as forerunners in developing preliminary concepts for this lengthy study. These background discussions, as well as an intensive assessment of secondary literature, revealed that a complete and comprehensive hotspeck data source, which planners and managers of the environmentally delicate area can use, is urgently needed. This will require a practical and workable strategy based on ecological surveys, ground truthing, and community surveys, as well as the application of geoinformatics in the development of a comprehensive interdisciplinary management tool. Discussions and literature searches revealed that (a) there are significant gaps in information regarding the spatial distribution of hotspecks and their level of biodiversity; (b) there is a lack of information on locally acting pressures resulting from recent landuse changes that have not been adequately documented; and (c) there are no planning norms that are specific to the needs of the small but highly unique habitats in the Western Ghats. Prioritized hotspots across the Ghats' natural and cultural landscapes can thus be leveraged to create specialized management initiatives through local participation and current government plans for biodiversity conservation in the Western Ghats' fragile eco-sensitive areas.

The goal of this study is to determine the various typologies of these hotspots and to prioritize each site within the various landscape aspects using a quantifiable process based on a carefully defined set of factors. This, on the other hand, can take a long time and demands a high level of experience. This is difficult to sustain for such a big territory. As a result, a 'Rapid Biodiversity Assessment Tool' was developed that is both quick and scientifically correct. Prioritization of hotspots is based on an assessment of their biodiversity values as well as the level of risks they face. Several similar technologies built for different reasons have to be assessed and suitably modified to meet the special criteria for identifying, prioritizing, and managing hotspecks in Maharashtra's Western Ghats.

Biodiversity hotspots

Norman Myers used the term "biodiversity hotspot" in the late 1980s to describe "particular locations on Earth's terrestrial surface harboring abnormally large numbers of living species" (Reid 1998).

Initially, based on the diversity of higher plant species, a list of 18 biodiversity hotspots was compiled (Mittermeier et al. 1998). Later, further places were added, bringing the total number of biodiversity hotspots to 25. (Fisher & Christopher 2007; Laurance 2007b). A total of 35 biodiversity hotspots have been identified as of now (Laurance, 2007a; Williams et al. 2011). The additional areas were chosen because they had a higher number of plant, animal, reptile, bird, and amphibian species, which are easily identifiable indicator taxa (Myers 1988, 1990 & 2001; Myers et al. 2000). The methods for locating biodiversity hotspots have been considerably updated and developed since then (Myers 2003). The level of threat in these places was an essential consideration.

The Western Ghats are one of the original 18 globally recognized biodiversity hotspots, with international and national recognition. The mountain range, which stretches across six western Indian states, is said to be older than the Himalayas (Kumara & Singh 2004; Pai 2005). Maharashtra is the most urbanized and industrialized of these six states (Mohan & Pant 1982; Ghatge et al. 2013). As a result, the northern Ghats have stronger consequences and pose a bigger threat to biological diversity.

Western Ghats – A global biodiversity hotspot

From Gujarat in the north to Kerala in the south, the Western Ghats mountain range stretches over 1600 kilometers and encompasses 1,60,000 square kilometers (Raman 2006; IUCN 2012). The Western Ghats' forest types range from deciduous in Gujarat to semi-evergreen in Maharashtra and Goa, and evergreen in Karnataka, Kerala, and Tamilnadu. Patches of evergreen forest can be found along the crest line of the Western Ghats in Maharashtra and Goa (Champion & Seth 1968; Reddy et al. 2015a). Pócs et al. (2007) found that the northern Western Ghats are drier than the southern Western Ghats. The Southern Western Ghats have a higher concentration of species and endemism (Gunawardene et al. 2007). In the northern Western Ghats, biotic pressures are more noticeable. As a result, effective biodiversity conservation in Gujarat and Maharashtra is critical.

More over 30% of India's plant and animal species are found inside the Western Ghats, which cover less than 6% of the country's surface mass (Das et al. 2006). Around 4,000 blooming species are found in the region, with 1500 (almost 38 percent) being indigenous to the Western Ghats (Nair & Daniel 1986; Bawa et al. 2011). The faunal diversity includes 508 bird species, 16 of which are endemic to the Western Ghats, 137 mammal species, 16 of which are endemic to the Western Ghats, 290 fish species, 189 of which are only found in the Western Ghats, 203 reptile species, 124 of which are endemic to the Western Ghats, and 181 amphibian species, 159 of which are endemic to the Western Ghats (Radhakrishnan & Rajmohana, 2012). Amphibians have the highest level of endemism in the Western Ghats (Das et al. 2006).

Western Ghats – Historical background

The first human footprints in the Western Ghats were discovered roughly 12000 years ago, during the Old Stone Age, or Paleolithic epoch (Thomas & Palmer 2007). Humans utilizing stone tools and Paleolithic artifacts recovered in the Western Ghats show that the ancient stone age people were hunter gatherers who caused little environmental disruption (Rajendran 1989; Unnikrishnan 1995; Chandran 1997). People transitioned from hunter gatherers to food growers during the Middle Stone Age, or Mesolithic period, which lasted from 12000 BP to 5000 BP. People may have burned the forest for sustenance during this time period, according to carbon dating (Chandran 1997). Primitive agriculture and pastoralism were introduced during the New Stone Age, or Neolithic period, which lasted from 5000 to 3000 years ago. Domestication of animals began around 4300 years ago. Around 3500 B.P., millets and horse gram were cultivated. Around 3400 to 2700 years ago, the Jorwe people in Maharashtra irrigated rice (Rao et al. 1971; Sahu 1988). There is evidence that the Jorwe community ate Konkan marine fish and other aquatic foods (Chandran 1997). There is evidence of iron use on a large scale during the Megalithic period, which lasted from 3000 to 2000 years ago. Agriculturalists began building dams and channeling water for developing cultivation around 3000 BC (Thapar 2002; Bharucha 2017). With the arrival of the Aryans, cattle rearing began (Sanyal 2012; Bharucha 2017). Between 2006 and 1700 BC, the Indus – Saraswati valley civilization began to establish cities with the help of a larger group of rural agriculturalists. The intensification of agriculture and pastoralism practices resulted in the clearance of forest areas in the Western Ghats. The soil in the Western Ghats was eroded by torrential rains, exposing rocky plateaus. The weathering of the rocks began as a result of this (Chandran 1997; Ranganathan et.al 2008).

RESEARCH METHODOLOGY

Study area – Western Ghats of Maharashtra

The research area is located in Maharashtra's Western Ghats (Map 1) and covers an area of 58,400 km2 (Zunjarrao et al. 2015). In Maharashtra, the area includes a National Park (Chandoli) and five Wildlife Sanctuaries (Kalsubai, Bhimashankar, Phansad, Koyna, and Radhanagri), as well as Gujarat's Purna Wildlife Sanctuary and Goa's Mhadei Wildlife Sanctuary (Table 1). (Trivedi et al. 2018). Tamhini Wildlife Sanctuary, which is located between Bhimashankar and Phansad Wildlife Sanctuary, was recently announced. The region is also designated as an Ecologically Sensitive Area, and it was included to UNESCO's World Heritage List in 2012. (IUCN 2012).

Detailed Biodiversity Assessment Tool

For evaluating the specifics of species and ecological values of these selected hotspots, a professionally designed evaluation method was devised. For the 'detailed biodiversity assessment tool,' this tool employed known quadrats/line transects when applicable. A collection of recognizable parameters were used in this tool. Size and shape of the hotspot, forest structure, vegetation analysis, mammalian, avian, and reptile surveys, availability and consumptive and productive use of natural resources, ecosystem services available, historic practices, and current concerns were among the factors. By getting GPS co-ordinates and entering the information into GIS software, the shape and size of the hotspeck were estimated. For the vegetation analysis, the point centered quarter (PCQ) approach was employed to calculate the number of trees per hectare (James & Shugart Jr 1970; Mitchell 2010).

The line transect approach was used in conjunction with the point centered quarter method to assess vegetation in sacred groves. To eliminate bias owing to the edge effect, the distance between two transects was 20 meters, and the initial and last transects were 5 meters apart from the grove boundary. On these transects, points were placed, and the closest tree in each quadrant was noted, along with its species name and trunk girth at breast height.

Because there were no precise forest limits outside the forts' walls, random places were chosen for the forts. A minimum of 50 points were recorded, with the nearest tree in each quadrant being noted, as well as the species name and trunk girth. Due to steep near-vertical slopes and a great risk of falling, this was not feasible in some circumstances.

A set of random places were chosen for assessing plateaus, and quadrats of 100 cm2 were laid on these points, with species in the quadrats being recorded (Hill 2005). The trees, herbs, and shrubs have all been identified. Endemism and threatened category were used to identify and assess endemic and threatened species.

With the use of the Mooseborn technique, also known as canopy scope, the canopy cover of forts and sacred groves was determined (Bhagwat 2005b). A clear Perspex screen with a 20-cm rope attached to one corner serves as the canopy scope. The rope is used to keep the screen at the same distance from the eye at all times. In a 5 5 square array, the screen is engraved with 25 dots, each around 1 mm in diameter and spaced 3 cm apart (center to center).

Sightings, tracks, and signs, as well as information from locals, were used to conduct a mammalian and reptile survey (Hill 2005). Bird surveys were conducted using the point-centered quarter method. The avian survey took 15 minutes at each location, and the birds seen were documented (Wiens & Rotenberry 1981). The minimum distance between two points was 50 meters. According to the Wildlife Protection Act of 2002, the existence of animals, birds, and reptiles documented during the survey was graded based on their IUCN endangered category and schedule list.

The site's unique features, such as large girth trees, nesting and roosting areas for forest birds, were also noted. Natural resource availability and consumption patterns, as well as ecosystem services such as habitat function, regulation function, production function, and information function, were observed (De Groot et al. 2002).

Different forms of traditional practices that are done and lead to the conservation of sacred groves and forts were recorded and assessed based on the level of conservation through these traditional practices for sacred groves and forts.

During the survey and via local interviews, threat patterns that affect the hotspeck were recorded. The spatial data collected during the survey was loaded into ArcGIS software, and a database was created to prioritize the hotspots.

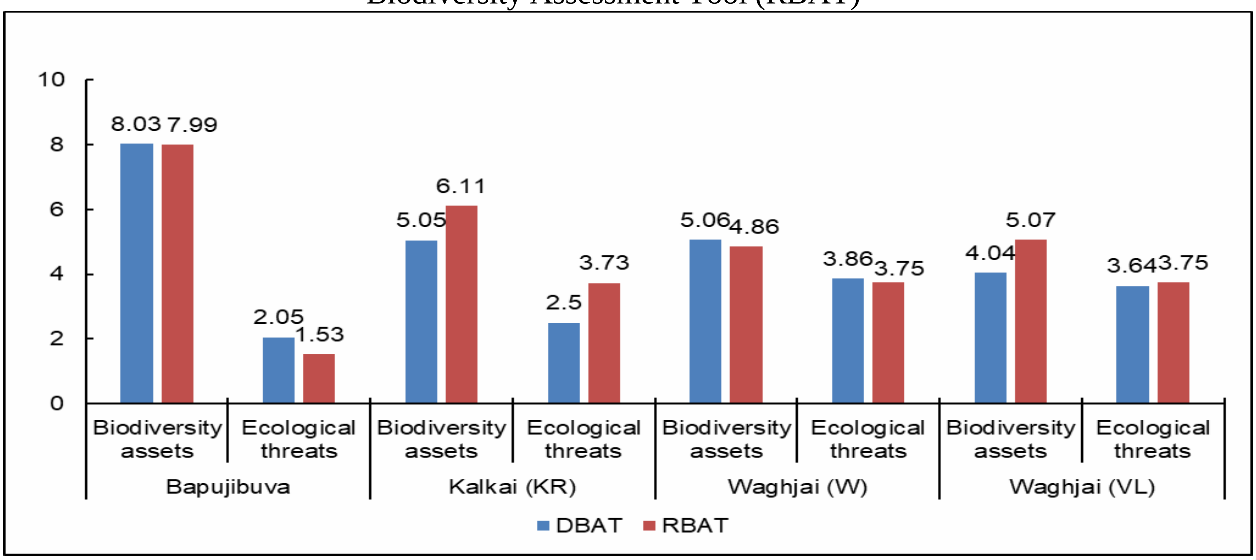
For the interviews, a set of questions was created. The in-depth interviews with the local communities are a significant aspect of the study since the information gathered from them reveals the present management strategies used by the local communities to conserve the hotspeck, if any exists. This also aided in identifying communities where Biodiversity Management Committees and People's Biodiversity Registers were formed or may be formed through Maharashtra State Biodiversity Board capacity building.

RESULTS AND DISCUSSION

Comparative analysis of Detailed and Rapid Biodiversity Assessment Tool

The initial Detailed Biodiversity Assessment Tool and the subsequent updated Rapid Biodiversity Assessment Tool scores of the four sacred groves were analyzed and compared. The graphs revealed a modest distinction between extensive and quick evaluation. Because the rapid assessment was done by visual interpretation, the score achieved for biodiversity and threat was higher than the full assessment. This demonstrates that fast assessment is a useful approach for ground truthing in such a broad-based investigation and only requires modest training for frontline employees and the local population.

Figure 1: Comparison of Detailed Biodiversity Assessment Tool (DBAT) and Rapid Biodiversity Assessment Tool (RBAT)



Analysis of Rapid Biodiversity Assessment Tool scores

The 51 discovered hotspecks in three different conservation typologies were prioritized in this study. Two locale-specific tools are used to prioritize the tasks. The first prioritizes biodiversity asset values, separating places with high levels of biodiversity from those with considerable, moderate, and low levels of biodiversity. The second part is centered on describing the magnitude of ecological threat levels, which range from high, considerable, moderate, and low. This serves as a predictor of future changes in the terrain.

As the value of current biodiversity assets (green bars) drops, the amount of ecological risks (red bars) increases, as shown in the graphs.

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Figure 2: Sacred Groves – Biodiversity assets vs Ecological threats

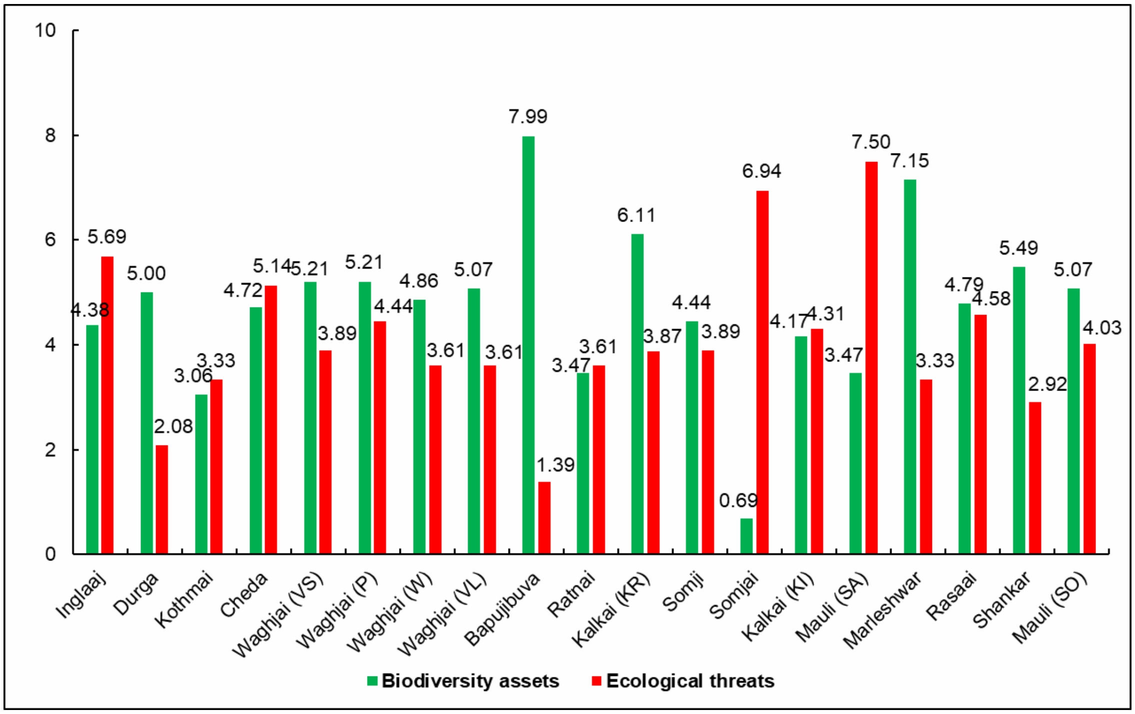


Figure 3: Forts – Biodiversity assets vs Ecological threats

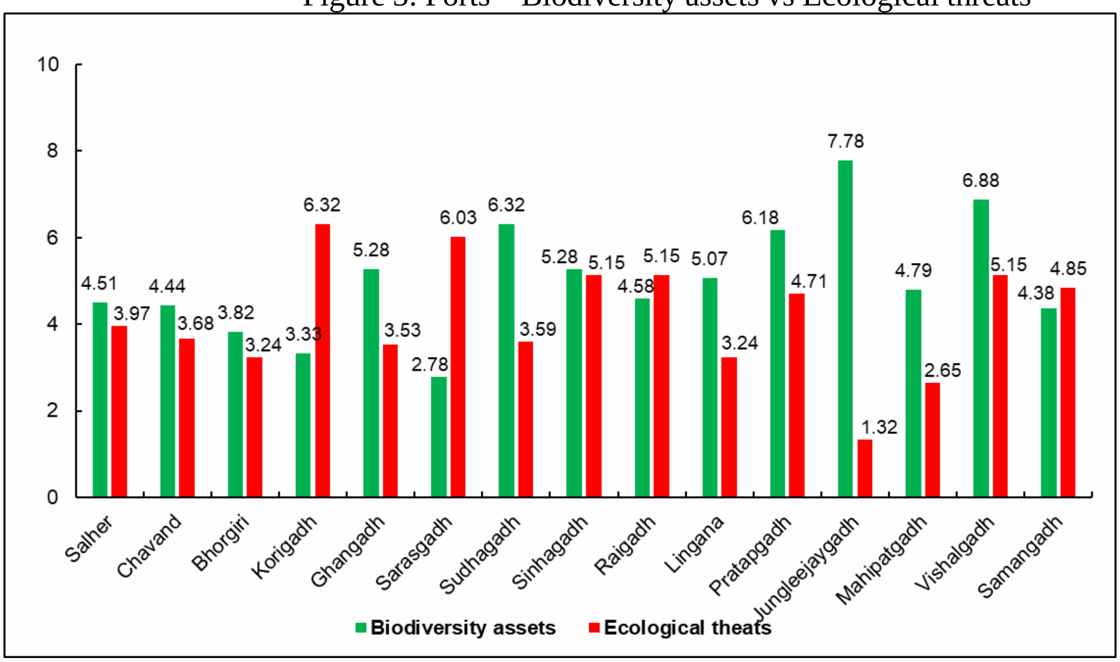
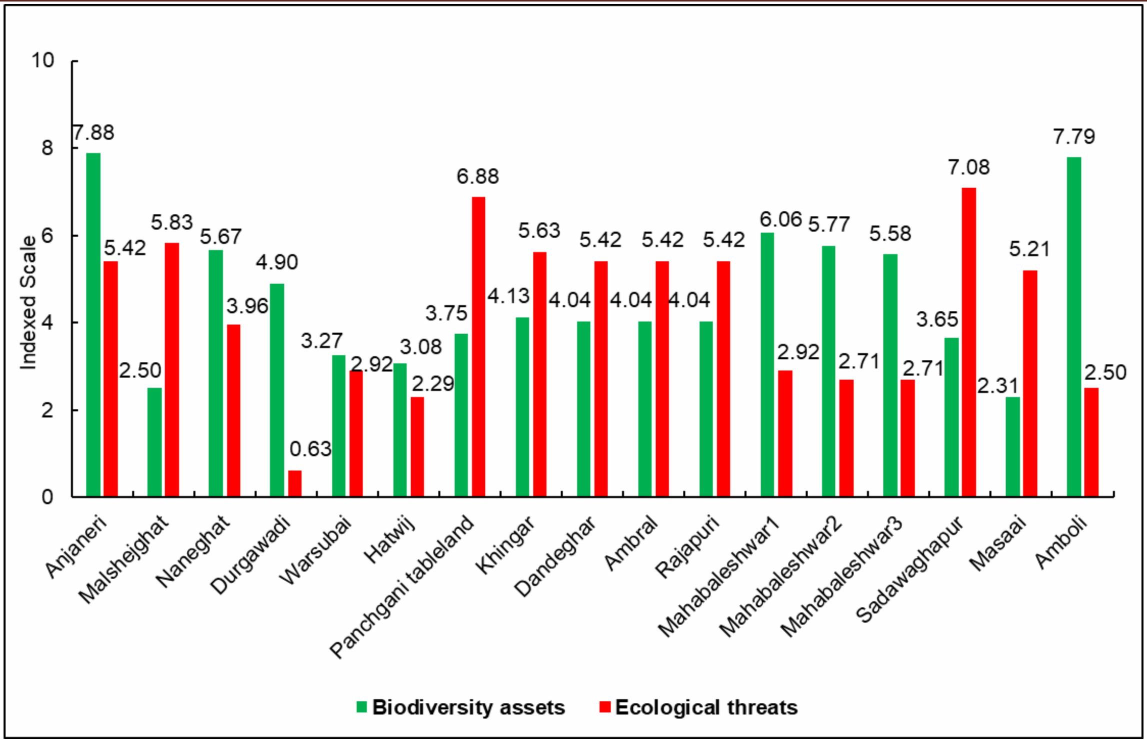


Figure 4: Plateaus – Biodiversity assets vs Ecological threats



Prioritisation matrix of hotspecks

In the prioritising matrix, the final biodiversity and threat values for each of the hotspeck typologies were shown. The prioritising matrix divided the 19 sacred groves, 15 forts, and 17 plateaus into 16 separate groups (tab.27, tab.28 & tab.29). The majority of the hotspecks were found to be moderate to considerable biodiversity assets and ecological threats, according to the findings. The biodiversity of one sacred grove, fort, and plateau was unusually high.

CONCLUSION

A review of relevant literature and expert knowledge yielded a list of 14 hotspeck typologies, of which sacred groves, forts, and plateaus were chosen for survey because they are key sites and easily delineated. The hotspecks belonging to each of the three typologies were plotted on a map of the research region, and hotspecks were chosen for ground survey using a random sample technique. Originally, a Detailed Biodiversity Assessment Tool was created to assess the identified biodiversity hotspots. According to a pilot survey of the hotspecks, this assessment technique is not feasible on the ground because it is time consuming and requires highly educated professional labor. Each hotspeck would necessitate field surveys utilizing transects/quadrat studies, which are not required for the prioritization process that local forest frontline employees can perform across thousands of hotspecks to select a few best-case scenarios. The formal assessment technique would necessitate extensive research, financial resources, and specialized knowledge. A sacred grove survey took at least three days using the Detailed Biodiversity Assessment Tool. The number of days required to survey forts and plateaus would grow due to their huge size. Because of this deficiency, a Rapid Biodiversity Assessment Tool was created to examine these hotspots.

The fast assessment method included a number of key criteria that were categorized into biodiversity assets and ecological dangers, with subcategories in between. Internal, external, traditional, economic development, current, and potential risks in the near future were all classified as ecological threats. The last one shows how the 'precautionary principle' is used to biodiversity and environmental management.

A series of questions was created, and semistructured open-ended interviews with the local communities were undertaken. This study took a transdisciplinary approach, bringing together locally relevant data from the Rapid Biodiversity Assessment Tool with what local people have noticed over time. As a result, the bias of a single brief one-time observational research is eliminated.

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