

First Prof. R. Misra Birth Centenary Lecture
Of Rivers, Fish and Poison

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ABSTRACT

Every one of the diverse ecosystems of the Indian subcontinent is being degraded to some measure; but it is the freshwater ecosystems that are under the greatest threat. The root causes of this degradation lie in human institutions, in the inequities that plague our society. A significant number of our people depend directly on natural resources for their livelihoods. These “ecosystem people”, however, have little control over the resource base. Instead the patterns of natural resource use are dictated by an “Iron triangle” of urban population, industry and large land-holders who are the beneficiaries of the supply of a variety of natural resources at highly subsidized rates, the politicians who decide as to who gets what subsidies and the administrators who implement them. Insulated from the effects of resource depletion, these constituents of the iron triangle promote exhaustive patterns of natural resource use whose adverse consequences are felt primarily by the rural landless, small-holders, artisans, herders, tribals, and fisherfolk. It is these ecosystem people who have a far greater stake in a healthy environment, and their empowerment and involvement holds the promise of eventually slowing down a continuing meltdown of our ecosystems.

India’s Biological Diversity Act is a welcome move towards engaging and empowering these people. The Biodiversity Management Committees that are being established under this act in all panchayat raj institutions and town and city municipalities would be engaged in documenting local ecosystems in the form of “People’s Biodiversity Registers”. Biodiversity Management Committee study groups comprising interested BMC members, students, and teachers from colleges/ high schools, volunteers from CBOs, NGOs, and knowledgeable individuals representing different stakeholder groups would carry out this task. This exercise would focus on the documentation of people-natural resource links, landscape/ waterscape of the study area, local biodiversity elements, people’s knowledge associated with biodiversity, and people’s perspectives on management issues, culminating in the formulation of a management plan to support the functioning of the local Biodiversity Management Committee. A pilot exercise on the preparation of People’s Biodiversity Registers was conducted in Mendha (Lekha), a primarily tribal village of eastern Maharashtra. This village is notable for many community level initiatives towards sustainable management of natural resources. We report here the components of the People’s Biodiversity Registers exercise focusing on perhaps the most threatened of our ecosystems, namely the freshwater bodies. The major aquatic habitat of the locality is the Kathani river. It is fished by Dhivars, a community of specialist fisherfolk and Gonds who primarily fish for self consumption, and who participated in this study along with local students, teachers and scientists from the Indian Institute of Science.

The study involved catching and releasing back to the river 1508 individuals through 146 fishing events. This sample comprised 32 species of 24 genera. Gonds reported 43 distinct fish names, while Dhivars reported 63. The total number expected to comprise the pool of species from which the sample was drawn is 64. About 70% of the fish species are reported to be declining, 5 species including *Anguilla bengalensis* are reported to have gone locally extinct, while 4 new species, primarily “Invasive Aliens” like Tilapia are reported to have appeared newly.

The study led to an in-depth understanding of the diversity of factors responsible for habitat destruction and fish population depletion, including insights such as the possible impact of ash generated by forest fires. The people already possess a variety of traditional conservation practices such as protection to sacred river stretches and species. To this, prompted by the study, people have added banning of use of all poison, herbal and synthetic, for

fishing in Kathani river. This ban is applicable to a cluster or *Ilakha* of 32 villages including Mendha (Lekha) and has been effectively implemented for the past three years.

Key Words: Fish Diversity, People's Biodiversity Registers, River Kathani, Traditional Knowledge,

ECOSYSTEM PEOPLE, ECOLOGICAL REFUGEES AND OMNIVORES

It is a great honour to have been invited to deliver the first Prof. R. Misra Birth Centenary lecture. This pioneer of Indian ecology gave the National Institute of Ecology its logo, including the verse 'रक्षये प्रकृतिं पातु लोकाः' or 'Let people be enabled to guard nature'. I hope to demonstrate in this talk the significance of this proclamation.

Every one of the diverse ecosystems of the Indian subcontinent is today being degraded to some measure; but it is the freshwater ecosystems that are under the greatest threat. The root causes of this degradation lie in human institutions, in the inequities that plague our society. People of India belong to three major ecological categories, namely, ecosystem people, ecological refugees and omnivores. The majority live in villages, hamlets and nomadic camps, often much as their ancestors did, and depend on natural resources such as water, fish, fuel and fodder garnered from their surroundings to meet many of their basic needs. To this category belong tribals, nomadic herders, artisanal fisherfolk, peasants and agricultural labourers. Following Dasmann (1988) we may call them *ecosystem people*. A significant proportion of these have been alienated from their traditional resource base, for example, by submersion of their lands under dams or have been deprived of it by compulsions of population growth. They have gone on either to encroach on forests (as on Western Ghats slopes or Andaman Islands) or, more often, have ended up in city slums. We may term these uprooted people with limited resource access, *ecological refugees*.

A minority of India's people, around one-sixth, are larger landowners in tracts of intensive agriculture or work in organized industries and services. Together they hold all the power; economic, political, administrative and employ it to draw resources, often, with high levels of state subsidies from a wide catchment to satisfy their much larger resource demands. They thus constitute an 'iron triangle' to borrow a term from political science (Figure 1). Unlike ecosystem people, they suffer little from resource exhaustion in any particular locality. If the river Ganga is polluted, they

can eat fish grown in ponds of Orissa; if the timber of the Western Ghats is exhausted, they can get it from Andamans or Malaysia. Devouring all manners of resources brought from everywhere, this component, termed *biosphere people* by Dasmann may, more appropriately, be termed *omnivores* (Gadgil and Guha 2001)

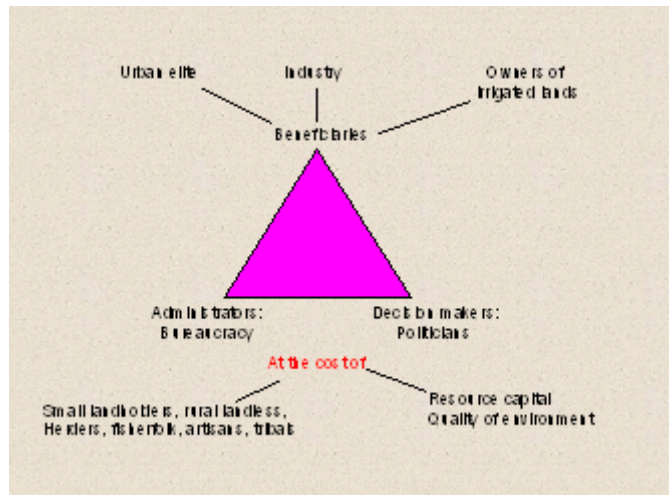


Figure 1. Operation of the iron triangle controlling the utilization of India's natural resource base.

OF PRUDENCE AND PROFLIGACY

The motivation of any segment of Indian society for sustainable or exhaustive resource use is governed by its relation to the resource base. People rooted in a locality dependent on resources drawn from a limited area that they are personally familiar with, are much more likely to identify their own interests with the health of their resource base. Of course, their motivation to utilize the resources sustainably also depends on how firmly they are in control of the resource base and on whether they can exclude outsiders and regulate the behaviour of their own group members. This is because only such authority can ensure that they reap long-term benefits of prudent resource use. Furthermore, people are only likely to practice prudence if they perceive the resource base as finite and limited. If, on the other hand, they

have open to them possibilities of access to resources of newer and newer localities or of newer and newer kinds, as resources in use earlier are exhausted, they are apt to use them in a profligate fashion.

This suggests that the social group most likely to practice prudence is the ecosystem people in control of resources of their immediate vicinity. But in India, such a situation is presently an exception. By the large, the country's resources are under firm control of an alliance of industry—bureaucracy—landlords—politicians, the core of omnivores. Given the large area from over which they can draw resources and perception of an ever-expanding resource base thanks to technological innovations, the omnivores have little reason to care for its sustainable use. Exhaustive patterns of resource use are also the rule with the bulk of ecosystem people lacking control over their resource base, including the uprooted ecological refugees. No segment of the Indian society is then presently motivated to use environmental resources in a prudent fashion. This is the dilemma that underlies India's environmental crisis (Gadgil and Guha 2001).

ADAPTIVE MANAGEMENT

The alliance of industry — bureaucracy — landlords — politicians monopolizing all decisions relating to use of natural resources has instituted an unfair, as well as an inflexible, system of resource management. This flies in the face of the most significant lessons emerging from the modern science of complexity. This is the growing appreciation of the limits to predictability in complex systems, and therefore the need to eschew rigidity in systems of natural resource management (Hilborn and Ludwig 1993, Ludwig et al. 1993). The tragedy of Keoladeo National Park at Bharatpur provides an excellent case in point. The Bharatpur wetlands, famous for the large heronries in the rainy season and the enormous flocks of migratory birds visiting in winter, was one of the first wildlife sanctuaries to be created after independence at the instance of Dr Salim Ali in the 1950s. He had worked for years at Bharatpur, banding thousands of migratory birds. Bharatpur had been subject to grazing by buffaloes and other uses such as collection of khus grass by local people for centuries, and had remained a biodiversity rich habitat. However, Dr Salim Ali felt that the habitat would greatly benefit from a cessation of buffalo grazing and was supported by experts of the International Crane Foundation. These recommen-

dations led to the declaration of the locality as a National Park in 1982. The rigid regulations applicable to a National Park called for total cessation of livelihood activities of local people, so buffalo grazing was banned without any alternatives being offered. There were protests; seven people were killed in the firing that followed, but the ban was enforced.

This intervention led to a totally unexpected outcome. It turned out that buffaloes were keeping under check a water loving grass *Paspalum*. When grazing stopped, this grass grew unchecked, rendering the wetland a far worse habitat for waterfowl, the prime objective of the National Park management (Vijayan 1987). The numbers of visiting Siberian cranes have also been declining. Residents of the village Aghapur adjoining the National Park have an intriguing suggestion in this regard. They believe that Siberian cranes earlier had better access to underground corms and tubers, their major food, because the soil used to be loosened while digging for khus roots. Since this collection was stopped on declaration of National Park, the soil has been compacted reducing their access to this food. This is a plausible hypothesis worth exploring further (Gadgil et al. 2000).

So, given the uncertainties in understanding and predicting the behaviour of complex ecosystems like the Bharatpur wetland, how do we proceed? The modern theory of management of living resources proposes that we should, in all humility, accept severe limitations to our current ability to predict future behaviour of complex natural systems, and focus on providing more limited, context specific prescriptions. Moreover, we should make extensive use of detailed locality and time-specific, including historical, information. We should organize a system of on-going monitoring of the situation on the ground and continually feed this information into updating management prescriptions. Such a system has been termed an "adaptive management system" (Walters 1986).

Indeed, it is widely acknowledged now that, today, ecologists are in no position to offer any general guidelines for managing biodiversity or other natural resources that would be of practical value in the field. Thus, there are no universal laws, for instance, that all human uses would lead to erosion of all forms of biodiversity. Some uses would lead to erosion of some components of biodiversity, other uses to enhancement of other components. Since sweeping generalizations are not feasible, what is required is to try out various options, monitor the consequences, and make corrections as we go along.

Such an adaptive approach would firstly attempt to put together all available information, including practical ecological knowledge of local people, to assess what measures might be favourable; such as, enhance the ability of wetlands like Bharatpur to support water birds. If such an assessment suggests the possibility that an elimination of grazing by buffaloes may be helpful, a decision could be made to explore the consequences of such elimination. This would not involve a complete ban for all times at all. Instead, it would entail elimination of grazing in some parts of the wetland, initially for a year. The consequences of such elimination would be carefully monitored, preferably in a transparent and participatory manner, by involving local students, teachers and community members, and assessed. If this suggests a beneficial effect, there could be a continuation and perhaps increase in the portion of wetlands where grazing was eliminated. If it suggests a negative effect, the area over which grazing was eliminated would be reduced, and careful monitoring continued over the area on which grazing is regulated to assess if elimination of grazing over two consecutive years turns out to be helpful. There would be a further assessment after two years; and so on. This would undoubtedly be a far better way, both practically and scientifically to manage complex systems like ecosystems.

Indeed, as Slobodkin (1988) puts it, ecologists at their best remain naturalists, aided by modern technology and computational devices, but for most practical purposes relying on accumulated experience. Many people of our countryside, too, are engaged in accumulating pertinent ecological experience while pursuing their manifold subsistence activities. The level of detailed ecological monitoring that they undertake out of sheer necessity to eke out livelihoods cannot be matched by any formal scientific effort, in spite of all our advances in remote-sensing and informatics. What is then needed is to organize a system of utilizing the information being thus continually gathered by the ecosystem people in the task of adaptive management of ecosystems (Gadgil 1996a, Gadgil 2000, Gadgil et al. 2000, Gadgil and Rao 1998, Shindler and Cheek 1999, Shrader-Frechette, and McCoy 1993).

COMMUNITY-BASED MANAGEMENT

In fact, where people have been involved in managing local natural resources on their own, they tend to adapt a flexible system akin to this concept of adaptive

management. This, for example, has happened in case of many self-initiated, informal Village Forest Committees of Orissa. Dhani forest committee of Nayagarh district is one such. It brings together five villages and has promoted the regeneration of 840 hectares of forest tract since 1987. The general body of the committee oversees the management of the forest as well as issues such as framing rules, resolving conflicts, taking action against offenders, and distributing benefits. The general body has a regular meeting once a year. But in an emergency- such as a forest offense or amendment of existing rules, a meeting of the general body can be called at any time. Over the years the committee has changed its rules in response to changing conditions. In the first year of operations, for instance, no people or cattle were permitted to enter the forest. After that the area was opened for grazing outside the rainy season from October to June. At the same time, people were permitted to enter the forest to collect dry and fallen wood and leaf litter between July and February. Subsequently, poor members of the community were permitted to extract a limited quantity of fuel wood. Restoration of the vegetation has also led to the return of wildlife to the area. The Dhani Village Forest Committee considered a proposal to declare the forest a wildlife sanctuary. But the proposal was rejected on the grounds that it would lead to a take-over by the government and denial of villager access to forest resources that had been replenished by their voluntary efforts (Perrings and Gadgil 2003).

There are however distinct limitations to local level management in the absence of an enabling environment. These include major problems that plague governance in our society at all levels, such as social divisions, politicization, and consequent difficulties in fostering cooperative activities. However, the key local level issue is the lack of secure rights over water, biodiversity and other natural resources and of any authority to prevent misuse by outsiders as also local community members (Ministry of Environment and Forests 2006). Over the years a number of attempts have been made to overcome these problems, some as old as the provision for constitution of "Village Forest" in the Indian Forest Act 1928. Other important initiatives include the Joint Forest Management Programme (JFM), formally in force since 1991, the Extension of Provisions of Panchayati Raj to Scheduled Areas Act (PESA) 1996, the Biological Diversity Act (BDA) 2002 and most recently, the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of

Forest Rights) Act (TFRA) 2006 (Gadgil 2007, 2008). TFRA very specifically visualizes empowering Gram Sabha and village level institutions to protect the wild life, forest, and biodiversity, of aquatic as well as terrestrial ecosystems. It confers on the forest dwellers the responsibilities and authority for sustainable use, conservation of biodiversity and maintenance of ecological balance. Complementary provisions exist under the Biological Diversity Act, which aims to promote conservation, sustainable use, and equitable sharing of benefits of India's biodiversity resources, including habitats, cultivars, domesticated stocks and breeds of animals and microorganisms, on public as well as private lands. With this in view it provides for the establishment of a National Biodiversity Authority (NBA), State Biodiversity Boards (SBB) and Biodiversity Management Committees (BMC) at the level of Panchayats (gram, taluk and zilla), Municipalities and City Corporations. The BMCs are authorized to regulate harvests of biodiversity resources within their jurisdiction, and to charge collection fees for this purpose. They will have at their disposal "Local Biodiversity Funds" into which such income, as well as other grants will be deposited. The NBA is authorized to scrutinize all Intellectual Property Rights related applications and ensure that they properly acknowledge the contributions of providers of indigenous knowledge. NBA is expected to consult all local BMCs in this respect and to ensure appropriate arrangements for equitable sharing of benefits. It is clearly appropriate that the gram sabha under the TFRA should perform the functions assigned to the Biodiversity Management Committees under the Biological Diversity Act (Gadgil et al. 2006).

There is today a certain lack of clarity as to the domain over which Biodiversity Management Committees will have the authority to operate. TFRA can help clarify these issues. In light of this act, the jurisdiction of BMCs may be taken to extend over not only revenue lands, but customary common forest land, including water bodies, within the traditional or customary boundaries of the village or seasonal use of landscape. These forest lands would include protected and reserved forest as well as areas under Wildlife Sanctuaries and National Parks. The rights of the Scheduled Tribes and other Traditional Forest Dwelling communities include the right to protect, regenerate, conserve, or manage any community forest resource, including fish and shellfish which they have been traditionally protecting and conserving for sustainable use.

Coming back to Biological Diversity Act, the rules promulgated under this Act, in force as of 15th April 2004, include the following provisions:

22. Constitution of Biodiversity Management Committees

(1) Every local body (i.e. Panchayat, Municipality etc.) shall constitute a Biodiversity Management Committee (BMC) within its area of jurisdiction.

(6) The main function of the BMC is to prepare People's Biodiversity Register in consultation with local people. The Register shall contain comprehensive information on availability and knowledge of local biological resources, their medicinal or any other use or any other traditional knowledge associated with them.

(7) The other functions of the BMC are to advise on any matter referred to it by the State Biodiversity Board or Authority for granting approval, and to maintain data about the local vairs and practitioners using the biological resources.

(8) The National Biodiversity Authority (NBA) shall take steps to specify the form of the People's Biodiversity Registers, and the particulars it shall contain and the format for electronic database.

(9) The NBA and the State Biodiversity Boards shall provide guidance and technical support to the Biodiversity Management Committees for preparing People's Biodiversity Registers.

(10) The People's Biodiversity Registers shall be maintained and validated by the Biodiversity Management Committees.

The Committee shall also maintain Register giving information about the details of the access to biological resources and traditional knowledge granted, details of the collection fee imposed and details of the benefits derived and the mode of their sharing.

Thus, all local bodies in the country, Gram, Taluk, and Zilla Panchayats, Town Municipalities and City Corporations would have the responsibility of documenting:

- Comprehensive information on availability and knowledge of local biological resources, their medicinal or any other use or any other traditional knowledge associated with them;
- Data about the local vairs and practitioners using

the biological resources;

- Details of the access to biological resources and traditional knowledge granted, details of the collection fee imposed and details of the benefits derived and the mode of their sharing.

PEOPLE'S BIODIVERSITY REGISTERS

A "People's Biodiversity Register" is much more than a simple list of plant and animal species and of varieties of cultivated crops and domesticated animals along with a record of folk knowledge of medicinal and other uses of living organisms. Rather, it is designed to serve as a component of the societal knowledge base for conservation, sustainable use, and equitable sharing of benefits of biodiversity. Such an exercise may be organized on behalf of Biodiversity Management Committees through a study group comprising: (1) Interested BMC members, (2) Students and teachers from local colleges/ high schools, (3) Volunteers from CBOs, NGOs, and (4) Knowledgeable individuals representing different user groups.

Biodiversity, as defined in the Biological Diversity Act, is the variability at the genetic, species as well as ecosystem levels. Hence, a PBR not only focuses on species and varieties, but is also concerned with maintenance and prudent management of ecosystems such as forests and grasslands, rivers, ponds and coral reefs. PBRs involve documentation of the many facets of people-ecosystem interactions as well. The PBR documentation focuses on the following elements:

People- natural resource links,
 Landscape/ waterscape of the study area,
 Local biodiversity elements,
 People's knowledge associated with biodiversity,
 People's perspectives on management issues,

Culminating in the formulation of a:

Management plan to support the functioning of the local Biodiversity Management Committee.

With this in view, it is proposed that the exercise encompasses six major classes of entities, namely: (1) People and institutions, (2) Knowledge, (3) Concerns, (4) Activities, (5) Species and other taxonomic categories, and (6) Habitats. Figure 2 depicts the most significant relationships amongst these classes of entities; additionally there are many other relationships

not depicted in this diagram. Thus knowledge not only underpins concerns and activities, it pertains to species and habitats, and so on. Hence, unlike the sectoral approach of the Forest Working Plans, the PBR approach is based on a systems perspective, and may use a very user-friendly RDBMS to facilitate effective planning of resource use.

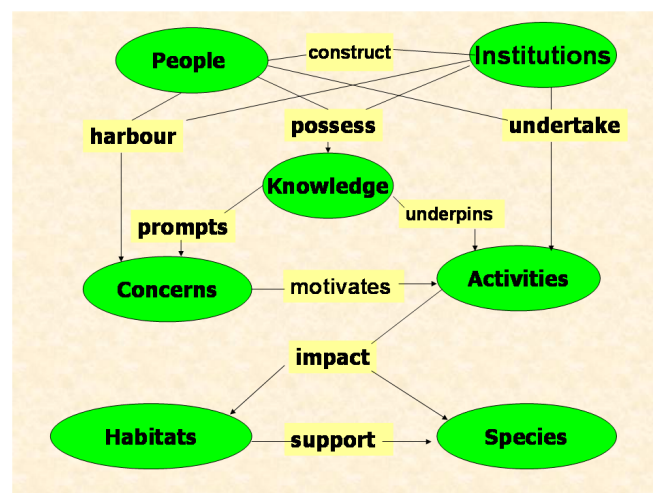


Figure 2. Schematic representation of the main classes of entities and their major relationships pertinent to a People's Biodiversity Register exercise

A great deal of experience has accumulated over the years in designing the People's Biodiversity Registers since the initiation of the programme by Foundation for Revitalization of Local Health Traditions, Bangalore, to record the rapidly eroding folk knowledge of medicinal uses of plants in 1995 (Gadgil 1996b). Two other NGOs, Navadhanya of New Delhi and Deccan Development Society of Hyderabad continued the activity, focusing on recording the occurrence and management practices of land races of cultivated crops to support their on-farm conservation, as well as promotion of farmers' rights. Kerala Sastra Sahitya Parishat, the leading People's Science Movement of the country went on to prepare PBRs covering all 85 gram panchayats of the district Ernakulam over 1998-99 as an element of the people's planning movement in the Kerala state (Ernakulam District Biodiversity Committee 1999). The M.S. Swaminathan Research Foundation of Chennai has prepared PBRs in Wynad district of Kerala and Paschim Banga Vigyan Manch and Society for Environment and Development of

Kolkata at several sites in West Bengal with a similar motivation. Following the passage of the Biological Diversity Act, the Madhya Pradesh Biodiversity Board vigorously propagated the preparation of PBRs in representative localities in all of the state's eco-regions over 2004-05. However, the most systematic attempt of preparation of PBRs, covering 52 sites in 7 states and UTs, was undertaken by a network coordinated through the Centre for Ecological Sciences, Indian Institute of Science, Bangalore, initiated as a part of the Biodiversity Conservation Prioritization Programme sponsored by WWF (India) over 1996-98 (Gadgil et al, 2000). Subsequently, the Union Ministry of Environment and Forests, funded CES to conduct pilot exercises of preparation of PBRs in a number of Gram Panchayats in the states of Karnataka and Maharashtra. Furthermore, CES was asked to conduct five Regional Workshops at Bangalore, Pune, Delhi, Bhuvaneshwar and Guwahati during 2003 to discuss the methodology of PBR preparation with a range of stake-holders including technical experts from Universities, research institutions, Botanical and Zoological Surveys, Forest and other Government Departments, school and college teachers, workers from NGOs, and members and office-bearers from Panchayat bodies. Assimilating all this experience, CES has formulated an appropriate methodology and designed a Relational Database Management System called "PeBINFo" for this purpose (Gadgil et al. 2006).

MENDHA- LEKHA EXPERIENCE

A pilot exercise on the preparation of People's Biodiversity Registers was conducted in Mendha (Lekha) ($20^{\circ} 11' 55''$ to $20^{\circ} 14' 48''$ N lat and $80^{\circ} 15' 55''$ to $80^{\circ} 19' 26''$ E long), situated in the *Dhânorâ* Taluk of *Gadchiroli* district, *Mahârâshtrâ* state, almost exactly at the geographical center of India (Figure 3). This primarily tribal village is notable for many community level initiatives towards sustainable management of natural resources. We report here the components of the People's Biodiversity Registers exercise focusing on perhaps the most threatened of our ecosystems, namely the freshwater bodies. The major aquatic habitat of the locality is the Kathani River, flowing at a distance of 1 km to the north of the Mendha (Lekha) village. It is fished by Dhivars, a community of specialist fisherfolk living in a nearby village Khursa and Gonds who primarily fish for self consumption, and who participated in this study along

with local students, teachers and scientists from Indian Institute of Science (Heda 2006, People of Mendha (Lekha), CES and Vrikshamitra 2006).

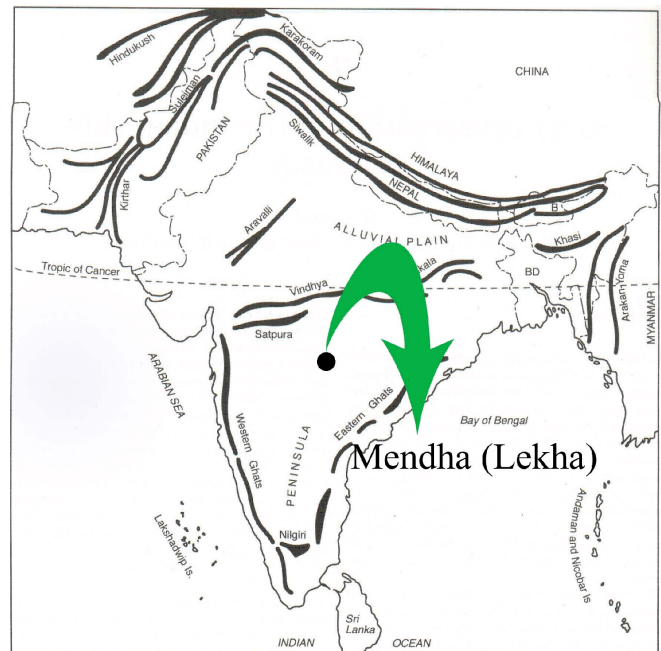


Figure 3. Geographical location of Mendha (Lekha)

Kathani, a mountain torrent River, flowing through a tract of dry deciduous forest, scrub and cultivation, originates in the *Dhanora Pendhri* hills at an altitude of 427 m and travels a distance of 70 km before joining *Wainganga*, a tributary of Gadavari, at an altitude of 170 m near *Gadchiroli* city. This region receives an annual rainfall of 1800 mm spread over 80 days from June to September. Kathani is a seasonal river that retains water only in a few deep pools in the summer. The river flows through sparsely inhabited area, and is not dammed, nor is it affected by any significant industrial pollution. Specifically, of 11 sampling sites on the river *Kathani*, six sites had good vegetation, two had moderate vegetation, one had sparse vegetation, and only one site at the confluence with *Wainganga* was totally devoid of riparian vegetation. Similarly, of 11 sites surveyed for river *Kathani*, 6 sites were unpolluted, 4 sites were moderately polluted, and only one site was extensively polluted. The river serves as a source of fish, water for irrigation and livestock for the local communities.

Medha (Lekha) is a *Gond* village with a population of 400. Most households cultivate paddy, with few external chemical inputs. Non-timber Forest Produce

like *Mahua*, gum, *Tendu* leaves and medicinal plants are also significant sources of income for them. Gonds fish entirely for self consumption. The village practices a unique system of local governance. It has its own laws, rules and regulations. All decisions regarding the village and its development are based on consensus at the Gramsabha, comprising all the adult residents. The villagers proudly proclaim: “*We have our government in Mumbai and Delhi; but, we are the government in our village.*”

Seventy families of Dhivars reside in *Khursa*, a multi-caste village (20°14'.394" N and 80° 09'.485" E), situated about 1 km north of the river Kathani and about 15 km from Mendha (Lekha). Dhivars are adept in various methods of river fishing and are regularly employed as workers on a ferry (Figure 4). They monopolize growing *Singada* or water nuts in tanks; they also grow melons, cucumbers and other vegetables on the sandy stretches along the banks of streams, but they do not excel at agriculture proper (Singh 2004).

Sampling and Group Discussions

The study involved catching and releasing back to the river 1508 individual fish through 146 fishing events, at six sampling points during January 2003 to September 2005. The sampling points were so selected as to ensure that: [1] All the part of river were covered, [2] All habitat type were covered, [3] Diverse human interventions were covered. Thus some sampling sites were adjacent to habitation, some were in undisturbed places and so on. Cast net, gill net, baited hooks and other locally available nets and traps were employed for sampling fish. After *in-situ* identification and counting, fishes were again released into water. Along with the scientific name of species, the local name of the species was also recorded. Additionally, the whole river was mapped in a participatory manner, recording local



Figure 4. A family of Dhivar community on the bank of Kathani river

names given to pools and river stretches. This brought out the very extensive understanding of the ecosystem by the local communities (Figure 5).

During group discussions, members of Gond as well as Dhivar community were requested to report on the following: (a) Current level of abundance, on a 4-point scale, namely, absent, rare, moderately common and abundant. Here, ‘absent’ implied that the species was present some time back, but has not been noticed now for several years. (b) Ongoing changes in the abundance of fish species, on a 6-point scale, namely, substantial increase, moderate increase, no change, moderate decrease, substantial decrease and now extinct. (c) Reasons behind ongoing changes in the abundance of fish species, (d) Use of fish species, (e) Occurrence of fish species in different habitat types, (f) Food and feeding behavior of the fish species, and (g) Seasonal abundance of the fish species.

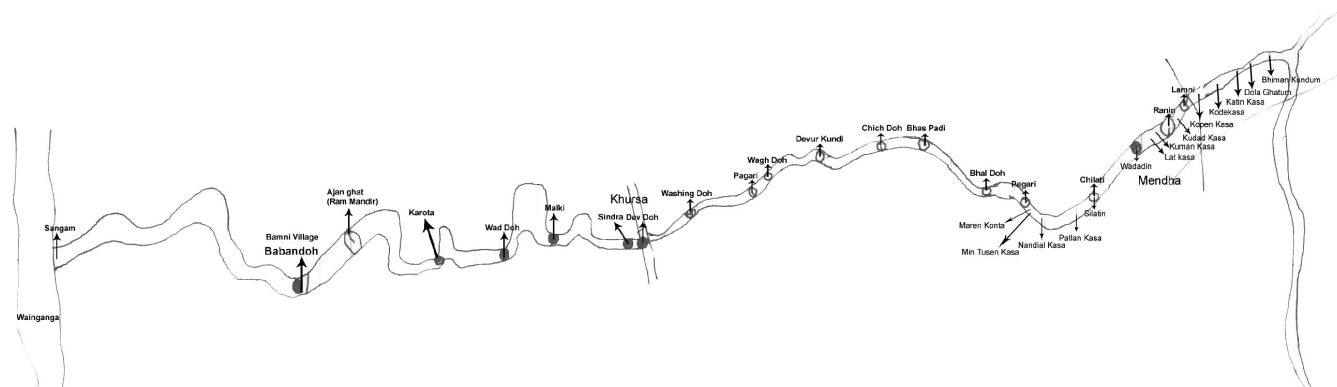


Figure 5. Sketch map of river Kathani indicating locally used names given to different places. Dhivar names are on the upper side, Gond names on the lower side. Map is not to scale.

Results

This sample of 1508 individuals yielded 32 species of 24 genera. During group discussions, the Gonds reported 43 distinct fish names, while Dhivars, with much greater involvement in fishing, reported 63. Statistical analysis suggests that the total number expected to comprise the pool of species from which the sample was drawn is 64 (Chao 1984, Magurran 2004). Evidently, Dhivars have a distinct name for all species present.

Figures 6 and 7 depict the perceptions of current levels of abundance of fish species and figures 8 and 9 the perceptions of trends of change in levels of abundance as reported by Gonds and Dhivars. By and large, there is a broad agreement, amongst the two communities. About 70% of the fish species are reported to be declining; 5 species including *Anguilla bengalensis* are reported to have gone locally extinct; while 4 species, primarily “Invasive Aliens” like Tilapia are reported to have newly appeared.

The group discussions yielded many insights into the reasons behind changes in fish abundance: [a] Over fishing because of human population increase, [b] Depletion of terrestrial wild fauna, creating additional pressure on the river for food, [c] Changing food habits of local people: People’s traditional food practices are changing day-by-day. Thus, earlier people used to eat NTFP like *Mahua* flowers, but this has now declined creating more pressure for food on the river, [d] Failure of aquaculture: In *Mendha(Lekha)* and adjoining villages the culture fishery is very poor or unsuccessful due to various reasons including lack of technical know how, increasing the pressure on the river fish. [e] Use of the chemicals in fishing: Non-tribal people from outside extensively use chemicals to poison fish. This has had a substantial negative impact. [f] Over use of river water for irrigation: Due to over use of the river water for irrigation, water availability in the river has decreased substantially, resulting in the drying of riverbed and depletion of fish fauna. [g] Forest fire effluent: *Gadchiroli* district is well known for its rich forest cover. During summer, forest fires generate massive amount of ash (*Nir* in local terminology). It has been reported that, in monsoon this ash mixes in water, which causes massive fish mortality.

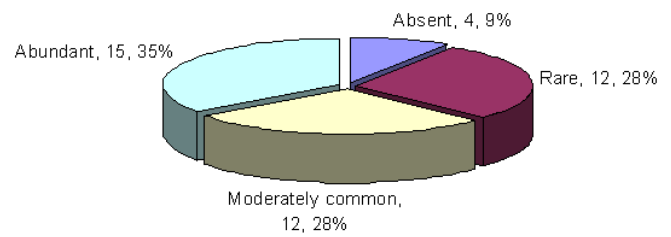


Figure 6. Current level of the abundance of 43 fish species according to Gonds

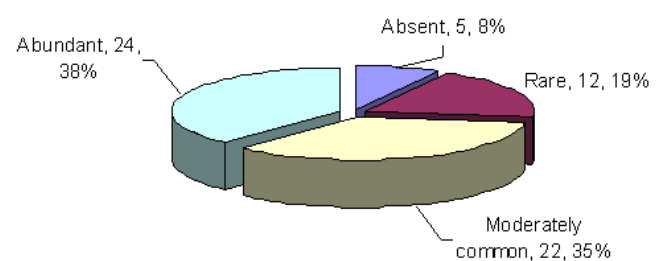


Figure 7. Current level of the abundance of 63 fish species according to Dhivars

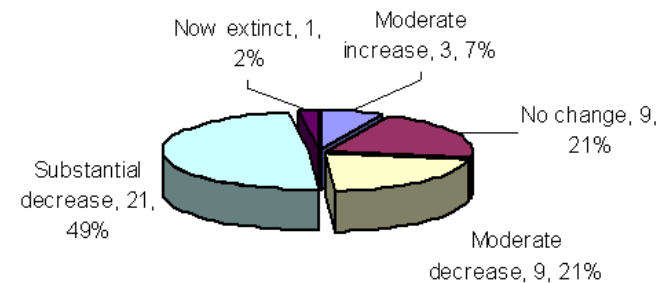


Figure 8. Trends in the abundance of 43 fish species according to Gonds

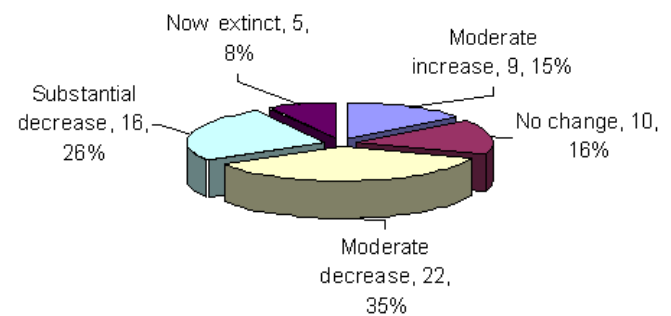


Figure 9. Trends in the abundance of 63 fish species according to Dhivars

Management Initiatives

Over years, the people of Mendha (Lekha) have taken a number of positive community initiatives in the area of natural resource management. These include:

- No encroachment on forest land
- Initiation and implementation of *Joint Forest Management*
- Daily forest vigilance, carried out equally by men and women members. Offenders are brought to the village and fined.
- Outsiders, including paper industry has been stopped from commercial extraction from forest.
- Bamboo harvest taken over by locals.
- Ban on cutting fruit trees.
- Ban on burning wood to prepare fields for cultivation.
- Wild honey extraction without killing bees.
- Use of Biogas
- Construction of 1000 gully plugs in the village area.
- Equitable distribution of cultured fishes from *van talab* to community members.

In this background, the People' Biodiversity Register study led to an in-depth understanding of the diversity of factors responsible for habitat destruction and fish population depletion, including insights such as the possible role of impact of ash generated by forest fires. The people already possess a variety of traditional conservation practices such as protection to sacred river stretches and species. To this, prompted by the study, people have added since 2006 banning of use of all poison, herbal and synthetic for fishing in Kathani river. This ban is applicable to a cluster or ilakha of 32 villages including Mendha (Lekha) and has been effectively implemented for the past three years. The residents of Mendha (Lekha) thus provide an excellent example of the validity of the maxim of the National Institute of Ecology coined by late Professor Ramdeo Misra, namely, रक्षये प्रकृतिं पातु लोकाः: Let people be enabled to guard nature.

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