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Research article

Scope and challenges of biodiversity conservation and mangement in Achanakmar-Amarkantak biosphere reserve

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Abstract: Achanakmar-Amarkanatak biosphere reserve (AABR) of India has been included under the World Network of Biosphere Reserves (WNBR) by the International Council of UNESCO's Man and the Biosphere Programme (MAB) meeting in Paris, 2012. This biosphere reserve is the ecologically diverse, less developed and least disturbed area, which falls under Deccan Peninsula biogeographic zone of tropical dry and moist deciduous forests biome of India. The forest land is protected in the core zone of AABR, while forests, agricultural and rehabilitated land in small suburban clusters are found in the buffer and transition zones. Twenty-seven tribal and non-tribal communities inhabit 418 villages living on agriculture (including the production of medicinal plants) and non-timber products produced in the buffer and transition zones. The biosphere reserve is dominated by moist deciduous forests and provide diverse habitat to various flora and fauna. The biosphere reserve is blessed with a total of 1738 identified floral species consisting of algae (7), fungi (238), lichens (184), bryophytes (44), pteridophytes (53), gymnosperms (16) and angiosperms (1196) that include monocots (335) and dicots (861). They yield spices, food, Ayurvedic medicines and timbers. Around 184 species of plants have been identified for their ethno botanical uses. Besides these, there are 389 identified faunal species consisting of 179 species of invertebrates that include centipedes (5), butterflies (66), moths (66), beetles (41) and cricket (1) and 210 species of vertebrates that include pisces (16), amphibians (10), reptiles (15), aves (144) and mammals (27). The biosphere reserve supports animals like tiger, bison, bear, spotted deer, barking deer, panther, wild cat, fox, wild dog, sambhar, four horned antelope, mouse deer etc. The scope and challenges are discussed in the light of the conservation and management of bio-resource of Achanakmar-Amarkantak biosphere reserve, a paradise of biological diversity.

Keywords: Achanakmar-Amarkantak biosphere reserve, Bio-resource, Flora, Fauna, Conservation, Management.

INTRODUCTION

The idea of Biosphere Reserves was mooted by United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 1973 under its Man and Biosphere (MAB) programme for "building scientific and technical capacity for effective management and sustainable use of biodiversity"(UNESCO-MAB, 1973). MAB was launched in 1971 to catalyse a greater understanding and provision of knowledge and skills to support a sustainable relationship between people and their environment. UNESCO proposed biosphere reserve (BR) term for the representative parts of natural and cultural landscapes extending over terrestrial or coastal or marine ecosystems. It consists of areas of terrestrial or marine ecosystems, which are internationally recognized within UNESCO's Man and Biosphere programme for promoting and demonstrating a balanced relationship between people and nature. The biosphere reserve may include one or more protected areas and surrounding lands that manage to combine both conservation and sustainable use of natural resources. The purpose of formation of a biosphere reserve is to conserve *in-situ* all forms of life, along with its support system, in its totality. Biosphere reserve acts as a keystone of MAB by providing a global network of sites for cooperative research toward this end and demonstrates the sustainable use goals of the world conservation strategy. In 1979, the first biosphere reserve of the world was established, since then the network of biosphere reserves has increased to 580 in 114 countries throughout the world (UNESCO, 2012). India launched National Biosphere Reserve Programme in 1979 under Indian MAB. The Ministry of Environment and Forest, Government of India, is implementing this programme in the country. Currently, there are 18 biosphere reserves operating in India (Table 1). Out of these, Achanakmar-Amarkantak Biosphere Reserve is located in the Chhattisgarh and Madhya Pradesh states.

Achanakmar - Amarkantak biosphere reserve

The name, Achanakmar-Amarkantak biosphere reserve (AABR) has come from Achanakmar forest village and Amarkantak, a holy place from where the rivers Narmada, Johilla and Sone emerge. This Biosphere Reserve was notified by Government of India vide notification no. 9/16/99 CS/BR dated 30th March 2005. It lies between 22º 15′ to 20º 58′ N & 81º 25′ to 82º 5′ E. It is spread from Maikal hill ranges to the junction of Vindhyan and Satpura hill ranges in a triangular shape. Bilaspur and Marwahi forest divisions of the Chhattisgarh state and Dindori and Anuppur forest

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divisions of Madhya Pradesh state surround the core zone of AABR. It has total geographical area of AABR is 3835.51 km^2 with a core area of the about 551.55 km^2 (Anonymous 2007). It is surrounded by buffer and transition zone area of 1955.875 km^2 and 1328.09 km^2. Out of this, 2058.98 km^2 falls in Bilaspur and Marwahi forest divisions of Chhattisgarh and 1,224.98 km^2 in Dindori and Anuppur forest divisions of Madhya Pradesh (Fig. 1).

Table 1. Biosphere reserves of India.

S.N.	Year	Name of biosphere reserve	State	Type	Key fauna	Area (km^2)
1	1986	Nilgiri*	Tamil Nadu, Kerala and Karnataka	Western Ghats	NilgiriTahr, Lion-tailed macaque	5520
2	1988	Nandadevi*	Uttarakhand	Western Himalayas		5860
3	1988	Nokrek*	Meghalaya	East Himalayas	Red Panda	820
4	1989	Gulf of Mannar*	Tamil Nadu	Coasts	Dugong or Sea Cow	10500
5	1989	Sunderbans*	West Bengal	Gangetic Delta	Royal Bengal Tiger	9630
6	1989	Manas	Assam	East Himalayas	Golden Langur, Red Panda	2837
7	1989	Great Nicobar *	Andaman and Nicobar Islands	Islands	Saltwater Crocodile	885
8	1994	Simlipal*	Orissa	Deccan Peninsula	Gaur	4374
9	1997	Dibru-Saikhowa	Assam	East Himalayas	Golden Langur	765
10	1998	Dihang-Dibang	Arunachal Pradesh	Eastern Himalaya		5112
11	1999	Pachmarhi*	Madhya Pradesh	Semi-Arid	Giant Squirrel, Flying Squirrel	4981.72
12	2000	Khangchendzonga	Sikkim	East Himalayas	Snow Leopard, Red Panda	2620
13	2001	Agasthyamalai	Kerala, Tamil Nadu	Western ghats	NilgiriTahr, Elephants	1828
14	2005	Achanakamar - Amarkantak *	Madhya Pradesh, Chattisgarh	Maikal Range	Tiger Bison	3835
15	2008	Great Rann of Kutch	Gujarat	Desert	Indian Wild Ass	12454
16	2009	Cold Desert	Himachal Pradesh	Western Himalayas	Snow Leopard	7770
17	2010	Seshachalam Hills	Andhra Pradesh	Eastern Ghats		4755
18	2011	Panna	Madhya Pradesh		Tiger Leopard	

Note: *Designated Member of World Network of Biosphere Reserve.
Source: hhhp://en.wikipedia.org/wiki/Biosphere_reserves_of_india.

Its topography is varied from crop fields in Bilaspur and Anuppur district and Dindori district to the hills of Maikal ranges of Satpura. The topography, in combination with perennial streams and valleys has created varied micro-climatic conditions in the area to provide diverse environmental conditions, encouraging luxuriant growth for several species of thallophytes, bryophytes, pteriodophytes (ferns), gymnosperms, angiosperms and many species of wild fauna of economic importance. The geology of the area is unique, which varied from schists and gneisses with granite intrusion rocks, sandstones, shales, limestone, basaltic lava and bauxite (Anonymous 2010). The soils of the AABR vary in composition and texture from sandy to loamy-clays, generally light brown to brownish yellow in colour. An olive green clay zone up to five mm sometimes exists at some places where marshy conditions develop due to poor seepage. Red soils (due to the presence of iron oxide), which is porous and fertile, also occur in some places. Deposits of alluvial soils are also seen on the banks of numerous streams in the tract. The black cotton soil exists in many areas of AABR.

The AABR has typical monsoon climate with three distinctly defined seasons and a short post rainy season. The summer season begins in April and lasts up to the middle of June. The rains commence from the middle of June and continue until the end of the September. Post rainy season remains during the month of October. The winter or cold season begins from November and lasts up to March. The mean daily maximum temperature ranges from 24-39°C and mean daily minimum temperature ranges from 10-25°C depending upon season. The lowest and highest temperatures are touching extremes in recent years as a consequence of climatic changes occurring throughout the country and globe. The average rainfall is 1322 mm to 1624.3 mm. The relative humidity is fairly high due to the thick vegetation of Sal forest at higher elevations and frequent showers of rain are between June-October. The rainfall falls to its lowest (12.98 mm) in the month of December. Frost is often observed between December-January. In Achanakmar and Lamni forest ranges are the core zone, while Khandoli is the buffer zone.

AABR is blessed with many seasonal monsoon dependent and permanent streams, is a place of origin of rivers like the Narmada, the Johilla and the Sone, many rivulets and two dams. Old Khudia dam situated in the south-western boundary on Maniary river in the core zone and Malhaniya dam built on Malhaniya river in the buffer zone are the main

constituents of the water bodies. These dams are very valuable for men and wild animals existing in AABR mainly during summers when the seasonal *nallah*s and streams dry up. The water bodies comprise an area of 33.61 km^2.

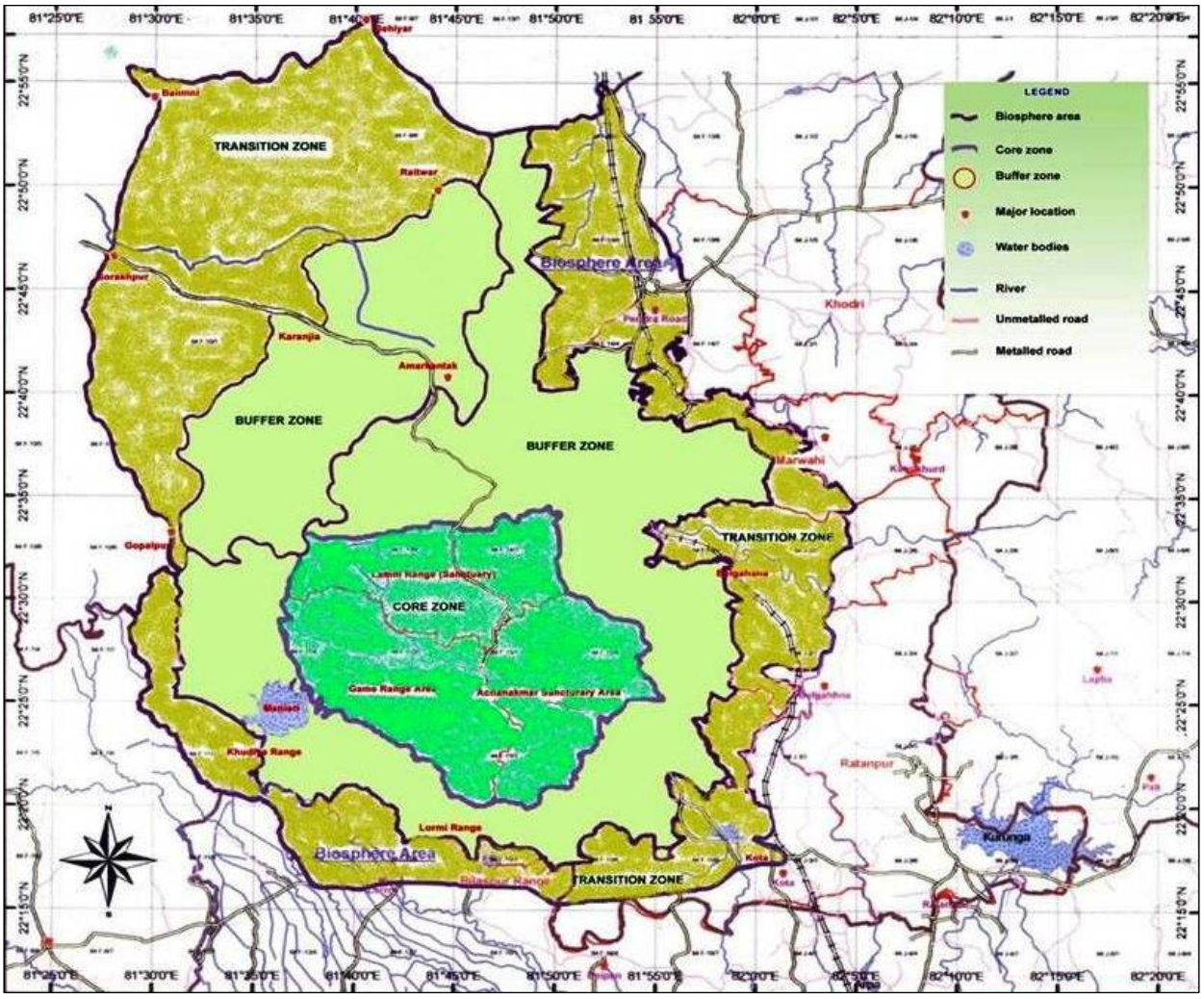


Figure 1. Map showing boundaries of Achanakmar-Amarkantak biosphere reserve.

Inhabitants and their socio-economic profile

As per the population census of the year 2001, nearly 7,617 traditional primitive tribal inhabitants are settled in 22 villages of the core zone. The buffer and transition zones of AABR comprise of 399 villages and suburban areas. Out of which, 238 forest & revenue villages and suburban areas with a population of 4,40,404 exist in the buffer and transition zones falling in Bilaspur and Marwahi divisions of Chhattisgarh. Major residential areas or settlements in buffer and transition zones are Kota, Khondri, Dindori, Lormi, Akhrar and some revenue and forest villages. In this biosphere reserve, there are 27 communities comprising Baiga, Gond, Dhanwar, Kol, Kanwar, oraon, Chamar, Sais (Sarthi), Basore, Lonia, Muslim, Sindhi, Brahmin, Rajput, Goswami, Baraith, Kalar, Kumhar, Kewat, Nai, Ahir (Raut), Panika, Sondhiya, Lohar, Maratha, Sonar and Baniya residing in core and buffer zones. The Baigas are a primitive Dravidian tribe. Among the tribal communities of this biosphere reserve, the Baigas are dominant in population and ranked on the top (Fig. 2). Mahamai village has two hamlets namely Babutola and Ghameri where 13 and 45 families are living from last 10-15 years. The population of Baiga is increasing due to the high birth rate and immigration from other parts of the state. Gonds also have their origin from Dravid culture. Their economy is largely dependent on agriculture. Kols migrated to AABR from Singhbhum district of Jharkhand province. Oraons are also Dravidians tribe migrated from Chhota Nagpur.

They are settled in Surhi, Jakadbandha, Daganiya, Mahamai, (core zone) and Jamunahi, Ghameriand Babutola (transition zone). All tribal and non-tribal inhabitant, get fuel, fodder, edible roots and tubers from forest beside cultivating some seasonal agricultural crops like wheat, maize, etc. in small areas. The cattle are low milk producing, unproductive and dependent on forest for grazing. Some of the labourers are engaged by forest department. Besides this, lack of education, unapproachable roads and footpaths in remote areas are some of the main huddles in the

upliftment of the status of the inhabitants. Non- wood forest produce collection plays a vital role in the economy of the inhabitants.

Figure 2. Baiga tribes in Achanakmar-Amarkantak biosphere reserve.

Zonation and forest types of Achanakmar-Amarkantak biosphere reserve

The core, buffer and transition zones of the BR are divided into following eleven ranges in Chhattisgarh and three ranges in Madhya Pradesh. The entire core zone lies in Chhattisgarh state comprising of Lamni, Achanakmar and Game range. The buffer and transition zone partly lies in both states of Chhattisgarh and Madhya Pradesh, the major portion falling in Chhattisgarh state. The forests ranges include, Lormi, Kota, Khudia, Belgahana, Khodri, Marwahi, Gorela, Lamni, etc. The forests of AABR constitutes of North Indian Tropical Moist forests and North Indian Moist Deciduous forests with subtypes in the likes of Moist Peninsular Sal Forests, Moist Mixed Deciduous Forests, Northern Dry Mixed Deciduous Forests interspersed with rain-fed fields and inhabited areas.

Floral attributes

The BR is very rich with high density of flora. It comprises of 1738 species of identified floral taxa (Table 2) (Anonymous, 2007a, 2008, 2010, 2012; Joshi, 2009; Roychoudhury *et al*., 2012; Roychoudhury, 2013). It has more than 429 species of thallophytes that includes 7 species of algae (Tiwari *et al*., 1995), 238 species of fungi (Shettyi, 1957; Soni *et al*., 1984; Harsh *et al.*, 1989; Chakraborty *et al*., 1991; Jamaluddin *et al*., 1990, 1993; Dadwal & Jamaluddin, 1991; Jamaluddin & Chandra, 1997) and 184 species of lichen (Tiwari *et al*., 1995; Nayaka *et al*., 2007; Upreti *et al*., 2007), 44 species of bryophytes (Tiwari *et al*., 1995), 53 species of pteridophytes (Saxena 1970; Prasad & Pandey, 1987; Panigrahi & Murti, 1989; Pandey *et al*., 1991; Verma *et al*., 1993; Tiwari *et al*., 1995; Chaubey *et al*., 2001; Saini, 2005; Singh & Dixit, 2005), 16 species of gymnosperms (Saxena, 1970; Prasad & Danayak, 1992; Tiwari *et al*., 1995; Singh *et al*., 2001) and more than, 1196 species of angiosperms (335 species of monocots and 861 species of dicots) (Saxena, 1970; Prasad & Pandey, 1993; Verma *et al*., 1993; Tiwari *et al*., 1995; Mudgal *et al.*, 1997; Murti & Panigrahi, 1999; Khanna *et al*., 2001, Chaubey *et al*., 2003; Ved *et al*., 2003). They provide produce for subsistence as well as substitute their livelihood through the sale of non-timber forest products (NTFP's). In Northern Tropical Moist Deciduous Forests, Sal (*Shorea robusta* Roth) is the dominant species occurring in hilly tracts and low level areas of Lamni, Game, Marwahi and Achanakmar ranges as well as in the valley in Khudia range. *Shorea robusta* and its associates like *Terminalia elliptica* Willd., *Pterocarpus marsupium* Roxb., *Bridelia retusa* (L.) A.Juss., *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill. & Perr., *Lagerstroemia parviflora* Roxb., etc. and many species of shrubs, climbers and herbs exist in this type. The forest consists of dry mixed deciduous *Shorea robusta* with associates in the topstorey like *Terminalia elliptica*, *Pterocarpus marsupium*, *Anogeissus latifolia*, *Schleichera oleosa* (Lour.) Merr., *Lagerstroemia parviflora*, *Syzygium cumini* (L.) Skeels., *Madhuca longifolia* (J.Konig) J.F.Macbr., *Phyllanthus emblica* L., *Buchanania cochinchinensis* (Lour.) M.R.Almeida, *Aegle marmelos* (L.) Corrêa, *Cleistanthus collinus* (Roxb.) Benth. ex Hook.f., *Miliusa tomentosa* (Roxb.) J.Sinclair, *Gmelina arborea* Roxb., *Boswellia serrata* Roxb. ex Colebr., *Diospyros melanoxylon* Roxb., *Wendlandia heynei* (Schult.) Santapau & Merchant, etc.; few other thorny species in the middlestorey like *Flemingia semialata* Roxb., Chhind, *Woodfordia fruticosa* (L.) Kurz, *Nyctanthes arbor-tristis* L., *Colebrookea oppositifolia* Sm., etc. and some grasses like *Imperata cylindrica* (L.) P.Beauv., *Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schult., *Eragrostis tenella* (Linn.) P. Beauv. ex Roem. & Schult. and *Bauhinia vahlii* Wight & Arn., etc. as common climbers (Anonymous 2007a, b). There are three endemic plant species, such as lichen, *Caloplaca amarkantakana* Y. Joshi & Upreti (Family- Teloschistaceae), fern, *Isoetes bilaspurensis* Panigr. (Family- Isoetaceae) and grass, *Bothriochloa grahamii* (Haines) Bor (Family- Poaceae) occur in this biosphere reserve.

Some species of ferns like *Adiantum capillus-veneris* L. and *Lygodium flexuosum* (L.) Sw. are endangered. Among angiosperms, *Rauvolfia serpentina* (L.) Benth. ex Kurz is critically endangered in the BR whereas *Clerodendrum serratum* (L.) Moon, *Acorus calamus* L. and *Eulophia herbacea* Lindl. are endangered locally as well as at regional level. Remaining 22 species are, however, found vulnerable. The pteridophyte *Ceratopteris thalictroides* (L.) Brongn., *Cheilanthes rufa Don*, *Dryoathyrium boryanum* (Willd.) Ching, *Marginaria macrocarpa* (Bory ex Willd.), *Microsorium membranaceum* (D.Don) Ching, *Polystichum auriculatum* (L.) C.Presl, *Pteris quadriaurita* Retz. were sampled in 1970 and thereafter some of the taxa recorded once or twice in 30 years whereas others could not be recorded and probably have become extinct from the wild. There are about 518 plant species, which have food and medicinal values. Seven of them are pteridophytes whereas remaining 511 species are flowering plants of dicotyledons and monocotyledons (Anonymous 2010).

Table 2. Data on flora occurring in Achanakmar-Amarkantak biosphere reserve.

Flora	Number of species	References
Thallophytes		Anon (2007a, 2008, 2010, 2012); Joshi (2009); Roychoudhury *et al*. (2012); Roychoudhury (2013)
Algae	7	
Fungi	238	
Lichen	184	
Bryophyte	44	
Pteridophyte	53	
Gymnosperm	16	
Angiosperm		
Monocot	335	
Dicot	861	
Total	**1738**	

Faunal Attributes

The faunal resources of BR are very rich and varied. It comprises of 389 species of identified fauna, out of which 179 species belong to invertebrate and 210 species belong to vertebrate (Table 3) (Anonymous, 2007a, 2008, 2010, 2014; Joshi, 2009; Roychoudhury, 2013). Among the invertebrates, 5 species belong to Chilopoda (Khanna, 2006), 132 species belong to Lepidoptera (66 butterflies and 66 moths) (Gupta & Mondal, 2005; Singh & Chandra, 2008; Chandra *et al*., 2006; Roychoudhury *et al*., 2007), 41 species belong to Coleoptera (Chandra, 2006a; Roychoudhury *et al*., 2004; Joshi *et al*., 2006) and only one species belongs to Orthoptera (Chandra & Gupta, 2005). Among the vertebrates, 16 species belong to Pisces (Chandra, 2006b), 10 species belong to Amphibia (Das & Chandra, 1997; Chandra & Pandey, 2004; Chandra, 2006b), 15 species belong to Reptilia (Kalaiarasan *et al*., 1991; Chandra & Pandey, 2005; Chandra, 2006b), 144 species belong to Aves (Ali, 1946, 1996; Tiwari, 1997; Chandra, 2006b) and 27 species belong to Mammalia (Tiwari *et al*., 1995; Tiwari, 1997; Harshey & Chandra, 2001; Chandra, 2006b; Akthtar & Chauhan, 2007).

Table 3. Data on fauna occurring in Achanakmar-Amarkantak biosphere reserve.

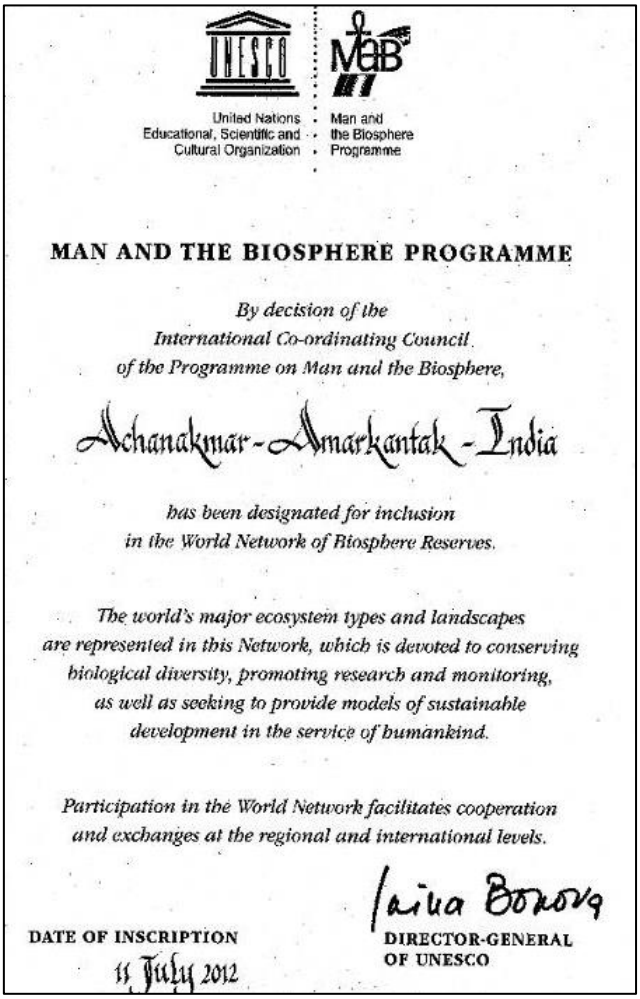
Fauna	Number of species	References
Invertebrate		Anon (2007a, 2008, 2010, 2014); Joshi (2009); Roychoudhury (2013)
Chilopoda	5	
Lepidoptera		
Butterflies	66	
Moths	66	
Coleoptera	41	
Orthoptera	1	
Total	**179**	
Vertebrate		
Pisces	16	

The area of the AABR has a known habitat for animals like tiger, bison, bear, spotted deer, barking deer, panther, wild cat, fox, wild dog, sambhar, four horned antelope, mouse deer, etc. It has rugged terrain as well as grasslands giving shelter to wildlife in all seasons. Among the faunal species, two critically endangered species, *viz.* sacred grove bush frog (*Philautus sanctisilvaticus* Das [fr] and Chanda) (Amphibia: Hylidae) and White-rumped vulture (*Gyps bengalensis* Gmelin) (Aves: Accipitridae); as well as two endangered species, *viz.* Chitala chitala (*Chitala chitala* F. Hamilton) (Pisces: Notopteridae) and Tiger (*Panthera tigris* L.) (Mammalia: Felidae) are present in the AABR

(Anonymous 2010). Besides these species, 51 low risk to vulnerable species as per IUCN categorization are also present in the study area (Anonymous 2010).

Achanakmar-Amarkantak Biosphere Reserve under World Network of Biosphere Reserve

The International Council of UNESCO's Man and the Biosphere Programme (MAB) meeting in Paris from 9-13 July 2012 declared Achanakmar-Amarkantak Biosphere Reserve under the World Network of Biosphere Reserves (WNBR) (Fig. 3).


United Nations Educational, Scientific and Cultural Organization

Man and the Biosphere Programme

MAN AND THE BIOSPHERE PROGRAMME

By decision of the International Co-ordinating Council of the Programme on Man and the Biosphere,

Achanakmar - Amarkantak - India

has been designated for inclusion in the World Network of Biosphere Reserves.

The world's major ecosystem types and landscapes are represented in this Network, which is devoted to conserving biological diversity, promoting research and monitoring, as well as seeking to provide models of sustainable development in the service of humankind.

Participation in the World Network facilitates cooperation and exchanges at the regional and international levels.

DATE OF INSCRIPTION
11 July 2012

DIRECTOR-GENERAL OF UNESCO

Figure 3. UNESCO certificate for declaration of Achanakmar-Amarkantak Biosphere Reserve in WNBR.

Biosphere programme consists of a dynamic and interactive net work of sites of excellence. It fosters the incorporation of people and nature for sustainable development through participatory dialogue, knowledge sharing, poverty reduction and human well-being improvements, respect for cultural values and society's ability to cope with change, thus contributing to the Millennium Development Goals (MDGs) (UNESCO, 2018). With this recognition from UNESCO, the Achanakmar-Amarkantak Biosphere Reserve enters into new realm of developmental activities which will usher in biodiversity conservation and socio-economic improvement of nearby tribal and provide opportunities for international scientific cooperation and funding.

Scope and Challenges

Though a significant progress has been made towards the understanding of the biodiversity of Achanakmar-Amarkantak biosphere reserve (Anon, 2007a,b, 2008, 2010, 2012; Roychoudhury *et al*., 2012), still a lot of information to be explored especially documentation of undescribed taxa of flora (algae, fungi, pteridophyte and angiosperm including medicinal plants) and fauna (crustacean, grasshoppers, crickets, beetles, beautiful moths, butterflies, odonata, wasps, termites, spiders and molluscs, fish, amphibians, reptiles, birds and even mammals like bats, flying squirrel, etc.), including forest invasive species (FIS) and their status, quality and quantity of ecosystem services that includes tangible and intangible benefits like climate change, socio-economic upliftment of local communities through sustainable production, harvesting, processing, marketing of forest produce and pilgrimage/ecotourism, without disturbing the overall activities of natural biome that serve as natural biological laboratory for the benefit of local peoples, scientists, government, decision makers and the world community.

Based on the findings and observations recorded, the following suggestions are being made for their possible use in implementation of Management Action Plan (MAP): Conservation of endemic species, threatened economically important plants and their habitats, reclamation of degraded habitats, bamboo plantation, providing training of bamboo artefacts and collection, processing of medicinal plants and *Bauhinia vahlii* leaves collection, pisiculture, Tasar culture, lac culture, bee keeping, mushroom cultivation, vermi composting and vermi wash production, ecotourism as approach for enhancement of livelihood of inhabitants and interpretation centres, which will attract and create awareness about biosphere reserve, its importance and role in conservation of forest ecosystem.

Biosphere reserves are "Science for sustainability support sites" *i.e.* spatial places for testing interdisciplinary approaches to understand and managing changes and interaction between social and ecological systems, including conflict anticipation and management of biodiversity. There are currently 669 biosphere reserves in 120 countries including 142 in 24 countries in Asia at the specific and comprising terrestrial, marine and coastal ecosystem. The criteria for designation of biosphere reserves are stated in the "Seville strategy and the statutory framework of world network". In 2008, the Madrid Action Plan 2008-2013 was endorsed at the third World Congress of Biosphere Reserves. It adapts the Seville strategy for emerging challenges and aims to rise biosphere reserves to be the principle internationally designated areas dedicated to sustainable development in the 21st century.

Action Plan of Lima for UNESCO's Man and Biosphere Programme

The Lima Action Plan (LAP) for UNESCO's Man and the Biosphere (MAB) Programme and its World Network of Biosphere Reserves (2015-2016), was endorsed at World Congress on Biosphere Reserves held in Lima Peru during March 2016. LAP contains an inclusive but concise set of actions intended for ensuring the effective implementation of the MAB strategy 2015-2025, adopted by the MAB ICC at its 27th session and endorsed by the UNESCO General Conference at its 38th session UNESCO. A key goal of LAP is to ensure that its World Network of Biosphere Reserve (WNBR) consists of effectively functioning models for sustainable development, by improving governance, collaboration and networking within the MAB and WNBR; by developing effective external partnerships to ensure long-term viability and by implementing an effective periodic review process so that all members of the network adhere to its standards (MAB Strategy, 2014). LAP places a strong emphasis on thriving societies in harmony with the biosphere for the achievement of the Sustainable Development Goals (SDGs) both within biosphere reserves and beyond, through the global dissemination of the models of sustainability developed in biosphere reserves.

Structure and implementation of the Lima Action Plan 2016-2025

LAP is presented as a matrix, structured according to the following 5 Strategic Action Areas of the MAB Strategy 2016-2015. It includes targeted outcomes, actions and outputs that will contribute to the effective implementation of the strategic objectives contained in the MAB Strategy. It also specifies the entities with prime responsibility for implementation, together with time range and performance indicators (MAB Strategy, 2014).

Strategic Action Area A: The World Network of Biosphere Reserves including those under the WNBR consisting of effectively functioning models for sustainable development (LAP, 2016).

Strategic Action Area B: Inclusive, dynamic and result oriented collaboration and networking within the MAB Programme and the World Network of Biosphere Reserves (LAP, 2016).

Strategic Action Area C: Effective external partnership and sufficient and sustainable funding for the MAB Programme and the World Network of Biosphere reserves (LAP, 2016).

Strategic Action Area D: Comprehensive, modern, open, and transparent communication, information and data sharing (LAP, 2016).

Strategic Action Area E: Effective governance of and within the MAB Programme and the World Network of Biosphere Reserves (LAP, 2016).

Recently, MoEFCC, Govt. of India, in association with UNESCO, organized a meeting-cum-workshop on "Strategy for National Action Plan for Biosphere Reserves", held during 20-21 February, 2017 at Pachmarhi, Madhya Pradesh, India, which focused on Lima Action Plan and the development of a National strategy for its implementation considering the concerns and realities of Indian Biosphere Reserves, which comprises presently a total of 18 BRs in the country, out of which 10 are included in WNBR.

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