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Socio-Cultural Attributes and Biodiversity Conservation in a Non-Protected Area: A Case Study from Anjaw District, Arunachal Pradesh

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ABSTRACT

Anjaw district in the eastern Arunachal Pradesh is part of the Eastern Himalaya biodiversity hotspot. This region is rich in biodiversity and harbours endemic species, some of which are classified as threatened. The Anjaw district is dominated by Miju Mishimi, Digaru Mishimi and the Mayor tribe who follow traditional hunting, fishing and other cultural practices that influence species conservation. However, there exist knowledge gaps pertaining to their traditional cultural practices, fishing and hunting and their impact on sustainability and conservation needs. We conducted surveys in 64 households in 14 villages using a semi-structured interview schedule to understand the demography, livelihood patterns, social taboos, hunting and fishing approaches of the communities in the Anjaw district of Arunachal Pradesh. Our surveys showed that agriculture is the primary occupation in the area. Hunting is widely practiced by the communities that also involve hunting of the threatened species. Parallelly, the communities also follow social taboos, which prohibits hunting of certain species some of which are also classified as threatened. Both traditional and modern gears are used for hunting and fishing. Also, forest fire is used extensively for the purpose of hunting which have a drastic impact on the forests and the concerned species. Understanding the social attributes of communities is crucial to develop frameworks and policies for biodiversity conservation in Anjaw district.

Key words: Conservation, communities, biodiversity hotspot, traditional hunting, taboos, endemic species

INTRODUCTION

India and the larger landscape of the South Asia are rich in biodiversity. It comprises of four global biodiversity hotspots: Eastern Himalayas, Indo-Burma, Sundaland, and Western Ghats, which holds astounding diversity of endemic species (Mittermeier et al. 1998). South Asia holds more than 20% of the world's population and is rich in cultural diversity (Parrotta and Trosper 2012). Around 350-400 million people are directly dependent on forests for goods and different ecological services, in addition to the forest-dwelling communities (Poffenberger 2000). They are intrinsically linked to the natural environment and depended on the natural resources for the livelihood (Parrotta and Trosper 2012). As a result, South Asia's biome diversity is threatened by impacts of land use (Foley et al. 2005, Newbold et al. 2015, Pandit et al. 2007), thereby leading to degradation of the ecosystems and parallelly changing species composition and structure (Poffenberger 2000).

Cultural groups in South Asia employ a wide range of resource use strategies that they have changed over time in response to regional environmental factors (Poffenberger 2000). The direct interactions between people and nature are significant for biodiversity because of people's attitudes and behaviour toward nature (Soga and Gaston 2016, Gaston et al. 2018), which gives rise to social-ecological and biocultural systems at the intersection of nature and culture (Marsh 1864, Moran 2016, Tremblay et al. 2020). Cultural practices have socio-ecological benefits that can be utilised to monitor access to natural resources that are at the verge of extinction (Colding and Folke 2001). The vast cultural diversity of the forested areas is reflected in the wide variety of subsistence-based resource use practices, including hunting, fishing, gathering, shifting cultivation, traditional settled farming etc.

The majority of the forests are still inhabited and

maintained by the local communities (Heckenberger et al. 2007 Noble and Dirzo 1997). They also act as ecologists and resource managers, applying Western science approaches (Kimmerer 2002). Indigenous and local knowledge (ILK) thus can play an important role in the conservation and management of natural resources, environmental decision-making, policy, and assessments (Anonymous 2017a, 2022a). ILK can help us better understand a wide range of processes including habitat disturbances, culturally important species and drivers of change (Garibaldi and Turner 2004, Tam et al. 2013) and formulation of policies like the IUCN Red List of Threatened Species (Anonymous 2022a).

Indigenous peoples and local communities (IPLCs) are custodians of over a third of the world's most important places for biodiversity (Anonymous 2021b). Experiences show that IPLCs are crucial as environmental stewards in complex social and ecological scenarios (Oldekop et al. 2016, Garnett et al. 2018, Reyes-García and Benyie 2019). Indigenous people also manage important Intact Forest Lands (IFLs), and 36% of the world's IFLs are within Indigenous People's lands (Fa et al. 2020). Though these forests are vulnerable to clearing and other threats, IFL loss is considerably lower than in other lands. Therefore, there is a growing need to recognise the IPLC lands as 'other effective area-based conservation measures' (OECMs), such as those proposed under the Aichi Biodiversity Target 11 of the Convention on Biological Diversity (CBD) (Jonas et al. 2017). Since Anjaw district holds IBAs, KBAs and Reserve Forest, there is a scope to recognise them as OECMs for long-term conservation.

The need for human dimension like social institutions (Becker and Ostrom 1995, Gunderson et al. 1995, Berkes and Folke 1998, Levin et al. 1998) for effective biological conservation and ecosystem management is often highlighted by the Ecologists (McDonnell and Pickett 1993, Carpenter and Turner 1998, Lubchenco 1998). Around the world, informal institutions like social conventions and taboos (North 1994), and local belief systems like indigenous religions have been attributed with preserving animal species, biodiversity conservation and ecosystem management (McDonald 1977, Colding and Folke 1997, Deb and Malhotra 2001, Lingard et al. 2003, Colding et al. 2003, Jones et al. 2008, Kideghesho 2008, Rabearivony et al. 2008, Sheppard et al. 2010). In traditional societies across the world, human conduct towards the natural environment is often guided by the prevailing taboos (Colding and Folke 2001). These religious and cultural systems are essential to the preservation of taxa and places where local beliefs or informal institutions serve as the only means of protection for threatened species or habitats. Most of the world's biodiversity is found outside of protected areas and informal institutions actively contribute to biodiversity conservation (Murphree 1994).

Arunachal Pradesh holds 15.76% of the Indian Himalaya and 43.62% of the biological hotspot of the Eastern Himalaya (Dollo et al. 2009). It is a part of the Indo-Myanmar biodiversity hotspot (Myers et al. 2000) and is one of the 200 globally important ecoregions (Olson and Dinerstein 1998). It is also a faunal gateway of Indo-Chinese and Indo-Malayan elements. Arunachal Pradesh lies in the transition zone between the Palearctic and Oriental Biogeographic Regions because of which it represents Indo-Chinese, Indo-Malayan, Indo-Burmese and Indian biotic components (Captain and Bhatt 2000).

Arunachal Pradesh is rich in cultural diversity and is home to 26 indigenous communities and more than 110 sub-tribes (Pandey et al. 1999). 80% of the communities primarily engage in agriculture (Aiyadurai et al. 2010). Most people are non-vegetarian, and fish is an integral part of their diet (Hussain et al. 2016). Also, wild meat is widely consumed and used traditionally, due to which hunting is widely practiced in Arunachal Pradesh (Datta 2002, Hilaluddin et al. 2005). Some of the tribes also follow traditional belief systems and taboos, which restricts hunting of certain species, thereby helping in conservation initiatives.

MATERIALS AND METHODS

Study area

Anjaw district lies in the eastern part of Arunachal Pradesh, between 26°55' and 28°40' N latitude and 92°40' and 94°21' E longitude, and the elevation ranges from 300–5000 m asl. It shares an international boundary with China in the north and Myanmar in the east (Das et al. 2017). Lohit originates in China and is the main river flowing

through the Anjaw district. The vegetation comprises Subtropical broad–leaved forests, Subtropical pine and Sub-alpine forests (Anonymous 2005, Das et al. 2017).

Miju Mishimis, Digaru Mishimis and the Meyor tribes are the dominant tribes in the Anjaw district (Aiyadurai 2007). The areas in the north towards the China border consist of the Meyor tribe. In contrast, the areas towards the south of Walong township are occupied by the Miju Mishimis and the areas towards the southernmost part along the border with the Lohit district are occupied by the Digaru Mishimis (Das et al. 2017). Its population density is 12 persons km^{-2}, the lowest in India (Anonymous 2014).

This area is a part of the larger landscape of the Walong and Dichu Important Bird and Biodiversity Areas (IBA) (Anonymous 2022b). These areas are also designated as Key Biodiversity Areas (KBA) (Anonymous 2017b). The landscape of Walong is located on the fringe of the Dichu Reserve Forest. *Pinus Merkusii* dominates the landscape of Walong, and the higher elevation areas are categorised as a Vulnerable species in the IUCN Red List of Threatened Species (Farjon 2013). The White-bellied Heron, one of the rarest birds in the world, also occurs in Walong. In 2021, two White-bellied Heron and a nest were recorded (Reddy et al. 2021). Since then, regular sightings of the White-bellied Heron have occurred in Walong and the nearby areas.

The present study is focused on the areas dominated by the Meyor and the Miju Mishimi tribes in Anjaw District. In the paper, we aim to highlight the social, cultural and ecological aspects of the indigenous tribes and their interactions with the natural environment. The study was conducted in the 14 settlements (villages and Townships) in the northern part of the Anjaw district. The settlements fall within the jurisdiction Walong and Kibithoo Revenue Circle and are located in the fringe of Dichu Reserve Forest and other unclassified forests along the of Lohit River

Data collection

From April 2021 to April 2022, the Walong area and other nearby areas within a 20 km radius, along the river banks were periodically surveyed to document the social attributes of the tribes: hunting, fishing, taboos, social norms etc. Data were also collected regarding the hunting and fishing techniques and gears used by the locals. We also conducted reconnaissance surveys and informal discussions with the village representatives to gather additional data.

From the preliminary surveys and field observations, we could conclude that hunting is carried out by men and in fishing too, men are primarily involved. Therefore, men were primarily targeted as respondents for our interview surveys. The data collection was carried out though semi-structured surveys using Kobo Collect mobile application. Sixty-four respondents were interviewed. Additionally, village Heads (known as 'Goan Bura') were interviewed to get detailed background and information about the fishing and hunting practices in their respective villages.

Questionnaire design

We designed a questionnaire consisting sub-sections, to record demographic information about the respondents and their livelihood patterns. The first section included information on the respondents' age, ethnic group, religion, and sources primary and secondary income. The second section included the fishing preferences and fishing methods. The third section included hunting preferences, hunting methods, and prey preferences. The fourth section involved information about their hunting taboos.

We used Colding and Folkes's methodology of resource and habitat taboos (RHTs), to classify the data obtained from the interviews into species-specific taboos (Colding and Folke 2001). A specific-species taboos restricts/prohibits the killing and indiscriminate use of specific species in both time and space.

RESULTS

In Anjaw District, the profile of the respondents has been measured in terms of Age group, Education, Religion and their Primary & Secondary Occupations. We observed considerable changes in these variables with respect to their locations and as such the surveyed settlements are classified into two groups: Upper Reaches (from Walong Township to Kaho village) and the Lower Reaches (the settlements in the south of Walong Township).

Demographic pattern

In terms of age, majority of the respondents, 37.5% were from late middle age group (42-54 years), 32.8% were from the early middle age (29-41 years), youth (<28 years) constitutes 18.8%, and old (>55 years) constitute 10.9 %. In education, 53.3% were literate and 46.7% were illiterate (with no formal education). 46.9% were educated till primary level (below Class 10), Matriculation (Class 10) and Higher Secondary (above class 12) comprises of 6.4% each. Most of the respondents belonging to 57.8% were Buddhist; followed by others (Animists) 39.1% and 1.6% included Christians and Hindus in the study area (Table 1).

The settlements from Walong Township towards the Indo-China border are dominated by the Meyor tribe, with the exception of Yakung village which is dominated by Mishimi. The areas from Walong Township to the south are dominated by the Miju Mishimis.

Livelihood pattern

The economic structural bases are discussed at the household level. The economic structural bases are discussed in terms of two dimensions: primary occupation and secondary occupation. Occupation indicates the Class position of the respondents as majority of the population preferred hunting. In Upper Reaches, 45.3% are farmers, followed by contraction worker 25%, Govt. Employee and Shopkeeper 7.8% each, Porter 6.3%, Gaon Bura 4.7% and Monk consisted 1.6%. The presence of large military establishments provides considerable livelihood options to the locals, who are primarily engaged as porters and construction workers. In case of secondary occupation, 85% of the respondents don't have any secondary occupation, 6.3% are engaged as farmers, 3.1% as construction workers and 3.1% as Lodge Owner and Porter. In Lower Reaches too, majority of the respondents (18.75) are engaged in farming as primary occupation. Few of the respondents (25%) were primarily engaged in construction works while 3.1% take up construction work occasionally (Table 1).

Agriculture is the major occupation in the region. Wet rice is cultivated in the flat terrain along with maize, millet, wheat and barley (Aiyadurai 2011, Chakraborty 2018). The Meyors practice terrace cultivation (Aiyadurai 2011), while the Mishmis in the lower elevation broadleaf forests practice jhum cultivation (Aiyadurai 2012). Rice is primarily cultivated, along with maize, millet and barley.

Table 1. Demographic and socio-economic profile of the households/respondents in the Anjaw district

Age Group	Frequency	Percent
<= 28	12	18.8
29 – 41	21	32.8
42 – 54	24	37.5
55+	7	10.9
Total	64	100
Education		
Illiterate	26	40.6
Primary	30	46.9
Matriculation (Class 10)	4	6.3
Higher Secondary (Class 12)	4	6.3
Total	64	100
Religion		
Buddhist	37	57.8
Christian	1	1.6
Hindu	1	1.6
Others	25	39.1
Total	64	100
Primary Occupation		
Construction worker	16	25.0
Farmer	29	45.3
Gaon Bura	3	4.7
Governmentt employee	5	7.8
Monk	1	1.6
Porter	4	6.3
Shopkeeper	5	7.8
Village member	1	1.6
Total	64	100
Secondary Occupation		
Construction worker	2	3.1
Farmer	4	6.3
Lodge owner	1	1.6
None	56	87.5
Porter	1	1.6
Total	64	100

Hunting and fishing preferences

The Mayor and the Miju Mishimis practice traditional hunting practices. Results shows that majority (57.8%) of the respondents prefers hunting,

Table 2. Species preferred for hunting and their protection status

Common Name	Scientific Name	Frequency	Percent	IUCN Status	Wildlife Protection Act
Mishimi Takin	*Budorcas taxicolor*	33	52	Vulnerable	Schedule 1
Barking Deer	*Muntiacas muntjak*	10	16	Least Concern	Schedule 3
Red Goral	*Naemorhedus bailey*	9	14	Vulnerable	Schedule 1
White-cheeked Macaque	*Macaca leucogenys*	6	9	Endangered	Not yet determined
Himalayan Serow	*Capricornis thar*	4	6	Vulnerable	Schedule 1
Black Bear	*Ursus thibetanus*	2	3	Endangered	Schedule 1
Total Responses		64	100		

Some of these hunted species: Mishimi Takin, Red Goral, Himalayan Serow, Black Bear are categorised as threatened in the IUCN Red List of Threatened Species.

42% of the respondents don't hunt due to lack of time, old age, lack of interest and rules imposed by the Forest Department, which is also described by Aiyadurai et al. (20). The preference for hunting is higher in the Lower Reaches (70.6%), which is predominantly inhabited by the Miju Mishimis. The respondents were also enquired about bird hunting. Majority of the Respondents (56.3%) don't prefer hunting of birds while 43.7 prefer bird hunting. Our survey results shows that 52% respondents hunt Mishimi Takin, followed by Barking Deer (16%), Red Goral (14%), White-cheeked Macaque (9%) and very few prefers hunting of Wild Goats (9%) and Bear (3%) (Table 2).

In terms of hunting gears, majority (75%) of the respondents use gun whereas 19% use Traps and only 6% respondents' use catapult (Table 3). Catapult is a primarily used for bird hunting. Subsistence fishing is widely practiced in the study areas. All the respondents prefer fishing. Results shows that the majority (61%) of the respondents use hooks, 35% use nets and 14% use traps for fishing. The use of generators for fishing is very limited. Due to lack of demand and local markets, commercial fishing is not practiced. Opportunistic field surveys of the fishers were carried out to document the fish species. Snow Trout *Schizothorax richardsonii* is widely found in Lohit River and is preferred by the fishers. Snow Trout is classified as Vulnerable in the IUCN Red List of Threatened Species (Anonymous 2021a). Species like *Aspidoparia jaya* and *Glypotothorax cavia* were documented in the tributaries of Lohit.

Table 3. Gears used for hunting and fishing

Gears used for hunting	Frequency	Percent
Gun	48	75
Traps	12	19
Catapult	4	6
Total Responses	64	100
Gears used for fishing		
Hooks	39	61
Nets	16	25
Traps	9	14
Total Responses	64	100

Animals not preferred for hunting

Results shows that one-third population (33%) avoid hunting Tiger, 30% they do not hunt Small Cats, 8% mentioned about specific birds, 6% mentioned about White-cheeked Macaque (Table 4). About 5% respondents mentioned they do not kill snakes or any kind of animals, 3% do not hunt Asiatic Wild Dog and only 2% mentioned about Common Leopard, Frogs and some rodents which they do not hunt. Few respondents (6%) mentioned that they are not aware of hunting related taboos. Both the Mayor and the Miju Mishimis have taboos associated with these species.

DISCUSSION

In Arunachal Pradesh, the primary reason for hunting and trapping species is to acquire meat for human

Table 4. Species not hunted

Species	Scientific Name	IUCN Status	Wildlife Protection Act
Royal Bengal Tiger	*Panthera tigris*	Critically Endangered	Schedule 1
Asiatic Wild Dog	*Cuon alpinus*	Endangered	Schedule 1
Common Leopard	*Panthera pardus*	Vulnerable	Schedule 1
White-cheeked Macaque	*Macaca leucogenys*	Endangered	Not yet determined
Jungle Cat	*Felis chaus*	Least Concern	Schedule 1
Leopard Cat	*Prionailurus bengalensis*	Least Concern	Schedule 1

consumption, rituals, recreation and in some cases retaliatory killing of animals raiding crops. Since the primitive times, fire has been used extensively for hunting (Eriksson et al. 2002) that adversely affect the ecosystems (Schmerbeck and Fiener 2015). In the study areas, forest fire is used by the communities as a tool for hunting (Das et al. 2017**).** Fire is lighted to clear the hunting trails and to lure the herbivorous species to the generated fresh grass. Burning practices are mostly carried in the winter months from October to April till the onset of monsoon. This has resulted in burning of large tracts of pine forests (Das et al. 2017**).** Forest fire can also cause severely disturb the rare species like the White-bellied Heron (Pradhan et al. 2007).

Informal discussions with the locals highlighted the issue of commercial hunting mostly due to higher demand of bush meat for religious ceremonies. Aiyadurai (2011) also reported the issue of commercial hunting including that of the Musk Deer. Commercial hunting is largely triggered by the lack of adequate protection measures by the enforcement agencies and the higher scope of income generation. In the state where hunting is both cultural and common, there is a dearth of wildlife (Datta 2002, Hilaluddin et al. 2005, Aiyadurai et al. 2010). Taboos, customs and the social norms of the communities can have severe implications on the wildlife and the conservation initiatives. Also, commodification, demographic changes and technological innovation are just a few of the ways that modernization affects hunting ethics (Essen 2017). Growth in social standards has led to modernisation in hunting, which was evident by the wide use of guns over traditional hunting gears. This has also led to ease of hunting. Informal institutions like taboos have been largely disregarded in conservation plans in developing nations with rich biodiversity (Alcorn 1995, Robbins 1998). The indigenous people and other small-scale societies are largely considered as outstanding conservationists in the media and the academics (Smith and Wishnie 2000), the evidence of which comes from cultural expressions of conservation ethics, animistic religious beliefs that view other species as social beings, and the relatively higher biodiversity found in these forests (Gadgil et al. 1998, Alcorn 1996, Bernbaum 2006). Since the forests in Anjaw district remains largely under community ownership, there is no formal scope for protection of the biodiversity in these landscapes. The taboos associated with important species like Royal Bengal Tiger, Asiatic Wild Dog etc. which are largely considered as 'Umbrella Species', can thus play an instrumental role in conservation of the larger landscape of Anjaw district. The White-bellied Heron found in Walong, can also be used as 'Flagship Species' for conservation of the riverine ecosystems. Implementation of Holistic Environmental Approach (HEA) which incorporates the ecological (environmental planning, evaluation, management, or monitoring) and the social (such as social, cultural, and economic) attributes can thus play a vital role biodiversity conservation (Dreujou et al. 2020). Establishment of people centric conservation sites like the Community Conserved Areas (CCA) or Community Reserve (CR) will immensely help in involving the fringe communities in the process of wildlife conservation and eco-tourism avenues.

CONCLUSION

The study reveals that the people of Anjaw district are aware of sustainable management of natural resources along the course of Lohit River, Arunachal Pradesh. There has been no mass scale exploitation of fishing and hunting. The fishing and hunting

observed in the area are for subsistence needs. The study findings too have some implications in the context of cultural attachment of the people to the landscape.

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