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ECOLOGY & BIODIVERSITY STUDY NEAR BAUXITE MINING AREA

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Abstract: Bauxite mining being an impermanent activity, at most times, leaves long term negative impact on the environment. Most of bauxite mining companies have well established biodiversity management plans, wherein the existing biome is mapped, operational and external impacts on biodiversity are assessed and opportunities to mitigate impacts or promote increased biodiversity are evaluated. Here in this study, we have selected some bauxite mining areas near the Lamba village in Taluka Kalyanpur, District Devbhoomi Dwarka, Gujarat for assessment of ecology and biodiversity.
Keywords: Bauxite Mining; Ecology, Floral diversity, Wildlife.

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INTRODUCTION

Biodiversity is declining rapidly due to land use change, climate change, invasive species, overexploitation, and pollution. These result from demographic, economic, sociopolitical, cultural, technological, and other indirect drivers. Integrating ecological thinking into the planning process is urgent need in the context of deterioration of natural environment, which is unwanted but direct consequence of development. Biodiversity includes diversity within species (genetic diversity), between species (species diversity) and of ecosystems (Heywood and Watson, 1995). Species diversity has been maintained at an approximately even level or at most a slowly increasing rate, although punctuated by brief periods of accelerated extinction every few tens of millions of years. The more similar the species under consideration, the more consistent the balance. Thus, within clusters, the numbers of species of birds or reptiles, or ants, or other equivalent groups found on each island in turn increases approximately as the fourth root of the area of the island. Study area (10 km wrt bauxite mining near Lamba village, Gujarat) comprises of 30% Sea, 29% cropping (dominant crop is ground nut), 9% Grassland, 7% fallow land, 5% stone (mainly bauxite), 2% Forest area, 1% human settlement and other area which is dry.

EXPERIMENTAL

The primary objective of survey was to describe the floral and faunal communities within the study area. The sampling plots for floral inventory were selected randomly in the suitable habitats (Anderson, 1867; Jain and Rao, 1983; Dixit, 1984; Wilson and Reeder, 2005; Kumar, 2013; Kumar *et al.,* 2013). The methodology adopted for faunal survey involve random survey, opportunistic observations, diurnal bird observation, active search for reptiles, faunal habitat assessment, active search for scats and foot prints, animal call, and review of previous studies. The aim was to set baselines in order to monitor and identify trends after the commissioning of the cargo handling activity. Emphasis has been placed on presence of endemic species, threatened species if any present in the study area. The qualitative study has been carried out in 8 villages and its vicinity *viz*. Lamba, Maleta, Navedra, Jodhpar, Gangdi, Satapar,

Chachlana, Jamdevliya. Desktop literature review was conducted to identify the representative spectrum of threatened species, population and ecological communities listed by IUCN, WCMC, ZSI, BSI and Indian Wild life Protection Act, 1972 (Bentham and Hooker, 1862-1883; Hunter, 1879; Dixit, 1984; Ghosh *et al.,* 2004; Lushington, 1915; Wilson and Reeder, 1993; BirdLife International, 2000; BirdLife International, 2004a, b; Wilson and Reeder, 2005; BirdLife International, 2010; Kumar and Srivastava, 2012; Kumar, 2013; Kumar *et al.,* 2013; Kumar and Aggarwal, 2013a,b). The status of individual species was assessed using the revised IUCN/SSC category system (WCMC, 1988; IUCN, 1994; WCMC, 2000; IUCN, 2001, 2003, 2008, 2010).

RESULTS AND DISCUSSION

The major crop in the study area is ground nut for winter season. Crop depends on soft water from dug well (rock aquifer) in the fields. No forest land is involved within the mine lease area; however it is present in the study area. The tropical dry deciduous forest exists in the study area. In this type of forest vegetation developed due to long dry seasons which last several months and vary with geographic location. The common trees are *Azadirachta* sp. and a variety of *Acacia* sp. However, vegetation in core zone of mine is sparsely distributed which is mainly *Prosopis juliflora*. The hare (*Lepus nigricollis*) is common in the study area as most of the area occupied by small bushes and favorable crops are there for them.

Floral Diversity

Natural flora and fauna are important features of the environment. They are organized into natural communities and are sensitive to outside influences. The objective of this floral inventory of the study area is to provide necessary information on floristic structure in the study area for formulating effective management and conservation measures. The climatic, edaphic and biotic variations with their complex interrelationship and composition of species, which are adapted to these variations, have resulted in different vegetation cover, characteristic of each region (Ohasi, 1975). The tree species, herbs, shrubs, climbers and major crops, were documented during this base line study (Jain, 1968; 1991). Main crops of the study region are ground nut, bajra, jowar, wheat and tur etc. No distinct variation was observed in vegetation covered of study region. Vegetation near villages and along the road was represented by trees and shrubs. Dominant vegetation of a study area was bushes. The dug well is the main source of irrigation water.

Figure 1. Open Scrub area

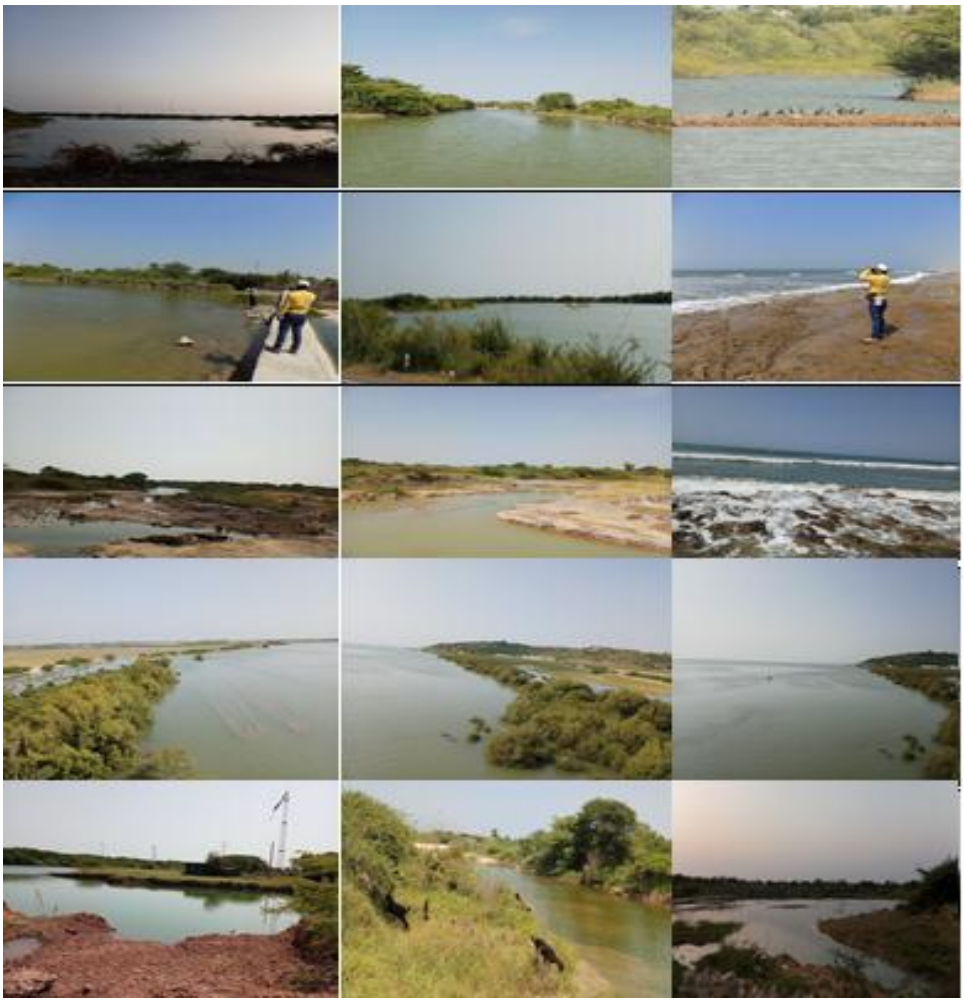

Figure 2. Aquatic Habitat of the Study Area

Figure 3. Agriculture Crop (Ground nut) in the study area

Table 1. List of Trees in the Study area

S. No.	Family and Scientific Name	Vernacular Name
1.	**Fabaceae**	
1/1	*Acacia nilotica*	Desi Baval
2/2	*Butea monosperma*	Khakhro
3/3	*Dalbergia sissoo*	Sissoo
4/4	*Pongomia pinnata*	Karanja
2.	**Rutaceae**	
5/1	*Aegle marmelos*	Bili
6/2	*Limonia acidissima*	Kothi
4.	**Cornaceae**	
7/1	*Alangium salvifolium*	Ankol

5.	**Meliaceae**	
8/1	*Azadirachta indica*	Limdo
9/2	*Soymida febriguga*	Royno
6.	**Combretaceae**	
10/1	*Terminalia bellerica*	Baheda
11/2	*Terminalia arjuna*	Arjun
12/3	*Terminalia chebula*	Harde
13/4	*Terminalia catappa*	Badam
14/5	*Terminalia tomentosa*	Sadad
10.	**Arecaceae**	
15/1	*Phoenix sylvestris*	Khajuri
11.	**Myrtaceae**	
16/1	*Syzygium cumunii*	Jambudo
12.	**Moraceae**	
17/1	*Ficus carica*	Anjir
18/2	*Ficus hispida*	Bhoyumro
19/3	*Ficus bengalensis*	Vad
19/4	*Ficus racemosa*	Umero
19/5	*Ficus religiosa*	Pipdo
12.	**Mimosaceae**	
20/1	*Pithecellobium dulce*	Vilayati ambli
21/2	*Albizia odoratissima*	Kalo Shirish
22/3	*Albizia lebbeck*	Siras
23/4	*Prosopis cineraia*	Khijdo
13.	**Caesalpiniaceae**	
24/1	*Cassia fistula*	Garmalo
25/2	*Tamarindus indica*	Amli
26/3	*Bauhinia racemosa*	Apto
14.	**Euphorbiaceae**	
27/1	*Emblica officinalis*	Amla
28/2	*Bridelia retusa*	Asan
15.	**Rubiaceae**	
29/1	*Adina cordifolia*	Haldarvo
30/2	*Mitragyna parviflora*	Kalam
16.	**Sapotaceae**	
31/1	*Madhuca indica*	Mohwa
32/2	*Manilkara hexandra*	Khirni
17.	**Verbenaceae**	
33/1	*Gmelina arborea*	Savan
34/2	*Tectona grandis*	Sag

Table 2. List of Shrub in the Study area

S. No.	Family and Scientific Name	Vernacular Name
1.	**Asclepiadaceae**	
1/1	*Calotropis procera*	Akdo
2.	**Apocynaceae**	
2/1	*Carissa conjesta*	Karmada
3/2	*Holarrhena antidysenterica*	Kado
4/3	*Catharanthus pusillus*	Parvatirai
3.	**Rosaceae**	
5/1	*Rosa damascena*	Rose
4.	**Malvaceae**	
5/1	*Hibiscus rosa-sinensis*	Jasud
6/2	*Hibiscus vitifolius*	Van kapas
7/3	*Thespesia lampas*	Jungli bhindo
8/4	*Pavonia zeylanica*	Ambari
9/5	*Sida acuta*	Bala
10/6	*Sida ovata*	Dabi
5.	**Solanaceae**	

11/1	*Datura metel*	Dhanturo
6.	**Verbenaceae**	
12/1	*Lantana camara*	Lantana
7.	**Oleaceae**	
13/1	*Nyctanthes arbor-tristis*	Parijatak
8.	**Euphorbiaceae**	
14/1	*Riccinus communis*	Divelo (Erandi)
15/2	*Acalypha indica*	Vinchikanto
9.	**Rhamnaceae**	
16/1	*Zizyphus mauritiana*	Bor
17/2	*Zizyphus galabrata*	Bor
18/3	*Zizyphus xylopyra*	Ghat Bor
19/4	*Zizyphus rugosa*	Toran
10.	**Acanthaceae**	
20/1	*Peristronphe bicalyculata*	Adhedo
21/2	*Adhatoda vasica*	Ardusi
22/3	*Dipteracanthus patulus*	Dhramandhrokali
11.	**Mimosaceae**	
23/1	*Prosopis juliflora*	Gando Baval

Table 3. List of Herbs in the Study Area

S. No.	Family and Scientific Name	Vernacular Name
1.	**Papaveraceae**	
1/1	*Argemone mexicana*	Darudi
2.	**Amaranthaceae**	
2/1	*Aerva sanguinolenta*	Gorakhganjo
3/2	*Achyranthes aspera*	Anghedi
3.	**Fabaceae**	
4/1	*Arachis hypogea*	Magaphali
5/2	*Cassia tora*	Takla
6/3	*Trigonella foenum-graecum*	Methi
4.	**Apocynaceae**	
7/1	*Catharanthus roseus*	Sadaphuli
5.	**Solanaceae**	
8/1	*Capsicum annuum*	Marchi
9/2	*Datura metel*	Ganthovalo Dhanturo
6.	**Apiaceae**	
10/1	*Centella asiatica*	Khadabrahmi
7.	**Malvaceae**	
11/1	*Hibiscus lobatus*	Tali
8.	**Lamiaceae**	
12/1	*Ocimum sanctum*	Tulsi
9.	**Phyllanthaceae**	
13/1	*Phyllanthus fraternus*	Bhuiavali
10.	**Liliaceae**	
14/1	*Chlorophytum tuberosum*	Safedmusli

Table 4. List of Climbers in the Study Area

S. No.	Family and Scientific Name	Vernacular Name
1.	**Vitaceae**	
1/1	*Cissus repanda*	Gandovelo
2/2	*Cissus quadrangulare*	Hadsakal
3/3	*Cayratia auriculata*	Khat-Khatumbo
4/4	*Cayratia camosa*	Khatumbo
2.	**Nyctaginaceae**	
5/1	*Bougainvillea spectabilis*	Booganvel
3.	**Cucurbitaceae**	
6/1	*Cucurbita maxima*	Lal kolu
7/2	*Cucumis sativus*	Khira
8/3	*Coccinia grandis*	Tondla

9/4	*Momondica dioica*	Katwal
10/5	*Cucumis callosus*	Tarbucha
4.	**Menispermaceae**	
11/1	*Cissampelos pareira*	Abuta

Table 5. List of Twinner in the Study Area

S. No.	Family and Scientific Name	Vernacular Name
1.	**Asclepiadaceae**	
1/1	*Hemidesmus indicus*	Sariva
2/2	*Leptadenia reticulata*	Meethi dodi
3/3	*Ceropegia bulbosa*	Khadula
2.	**Asparagaceae**	
4/1	*Asparagus racemosus*	Shatavari
3.	**Minispermaceae**	
5/1	*Cocculus hirsutus*	Vasanvel
6/2	*Cyclea peltata*	Raj Patha

Table 6. List of Creeper in the Study Area

S. No.	Family and Scientific Name	Vernacular Name
1.	**Convolvulaceae**	
1/1	*Ipomoea aquatica*	Nali
2/2	*Ipomoea eriocarpa*	Maal ghanti
3/3	*Ipomoea pes-caprae*	Maryada-vel
2.	**Cucurbitaceae**	
4/1	*Luffa acutangula*	Galka
4/2	*Momordica charantia*	Karela

Table 7. List of Parasite in the Study Area

S. No.	Family and Scientific Name	Vernacular Name
1.	**Convolvulaceae**	
1/1	*Cuscuta chinensis*	Amarvel
2/2	*Cuscuta reflexa*	Akashvel

Table 8. Medicinally Important Plants

S.No.	Scientific Name	Vernacular Name
1.	*Acacia nilotica*	Desi Baval
2.	*Azardirachta indica*	Limdo
3.	*Asparagus racemosus*	Shatavari
4.	*Adhatoda vasica*	Ardusi
5.	*Calotropis procera*	Akado
6.	*Cuscuta reflexa*	Akashvel
7.	*Datura metel*	Dhanturo
8.	*Ficus bengalesis*	Vad
9.	*Ficus religiosa*	Pipdo
10.	*Ocimum sanctum*	Tulsi
11.	*Catharanthus roseus*	Sadaphuli

Cultivated Plants in the Study Area

The prevalent cropping systems of this area are the cumulative results of past and present decisions by individuals; these decisions are usually based on experience, tradition, expected profit, personal preferences and resources, and so on. The crop occupying the highest percentage of the sown area of this region is taken as the major crop and all other possible alternative crops which are sown in this region either as substitutes of the base crop in the same season or as the crops which fit in the rotation in the subsequent season, are considered as minor crop. No any major/minor and vegetable crop in the core zone was observed during study period, but observed major/minor and vegetable crop in the buffer zone.

a. Major Crops in buffer zone: *Arachis hypogaea* (Groundnut), *Zea mays* (Maize), *Sorghum bicolor* (Jowar) and *Pennisetum glaucum* (Bajra).

b. Minor crops in buffer zone: *Triticum aestivum* (Wheat), *Cajanus cajan* (Tur), *Cicer*

arietinum (Gram) and *Tagetes* (Marigold crop) for flower.

c. Major horticultural crops in buffer zone: *Mangifera indica* (Kairi), *Manilkara zapota* (Chikku) and *Musa* × *paradisiaca* (Banana).

d. Major Vegetable corps: The major vegetables grown in the study area (buffer zone) were: *Abelmoschus esculentus* (Bhinda), *Lagenaria siceraria* (Bottle gourd), *Luffa acutangula* (Gilka) and *Momordica charantia* (Bitter gourd).

e. Major Ornamental Plants: Following is the list of ornamental plants in the study area (buffer zone) *Hibiscus rosa-sinensis* (China rose), *Ixora coccinea* (Red ixora), *Rosa* (Rose) and *Tagetes* (Marigold).

Status of the Forest, Their Category in Study Area

The forest areas of Gujarat are unevenly distributed. The major concentration of forests is found all along the eastern border of the state and the hilly portion of Saurashtra. The wide variations in Geophysical and Eco-climatic conditions ranging from hot saline deserts to humid hilly tracts and from coast to high hills have resulted in to formation of various types of forest. No forest land is involved within the mine lease area; however it is present in the study area. On the basis of forest classification by Champion and Seth 1968, tropical dry deciduous forest exists in the study area. In this type of forest vegetation developed due to they have long dry seasons which last several months and vary with geographic location. The common trees are the teak and a variety of acacia. However, vegetation in core are of mine is very sparsely distributed. As per revenue record and toposheet (SOI), there is a reserved forest (open scrub) for stony waste area. This can be classified under open scrub. This reserved forest fall near bauxite mine at a distance of ~1.0 km in NW direction. This is open and having no vegetation currently, reserved for minerals.

Mangrove: Mangroves not only simply a type of specialized tree, but also an ecosystem that predominantly consists of mangrove trees. They have a remarkable ability to adapt and survive in their suffocating, salt laden environment. The mangrove (marine and terrestrial) encountered in study area is tabulated below. The aquatic mangrove *Avicennia marina* was seen near the creek (Miyani) only.

Rare and Endangered Flora in the Study Area: Among recorded plant species none can be assigned the status of endemic plant of this region in core or buffer zone. None of the rare and endangered floral species were recorded in study area during the field study.

Faunal Biodiversity

Avifauna: Water birds are very common as creek and sea shore line is the major part falls under study area. The Indian Peafowl was observed which is listed as schedule –I as per IWPA, 1972 and others listed as schedule IV as per IWPA, 1972. Systematic account of the birds in the study area with the status of occurrence is given in the Table 10.

Table 9. List of Mangrove in the study area

S.No.	Scientific name	Common name	Family
Marine			
1.	*Avicennia marina*	Grey Mangrove	Acanthaceae
2.	*Avicennia officinalis*	Indian Mangrove	Acanthaceae
Terrestrial			
3.	*Salvadora persica*	Toothbrush Tree	Salvadoraceae
4.	*Salvadora oleoides Decne*	Toothbrush Tree-Big	Salvadoraceae

Table 10. Systematic Lists of Birds encountered in the Study Area

S.No	Family	Common Name	Scientific Name	Schedule/IUCN	Status
1.	Accipitridae	Shikra	*Accipiter badius (Gmelin, 1788)*	Schedule IV	R
2.		Imperial Eagle	*Aquila heliaca (Saigny, 1809)*	Vulnerable	R
3.		Black-winged Kite	*Elanus caeruleus* (Desfontaines, 1789)	Schedule IV	R
4.	*Alaudidae*	Oriental Sky Lark	*Alauda gulgula (Franklin, 1831)*	Schedule IV	M
5.	Alcedinidae	White-throated Kingfisher	*Halcyon smyrnensis* (Linnaeus,	Schedule IV	R

			1758)		
6.	Ardeidae	Indian pond heron	*Ardeola grayii* (Sykes, 1832)	Schedule IV	R
7.		Cattle Egret	*Bubulcus ibis* (Linnaeus, 1758)	Schedule IV	RM
8.		Little Egret	*Egretta garzetta* (Linnaeus, 1766)	Schedule IV	R
9.	Charadriidae	Lapwing	*Vanellus indicus* (Boddaert, 1783)	Schedule IV	R
10.	Ciconiidae	Painted Stork	*Mycteria leucocephala* (Pennant, 1769)	Schedule IV	RM
11.	Columbidae	Eurasian Collared-Dove	*Streptopelia decaocto* (Frivaldszky, 1838)	Schedule IV	R
12.		Rufous Turtle Dove	*Streptopelia orientali* (Latham, 1790)	Schedule IV	RM
13.	Coraciidae	Indian Roller	*Coracias benghalensis* (Linnaeus, 1758)	LC	R
14.	Cuculidae	Crow-Pheasant	*Centropus sinensis* (Stephens, 1815)	LC	R
15.		Blue Rock Pigeon	*Columba livia* (Gmelin, 1789)	LC	R
16.	Dicruridae	Black drongo	*Dicrurus macrocercus (Vieillot, 1817)*	LC	R
17.	Laniidae	Great Grey Shrike	*Lanius excubitor* (Linnaeus, 1758)	Schedule IV	RM
18.	Laridae	Little Tern	*Sternula albifrons* (Pallas, 1764)	LC	R
19.	Leiotrichidae	Common Babbler	*Turdoides caudatus* (Dumont, 1823)	Schedule IV	R
20.	Meropidae	Chestnut-headed Bee-eater	*Merops leschenaulti* (Vieillot, 1817)	LC	R
21.	Motacillidae	Yellow Wagtail	*Motacilla flava* (Linnaeus, 1758)	Schedule IV	RM
22.	Muscicapidae	Spotted Flycatcher	*Muscicapa striata (Pallas, 1764)*	Schedule IV	R
23.	Nectariniidae	Purple Sunbird	*Nectarinia asiatica* (Latham, 1790)	Schedule IV	R
24.	Passeridae	House sparrow	*Passer domesticus* (Linnaeus, 1758)	LC	R
25.	Phalacrocoracidae	Cormorant	*Phalacrocorax fuscicollis* (Stephens, 1826)	Schedule IV	R
26.		Little Cormorant	*Phalacrocorax niger* (Vieillot, 1817)	Schedule IV	RM
27.	Phasianidae	Indian Peafowl	*Pavo cristatus* (Linnaeus, 1758)	Schedule I	R
28.	Phoenicopteridae	Lesser Flamingo	*Phoenicopterus minor* (Geoffroy Saint-Hilaire, 1798)	Schedule IV	RM
29.	Ploceidae	Baya weaver	*Ploceus philippinus* (Linnaeus, 1766)	Schedule IV	R
30.	Podicipedidae	Little Grebe	*Tachybaptus ruficollis* (Pallas, 1764)	Schedule IV	R
31.	Psittacidae	Rose-ringed Parakeet	*Psittacula krameri* (Scopoli, 1769)	Schedule IV	R
32.	Rallidae	White-breasted Water hen	*Amaurornis phoenicurus (Pennant, 1769)*	Schedule IV	R
33.		Coot	*Fulica atra* (Linnaeus, 1758)	Schedule IV	R
34.	Scolopacidae	Ruff	*Philomachus pugnax* (Linnaeus, 1758)	LC	R
35.	Sturnidae	Bank Myna	*Acridotheres ginginianus* (Latham 1790)	Schedule IV	R
36.	Threskiornithidae	Eurasian Spoonbill	*Platalea leucorodia* (Linnaeus, 1758)	Schedule IV	P

37.		Red-naped ibis	*Pseudibis papillosa* (Temminck, 1824)	Schedule IV	R
38.		Black headed ibis	*Throskiornis Melanocephalus* (Latham, 1790)	Schedule IV	M

Note: R-Resident, M- Migratory, RM – Resident & Migratory

Figure 4. Peacock spotting

Migratory Pattern of Birds: Migration is the best studied of animal behaviors, yet few empirical studies have tested hypotheses explaining the ultimate causes of these cyclical annual movements. Fretwell's (1980) hypothesis predicts that if nest predation explains why many tropical birds migrate uphill to breed, then predation risk must be negatively associated with elevation. The proportion of nests depredated by different types of predators differed among elevations.

Herpetofauna and mammals: In amphibian group, the toads were sighted during the study period. The reptile, Common Garden Lizard, House Gecko and Fan-Throated Lizard, Common rat Snake and were observed in the region is given in the table 11. The mammals observed in the study area are listed in table 12 and marine fishes observed are listed in the table 13.

Table 11. List of Reptiles in the Study Area

S. No.	Family	Common Name	Scientific Name	Schedule as per WPA 1972
1.	Agamidae	Common Garden Lizard	*Calotes versicolor* (Cuvier, 1817)	Not listed
3.		Fan-Throated Lizard	*Sitana ponticeriana* (Cuvier, 1817)	Not listed
2.	*Agamidiae*	Roux's Forest Lizard	*Calotes rouxii* (Dumeril and Bibron, 1837)	Not listed
4.	Chamaeleonidae	Indian Chameleon	*Chameleon zeylanicus* (Rafinesque, 1815)	Not listed
9.	Colubridae	Checkered Keelback	*Xenochrophis piscator* (Schneider, 1799)	Schedule II
5.	Elapidae	Indian Cobra	*Naja naja* (Linnaeus, 1758)	Schedule II
8.		Common Indian Krait	*Bungarus caeruleus* (Schneider, 1801)	Schedule II
6.	Gekkonidae	House Gecko	*Hemidactylus flaviviridis (Ruppell, 1835)*	Not listed
10.	Viperidae	Indian Saw Scaled Viper	*Echis carinatus* (Schneider, 1801)	Not listed
7.		Russell's Viper	*Daboia russelli* (Shaw & Nodder, 1797)	Schedule II

Table 12. Mammals in Study Area

S.No.	Family	Common Name	Scientific Name	Status as per IWPA 1972/IUCN
1.	Antilopinae	Blue Bull	*Boselaphus tragocamelus* (Pallas, 1766)	Schedule III
2.	Herpestidae	Small Asian mongoose	*Herpestes javanicus* (Geoffory Saint-Hilaire, 1818)	Schedule II
3.	Leporidae	Indian Hare	*Lepus nigricollis (*F. Cuvier, 1823*)*	Schedule IV
4.	Pteropodidae	Indian flying fox/Fruit bat	*Pteropus giganteus* (Brünnich, 1782)	LC
5.	Sciuridae	Five striped Palm Squirrel	*Funambulus pennantii* (Wroughton, 1905)	Schedule IV

Table 13. List of Marine Fish

S.No.	Family	Common name	Scientific name
1.	Clupeidae	Hilsa shad	*Tenualosa ilisha (H*amilton, 1822)

2.	Mugilidae	Blue Spot Grey Mullet	*Valamugil seheli** (Forsskal, 1775)
3.		Grey Mullet	*Mugil cephalus (Linnaeus, 1758)*
4.		Mullet	*Mugil dussumieri (Linnaeus, 1758)*
5.	Penaeidae	Indian Prawn	*Penaeus indicus* (Milne-Edwards, 1837)
6.	Polynemidae	Thread Fin	*Polynemus indicus (Linnaeus, 1758)*
7.	Stromateidae	Pomfret	*Pampus chinensis* (Bonaparte, 1834)
8.	Synodontidae	Bombay Duck (Bumla)	*Harpodon neherius* (Hamilton, 1822)
9.	Sciaenidae	Jewfish	*Pseudosciaena amblyceps* (Bleeker, 1863)
10.			Argyrosomus japonicus (Temminck & Schlegel, 1844)
11.			Protonibea *diacanthus (*Lacepede, 1802)

*not seen directly

RET species: The IUCN Red List is the world's most comprehensive inventory of the global conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. Among the birds in the study area, Pea fowl (*Pavo cristatus*) is included in schedule I of Wild life protection Act (1972), while many other birds are included in schedule IV. Among the reptiles, Indian Cobra (*Naja naja*), *Daboia russelli* (Russell's viper) and *Xenochrophis piscator* (Checkered keelback) is provided protection as per Schedule-II of Wild life Protection Act, (1972). None of the sighted animal species can be assigned endemic species category of the study area.

CONCLUSION

To undertake the appropriate, mandatory eco-friendly mining and reclamation methods, the bauxite mining operations and Environmental Management Plan (EMP) need to be carefully and scientifically planned and implemented through appropriate sustainable manner to have minimum environmental damage. Mining operation may affect the crop productivity of nearby area, as agriculture fields are very close to lease. An urgent need to protect agro-biodiversity of the area by using good practice, 5m high boundry on periphery; regular water sprinkling and manual mining instead of mechanized mining, plantation over benches, rainwater harvesting and its use in irrigation and restoration of mine pits. The effective plantation should be done in periphery *i.e.* 10 m wide in 3 tier green belt development.

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