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RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

Mammalian and Avian Faunal Diversity in Damodar Valley under DVC Project Area

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INTRODUCTION

The close dependence of man with water has existed over thousands of years. In the process of dependency of using natural water, human being has planned such a way that natural flow of rivers could hardly be said natural now-a-days. River valleys have remained as cradles of human activities and achievements throughout the course of human history and the Damodar Valley is no exception nurturing civilization in different phases through 3500 years.

The Damodar is a shallow, wide, seasonal and flashy river. It originates near Chandwa village, Palamau district, Chotanagpur Plateau in Jharkhand State, and flows eastwards 592 km up to the estuary of river Hugli in West Bengal. Area of Damodar Valley under DVC Project covers nearly 24235 km^2 across Hazaribagh, Koderma, Giridih, Dhanbad, Dumka, Bokaro, Chatra districts of Jharkhand and Bardhaman, Hugli, Puruliya and Haora districts of West Bengal. Even in the near past up to the middle of the 20th century, the upper reaches of the valley was a paradise for the wild beasts and the whole valley was tuned with the song of an enormous number of birds. At present the area is an industrial belt. During rain, its flow is torrential and in the hot summer, barely a trickle. Its destructive propensities have earned the Damodar, the sobriquet of 'River of sorrow'

After a devastating flood in 1943, a plan was taken to construct eight reservoirs in two phases on the river Damodar and its tributaries. India's first multipurpose river valley project was launched on 7th July in the year 1948 under DVC. The dams to be constructed were Tilaiya, Maithon and Balpahari on the river Barakar; Bokaro on river Bokaro; Konar on the river Konar and the Panchet, Aiyer and Bermo detention dams on the Damodar itself. On the first phase, only four dams' *viz.* Tilaiya (1953), Konar (1955), Maithon (1957) and Panchet (1959) were constructed by DVC. Durgapur barrage was constructed downstream of the four dams in 1955 with head regulators on canals for irrigation purpose. Maithon dam lies downstream of Tilaiya on Barakar river and Panchet is situated downstream of Konar on Damodar. As such, the Maithon and Panchet act as control reservoirs and are located about 8 km above the confluence point of Barakar joining the Damodar. Only one more reservoir, the Tenughat, came up on 1978 on river Damodar which is under control of Government of Jharkhand. All the five dams are now in the Jharkhand state and only Durgapur barrage is situated in West Bengal.

Though DVC project was launched for the well being of the people yet inundation of a large area had obviously affected the wilds. Almost after half a century, an attempt has been made in the years 2006-08 for assessing the species diversity of mammal and bird in particular in both dam and catchment areas.

TOPOGRAPHY

Damodar basin is located between 84°45' E longitude and 22°15' to 24°30' N latitude. The river Damodar has a number of tributaries and sub-tributaries, such as Barakar, Konar, Bokaro, Haharo, Jamnai, Ghagri, Khadia and Bhera. The hilly terrain is almost within the state of Jharkhand and the flatter portion lie within the state of West Bengal. The hills consist of narrow ridges with several craggy peaks rising solitarily from a vast flat plain and extend to south-east, where they subside eventually into an extended belt of high land with peaked hills. The slopes except for a few grass covered spaces near summit are covered with dense jungles. Certain areas are covered with scrub jungles, including much stunted Sal (*Shorea robusta*) and endless paddy fields with a number of tanks and low jungle covered hillocks abruptly rising from the plain.

River System:

The river Damodar rises in the Palamau hills of Chotanagpur in Jharkhand at about 609.57 m above mean sea level. After flowing generally in a south-easterly direction for 240 km in Jharkhand and rest in West Bengal, it joins the river Hugli about 50 km below Kolkata. Its principal tributary, the Barakar, joins it just upstream of Jharkhand-West Bengal border. Below Durgapur (West Bengal), it abruptly changes its course and then bifurcates into two channels *viz.* the Damodar Channel (also known as Amta Channel) and the Kanka-Mundeswari Channel which finally meets the river Hugli. The Barakar is the most important tributary of the river Damodar. It originates near Padma in Hazaribagh district and flows through Jharkhand before meeting the Damodar near Dishergarh in West Bengal. Rivers Damodar and Barakar trifurcate the Chotanagpur Plateau. Rivers pass through hilly areas with great force, sweeping away whatever lies in their path.

Catchments:

The catchment of the river is about 22,000 km^2 of which about 19,000 km^2 is in upland and 3000 km^2 in plains which are deltaic in nature. The catchments are irregular in shape and somewhat elongated in the lower reach. The river slope is 1.86 m/km for the first 241 km, 0.57 m/km in the next 167 km and 0.16 m/km in the last reach.

Geology:

Metamorphic rocks occur throughout the plateau as the basal formation persists throughout the valley. They consist of gneiss which is sometimes excessively granitic or syenitic and without a trace of foliation-hornblendic and mica-schists and quartzites. These rocks are in some localities much traversed by veins of quartz and granite, and in places by system of trap dykes. Almost all the loftiest plateaus and most of the hills are formed of these metamorphic rocks. Resting upon these, the oldest primary rocks, is a perfectly distinct series of metamorphosed beds. Rocks are much richer in ores like iron,

copper, lead *etc.*, while gold is found in the river sands throughout. The area is also under lying with coal reserve. There is best known sandstone in certain hills like Panchet. As a result of disintegration of certain rocks and soils, growth of particular plants, which in some cases support special forms of animal life (Ball, 1874) also retarded.

Soil:

Six sub-types of soils have been identified under the main alluvium, either the Ganga alluvium or the Damodar alluvium in the delta area. Open Sal forests (*Shorea robusta*) thrive mainly on laterite and dense Sal forest on red and yellow loams in the upper valley.

Climate:

The climate of the area is characterized by moderate winter and hot and humid summer. In the winter from December to March the valley usually receives little rain. In the summer months from June to September, the flow of air is from sea to land and the season is characterized by high humidity, clouds and rain. The direction of winds being south-westerly, the season is named south-west monsoon which is the main season producing rains. Between these two principal seasons are the transition seasons of the hot weather months of April-May and the retreating monsoon months of October-November.

Rainfall:

The annual rainfall over the valley ranges between 1000-1,800 mm. Within the command area, the upper and the middle parts of the Damodar basin receive approximately 1,209 mm rainfall annually and the lower valley 1,329 mm. Mean annual rainfall in the Damodar basin is 1,300 mm and about 80% of rain precipitates during June-September. Mean relative humidity varies from 80% during July-September to 40% in March-May.

Temperature:

The highest maximum temperature exceeding 46° C was recorded over a large part of the valley and summer temperature swings between 40-42° C and the same in winter between 23-26° C.

Flora and Vegetation:

The vegetation of the higher reaches of Damodar valley is almost tropical moist deciduous type with an admixture of tropical dry deciduous vegetation in some areas. The vegetation of the area is one of its principal natural resources. Sal (*Shorea robusta*) is the most important timber tree and the others are Shisham, Bia (*Pterocarpus marsupium*), Asan (*Terminalia tomentosa*), Gamhar (*Gmelina arborea*), Karam *etc.* Other important trees are Mahua (*Bassia latifolia*), Kusum (*Schleichera trijuga*), Gular

(*Ficus glomerata*), Pier (*Buchanania latifolia*), Khair (*Acacia catechu*), Amaltas (*Cassia fistula*), Kend (*Diospyros malanoxylon*), Karanj (*Ponamia glabera*), Palas (*Butea frondosa*), Khajur (*Phoenix sylvestris*) *etc.* A few species of bamboo occurs throughout the area. Water weeds like *Chara*, *Nymphoea*, *Potomogeton*, *Alisma* and grass like *Cyperus* and Salai (*Boswalia* serrata) are very common. The best fodder grasses are dub and kans. Firewood is supplied by Salai, Semal, *Acacia* and Harra. The common ferns are *Droser*, *Arums*, and *Oxalis*. The parasitic and ephiphytic plants are *Cuscuta*, *Cassytha*, *Loranthus*, *Viscum etc.* The best matchwood trees are Piar, and Ginjan (*Odina wodier*) and the others are Semal, Salai, Gamhar, Chilbil (*Hooptelia integrifolia*). Lac is grown over entire Chhotanagpur but most important districts are Palamau and Ranchi and the best trees on which lac insects are reared are Kusum and Palas. Other trees on which lack insects subsits are Ber (*Zizyphus jujuba*), Dumur (*Ficus hispida*), Khair, Ghont (*Zizyphus xylopyra*) and Karam (*Adina latifolia*) *etc.* Chotanagpur is the home of Tasar Silkworm. It feeds on the leaves of Ber, Asan, Arjun *etc.*

Agriculture:

Paddy is the main crop of Damodar Valley area. 90 percent of paddy grown in the area is winter paddy, the remaining being autumn or broadcast rice. The other crops are maize, wheat, Barley, oil seeds, pulses and vegetables.

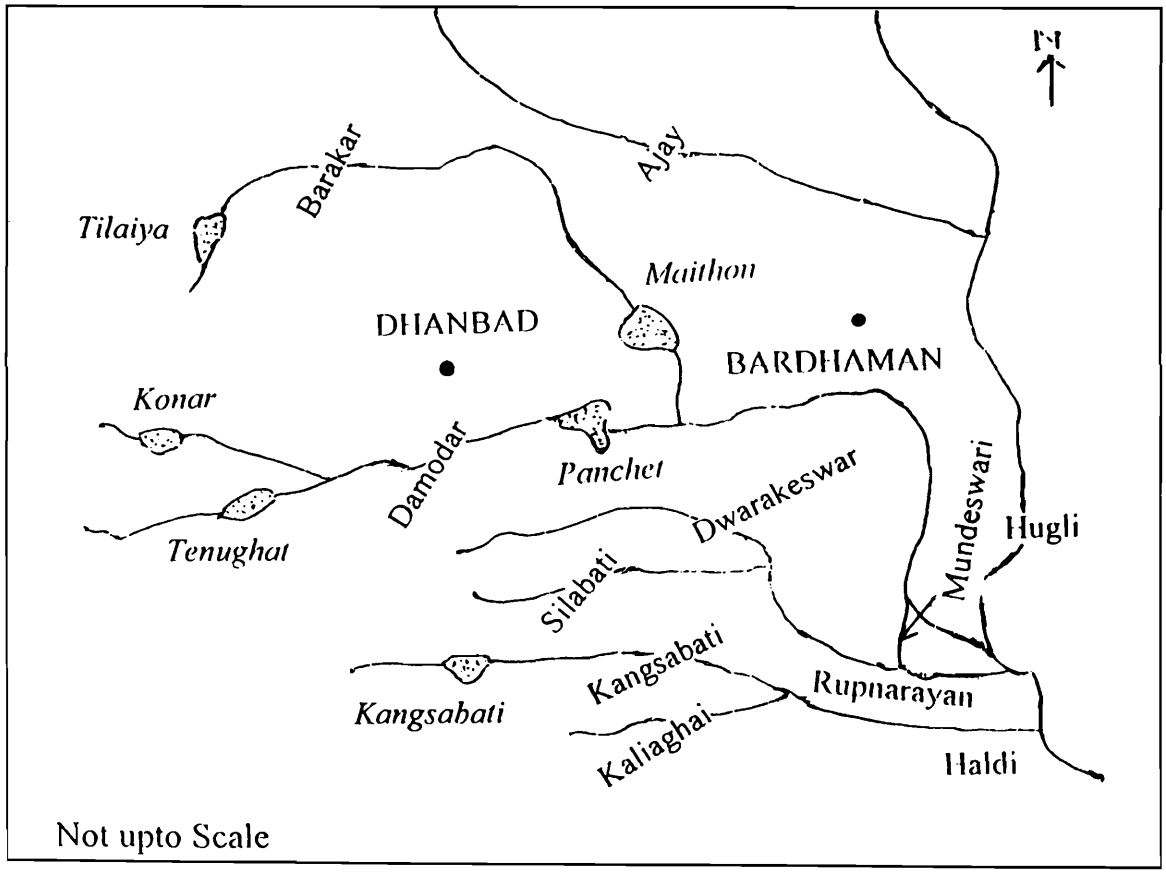

Figure 1 : Damodar Basin

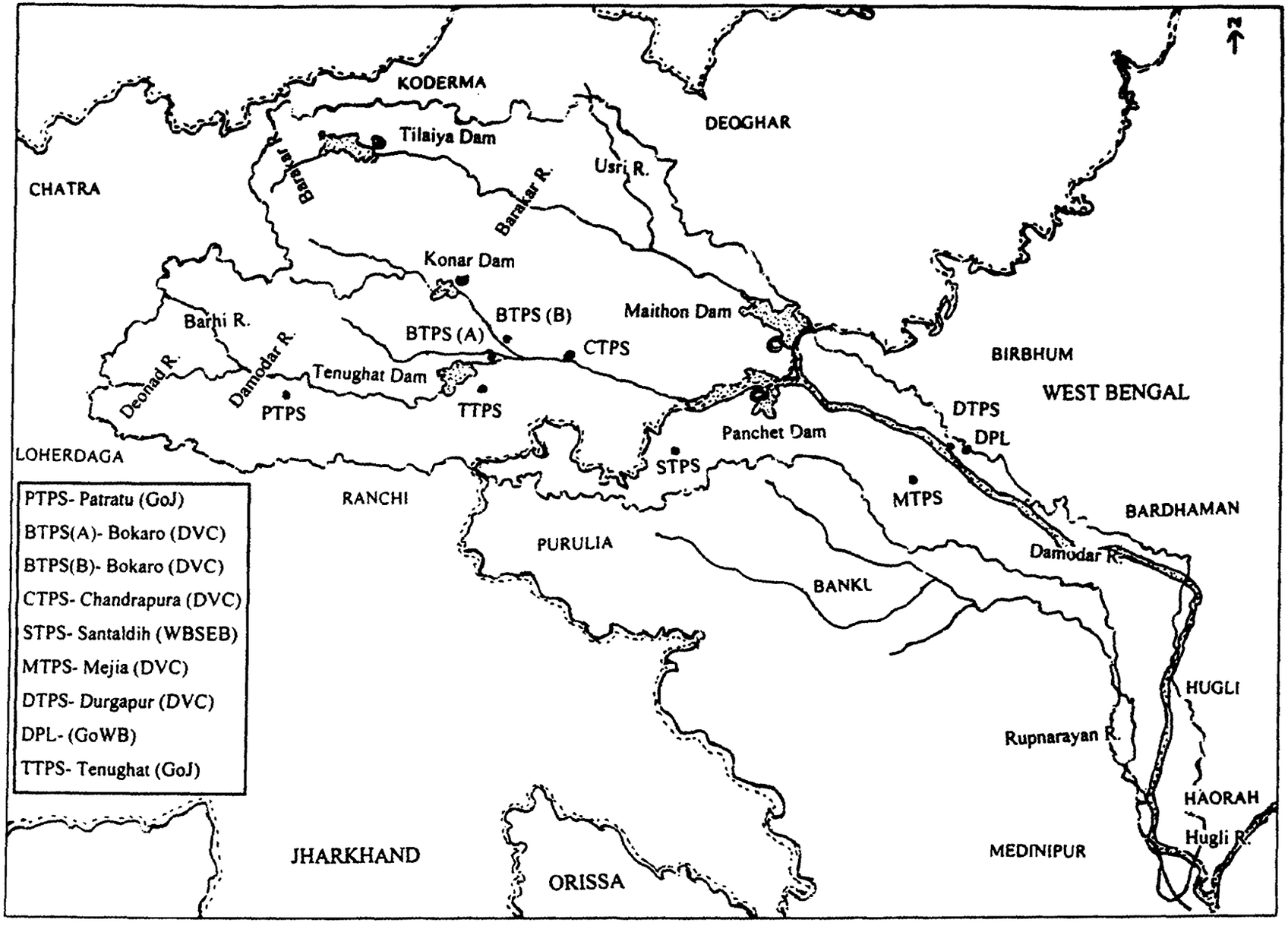

Figure 2 : Map of DVC in the states of Jharkhand and West Bengal

STUDY AREA

Study was conducted in the Damodar Valley (Fig. 1) area during 2006-2008 covering the districts Koderma, Hazaribagh, northern Ranchi, Giridih, Bokaro, Dhanbad in Jharkhand and northern side of Purulia and Bankura districts as well as stretches of Bardhaman, Hugli and Haorah districts in West Bengal. Study was confined along the courses of Damodar, Barakar, Konar and Bokaro rivers as well as in and around the dam sites *viz.* Tilaiya, Konar, Tenughat, Maithon and Panchet (Fig. 2). Other than these Gonda, Jamunia and Ghagra reservoir areas were also surveyed. As tributaries and sub-tributaries of the main rivers are originated in the hills and hillocks of the Jharkhand state, thus the hilly forested tracts of Hazaribagh, Koderma, Giridih, Panchet and Maithon were also explored during the survey period. The areas around the thermal power stations like Patratu, Bokaro and Chandrapura were also taken into account for assessing the species diversity in those areas.

METHODOLOGY

The total study area was subdivided into four study zones *viz.* dam, thermal power, catchments and river course. As the study area is mostly on plateau and full of hillocks, thus the survey was carried out both transversely and horizontally. In India, line transect (Burnham *et al.* 1980, Chakraborty and Kar 2004,) and vehicle census methods (Berwick 1974, Johnsingh 1983) are much used. In the present study direct observation was carried out on foot and on road by vehicle. Several spotlight observations were also conducted at night. Apart from the direct observations, indirect evidences like dung, scat, pellets and diggings in case of mammals were also taken into consideration (Chakraborty and Kar 2004, Eisenberg and Lockhart 1972, Dinerstein 1980). Country boats were used in the navigable zones of the rivers as well as in dams also. In case of avian species, apart from direct sighting, nests and calls are also taken into account for studying the diversity. The species, listed under River course (RC) are either primarily aquatic or water dependent. Sighting records were determined with the help of high power binocular and for indirect evidence, the materials were studied in the laboratory.

Taxonomic status was followed after Alfred *et al* (2002) and Wilson and Reeder (1993, 2005) for mammals and Manakadan and Pitte (2001) for birds. Identification of mammals were based on Corbett and Hill (1992), Ellerman (1947, 1961), Ellerman and Morrison-Scott (1951), Pocock (1939, 1941), and the same of avian species was mainly based on Ali and Ripley (1968-74).

OBSERVATIONS

The mammalian and avian species observed and identified during the study period are tabulated in Table 1 and 2 respectively.

Table 1 : List of Mammalian species present in and around Damodar Valley

TPS – Thermal Power Station, CAT – Catchments (including forest, cultivation, groves, orchards), RC – River Course

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC
	Order INSECTIVORA Family SORICIDAE					
1.	*Suncus murinus* (Linnaeus)	Grey Musk Shrew	–	+	+	–
	Order SCANDENTIA Family TUPAIIDAE					
2.	*Anathana ellioti* (Waterhouse)	Madras Tree Shrew	–	–	+	–
	Order CHIROPTERA Suborder MEGACHIROPTERA Family PTEROPODIDAE					
3.	*Cynopterus sphinx* (Vhal)	Short-nosed Fruit Bat	–	+	+	–
4.	*Pteropus giganteus* (Brünnich)	Indian Flying Fox	–	–	+	–
5.	*Rousettus leschenaulti* (Desmarest)	Fulvous Fruit Bat	–	+	+	–
	Suborder MICROCHIROPTERA Family RHINOPOMATIDAE					
6.	*Rhinopoma hardwickei* Gray	Lesser Mouse-tailed Bat	–	–	+	–
	Family EMBALLONURIDAE					
7.	*Taphozous longimanus* Hardwicke	Long-winged Tomb Bat	–	–	+	–

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC
	Family MEGADERMATIDAE					
8.	*Megaderma lyra* Geoffroy	Indian False Vampire	–	+	+	–
	Family RHINOLOPHIDAE					
9.	*Rhinolophus lepidus* Blyth	Blyth's Horse-shoe Bat	–	+	–	–
10.	*Hipposideros fulvus* Gray	Fulvus Leaf-nosed Bat	–	–	+	–
	Family VESPERTILIONIDAE					
11.	*Pipistrellus coromandra* (Gray)	Indian Pipistrelle	–	+	+	–
12.	*Pipistrellus mimus* Wroughton	Indian Pygmy Pipistrelle	–	+	+	–
13.	*Scotophilus heathi* (Horsfield)	Greater Yellow bat	–	–	+	–
14.	*Scotophilus kuhlii* Leach	Lesser Yellow Bat	–	+	+	–
	Order PRIMATES Family CERCOPITHECIDAE					
15.	*Macaca mulatta* (Zimmermann)	Rhesus Macaque	–	–	+	–
16.	*Semnopithecus entellus* (Dufresne)	Hanuman Langur	–	+	+	–
	Order CARNIVORA Family CANIDAE					
17.	*Canis aureus* Linnaeus	Asiatic Jackal	–	–	+	–
18.	*Canis lupus* Linnaeus	Wolf	–	–	+	–
19.	*Vulpes bengalensis* (Shaw).	Indian Fox	–	–	+	–

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC
	Family FELIDAE					
20.	*Felis chaus* Schreber	Jungle Cat	–	–	+	–
21.	*Prionailurus bengalensis* (Kerr)	Leopard Cat	–	–	+	–
22.	*Prionailurus viverrinus* (Bennett)	Fishing Cat	–	–	–	+
23.	*Panthera pardus* (Linnaeus)	Leopard	–	–	+	–
	Family HERPESTIDAE					
24.	*Herpestes edwardsii* (E.Geoffroy Saint-Hilaire)	Indian Gray Mongoose	–	–	+	–
25.	*Herpestes javanicus* (E.Geoffroy Saint-Hilaire)	Small Indian Mongoose	–	+	+	–
	Family HYAENIDAE					
26.	*Hyaena hyaena* (Linnaeus)	Hyena	–	–	+	–
	Family MUSTELIDAE					
27.	*Lutrogale perspicillata* (I.Geoffroy Saint-Hilaire)	Smooth-coated Otter	+	–	+	+
	Family URSIDAE					
28.	*Melursus ursinus* (Shaw)	Sloth Bear	–	–	+	–
	Family VIVERRIDAE					
29.	*Paradoxurus hermaphroditus* (Pallas)	Common Palm Civet	–	+	+	–
30.	*Viverricula indica* (Desmarest)	Small Indian Civet	–	–	+	–

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC
	Family ELEPHANTIDAE					
31.	*Elephas maximus* Linnaeus	Indian Elephant	–	–	+	–
	Order ARTIODACTYLA Family SUIDAE					
32.	*Sus scrofa* Linnaeus	Wild Boar	–	–	+	–
	Family CERVIDAE					
33.	*Axis axis* (Erxleben)	Spotted Deer	–	–	+	–
34.	*Cervus unicolor* Kerr	Sambar	–	–	+	–
35.	*Muntiacus muntjak* (Zimmermann)	Barking Deer	–	–	+	–
	Family BOVIDAE					
36.	*Boselaphus tragocamelus* (Pallas)	Nilgai	–	–	+	–
37.	*Antilope cervicapra* (Linnaeus)	Indian Antelope	–	–	+	–
38.	*Tetracerus quadricornis* Blainville	Choushinga	–	–	+	–
	Order PHOLIDOTA Family MANIDAE					
39.	*Manis crassicaudata* Gray	Indian Pangolin	–	–	+	–
	Order RODENTIA Suborder SCIUROGNATHI Family SCIURIDAE					
40.	*Funambulus pennantii* Wroughton	Northern Palm Squirrel	–	+	+	–
41.	*Funambulus palmarum* (Linnaeus)	Indian Palm Squirrel	–	–	+	–

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC
	Family MURIDAE					
42.	*Tatera indica* (Hardwicke)	Antelope Rat	–	+	–	–
43.	*Bandicota bengalensis* (Gray & Hardwicke)	Lesser Bandicoot Rat	–	+	–	–
44.	*Bandicota indica* (Bechstein)	Greater Bandicoot Rat	–	+	–	–
45.	*Golunda ellioti* Gray	Indian Bush Rat	–	–	+	–
46.	*Millardia meltada* Gray	Soft-furred Field Rat	–	–	+	–
47.	*Mus booduga* (Gray)	Indian Field Mouse	–	–	+	–
48.	*Mus musculus* Linnaeus	House Mouse	–	+	–	–
49.	*Mus saxicola* Elliot	Elliot's Spiny Mouse	–	–	+	–
50.	*Mus platythrix* Bennett	Brown Spiny Mouse	–	–	+	–
51.	*Rattus rattus* (Linnaeus)	House Rat	–	+	–	–
52.	*Vandeleuria oleracea* (Bennett)	Long-tailed Tree Mouse	–	–	+	–
53.	*Cremnomys blanfordi* (Thomas)	Blanford's Rat	–	–	+	–
	Suborder HYSTRICOGNATHI Family HYSTRICIDAE					
54.	*Hystrix indica* Kerr	Indian Crested Porcupine	–	–	+	–
	Order LAGOMORPHA Family LEPORIDAE					
55.	*Lepus nigricollis* Cuvier	Black-naped Hare	–	–	+	–

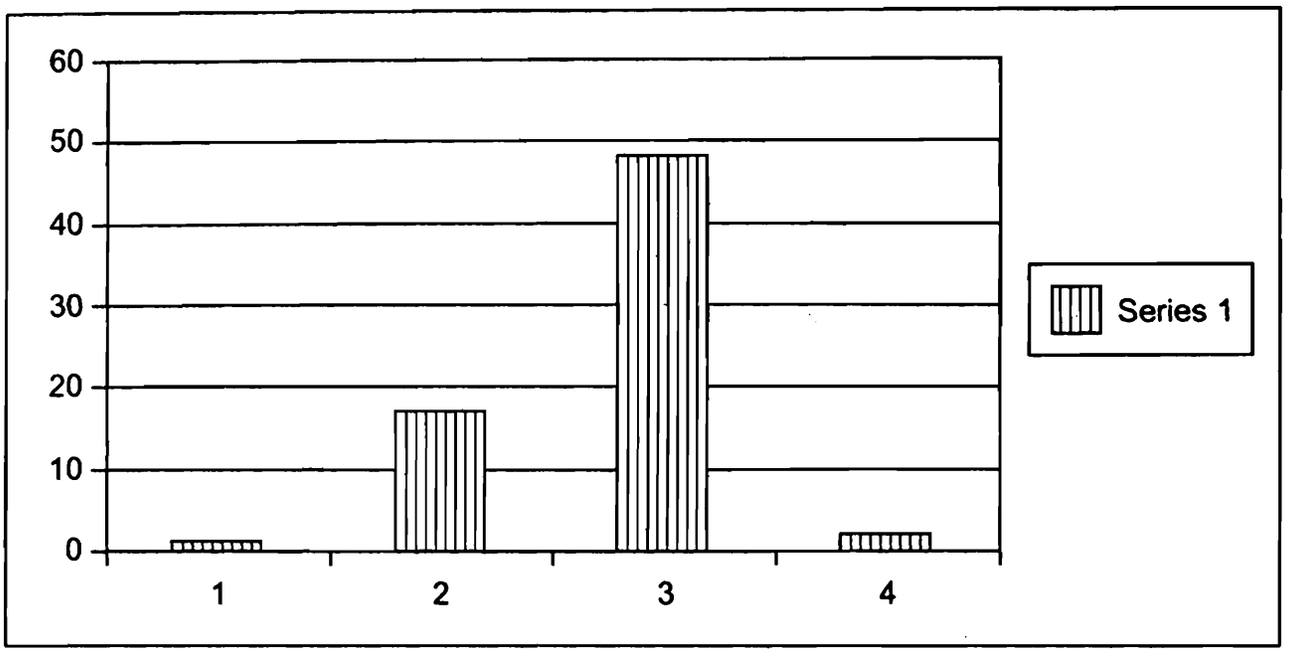

Figure 3 : Comparative Mammalian diversity in different study areas of Damodar Valley

1. DAM; 2. TPS – Thermal Power Station; 3. CAT – Catchments (including forest, cultivation, groves, orchards.); 4. RC – River Course

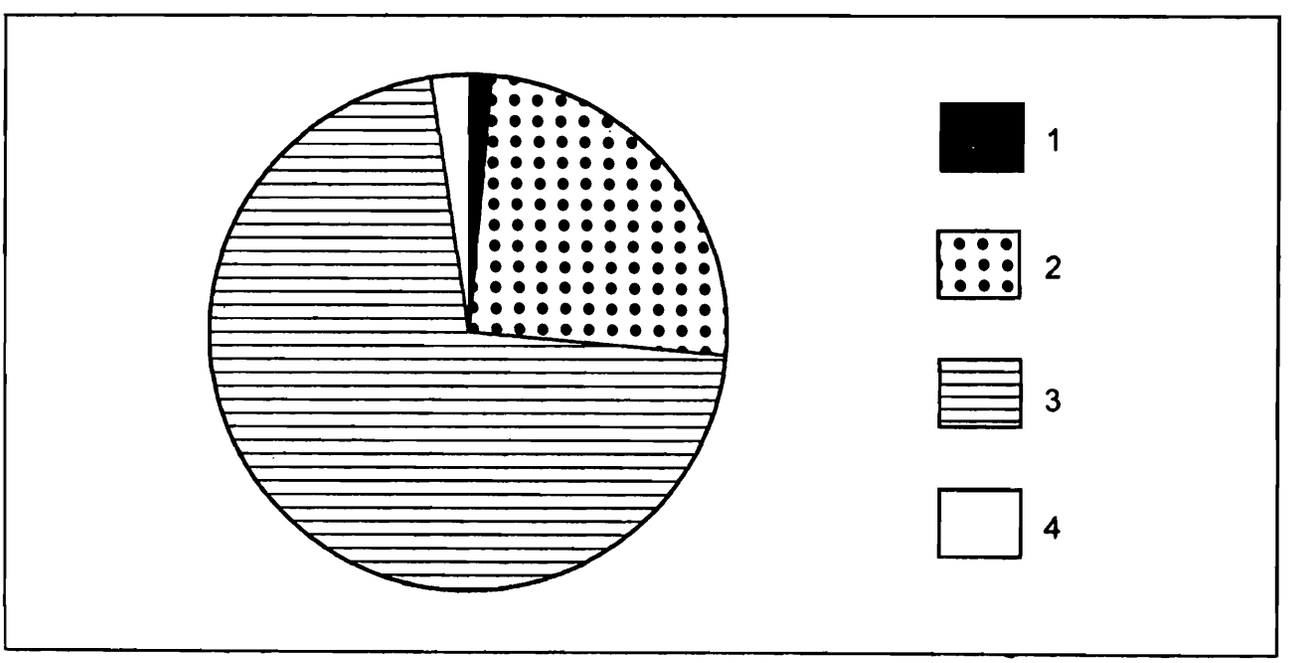

Figure 4 : Comparative percentage of mammalian diversity in different study areas of Damodar Valley

1. DAM; 2. TPS – Thermal Power Station; 3. CAT – Catchments (including forest, cultivation, groves, orchards.); 4. RC – River Course

Table 2 : List of avian species present in and around Damodar Valley

TPS – Thermal Power Station, CAT – Catchments (including forest, cultivation, groves, orchards, ponds), RC – River Course, R – Resident, WV – Winter visitor, SV – Summer. visitor

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Order PODICIPEDIFORMES Family PODICIPEDIDAE						
1.	*Podiceps cristatus* (Linnaeus)	Great Crested Grebe	+	–	–	–	WV
2.	*Tachybapyus ruficollis* (Pallas)	Little Grebe	+	–	–	–	R
	Order PELICANIFORMES Family PHALACROCORACIDAE						
3.	*Phalacrocorax carbo* (Linnaeus)	Cormorant	+	–	–	+	R
4.	*Phalacrocorax fuscicollis* Stephens	Indian Shag	+	–	–	–	R
5.	*Phalacrocorax niger* (Vieillot)	Little Cormorant	+	+	+	+	R
	Family ANHINGIDAE						
6.	*Anhinga melanogaster* Pennant	Darter	+	–	–	+	R
	Order CICONIFORMES Family ARDEIDAE						
7.	*Ardea cinerea* Linnaeus	Grey Heron	+	–	–	+	R
8.	*Ardea purpurea* Linnaeus	Purple Heron	+	–	–	+	R
9.	*Casmerodius albus* (Linnaeus)	Large Egret	+	–	–	+	R
10.	*Butoroides striatus* (Linnaeus)	Little Green Heron	+	–	–	+	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
11.	*Ardeola grayii* (Sykes)	Indian Pond Heron	+	+	+	+	R
12.	*Bubulcus ibis* (Linnaeus)	Cattle Egret	+	+	+	+	R
13.	*Egretta garzetta* (Linnaeus)	Little Egret	+	–	+	+	R
14.	*Nycticorax nycticorax* (Linnaeus)	Black-crowned Night Heron	+	–	+	–	R
15.	*Ixobrychus sinensis* (Gmelin)	Yellow Bittern	+	–	–	–	R
16.	*Botaurus stellaris* (Linnaeus)	Bittern	+	+	–	+	WV
	Family CICONIIDAE						
17.	*Mycteria leucocephala* (Pennant)	Painted Stork	+	–	–	+	R
18.	*Anastomus oscitans* (Boddaert)	Asian Open-bill Stork	+	+	+	+	R
19.	*Ciconia episcopus* (Boddaert)	White-necked Stork	+	–	–	+	R
20.	*Ephippiorhynchus asiaticus* (Latham)	Black-necked Stork	+	–	–	+	R
21.	*Leptoptilos javanicus* (Horsfield)	Lesser Adjutant	–	+	–	–	R
	Family THRESKIORNITHIDAE						
22.	*Threskiornis melanocephalus* (Latham)	Oriental White Ibis	+	–	–	+	R
23.	*Pseudibis papillosa* (Temminck)	Black Ibis	+	–	–	+	R
24.	*Plegadis falcinellus* (Linnaeus)	Glossy Ibis	–	–	–	+	R
25.	*Platalea leucorodia* Linnaeus	Spoonbill	+	–	–	+	

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Order ANSERIFORMES Family ANATIDAE						
26.	*Anser anser* (Linnaeus)	Greylag Goose	+	–	–	–	WV
27.	*Dendrocygna javanica* (Horsfield)	Lesser Whistling Teal	+	–	–	–	R
28.	*Tadorna ferruginea* (Pallas)	Brahminy Shelduck	+	–	–	–	WV
29.	*Anas acuta* Linnaeus	Northern Pintail	+	–	–	–	WV
30.	*Anas crecca* Linnaeus	Common Teal	+	–	–	–	WV
31	*Anas poecilorhyncha* J.R. Forster	Spot-billed Duck	+	–	–	–	WV
32.	*Anas strepera* Linnaeus	Gadwall	+	–	–	–	WV
33.	*Anas penelope* Linnaeus	Eurasian Wigeon	+	–	–	–	WV
34.	*Anas querquedula* Linnaeus	Garganey	+	–	–	–	WV
35.	*Anas clypeata* Linnaeus	Northern Shoveller	+	–	–	–	WV
36.	*Rhodonessa rufina* (Pallas)	Red-crested Pochard	+	–	–	–	WV
37.	*Aythya fuligula* (Linnaeus)	Tufted Pochard	+	–	–	–	WV
38.	*Nettapus coromandelianus* (Gmelin)	Cotton Teal	+	–	–	+	WV
	Order FALCONIFORMES Family ACCIPITRIDAE						
39.	*Elanus caeruleus* (Desfontaines)	Black-shouldered Kite	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
40.	*Pernis ptilorhynchus* (Temminck)	Oriental Honey-Buzzard	–	–	+	–	R
41.	*Milvus migrans* (Boddaert)	Black Kite	–	+	+	–	R
42.	*Haliastur indus* (Boddaert)	Brahminy Kite	+	–	–	+	R
43.	*Accipiter badius* (Gmelin)	Shikra	–	–	+	–	R
44.	*Ichthyophaga ichthyaetus* (Horsfield)	Greater Grey-headed Fish Eagle	+	–	–	+	R
45.	*Circus macrourus* (S.G. Gmelin)	Pallid Harrier	–	–	+	–	WV
46.	*Circus melanoleucos* (Pennant)	Pied Harrier	+	–	–	–	WV
47.	*Pandion haliaetus* (Linnaeus)	Osprey	+	–	–	–	WV
	Family FALCONIDAE						
48.	*Falco peregrinus* Tunstall	Peregrine Falcon	+	–	–	+	WV
49.	*Falco chicquera* Daudin	Red-headed Falcon	–	–	+	–	R
50.	*Falco tinnunculus* Linnaeus	Common Kestrel	–	–	+	–	+
	Order GALLIFORMES Family PHASIANIDAE						
51.	*Francolinus pondicerianus* (Gmelin)	Grey Francolin	–	–	+	–	R
52.	*Coturnix coturnix* (Linnaeus)	Common Quail	–	–	+	–	WV
53.	*Coturnix coromandelica* (Gmelin)	Rain Quail	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
54.	*Perdicula erythrorhyncha* (Sykes)	Painted Bush Quail	–	–	+	–	R
55.	*Gallus gallus* (Linnaeus)	Red Jungle Fowl	–	–	+	–	R
56.	*Pavo cristatus* (Linnaeus)	Indian Peafowl	–	–	+	–	R
	Order GRUIFORMES Family TURNICIDAE						
57.	*Turnix sylvatica* (Desfontaines)	Little Bustard Quail	–	–	+	–	R
58.	*Turnix tanki* Blyth	Button Quail	–	–	+	–	R
	Family RALLIDAE						
59.	*Rallus aquaticus* Linnaeus	Water Rail	–	–	–	+	WV
60.	*Porzana pusilla* (Pallas)	Baillon's Crake	–	–	–	+	WV
61.	*Amaurornis phoenicurus* (Pennant)	White-breasted Waterhen	+	+	–	–	R
62.	*Gallicrex cinerea* (Gmelin)	Water Cock	+	–	+	–	R
63.	*Gallinula chloropus* (Linnaeus)	Common Moorhen	+	+	–	–	R
64.	*Porphyrio porphyrio* (Linnaeus)	Purple Moorhen	+	–	–	+	R
65.	*Fulica atra* Linnaeus	Common Coot	+	–	–	–	R
	Order CHARADRIIFORMES Family JACANIDAE						
66.	*Hydrophasianus chirurgus* (Scopoli)	Pheasant-tailed Jacana	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
67.	*Metopidius indicus* (Latham)	Bronze-winged Jacana	–	–	+	–	R
	Family ROSTRATULIDAE						
68.	*Rostratula benghalensis* (Linnaeus)	Painted Snipe	–	–	+	+	R
	Family BURHINIDAE						
69.	*Esacus magnirostris* (Vieillot)	Beach Stone Plover	+	–	+	+	R
	Family CHARADRIIDAE						
70.	*Vanellus indicus* (Boddaert)	Red-wattled Lapwing	+	+	+	+	R
71.	*Vanellus duvaucelii* (Lesson)	River Lapwing	–	–	–	+	R
72.	*Charadrius dubius* Scopoli	Little Ringed Plover	–	–	–	+	WV
73.	*Tringa totanus* (Linnaeus)	Common Redshank	+	–	–	+	WV
74.	*Tringa nebularia* (Gunner)	Common Greenshank	+	–	–	+	WV
75.	*Tringa ochropus* Linnaeus	Green Sandpiper	–	–	+	+	WV
76.	*Tringa glareola* Linnaeus	Wood Sandpiper	–	–	+	+	WV
77.	*Actitis hypoleucos* Linnaeus	Common Sandpiper	+	–	–	+	WV
78.	*Gallinago gallinago* (Linnaeus)	Common Snipe	–	–	+	+	WV
	Family RECURVIROSTRIDAE						
79.	*Himantopus himantopus* (Linnaeus)	Black-winged Stilt	+	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Family LARIDAE						
80.	*Gelochelidon nilotica* (Gmelin)	Gull-billed Tern	+	–	–	+	WV
81.	*Sterna aurantia* J.E. Gray	River Tern	+	–	–	+	R
82.	*Sterna acuticauda* J.E. Gray	Black-bellied Tern	+	–	–	+	R
	Order COLUMBIFORMES Family COLUMBIDAE						
83.	*Treron bicincta* (Jerdon)	Orange-breasted Green Pigeon	–	–	+	–	R
84.	*Treron phoenicoptera* (Latham)	Yellow-legged Green Pigeon	–	–	+	–	R
85.	*Treron aenea* (Linnaeus)	Green Imperial Pigeon	–	–	+	–	R
86.	*Columba livia* Gmelin	Blue Rock Pigeon	–	+	+	–	R
87.	*Columba eversmanni* Bonaparte	Eastern Stock Pigeon	–	–	+	–	WV
88.	*Columba punicea* Blyth	Purple Wood-Pigeon	–	–	+	–	R
89.	*Streptopelia orientalis* (Latham)	Oriental Turtle Dove	–	–	+	–	R
90.	*Streptopelia decaocto* (Frivaldszky)	Eurasian collared Dove	–	–	+	–	R
91.	*Streptopelia tranquebarica* (Hermann)	Red collared Dove	–	–	+	–	R
92.	*Streptopelia chinensis* (Scopoli)	Spotted Dove	–	+	+	–	R
93.	*Streptopelia senegalensis* (Linnaeus)	Little Brown Dove	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Order PSITTACIFORMES Family PSITTACIDAE						
94.	*Psittacula eupatria* (Linnaeus)	Alexandrine Parakeet	–	–	+	–	R
95.	*Psittacula krameri* (Scopoli)	Rose-ringed Parakeet	–	+	+	–	R
96.	*Pssitacula cyanocephala* (Linnaeus)	Blossom-headed Parakeet	–	–	+	–	R
	Order CUCULIFORMES Family CUCULIDAE						
97.	*Clamator jacobinus* (Boddaert)	Pied Crested Cuckoo	–	–	+	–	SV
98.	*Hierococcyx varius* Vahl	Brainfever Bird	–	–	+	–	R
99.	*Cuculus micropterus* Gould	Indian Cuckoo	–	–	+	–	R
100.	*Cuculus canorus* Linnaeus	Common Cuckoo	–	–	+	–	SV
101.	*Cacomantis passerinus* (Vahl)	Indian Plaintive Cuckoo	–	–	+	–	R
102.	*Eudynamys scolopacea* (Linnaeus)	Asian Koel	–	+	+	–	R
103.	*Phaenicophaeus tristis* (Lesson)	Large Green-billed Malkoha	–	–	+	–	R
104.	*Centropus sinensis* (Stephens)	Greater Coucal	–	+	+	–	R
105.	*Centropus bengalensis* (P.L.S. Muller)	Lesser Coucal	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Order STRIGIFORMES Family STRIGIDAE						
106.	*Tyto alba* (Scopoli)	Barn Owl	–	+	–	–	R
107.	*Bubo coromandus* (Latham)	Dusky Eagle Owl	–	–	+	–	R
108.	*Ketupa zeylonensis* (Gmelin)	Brown Fish Owl	–	–	+	–	R
109.	*Glaucidium radiatum* (Tickell)	Jungle Owlet	–	–	+	–	R
110.	*Athene brama* (Temminck)	Spotted Owlet	–	+	+	–	R
	Order CAPRIMULGIFORMES Family CAPRIMULGIDAE						
111.	*Caprimulgus asiaticus* Latham	Common Indian Nightjar	–	–	+	–	R
112.	*Caprimulgus affinis* Horsfield	Franklin's Nightjar	–	–	+	–	R
	Order APODIFORMES Family APODIDAE						
113.	*Zoonavena sylvatica* (Tickell)	White-rumped Needletail Swift	+	–	+	–	R
114.	*Cypsiurus balasiensis* (J.E.Gray)	Asian Palm Swift	–	+	+	–	R
	Family HEMOPROCNIDAE						
115.	*Hemiprocne coronata* (Tickell)	Crested Tree Swift	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Order CORACIIFORMES Family ALCEDINIDAE						
116.	*Ceryle rudis* (Linnaeus)	Lesser Pied Kingfisher	+	+	+	+	R
117.	*Alcedo atthis* (Linnaeus)	Common Kingfisher	+	+	+	+	R
118.	*Alcedo meninting* Horsfield	Blue-eared Kingfisher	+	–	–	–	R
119.	*Halcyon capensis* (Linnaeus)	Stork-billed Kingfisher	+	–	–	+	R
120.	*Halcyon smyrnensis* (Linnaeus)	White-breasted Kingfisher	+	+	+	+	R
	Family MEROPIDAE						
121.	*Merops orientalis* Latham	Small Bee-eater	–	+	+	–	R
	Family CORACIDAE						
122.	*Coracias benghalensis* (Linnaeus)	Indian Roller	–	–	+	–	R
	Family UPUPIDAE						
123.	*Upupa epops* Linnaeus	Common Hoopoe	–	+	+	–	SV
	Family BUCEROTIDAE						
124.	*Ocyceros birostris* (Scopoli)	Indian Grey Hornbill	–	–	+	–	R
125.	*Anthracoceros malabaricus* (Gmelin)	Indian Pied Hornbill	–	–	+	–	R
	Order PICIFORMES Family CAPITONIDAE						
126.	*Megalaima zeylanica* (Gmelin)	Brown-headed Barbet	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
127.	*Megalaima haemacephala* (P.L.S. Muller)	Coppersmith Barbet	–	+	+	–	R
	Family PICIDAE						
128.	*Jynx torquilla* Linnaeus	Eurasian Wryneck	–	–	+	–	WV
129.	*Celeus brachyurus* (Vieillot)	Rufous Woodpecker	–	–	+	–	R
130.	*Picus xanthopygaeus* (J.E. Gray & G.R. Gray)	Little Scaly-bellied Green Woodpecker	–	–	+	–	R
131.	*Picus flavinucha* Gould	Large Yellow-naped Woodpecker	–	–	+	–	R
132.	*Picus chlorolophus* Vieillot	Small Yellow-naped Woodpecker	–	–	+	–	R
133.	*Dinopium benghalense* (Linnaeus)	Lesser Golden-backed Woodpecker	–	+	+	–	R
134.	*Dendrocopos macei* (Vieillot)	Fulvous-breasted Pied Woodpecker	–	–	+	–	R
135.	*Chrysocolaptes festivus* (Boddaert)	Black shouldered Woodpecker	–	–	+	–	R
136.	*Chrysocolaptes lucidus* (Scopoli)	Greater Golden-backed Woodpecker	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Order PASSERIFORMES Family PITTIDAE						
137.	*Pitta brachyura* (Linnaeus)	Indian Pitta	–	–	+	–	R
	Family ALAUDIDAE						
138.	*Mirafra assamica* Horsfield	Bengal Bush-Lark	–	–	+	–	R
139.	*Eremopterix grisea* (Scopoli)	Ashy-crowned Sparrow Lark	–	–	+	–	R
140.	*Calandrella acutirostris* Hume	Hume's Short-toed Lark	–	–	+	–	R
	Family HIRUNDIDAE						
141.	*Riparia riparia* (Linnaeus)	Sand Martin	+	–	–	–	WV
142.	*Riparia paludicola* (Vieillot)	Plain Martin	+	–	–	–	R
143.	*Hirundo rustica* Linnaeus	Common Swallow	–	–	+	–	WV
144.	*Hirundo smithi* Leach	Wire-tailed Swallow		–	+	–	R
	Family LANIIDAE						
145.	*Lanius excubitor* Linnaeus	Great Grey Shrike	–	–	+	–	R
146.	*Lanius vittatus* Valenciennes	Bay-backed Shrike	–	–	+	–	R
147.	*Lanius schach* Linnaeus	Rufous-backed Shrike	–	–	+	–	R
148.	*Lanius cristatus* Linnaeus	Brown Shrike	–	–	+	–	R
	Family ORIOLIDAE						
149.	*Oriolus chinensis* Linnaeus	Black-naped Oriole		–	+	–	WV

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
150.	*Oriolus xanthornus* Linnaeus	Black-headed Oriole	–	–	+	–	R
151.	*Oriolus oriolus* (Linnaeus)	Golden Oriole	–	–	+	–	WV
	Family DICRURIDAE						
152.	*Dicrurus macrocercus* Vieillot	Black Drongo	–	–	+	–	R
153.	*Dicrurus hottentottus* (Linnaeus)	Spangled Drongo	–	–	+	–	R
154.	*Dicrurus paradiseus* (Linnaeus)	Greater Racket-tailed Drongo	–	–	+	–	R
	Family STURNIDAE						
155.	*Sturnus malabaricus* (Gmelin)	Grey-headed Starling	–	–	+	–	R
156.	*Sturnus pagodarum* (Gmelin)	Brahminy Starling	–	–	+	–	R
157.	*Sturnus roseus* (Linnaeus)	Rosy Starling	–	–	+	–	WV
158.	*Sturnus contra* Linnaeus	Asian Starling	–	+	+	–	R
159.	*Acridotheres tristis* (Linnaeus)	Common Myna	–	+	–	–	R
160.	*Acridotheres ginginianus* (Latham)	Bank Myna	–	+	–	–	R
161.	*Acridotheres fuscus* (Wagler)	Jungle Myna	–	–	+	–	R
	Family CORVIDAE						
162.	*Dendrocitta vagabunda* (Latham)	Indian Tree Pie	–	+	+	–	R
163.	*Corvus splendens* Vieillot	House Crow	–	+	+	–	R
164.	*Corvus macrorhynchos* Wagler	Jungle Crow	–	+	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
	Family CAMPEPHAGIDAE						
165.	*Hemipus picatus* (Sykes)	Pied Flycatcher Shrike	–	–	+	–	R
166.	*Coracina macei* (Lesson)	Large Cuckoo-Shrike	–	–	+	–	R
167.	*Coracina melanoptera* (Rüppell)	Black-headed Cuckoo Shrike	–	–	+	–	R
168.	*Tephrodornis pondicerianus* (Gmelin)	Common Wood Shrike	–	–	+	–	R
169.	*Pericrocotus flammeus* (Forster)	Scarlet Minivet	–	–	+	–	R
170.	*Pericrocotus cinnamomeus* (Linnaeus)	Small Minivet	–	–	+	–	R
171.	*Pericrocotus erythropygius* (Jerdon)	White-bellied Minivet	–	–	+	–	R
	Family IRENIDAE						
172.	*Aegithia tiphia* (Linnaeus)	Common Iora	–	–	+	–	R
173.	*Chloropsis aurifrons* (Temminck)	Gold-fronted Chloropsis	–	–	+	–	R
	Family PYCNONOTIDAE						
174.	*Pycnonotus jocosus* (Linnaeus)	Red-whiskered Bulbul	–	–	+	–	R
175.	*Pycnonotus cafer* (Linnaeus)	Red-vented Bulbul	–	+	+	–	R
	Family MUSCICAPIDAE						
176.	*Turdoides earlei* (Blyth)	Striated Babbler	–	–	+	–	R
177.	*Turdoides striatus* (Dumont)	Jungle Babbler	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
178.	*Turdoides caudatus* (Dumont)	Common Babbler	–	–	+	–	R
179.	*Ficedula westermanni* (Sarpe)	Little Pied Flycatcher	–	–	+	–	WV (short range)
180.	*Ficedula superciliaris* (Jerdon)	Ultramarine Flycatcher	–	–	+	–	R
181.	*Cyornis tickellie* (Blyth)	Tickell's Blue Flycatcher	–	–	+	–	R
182.	*Eumyias thalassina* (Swainson)	Verditer Flycatcher	–	–	+	–	WV
183.	*Rhipidura aureola* Lesson	White-browed Fantail Flycatcher	–	–	+	–	R
184.	*Rhipidura albicollis* (Vieillot)	White-throated Fantail Flycatcher	–	–	+	–	R
185.	*Terpsiphone paradisi* (Linnaeus)	Paradise Flycatcher	–	–	+	–	WV
186.	*Prinia buchanani* Blyth	Rufous-fronted Prinia	–	–	+	–	R
187.	*Prinia socialis* Sykes	Ashy Prinia	–	–	+	–	R
188.	*Orthotomus sutorius* (Pennant)	Common Tailor Bird	–	+	+	–	R
189.	*Acrocephalus stentoreus* (Hemprich & Ehrenberg)	Indian Great Reed Warbler	+	–	–	–	WV
190.	*Phylloscopus collybita* (Vieillot)	Common Chiffchaff	–	–	+	–	WV
191.	*Phylloscopus trochiloides* (Sundevall)	Greenish Leaf-warbler	–	–	+	–	WV
192.	*Luscinia calliope* (Pallas)	Siberian Ruby throat	–	–	+	–	WV

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
193.	*Copsychus saularis* (Linnaeus)	Oriental Magpie-Robin	–	+	+	–	R
194.	*Copsychus malabaricus* (Scopoli)	White-rumped Shama	–	–	+	–	R
195.	*Cercomela fusca* (Blyth)	Indian Chat	–	–	+	–	R
196.	*Saxicola caprata* (Linnaeus)	Pied Bush Chat	–	–	+	–	R
197.	*Saxicoloides fulicata* (Linnaeus)	Indian Robin	–	+	+	–	R
198.	*Zoothera citrina* (Latham)	Orange-headed Ground Thrush	–	–	+	–	WV
	Family PARIDAE						
199.	*Parus major* Linnaeus	Great Tit	–	–	+	–	R
200.	*Parus xanthogenys* Vigors	Black-lored Tit	–	–	+	–	R
	Family MOTACILLIDAE						
201.	*Anthus hodgsoni* Richmond	Indian Tree Pipit	–	–	+	–	WV
202.	*Anthus similis* Jerdon	Brown Rock Pipit	–	–	+	–	WV
203.	*Motacilla flava* Linnaeus	Yellow Wagtail	+	–	+	+	WV
204.	*Motacilla cinerea* Tunstall	Grey wagtail	+	–	+	+	WV
205.	*Motacilla alba* Linnaeus	Pied Wagtail	+	+	+	+	WV
206.	*Motacilla maderaspatensis* Gmelin	Large Pied Wagtail	+	–	+	+	R
	Family DICAEIDAE						
207.	*Dicaeum agile* (Tickell)	Thick-billed Flowerpecker	–	–	+	–	R

Sl. No.	Scientific Name	Common Name	DAM	TPS	CAT	RC	Remarks
208.	*Dicaeum erythrorhynchos* (Latham)	Tickell's Flowerpecker	–	–	+	–	R
	Family NECTARINIIDAE						
209.	*Nectarinia zeylonica* (Linnaeus)	Purple-rumped Sunbird	–	–	+	–	R
210.	*Nectarinia asiatica* (Latham)	Purple Sunbird	–	+	+	–	R
211.	*Aethopyga siparaja* (Raffles)	Yellow-backed Sunbird	–	–	+	–	R
	Family ZOSTEROPIDAE						
212.	*Zosterops palpebrosa* (Temminck)	White-eye	–	–	+	–	R
	Family PLOCEIDAE						
213.	*Passer domesticus* (Linnaeus)	House Sparrow	–	–	+	–	R
214.	*Petronia xanthocollis* (Burton)	Yellow-throated Sparrow	–	–	+	–	R
215.	*Ploceus philippinus* (Linnaeus)	Baya weaver	–	–	+	–	R
216.	*Estrilda amandava* (Linnaeus)	Red Munia	–	–	+	–	R
217.	*Lonchura malabarica* (Linnaeus)	White-throated Munia	–	–	+	–	R
218.	*Lonchura punctulata* (Linnaeus)	Spotted Munia	–	–	+	–	R
219.	*Lonchura malacca* (Linnaeus)	Black-headed Munia	–	–	+	–	R
	Family EMBERIZIDAE						
220.	*Emberiza melanocephala* Scopoli	Black-headed Bunting	–	–	+	–	R
221.	*Melophus lathami* (Gray)	Crested Bunting	–	–	+	–	R

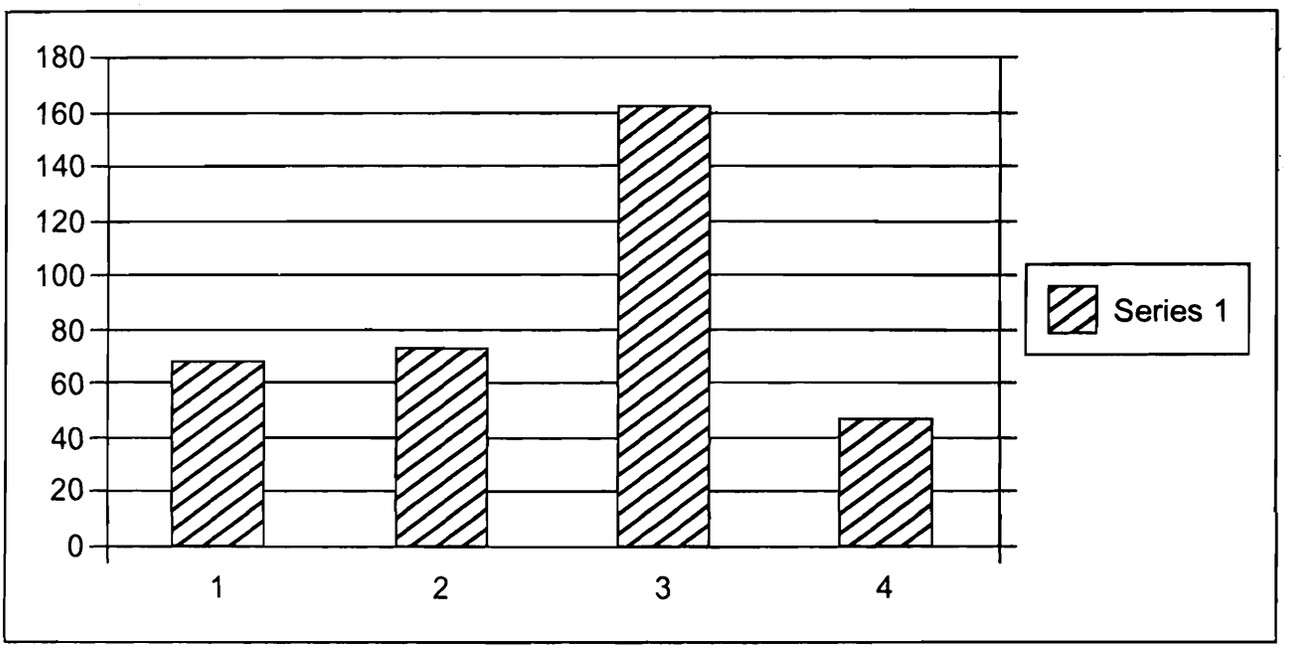

Figure 5 : Comparative Avian diversity in different study area of Damodar Valley

1. DAM; 2. TPS – Thermal Power Station; 3. CAT – Catchments (including forest, cultivation, groves, orchards.); 4. RC – River Course

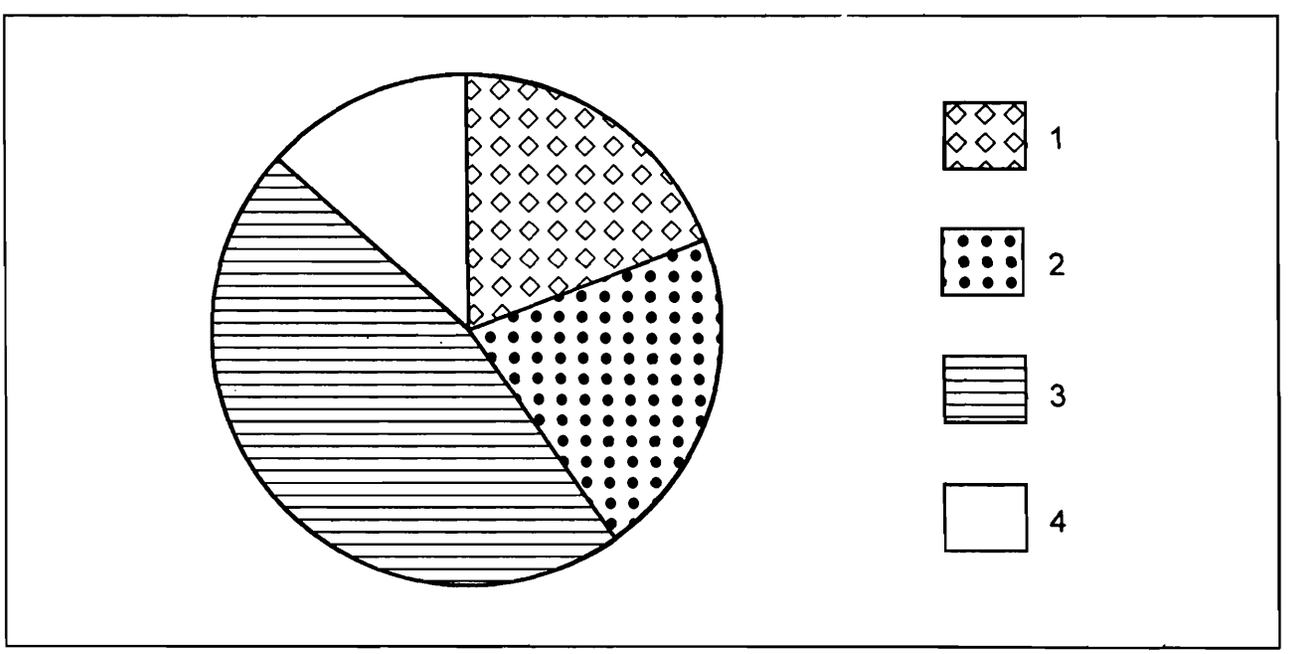

Figure 6 : Comparative percentage of avian diversity in different study area of Damodar Valley

1. DAM; 2. TPS – Thermal Power Station; 3. CAT – Catchments (including forest, cultivation, groves, orchards.); 4. RC – River Course

RESULT & DISCUSSION

From the study 55 species of mammals belonging to 44 genera, 25 families, 9 orders and 222 species of birds belonging to 149 genera, 51 families, 17 orders were observed and identified (Table 1 & 2). Practically no work has so far been carried out particularly on the avian and mammalian fauna of Damodar Valley itself and only a scattered report is available on Chotanagpur plateau. Except the work of Datta *et. al.* (2004), Sinha (1986, 2004), Venkateshwarlu (1973) and Roy Chaudhury (1961, 1964) all other workers, such as Ball (1874), Hinton (1918), Houlton (1949), Nath (1950), Wroughton (1918-20), were carried out the work before the construction of the dams. Gauntlet's (1985) report was particularly based during the time of construction of Durgapur Barrage. In the year 1948, three surveys were conducted by the Zoological Survey of India from April to December specially in those areas where dam construction projects were located, with a view to know the faunal structure before the dams are actually constructed and later after the construction of dams in order to study the animal ecological succession. From the study a total of 160 specimens of mammals comprising of 18 species were collected and examined (Nath, 1950).

There is no doubt that before the construction of the dams, the catchments of the river Damodar and its tributaries was covered with more dense forest than todays and the plains of the valley were exposed to human habitation. After starting the construction of the dams from 1950s, the ecological scenario of the area was broadly changed due to inundation of vast area for construction of dams and as a result, not only the microfauna but the larger terrestrial animals were also been affected.

Sinha (2004) reported 95 species and subspecies of mammals from Bihar and Jharkhand, of which 74 species and subspecies were reported from Jharkhand and as many as 69 species were reported from the districts included in the Damodar Valley. However, the species like *Pipistrellus ceylonicus*, *Cuon alpinus*, *Panthera tigris*, *Cremnomys cutchicus* reported were not traced during the present study.

Probably more intensive study is required for identifying certain species of chiroptera from Jharkhand as Sinha (1986) reported *Pipistrellus ceylonicus* from Dhanbad and Singbhum but during the present study it was not possible to identify the colony of the same from Damodar Valley and the presence of the species was not authenticated also by Chakraborty and Kar (2004) from Purulia district of West Bengal. Roy Chaudhury (1961, 1964) reported *Cuon alpinus* from Palamau and Dhanbad districts but it was not observed during the present survey. It may be due to much anthropogenic activity or habitat loss in those areas. There may be a probability of shifting of population in the much dense forest or in the protected areas. There is no doubt that *Panthera tigris* is still present in certain protected areas of Jharkhand. Roy Chaudhury (1961, 1964) reported the species from Palamau and Dhanbad districts but at present there is no *Panthera*

tigris present in the catchments of the river Damodar mostly due to habitat loss and indiscriminate poaching. *Cremnomys cutchicus* was reported from Hazaribagh district (Sinha, 2004), while the present author was failed to capture the same from that area.

Certain species *viz., Anathana ellioti, Lutrogale perspicillata, Viverricula indica, Vandeleuria oleracea, Cremnomys blanfordi, Mus booduga, Bandicota indica* and *Tatera indica* were reported first time from certain districts of Jharkhand. *L. perspicillata* was observed only once near the forested tracts of Ghagra nallah (23° 55' 48" : 85° 07' 47") of Hazaribagh district. Except *Mus booduga* and *Bandicota indica* all other species were observed either in the hilly forest of catchments (Table 1) or in the Forest Rest House (FRH) of that area. Particularly *V. indica* and *T indica* were only observed in the FRH campus of Koderma district. Chakraborty and Kar (2004) also reported *A.ellioti, L. perspicillata, V. indica* from the Purulia district. Though faunal structure of Damodar Valley of Jharkhand is very much alike to that of Purulia district of West Bengal (Chakraborty and Kar, 2004, 2006) yet the species like *Petaurista petaurista* has not been come across in the Damodar Valley.

The present study is not much alarming in respect of mammalian diversity but actually the population structure of the same is very much declined. *Elephus maximus* could be observed only during the migratory season. Except *P. viverrinus* all other felids are restricted in the protected areas of Hazaribagh and Palamau districts and only a small population of *P. viverrinus* was observed near the junction of the rivers Damodar and Hugli at Haorah district. Except *Sus scrofa* and *Muntiacus muntjak* there were no direct sighting of artiodactyle species. It was only confirmed either from their droppings or from the locals. *Platanista gangetica* (Roxburg), the Gangetic Dolphin was reported to enter into the last phase of the river Damodar, from the river Hugli during the heavy monsoon rain and thus not enlisted in the classified list (Table 1).

Considerable information on avifauna, before and after the construction of the dams is available from the work of Ball (1874), Gauntlet (1985), Datta *et. al.* (2004), Chakraborty and Kar (2004, 2006). Ball (1874) reported 287 birds from Chotanagpur which included certain portion of presently known eastern Chatishgarh and eastern Madhya Pradesh. Chakraborty and Kar (2004) reported 176 birds from Purulia district of West Bengal.

Datta *et. al.* (2004) reported 465 species and subspecies of birds from Bihar and Jharkhand, of which 317 are resident and 148 are migratory. Though during the present survey altogether 222 species of birds were observed and identified yet a number of species were missing from the list of the earlier workers. Datta *et al.* (2004) enlisted at least 4 species of vulture from Bihar and Ball (1874) enlisted 3 species of vulture from Chotanagpur. Throughout the Damodar Valley not a single species of vulture was

observed during the present study. The decline of vulture species throughout the country was noticed during the last two decades (IUCN, 2007). No doubt, the avifaunal species observed and identified during the recent surveys are much lower in diversity than the earlier. This is mainly due to increased anthropogenic activities and reduction in natural areas. Further, the present report covers mainly DVC project area. However, several species *viz.*, *Copsychus malabaricus*, *Rhipidura albicollis*, *Dicrurus paradiseus*, *Dicrurus hottentottus*, *Ephippiorhynchus asiaticus* which were rare even before a century ago are still present there. On the other hand, some birds like *Hypothymis azurea*, *Gallinago nemoricola* (WV), *Artamus fuscus* which were plenty in number were not seen during the present study. The *Luscinia calliope* a migratory visitor was reported as rare by Ball (1874) but the same was observed in good number during the present surveys.

There is no doubt that diversity of preying birds is much lower than the earlier times. It may be due to lack of favourable breeding, hunting and roosting ground of the birds due to inundation of forest land or agricultural fields. There may be so many problems for the perching birds yet both resident and migratory aquatic birds as got their shelter near the dams.

From the fig.3, it is clear that the species diversity of mammals is much higher in the catchments than Thermal power generating areas and is lowest in the dam and riverine zone. The areas near the thermal power generating stations like Chandrapura, Bokaro, Santhaldih, Mejia are much unhealthy and only a few rodents and chiropterans are the main inhabitants. The ratio of percent diversity of mammalian species among DAM, TPS, CAT and RC is 1 : 25 : 72 : 2 respectively (Fig. 4).

On the other hand from the fig.5, it could be interpreted that the diversity of avian species is also much higher in the catchments. Most interestingly, the species diversity of birds is much higher in the TPS than riverside zone. Altogether 164 resident species and 58 migratory species of birds were recorded during the study. Fig. 6, has clearly shown that the percent species diversity of birds is 19 in DAM, 21 in TPS, 47 in CAT and 13 in RC.

Since the coming up of hydel-power projects, the water flow that enters the river, below the dams, is only a negligible quantity resulting from very little seepage. The canals and rivulets which empty their water below the dam, carries only a small quantity of water during the summer months which renders the river beds dry. This obviously lowers the water table along the stretch of the river and its banks, resulting in the depletion of faunal diversity and population as well as gradual migration and ultimately causes practical disappearance.

The river Damodar is polluted with minerals, mine rejects and toxic effluents. Both its water and its sand are infested by coal dust and waste from industries that have sprung

up in its basin. In the upper valley area, mining and mine-based industries are the dominant economic activity, with low agricultural productivity has made the valley vulnerable to soil erosion. There is no doubt that seven DVC thermal power plants consume a lot of river water, approximately 3,000 to 8,000 tonnes of coal and dump 50 percent of the total solids generated in the form of fly ash which eventually find its way into the river water. In the valley and total suspended solid (TSS) count at most places along the upper and middle stretches of the river is 40-50 times higher than the permissible limit. Large public sector plants are gradually taking steps to reduce the TSS level and other effluents but smaller private factories are doing nothing (Anon, 1993). The river Damodar made an entire industrial complex possible. Now, the entire industrial complex has made the river impossible.

The emission of fly ash from the thermal power stations causing practical nuisance to that area covering the total area with blackish dust particles. As a result species diversity of both mammal and bird is much lower in those areas due to lack of suitable food and shelter. Major pollution problem in the areas should be given high priority. Dumping near the coal mines are damaging the landscape in a large scale which should be recovered with due management for reclamation of faunal wealth. Collection of fire wood by the locals is another problem which should be stopped by providing alternative source of livelihood. Cutting of large and old trees for illegal business is a nuisance throughout the forested tracts of the valley. Damodar, Barakar and their tributaries are the lifeline of the valley and are the main source of water for drinking and agriculture. So, water flows through the rivers should be made pollution free not only for the human being but also for steady increase of faunal wealth. A research on water quality of the river Damodar revealed that the presence of coliform bacteria Escherichia coli and Streptococcus sp. between 2,600 and 20,000 colony-forming unit / 100 ml throughout the study area with peak abundance during post-monsoon period (Chatterjee *et al.*, 2009).

Chakraborty (1998) reported about the three disasters *viz.*, (1) fish and frogs were died in thousands at the left bank irrigation canal of the Durgapur Barrage and paddy cultivation on 240 ha of land along the canal lost in 1973, (2) large number of cattleheads were died after drinking water from the canal in 1978, (3) About 500 cattleheads were died and 8,000 quintals of processed crop were destroyed because of contamination in 1983. All the three disasters mentioned here caused by the discharge of toxic chemicals containing ammonia and arsenic compounds into the Damodar canal water by the Fertilizer Corporation of India (Durgapur). In 1990, a massive oil spill into the river Damodar from the Bokaro Steel Plant set the alarm bells ringing once more. In the coal mining areas, a strong wind takes a considerable amount of overburden dumps from the opencast mines into the river and the water becoming increasingly unusable. There is no doubt about it, the river Damodar is dying. Experts say, it is more alarming since this polluted water is used for irrigation.

Singh *et al.* (2005) opined that, water chemistry of the reservoirs strongly reflects the dominance of continental weathering aided by atmospheric and anthropogenic activities in the catchments. Higher concentration of sulphate and TDS in Panchet, Durgapur and Tenughat reservoirs indicate mining and anthropogenic impact on water quality. The high contribution of Calcium, Magnesium, dissolve Silica and relatively high (Na+K) / TZ ratio (0.3) and low equivalent ratio of (Ca+Mg) / (Na+K) suggests combined influence of carbonate and silicate weathering. Kaolinite is the possible mineral that is in equilibrium with the water, implying that the chemistry of reservoir water favours kaolinite formation. However, he opined that the calculated values of SAR, RSC and sodium percentage indicate the 'excellent to good quality' of water for irrigation uses.

Saha (2002) mentioned that, the contaminated water leads to waterborne diseases among the users' irrespective man and animal and is viscous and unfit for consumption due to ash reaching to the river from the effluent of the power plant. He also mentioned the presence of arsenic and lead in water sediment in the Damodar is an eye-opener for those who consume river water directly and suffer from various diseases.

As stated earlier, the Thermal Power Stations, Coke Plants and other industries are the chief source of pollution (Anon, 2008). Those are all situated by the side of the river and they are using the river water and at the same time releasing waste water in the river. This system must be stopped by introducing proper treatment plant to each industry; otherwise so many species will be vanished from the area in near future. Thus, pollution level should be minimized for the betterment of the environment.

Minimum flow of water should be maintained from the dams like Tenughat, Maithon, Panchet, Tilaiya for increasing assimilative capacity of the river, especially during the lean period. Forest coverage should be increased to at least 33% as upper Damodar river basin is very much prone to soil erosion. Though some protected areas such as Hazaribagh National Park, Palamau Tiger Reserve as well as migratory corridor in north Maranpura valley and forests of Koderma, Topchachi, Parasnath and Panchet are situated in the catchments yet more intense green belt is needed for protecting the area and its faunal wealth. Thus, an honest attempt should be made for afforestation, agro forestry and social forestry. Aquatic environmental safety programme may also be initiated for restoring the aquatic fauna of the valley.

Though a number of mammals and birds have already been wiped out from the area yet the situation is not out of catch and a sincere attempt for restoring the rest could be possible. If the area become greener and pollution free, then it may not be impossible to see some more bird and mammal species in the Damodar Valley.

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SUMMARY

Altogether 55 species of mammals under 44 genera, 25 families and 9 orders were observed and identified from the Damodar Valley area. Among the mammals the highest diversity existed in the catchments and poorer near dam and along the river course. In true sense except *Lutrogale perspicillata* there was no completely aquatic or water dependent mammal in Damodar valley. Diversity of rodents and chiroptera was little good near the Thermal Power stations. The avian diversity was higher than mammalian ones. As many as **222** species of birds under 149 genera, 51 families and 17 orders were observed and identified. The avian diversity was almost little more than 70 percent in catchments. The percentage of aquatic or water dependent (DAM) avifauna was only 30 percent, which was little higher than that of Thermal Power Station or River course. In both the areas the percentage of avian diversity was calculated as almost 22 percent. From the study, it was revealed that, the well forested catchments of rivers always provide a healthy faunal diversity to the nature for the betterment of mankind. Thus, no developmental activities should be entertained at the cost of nature which is practically impossible to regain.

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Figure 1 :
A panoramic view
of Tilaiya Dam

Figure 2 :
A panoramic view
of Konar Dam

Figure 3 :
A panoramic view
of Tenughat Dam

Figure 4 : TPS at Tenughat

Figure 5 : Lower Damodar near Panchet Dam

Figure 6 : Barakar R. after damming at Maithon

Figure 7 : A way to opencast coal mine

Figure 8 : Party with forest officials in the forest of Koderma district

Figure 9 : Reserve forest of Palamau district

Figure 10 : A view of Hazaribagh National Park

Figure 11 : Dense forest near upper Ghagra nallah at Hazaribagh

Figure 12 : Social forestry at Chandrapura

Figure 13 : River course of Damodar in dry season

Figure 14 : Lower Damodar near Durgapur

Figure 15 : Cultivation on the bank of lower Damodar

Figure 16 : The Little Grebe, *Tachybapyus ruficollis* in fisherman's net at Maithon dam

Figure 17 : Releasing of the Little Grebe, *Tachybapyus ruficollis* in the dam

Figure 18 : Foot mark of the Sambar, *Cervus unicolor*

Figure 21 : Pugmark of the Leopard, *Panthera pardus*

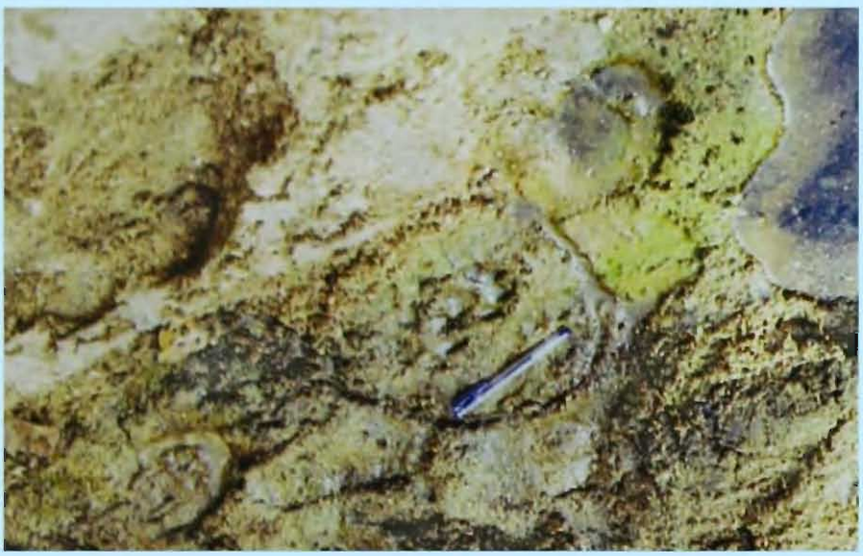

Figure 19 : Foot mark of the Sloth Bear, *Melursus ursinus*

Figure 20 : Foot mark of the wolf, *Canis lupus*

Figure 22 : The wolf, *Canis lupus*

Figure 23 : The Indian Gray Mongoose, *Herpestes edwardsi*

Figure 24 : The Rhesus Macaque, *Macaca mulatta*

Figure 25 : The Indian Pangolin, *Manis crassicaudata*

Figure 26 : The Wild Boar, *Sus scrofa*

Figure 27 : The Indian Crested Porcupine, *Hystrix indica*

Figure 28 : The Black-naped Hare, *Lepus nigricollis*