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Faunal Diversity of all Vertebrates (excluding Aves) of Himachal Pradesh

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ABSTRACT: Himachal Pradesh, a mountainous state is located in the North Western Himalaya. Spiti Valley, Lingti plain of Lahaul of district Lahaul & Spiti and Pooh tehsil of District Kinnaur of the state comes under the Trans Himalayan Zone. It encompasses nearly 10.54% of the Himalayan land mass. Due to varied climatic conditions, forests and altitude (from 320 to 7,000 m asl), it harbours a diverse and unique faunal diversity. In this paper, an attempt has been made to document the vertebrate fauna (Pisces, Amphibian, Reptiles and Mammals) of the state of Himachal Pradesh as per the present studies and past literature. In present communication 81 Pisces species, 16 species of Amphibians, 55 species of Reptiles and 112 species of Mammals along with present status, distribution and conservation has been described in details. The various aspects *viz.* scientific evidences and perceptions, Trends and Impacts of Environment, Status of Research, Issues and gaps and Way Forward for the conservation measures have been discussed.

Key Words: Vertebrates, Diversity, Conservation, Mountainous

INTRODUCTION

Himalaya is one of the youngest mountain systems in the world. Because of its extremely active geodynamic condition, even small tampering with the geoecological balance can initiate environmental changes that may eventually lead to alarming proportion (Valdiya, 1993, 1997, 2001; Gaur, 1998). The mighty Himalaya is one of the youngest, complex geologic structures and the highest mountain system in the world. The loftiest ranges of mountains act as a physical barrier between the plateau of Tibet, Central Asia and alluvial plains of the Indian subcontinent. Therefore, Himalaya plays a vital role since they acts as wall for coming monsoon wind and regulate the climate of the province. They cover 27% of the world's land surface and people of mountains as well as of lowland are benefited by them in terms of food security, water, timber, energy and recreation. Consequently, the Himalayan mountain biodiversity have a key role for global economy and climate change.

The Himalaya comprises a series of parallel and converging ranges forming the highest mountain region in the world. They are the gigantic mountain system which spread from west-northwest to east-southeast stretches for about 2500 Km covering countries *viz.* Afghanistan, Pakistan, India, Nepal, Bhutan and China. It is divided into three major geographical regions *viz.* Great Himalaya (Himadri), Lesser Himalaya (Himadri) and the Outer Himalaya (Shiwaliks), which run parallel to each other. Three mountain ranges run parallel to each other in the north-western part of India. Karakoram ranges is the northern most ranges, to the south of the Karakoram ranges run the Zanskar ranges and parallel to the Zanskar ranges lie the Pir Panjal ranges. This great chain of mountains in Indian territory extends all along the northern border of the country from the eastern border of Pakistan on the west to the frontiers of Myanmar in the east covering partially/fully twelve states of India, *viz*., Jammu & Kashmir, Himachal Pradesh, Uttarakhanad, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and hills of Assam & West Bengal. It covers 18% of India's land surface. Indian Himalaya is divided geographically into four zones i) the Trans Himalaya ii) the North-West Himalaya iii) the Western Himalaya and iv) the Eastern or Assam Himalaya. The North West-Himalaya includes the sates of Jammu and Kashmir and Himachal Pradesh.

Himachal Pradesh is intricate mosaic of numerous mountain ranges, hills and valley and encompasses 17% area of north Western Himalaya. It is located in the northern part of India covering an area of 55,673 sq. km. and encompasses nearly 10.54% of the Himalayan land mass. It is bounded by Jammu and Kashmir in the north, Uttarakhand in the southeast, Haryanan in the south, Punjab in the west and in the east it forms India's international boundary with Tibet (China). Administratively, the state is divided into 12 districts *viz.* Bilaspur, Chamba, Hamirpur, Kangra, Kinnaur, Kullu, Lahaul & Spiti, Mandi, Shimla, Solan, Sirmour and Una (Fig. 1). It is situated between 30°22′ 44″ - 33°12′ 40″ North and 75°40′ 55″ -79°04′ 20″ East and its altitude ranges from 320 to 7,000 meter above the mean sea level. There is general increase in the elevation from west to east and south to north. Physiographically, there are four distinct parallel zones in the state *viz*. Shiwalik Himalaya, Lesser Himalaya, Great Himalaya and Trans-Himalaya. The Shiwalik Himalaya (up to an elevation of 1500m) represents the southernmost zone, extending from northwest to south, 40-60Km wide and covering the districts of Sirmour, Solan, Hamirpur, Una and Parts of Chamba and Kangra. The Lesser Himalaya (About 80 Km wide) run from north of the Shiwalik and parallel to the great Himalayan range. This zone encompasses the districts of Shimla, Mandi and parts of the districts of Chamba. Kullu, Kangra and Sirmour. The Great Himalayan ranges lies just north of Chanderbhaga River in Lahaul and Spiti and contains peaks with an elevation in excess of 6000m. This zone covers the Pangi region of Chamba district and certain portions of Kullu and Kinnaur districts. The Trans-Himalayan region, comprising Lahaul and Spiti valleys and parts of the districts of Kinnaur, is characterized by extreme cold, low precipitation and lack of vegetation and is often referred a cold desert (Rodger & Panwar 1988).

Meadows and Pastures form an important part of the ecosystem in Western Himalaya, providing nutrient rich forage for grazing livestock and wildlife. Most of the high altitude geographical areas of Himachal Pradesh are under permanent alpine pastures.

Rivers: The state is endowed with rich diversity of water resources such as snow fed perennial rivers, Seasonal Streams, Reservoirs, Ponds, Natural Lakes and Irrigational channels. It is blessed with two important perennial rivers of India *i.e*. River Indus and Ganga. The main river systems of the region are the Chandra-Bhaga or the Chenab, the Ravi, the Beas, the Satluj and the Yamuna.

The Chandra Bhaga, the largest river in (volume of water) in Himachal is the joint stream of the Chandra and Bhaga. The two streams have their origin on the opposite sides of Bara Lacha at an elevation of 4900m as l. After their confluence at Tandi, the Chandra and Bhaga flow as as a joint stream (also known as Chenab). The Chenab with a length of 1, 200 Km has a catchment area of 61,000Km^2 out of which 7,500km^2 lie in Himachal.

The Ravi rises in Bara Banghal of Dhauladhar Range. Tundah, Budhil, Sal, Beljedi, Siul and Siowa are the main tributaries of the River. The river with its length of about 158Km in Himachal and has a catchment area of about 5,451Km^2.

The Beas rises in the Pir Panjal range near Rohtang Pass at an elevation of about 4,000m asl. It flows for about 256km before joining in the plains at Mirthal. The River is joined by number of tributaries. The Pong Dam (Ramsar site) which is impounded on River Beas in the district Kangra. The construction of dam at Pandoh on River Beas in district Mandi has resulted in the formation of reservoir in the upstream and thus it reduces the water flow in the downstream.

The Satluj has its origin in the distant highlands Mansarovar Lake of Tibet. It flows for a distance of 400km almost parallel to the Indus and then cuts right through both the Zanksar range and the great Himalaya. It enters in Himachal Pradesh at Shipki at an altitude of 6,608m in Kinnaur district. The Trans-Himalayan portion of its basin receives little rain. The upper catchment of about 50,140 Km^2 is located above the permanent snow line at the elevation of 4.500m. The Spiti River joins it at this point from the north, beyond which it flows in the south-westerly direction in Himachal. It then emerges from the mountains at the Bhakra gorge where the Gobind Sagar is impounded. The total catchment area up to Bhakra Dam in Himachal region is 20,000Km^2.

The Yamuna River rises in the Yamuntori in Uttar Kashi. The total catchment area in Himachal is 2,320km^2. The Giri and the Bata join the Yamuna upstream and downstream of Ponta respectively.

Climate: The climate varies from semi-tropical to semi-arctic depending on the altitude of the region. However, the state experiences four seasons in the lower altitudes *i.e.* Summer (March to June), Monsoon (July to September), Post Monsoon (October to November) and Winter (December to February). It has the area in Dharmshala in district Kangra that receive very high rain fall. The areas of the great Himalaya and Trans Himalayas under which comes the district Lahaul-Spiti, Kinnaur and Pangi valley of the district Chamba remains cold throughout the year and most of the year covered with snow. The range has arid climate and winter temperature plunges to -30° to -40°C.

Forest: Total forest cover in Himachal Pradesh is 14, 353Km^2 (25.78%) of the total geographical area of the state (55,673Km^2). Total dense forest cover is 8, 976 km^2 (16.1%) and open forest cover is 5,377 km^2 (9.7%) (FSI, 2005). The 63.9% of the state is under thick forest. Broadly the forests are of three types *i.e.* Tropical, Sub tropical, Temperate. The vegetation comprises of Ban Oak Forest, Moist Deodar Forest, Himalayan Alpine Pastures and Rhododendron Scrub Forest.

Along the foothills, vegetation is dominated by tropical forest of *Acacaia* and *Zizyphus* or deciduous Sal (*Shorea robusta*) forest. Within an altitude of 500-1800, subtropical forest of *Terminalia*, *Abizzia* or pure Cheerpine (*Pinus roxburgii*) are found. Forest type between1500-3000m asl can be distinguished into moist temperate and dry temperate. Moist temperate forest is dominated by various species of oak (*Querccus* spp.), deodar (*Cedrus deodara*), blue pone (*Pinus wallichiana*) and Rhododendron sp. The dry temperate forest is characterized by species like Quercus sp. and *Pinus geradiana*, subalpine forest of the state is composed of brich (*Betula utilis*) and fir (*Abies spectabillis*) or scrub of *Rhododendron campanulatum* and *Juniperus communis*. Between tree line and the snow line, dry alpine pastures of *Caragana* sp., *Lonicera* are found.

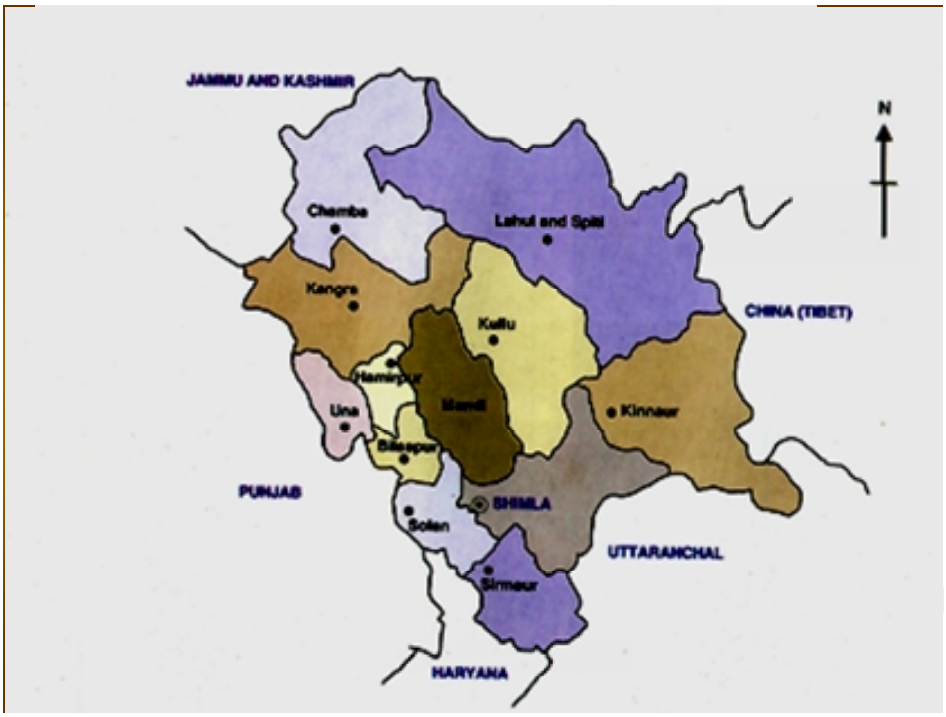

Fig. 1. Map of Himachal Pradesh.

Himachal Pradesh has a large network of protected areas comprising 32 wildlife Sanctuaries (5731.35sq.km.) and 02 National Parks (1429.40sq.km.). The PAs of Himachal Pradesh cover all biotic provinces. Two PAs are located the Trans Himalayas; 17 PAs in Western Himalaya to west of Satluj River; 13 PAs in western Himalayas to east of Satluj River; and 4 PAs in Semi-Arid zone. Himachal Pradesh has the highest protected area in country which comprises 8,409 sq. Km. (15.11%) of its geographical area as compared to 4.7% of nation. The protected areas of the state are known to conserve the endemic and threatened fauna because of varied landscape features which is the habitat of diverse flora from tropical to alpine. Mountains are identified as more at threat due to environmental destruction and even PA's found here are susceptible to the climatic change. Climate and vegetation change rapidly with altitude over relatively short distances in mountainous environment. Further, due to narrow elevation range and restricted geographical area, alpine ecosystems are mostly at risk due to climatic change. Consequently, alpine ecosystems are particularly vulnerable to encroachment by lower elevation ecosystems. Species that is found in the higher altitude and alpine zones are shifting to high and thus thereby their habitats are reducing in which they can survive.

It has led to the decline of the species and even destruction of some of species is certain, which are already threatened by small population size. Thus, keeping in view of this the Thematic Status Paper with reference to climate change in Himachal Pradesh w.r.t. vertebrate fauna has been undertaken.

Status in State: India is endowed with the world's richest diversity and represents 7.50% of the world's Fauna. The estimated faunal diversity of India updated up to 2013 is (92,279) species (http: www.zsi.gov.in). Himachal-Pradesh has only 1.7% of total geographical area of the country but shares 6.4% of the total diversity of India.

The vertebrate fauna of Himachal-Pradesh has been explored by various workers from time to time. It contributes 17% of the total vertebrate diversity of India. The status of fauna of Pisces, Amphibian, Reptiles and Mammals has been discussed in the in Table-1, 2, 3, 4 respectively.

Table 1: Fish Fauna in Himachal Pradesh.

S. N.	Species Name	Common Name	Distribution		Status
			State (Districts)	India	IUCN, 2012
	ORDER: OSTEOGLOSSIFORMES FAMILY: NOTOPTERIDAE				
1.	*Notopterus notopterus* (Pallas)	Grey featherback	Kangra, Bilaspur, Sirmour	Punjab, Assam, Karnataka, Kerala, Maharsahtra, Tamil Nadu, Uttar Pradesh, West Bengal and Himachal-Pradesh	LC
2.	*Chitala chitala* (Hamilton)	Humped featherback	Sirmour	Punjab, Assam, Karnataka, Kerala, Maharashtra, Tamil Nadu, Uttar Pradesh, West Bengal and Himachal-Pradesh	NT
	ORDER: CYPRINIFORMES FAMILY: CYPRINIDAE SUBFAMILY: DANIONINAE				
3.	*Barilius bendelisis* (Hamilton)	Hamilton's barila	Bilaspur, Mandi, Kullu, Chamba, Kangra, Solan, Sirmour, Shimla, Hamirpur, Una;	Jammu & Kashmir, Assam, Maghlaya, Bihar, Haryana, Karnataka, Kerala, Orissa, Punjab, Rajasthan, Sikkam, Tamil Nadu, Uttar Pradesh, West Bengal, Maharashtra and Himachal-Pradesh	LC
4.	*Barilius barila* (Hamilton)	Barred barila	Solan, Shimla, Sirmour, Bilaspur, Kangra, Mandi, Hamirpur	Jammu and Kashmir, Delhi, Rajasthan, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Assam, Manipur, Nagaland and Orissa, Burma and Himachal-Pradesh	LC
5.	*Barilius barna* (Hamilton)	Barna baril	Kangra, Sirmour	Uttarakhand, Assam, Bihar, West Bengal, Karnataka, Meghalaya, Orissa, Rajasthan, Sikkim, Burma and Himachal-Pradesh	LC
6.	*Barilius shacra* (Hamilton)	Shacra baril	Sirmour	Assam, Bihar, Jammu and Kashmir, Orissa, Punjab, Uttar Pradesh, West Bengal and Himachal-Pradesh	LC
7.	*Barilius vagra* (Hamilton)	Vagra barila	Kangra, Mandi, Bilaspur, Chamba, Shimla, Sirmour	Assam, Bihar, Delhi, Jammu and Kashmir, Punjab, Sikkim, Uttar Pradesh, West Bengal and Himachal-Pradesh:	LC
8.	*Raiamas bola* (Hamilton)	Indian Trout	Sirmour	Haryana, Uttar-Pradesh, Uttar Pradesh, Bihar, Assam, Orissa, West Bengal and Himachal-Pradesh	LC
9.	*Salmophasia bacaila* (Hamilton)	Large razorbelly minnow	Sirmour	Haryana, Uttar-Pradesh, Uttar Pradesh, Bihar, Assam, Orissa Himachal-Pradesh	NE

	Genus: *Danio* Hamilton				
10.	*Danio rerio* (Hamilton)	Zebra Fish	Solan, Kangra, Sirmour, Solan, Bilaspur	Uttar Pradesh, Andhra Pradesh, Bihar, Karnataka, Orissa, Punjab, Sikkim, Tamil Nadu, West Bengal and Himachal-Pradesh	LC
11.	*Devario devario* (Hamilton)	Devario danio	Solan, Sirmour, Kangra, Hamirpur, Una	Jammu and Kashmir, Uttar Pradesh, Assam, Bihar, Gujarat, Punjab, Haryana, Orissa, Rajasthan, West Bengal, Bangladesh, Burma and Himachal- Pradesh:	DD
	Genus: *Esomus* Swainson				
12.	*Esomus danricus* (Hamilton)	Flying barb	Kangra, Sirmour, Una	Jammu and Kashmir, Punjab, Uttar Pradesh, Assam, Bihar, Delhi, Goa, Daman and Diu, Gujarat, Madhya Pradesh, Orissa, Tamil Nadu, West Bengal and Himachal-Pradesh	LC
13.	*Rasbora daniconius* (Hamilton)	Blackline rasbora	Kangra, Hamirpur, Bilaspur, Solan, Sirmour	Throughout India	LC
	SUBFAMILY: LEUCISCINAE				
14.	*Hypophthalmichthys molitrix* (Valenciennes)	Silver Carp	Bilaspur, Kangra, Mandi, Solan, Sirmour	Throughout India	INTR
	SUBFAMILY: CYPRININAE				
15.	*Tor putitora* (Hamilton)	Putitor Mahseer	Solan, Sirmour, Kangra, Mandi, Shimla, Bilaspur, Chamba	Throughout Northern States (All along Himalayas)	EN
16.	*Tor tor* (Hamilton)	Tor Mahseer	Kangra, Shimla, Sirmour	All northern states	NT
17.	*Tor chelynoides* (McClelland)	Black Mahseer	Kangra, Sirmour, Shimla	All along Himalayas	VU
18.	*Neolissochilus hexagonoleopis* (McClelland)	Katli	Shimla	Assam, Eastern Himalaya and Himachal-Pradesh	NT
19.	*Osteobrama cotio cotio*(Hamilton)	Cotio	Bilaspur, Sirmour	Assam, Bihar, Delhi, Madhya Pradesh, Punjab, Uttar Pradesh, West Bengal and Himachal-Pradesh	LC
20.	*Chagunius chagunio* (Hamilton)	Chaguni	Solan, Sirmour	Throughout Indian Sub Continent along the Himalayan foothills and Himachal-Pradesh	LC
21.	*Pethia ticto* (Hamilton)	Two-spot barb	Bilaspur, Solan, Sirmour, Shimla, Kangra, Mandi, Kullu, Chamba, Hamirpur, Una;	Through Indian Subcontinent and Himachal-Pradesh	LC
22.	*Pethia conchonius* (Hamilton)	Rosy Barb	Kangra, Mandi, Bilaspur, Chamba, Hamirpur, Solan, Sirmour	Through Indian Subcontinent and Himachal-Pradesh	LC
23.	*Puntius sophore* (Hamilton)	Spot fin swamp Barb	Solan, Sirmour, Kangra, Mandi, Kullu, Hamirpur, Chamba, Bilaspur, Una;	Through Indian Subcontinent	LC
24.	*Puntius chola* (Hamilton)	Chola barb	Kangra, Bilaspur, Solan, Sirmour, Una	Throughout India	LC
25.	*Systomus sarana* (Hamilton)	Olive Barb	Bilaspur, Kangra, Solan, Sirmour	Through Indian Subcontinent	LC

26.	*Oreinus richardsonii* (Gray)	Gugali	Bilaspur, Solan, Sirmour, Kangra, Mandi, Kullu, Shimla, Chamba	Jammu and Kashmir, Punjab, Uttar Pradesh, Assam, Sikkim and Himachal-Pradesh:	VU
27.	*Diptychus maculatus* Steindachner	Tibetan Snow Trout	Chandra Bhaga River, district Lahaul-Spiti	Ladakh: Indus River, Shyok River, Dumkar Nala, Drass River, (J. & K.) and Himachal-Pradesh	**NE**
28.	*Carassius auratus* (Linnaeus)	Golden Carp	Kangra, Bilaspur, Mandi, Kullu, Chamba, Hamirpur, Solan, Shimla, Sirmour, Una	Throughout Indian subcontinent	INTR
29.	*Carassius carassius* (Linnaeus)	Crucian Carp	Kangra, Mandi, Kullu, Shimla, Solan, Sirmour, Chamba, Hamirpur, Una	Throughout Indian Subcontinent	INTR
30.	*Ctenopharyngodon idella* (Valenciennes)	Grass Carp	Bilaspur, Kangra, Mandi, Kullu, Shimla, Solan, Sirmour, Chamba, Hamirpur, Una	Introduced in India	INTR
31.	*Cyprinus carpio communis* Linnaeus	Scale Carp	Bilaspur, Kangra, Mandi, Kullu, Shimla, Solan, Sirmour, Chamba, Hamirpur, Una	Throughout India	INTR
32.	*Cyprinus carpio specularis* Lacepede	Mirror Carp	Bilaspur, Kangra, Mandi, Kullu, Shimla, Solan, Sirmour, Chamba, Hamirpur, Una	Throughout India	INTR
33.	*Cyprinus carpio nudus Bloch*	Mirror Carp	Bilaspur, Kangra, Mandi, Kullu, Shimla, Solan, Sirmour, Chamba, Hamirpur, Una	Throughout India	INTR
34.	*Catla catla* (Hamilton)	Catla	Bilaspur, Kangra, Sirmour	Throughout India	LC
35.	*Cirrhinus mrigala* (Hamilton)	Mrigal	Bilaspur, Kangra, Sirmour	Northern India	LC
36.	*Cirrhinus reba* (Hamilton)	Reba Carp	Bilaspur, Kangra, Sirmour	Throughout India	LC
37.	*Labeo rohita* (Hamilton)	Rohu	Bilaspur, Hamirpur, Kangra, Mandi, Sirmour, Solan, Una	Punjab, Delhi, Uttar Pradesh, Assam, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Orissa, West Bengal (Introduced) and Himachal-Pradesh	LC
38.	*Labeo bata* (Hamilton)	Bata labeo	Kangra, Bilaspur, Sirmour	Uttar Pradesh, Madhya Pradesh, Bihar, Orrisa, West Bengal, Maharashtra, Andhra Pradesh and Himachal-Pradesh	LC
39.	*Labeo boga* (Hamilton)	Boga labeo	Sirmour	Uttar Pradesh, Bihar, West Bengal, Assam, Orissa, Andhra Pradesh, Tamil Nadu and Himachal-Pradesh	LC
40.	*Labeo calbasu* (Hamilton)	Kalabasu	Bilaspur, Kangra	Punjab, Delhi, Assam, Bihar, Andhra Pradesh, Gujarat, Karnataka, Tamil Nadu, Uttar Pradesh and West Bengal and Himachal-Pradesh	LC
41.	*Labeo dyocheilus* (McClelland)	Brahmaputra labeo	Bilaspur, Shimla, Sirmour	Jammu and Kashmir, Punjab, Uttar Pradesh, Assam, Sikkim and Himachal-Pradesh	LC

42.	*Bangana dero* (Hamilton)	Kalabans	Bilaspur, Kangra, Mandi, Chamba, Sirmour	Jammu and Kashmir, Punjab, Haryana, Delhi, Assam, Bihar, Rajasthan, Uttar Pradesh, West Bengal and Himachal-Pradesh	LC
43.	*Crossocheilus latius latius* (Hamilton)	Gangetic latia	Solan, Sirmour,Bilaspur, Mandi, Kangra, Chamba, Hamirpur, Una	Northern states along the Himalayas	LC
44.	*Garra gotyla gotyla* (Gray)	Gotyla	Bilaspur, Kangra, Mandi, Kullu, Chamba, Shimla, Solan, Hamirpur, Sirmour	Jammu and Kashmir, Assam, Bihar, Delhi, Manipur, Nagaland, Punjab, Rajasthan, Sikkim, Uttar Pradesh, Madhya Pradesh, West Bengal, Manipur and Himachal-Pradesh	LC
45.	*Garra lamta* (Hamilton)	Lamta Garra	Mandi, Sirmour, Solan	Assam, Sikkim, Darjeeling and Kumaon Himalayas and Himachal-Pradesh	LC
46.	*Acanthocobitis botia* (Hamilton)	Botia Loach	Solan, Sirmour, Kangra, Mandi	Uttar Pradesh, Uttarakhand, Assam, Bihar and Himachal-Pradesh	LC
47.	*Schistura corica* (Hamilton)	Corica Loach	Bilaspur, Chamba, Mandi	Occurs in Himalayas from Darjeeling through Kumaon to Himachal Pradesh and Punjab in Sutlej basin	LC
48.	*Schistura horai* (Menon)	Horai Loach	Kangra, Solan, Sirmour	Jammu and Kashmir, Punjab and Himachal-Pradesh	VU
49.	*Schistura rupecula* (McClelland)	Hill Loach	Solan, Sirmour, Shimla, Kullu	Jammu and Kashmir, Uttarakhand and Uttar Pradesh and Himachal-Pradesh	LC
50.	*Paraschistura montana* (Hamilton)	Mountain Loach	Kangra, Solan, Shimla, Sirmour	Uttarakhand, Jammu and Kashmir, Bihar and Himachal-Pradesh	NE
51.	*Triplophysa microps* (Steindachner)	Leh triplophysa-Loach	Lahaul-Spiti	Ladakh (Jammu and Kashmir) and Himachal-Pradesh	LC
52.	*Triplophysa stoliczkae* (Steindachner)	Stoliczkae triplophysa-Loach	Lahaul-Spiti	Ladakh and Himachal-Pradesh	NE
	FAMILY: COBITIDAE SUBFAMILY: BOTIINAE				
53.	*Botia dario* (Hamilton)	Necktic Loach	Sirmour	Assam, Bihar, West Bengal, Meghalaya, Uttar Pradesh, Punjab, Uttarakhand and Himachal Pradesh	LC
54.	*Botia lohachata* Chaudhuri	Y-Loach	Kangra, Solan	Uttrakhand, Bihar, Delhi, Rajasthan and Himachal-Pradesh	NE
	SUBFAMILY: COBITINAE				
55.	*Lepidocephalichthys guntea* (Hamilton)	Guntea Loach	Kangra, Chamba and Sirmour	Throughout northern States	LC
	ORDER: SILURIFORMRS FAMILY: BAGRIDAE SUBFAMILY: RITINAE				
56.	*Sperata aor* (Hamilton)	Long-whiskered cat fish	Kangra, Bilaspur, Sirmour	Throughout Indian Subcontinent	LC
57.	*Sperata seenghala* (Sykes)	Seenghari	Kangra, Bilaspur	Throughout Indian subcontinent	LC
58.	*Mystus bleekeri*(Day)	Day's mustus	Kangra, Bilaspur, Sirmour	All north India states	LC
59.	*Mystus vittatus* (Bloch)	Striped dwarf catfish	Sirmour	Northern India	LC

	FAMILY: SILURIDAE				
60.	*Wallago attu*(Schneider)	Freshwater Shark	Kangra, Sirmour	Throughout India	NT
	FAMILY: SCHILBEIDAE SUBFAMILY: SCHILBINAE				
61.	*Clupisoma garua* (Hamilton)	Garua Bachaha	Bilaspur	Throughout India except south of Mahanadi	LC
	FAMILY: AMBLYCIPITIDAE				
62.	*Amblyceps mangois* (Hamilton)	Indian Torrent Catfish	Kangra, Mandi	Uttrakhand, Meghalaya, Manipur, Punjab, Uttar Pradesh, West Bengal and Himachal-Pradesh	LC
	FAMILY: SISORIDAE SUBFAMILY: SISORINAE				
63.	*Bagarius bagarius* (Hamilton)	Gangetic goonch	Bilaspur	Throughout India	NT
64.	*Glyptothorax conirostrae (*Steindachner)	Glyptothorax	Kangra, Mandi, Chamba, Bilaspur, Solan, Shimla, Sirmour	Jammu and Kashmir, Uttarakhand and Himachal-Pradesh	DD
65.	*Glyptothorax pectinopterus* (McClelland)	Glyptothorax	Kangra, Bilaspur, Chamba, Solan, Sirmour	Jammu and Kashmir, Uttarakhand and Himachal-Pradesh	LC
66.	*Glyptothorax brevipinnus*Hora	Glyptothorax	Sirmour	Himachal-Pradesh	DD
67.	*Glyptosternon reticulatum* McClelland	Cat fish	Chamba, Shimla	Ladakh, Jammu and Kashmir and Himachal-Pradesh	NE
68.	*Pseudecheneis sulcata* (McClelland)	Sulcatus Catfish	Shimla, Sirmour	Uttrakhand, North Bengal, Meghalaya and Himachal-Pradesh	LC
	FAMILY: CLARIIDAE SUBFAMILY: CLARIINAE				
69.	*Clarias magur* (Hamilton)	Magur	Sirmour	Throughout India	EN
	FAMILY: HETEROPNEUSTIDAE				
70.	*Heteropneustes fossilis* (Bloch)	Stinging Catfish	Kangra	Punjab, Bihar, Uttar Pradesh, Uttrakhand, West Bengal, Orissa, Madhya Pradesh and Himachal-Pradesh	LC
	ORDER: SALMONIFORMES FAMILY: SALMONIDAE				
71.	*Oncorhynchus mykiss* (Smith & Stearby)	Rainbow Trout	Kangra, Mandi, Kullu, Shimla, Sirmour	Jammu and Kashmir, Neelgiri Hills and Himachal-Pradesh	INTR
72.	*Salmo trutta fario*Linnaeus	Brown Trout	Kangra, Chamba, Mandi, Kullu, Shimla, Kinnaur	Jammu and Kashmir, Uttarakhand and Himachal Pradesh	INTR
	ORDER: BELONIFORMES FAMILY: BELONIDAE				
73.	*Xenentodon cancila* (Hamilton)	Needle Fish	Kangra, Bilaspur, Sirmour	Throughout Indian Subcontinent	LC

	ORDER: SYNBRANCHIFORMES FAMILY: MASTACEMBELIDAE				
74.	*Macrognathus pancalus* Hamilton	Striped Spiny eel	Solan	Throughout India	**LC**
75.	*Mastacembelus armatus* (Lacepede)	Tire-trackspiny eel	Chamba, Solan, Una	Throughout Indian Subcontinent	**LC**
	ORDER: PERCIFORMES FAMILY: CHANDIDAE				
76.	*Pseudambassis baculis* (Hamilton)	Himalayan glassy perchlet	Kangra, Bilaspur, Sirmour	Bihar, Uttar Pradesh, Punjab, West Bengal, Orissa, Madhya Pradesh, Maharashtra and Himachal-Pradesh	LC
	FAMILY: NANDIDAE SUBFAMILY: BADINAE				
77.	*Badis badis* (Hamilton)	Dwarf Chamelon Fish	Solan, Sirmour	Throughout India	LC
	FAMILY: GOBIIDAE SUBFAMILY: GOBIINAE				
78.	*Glossogobius giuris* (Hamilton)	Tank Goby	Kangra, Sirmour	Throughout India	LC
	FAMILY: CHANNIDAE				
79.	*Channa gachua* (Schneider)	Snake Headed Fish	Kangra, Bilaspur, Solan, Sirmour	Throughout India	LC
80.	*Channa marulius* (Hamilton)	Snake Headed Fish	Kangra, Bilaspur, Sirmour	Throughout India	LC
81.	*Channa punctata* (Bloch)	Spotted Snake Headed Fish	Kangra, Sirmour	Throughout India	LC

Table 2: Amphibian Diversity in Himachal-Pradesh.

	Species Name	**Common Name**	**Distribution**		**Status**
	Class: Amphibia Order: Anura Fischer von Waldheim Family: Bufonidae Gray		State(Districts)	India	(IUCN, 2012)
1.	*Duttaphrynus melanostictus* (Schneider 1799)	Indian Toad	Bilaspur, Chamba, Hamirpur, Kangra,Kullu, Mandi,Sirmour, Solan, Una	All over India (Dutta, 1997)	Least Concern
2.	*Duttaphrynus stomaticus* (Lutken, 1862)	Marbled Toad	Bilaspur, Chamba, Hamirpur, Kullu, Mandi, Shimla,Sirmour, Solan, Una	Western and Eastern Himalayas, Assam, West Bengal, Uttar Pradesh, Bihar. Rajsthan, Orissa, Maharashtra, Andhra Pradesh and Karnataka (Dutta, 1997 and Chanda, 2002)	Least Concern
3.	*Duttaphrynus himalayanus* (Gunther, 1864)	Himalayan Toad	Chamba,Kangra, Kinnaur,Kullu, Mandi,Shimla, Sirmour, Solan	Himachal-Pradesh, Sikkim, Meghalaya, Arunachal Pradesh and West Bengal (Dutta, 1997)	Least Concern
4.	*Pseudepidalea latastii* (Boulenger, 1882)	Ladakh Toad	Kinnaur, Lahaul-spiti	Himachal Pradesh and Kashmir (Dutta, 1997)	
5.	*Euphlyctis cyanophlyctis* (Schneider, 1799)	Skittering Frog, Green Stream Frog	Bilaspur, Chamba, Hamirpur, Kangra, Kullu,Mandi, Sirmour, Solan, Una	Throughout India (Dutta, 1997)	Least Concern
6.	*Fejervarya syhadrensis* (Annandale, 1919)	Long –legged Cricket Frog	Bilaspur, Chamba, Hamirpur, Kangra, Kullu, Mandi, Sirmour, Solan, Una	Maharashtra, Orissa (Biju,2001) and Himachal Pradesh	Least Concern

7.	*Fejervarya teraiensis* (Dubois, 1984)	Terai Cricket Frog	Sirmour	Nagaland (Ao *et al*., 2003), uttar Pradesh (Hedge *et al*.(2009a) and Himachal Pradesh	Least Concern
8.	*Hoplobatrachus tigerinus*(Daudin, 1803)	Indian Bull Frog	Bilaspur, Hamirpur, Kangra, Sirmour, Solan, Una	Throughout India (Dutta, 1997)	Least Concern
9.	*Nanorana liebigii* (Gunther, 1860)	Spiny-armed Frog	Chamba, Kangra,Kullu, Mandi, Shimla, Sirmour, Solan	Uttar Pradesh, Sikkim, West Bengal, Himachal Pradesh and Jammu Kashmir (Dutta, 1997)	Least Concern
10.	*Nanorana minica* (Dubois, 1975)	Tiny Frog	Bilaspur, Chmaba, Hamirpur, Kangra, Kullu, Lahaul Spiti, Shimla, Sirmour, Solan	Himachal Pradesh and Uttar Pradesh (Dutta, 1997)	Vulnerable
11.	*Nanorana vicina* (Stoliczka, 1872)	Himalayan Paa Frog	Kullu,Mandi, Sirmour, Solan	Himachal Pradesh, Uttar Pradesh, Jammu and Kashmir (Dutta, 1997)	Least Concern
	Family: Microhylidae Gunther				
12.	*Sphaerotheca breviceps* (Schneider, 1799)	Indian Burrowing Frog	Bilaspur, Hamirpur, Kangra, Kullu, Mandi, Sirmour, Solan, Una	Punjab, Orissa, West Bengal, Rajstahn, Tamil Nadu, Kerela, Maharashtra, Karnataka (Dutta, 1997 and Biju, 2001) and Himachal Pradesh	Least Concern
13.	*Microhyla ornata* (Dumeril and Bibron, 1841)	Ornate Narrow-mouthed Frog	Bilaspur, Chamba, Hamirpur, Kangra, Sirmour, Solan, Una	Throughout India (Dutta, 1997) including Andaman and Nicobar Island (Sarkar, 1990)	Least Concern
14.	*Uperodon systoma* (Schneider, 1799)	Marbled Balloon Frog	Kangra, Sirmour, Una	Himachal Pradesh, Uttar Pradesh, West Bengal, Orissa,Andhra Pradesh, Tamil Nadu, Kerela and Karnataka (Dutta, 1997)	Least Concern
15.	*Amolops himalayanus* (Boulenger, 1888)	Himalaya Sucker Frog	Kangra, Kullu, Kullu, Sirmour,	Himachal Pradesh and Darjeeling	Data deficient
	Family: Rhacophoridae Hoffman				
16.	*Polypedates maculatus* (Gray, 1833)	Common Indian Tree Frog	Shimla	Throughout India (Dutta, 1997)	Least Concern

Table 3: Reptiles Diversity of Himachal-Pradesh.

S N	**Scientific Name**	**Common Name**	**Distribution**		**Status**
	Class: Reptilia **Order: Squmata** **Family: Gekkonidae Smith, 1935**		State (Districts)	**India**	**(CAMP)**
1.	*Cyrtodactylus fasciolatus* (Blyth, 1860)	Banded Bent-toed Gecko	Solan, Shimla	Garhwal Hills, Almora, Kumaon, Himachal Pradesh	VU
2.	*Cyrodactylus lawderanus* (Stollczka, 1871)	Lawder's Bent –toed Gecko	Solan, Shimla, Kullu	Kumaon, Himachal Pradesh	VU
3.	*Hemidactylus brookii* Gray, 1845	Brook's House Gecko	Throughout state except Trans-Himalaya	Assam, Tamil Nadu, Andhra Pradesh, Tamil Nadu, Maharashtra, Gujarat, Mizoram, Himachal Pradesh	LR-Ic
4.	*Hemidactylus flaviviridis* Ruppel, 1835	Yellow-green House Gecko	Throughout state except Trans-Himalaya	Andhra Pradesh, Assam, West Bengal, Bihar, Uttar Pradesh. Delhi, Punjab, Maharashtra, Gujarat, Rajasthan, Madhya Pradesh, Bihar, Orissa, Mizoram, Himachal Pradesh	LR-Ic

	Family: Agamidae Gray, 1827				
5.	*Sitana ponticeriana* Cuvier, 1829	Fan-throated Lizard	Throughout state except Trans-Himalaya	Tamil Nadu, Maharashtra, Gujarat, Himachal Pradesh	LR-Ic
6.	*Oriotaris major* (Jerdon, 1870)	Large Mountain Lizard	Sirmour, Solan, Shimla, Chamba	Garhwal, Himachal Pradesh	
7.	*Calotes versicolor* (Daudin, 1802)	Indian Garden Lizard	Throughout India except Trans-Himalaya	Tamil Nadu, Assam, Maharashtra, Gujarat, Kerala, Mizoram, Himachal Pradesh	LR-nt
8.	*Laudakia tuberculata* (Hardwickie & Gray, 1827)	Kashmir Agama	Throughout the state including Trans-Himalayan districts of Lahaul & Spiti and Kinnaur	Kashmir, Punjab, Jammu, Uttar Pradesh, Himachal Pradesh	LR-Ic
	Family: Scincidae Gray, 1825				
9.	*Mabuya carinata carinata* (Schnieder)	Common Keeled Grass Skink	Solan	Gujarat, Maharashtra, Kerala, Tamil Nadu, Mizoram, Himachal Pradesh	LR-nt
10.	*Mabuya dissimilis* (Hallowell, 1857)	Stripped Grass Skink	Solan, Shimla	Punjab, Rajasthan, Uttar Pradesh, Bihar, Madhya Pradesh, Himachal Pradesh	DD
11.	*Mabuya macularia* (Blyth, 1853)	Bronze Grass Skink	Sirmour	Assam, Mizoram, Himachal Pradesh	LR-Ic
12.	*Asymblepharus himalayanum* (Gunther, 1864)	Himalayan Ground Skink	Throughout the state including Trans-Himalaya	Kashmir, Punjab, Uttar Pradesh, Himachal Pradesh	DD
13.	*Asymblepharus ladacensis* (Gunther, 1864)	Mountain Ground Skink	Lahaul & Spiti	Kashmir, Uttar Pradesh, Himachal Pradesh	DD
14.	*Ablepharus pannonicus* (Lichtenstein, 1823)	Mediterranean Dwarf Skink	Mandi, Kullu	Himachal Pradesh	DD
15.	*Lygosoma punctata* (Gmelin, 1799)	Spotted Supple Skink	Throughout state except Trans-Himalaya	West Bengal, Gujarat, Tamil Nadu, Maharashtra, Kerala, Mizoram, Himachal Pradesh	LR-Ic
16.	*Eurylepis taeniolatus* Blyth, 1854	Yellow-belled Mole Skink	Kangra, Sirmour	Kashmir, Gujarat, Rajasthan, Punjab, Himachal Pradesh	
	Family: Lacertidae Gray, 1825				
17.	*Ophisops jerdoni* Blyth, 1853	Snake-eyed Lacerta	Sirmour	Punjab, Rajasthan, Gujarat, Madhya Pradesh, Karnataka, Andhra Pradesh, Tamil Nadu, Himachal Pradesh	DD

	Family: Anguidae Gray, 1825				
18.	*Ophisaurus gracilis* (Gray, 1845)	Indian Glass Snake	Shimla	Assam, Arunachal Pradesh, Meghalaya, Mizoram, North Bengal, Sikkim, Himachal Pradesh	LR-nt
	Family: Varanidae Gray, 1827				
19.	*Varanus bengalensis* (Daudin, 1802)	Bengal Monitor	Throughout state except Trans-Himalaya	Assam, Tamil Nadu, Gujarat, Mizoram, Himachal Pradesh	VU
20.	*Varanus flavescens* (Gray, 1827)	Yellow Monitor	Sirmour	Assam, Bihar, Punjab, Uttar Pradesh, West Bengal, Orissa, Himachal Pradesh	VU
	Family: Typhlopidae Merrem, 1820				
21.	*Ramphotyphlops braminus* (Daudin, 1803)	Brahminy Worm Snake	Solan, Sirmour	Madhya Pradesh, Kerala, Maharashtra, Arunachal Pradesh Punjab Gujarat, Himachal Pradesh	LR-nt
22.	*Typhlops porrectus* (Stollczka, 1871)	Slender Blind Snake	Throughout state except Trans-Himalaya	Himachal Pradesh	LR-nt
23.	*Typhlops diardii* Schlegel, 1839	Diard's Blind Snake		Assam, Himachal Pradesh	DD
	Family: Pythonidae Fitzinger, 1826				
24.	*Python molurus* (Linnaeus, 1758)	Indian Rock Python	Shiwalik areas of state	Assam, Madhya Pradesh, Gujarat, Kerala, Tamil Nadu, Karnataka, Maharashtra, Himachal Pradesh	LR-nt
	Family: Boidae Gray, 1825				
25.	*Gongylophis conicus* (Schneider, 1801)	Common Sand Boa	Shiwalik areas of state	Kerala, Uttar Pradesh, Karnataka, Madhya Pradesh, Tamil Nadu, Madhya Pradesh, Himachal Pradesh	
26.	*Eryx jhonii* (Russel, 1801)	Eastern Red Sand Boa	Shiwalik areas of state	Tamil Nadu, Andhra Pradesh, Rajasthan, Maharashtra, Himachal Pradesh	
	Family: Colubridae Oppel, 1811				
27.	*Coelognathus helena helena* (Daudin, 1803)	Common Indian Trinket	Solan, Sirmour	Gujarat, Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Orissa, Maharashtra, Himachal Pradesh	VU
28.	*Orthriophis hodgsonii* (Gunther, 1860)	Himalayan Trinket Snake	Throughout the state including Trans-Himalaya	Sikkim, Assam, Kashmir, Himachal Pradesh	
29.	*Ptyas mucosa* (Linnaeus, 1758)	Indian Rat Snake	Throughout the state	Assam, Tamil Nadu, Madhya Pradesh, Maharashtra, Himachal Pradesh	LR-nt

30.	*Oligodon arrensis* (Shaw, 1802)	Banded Kukri Snake	Throughout state except Trans-Himalaya	Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Gujarat, Madhya Pradesh, Uttar Pradesh, Maharashtra, Himachal Pradesh	LR-Ic
31.	*Lycodon striatus* (Shaw, 1802)	Barred Wolf Snake	Shimla	Karnataka, Gujarat, Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Uttar Pradesh, Maharashtra, Punjab, Himachal Pradesh	LR-nt
32.	*Lycodon aulicus* (Linnaeus, 1758)	Common Wolf Snake	Kangra	Karnataka, Gujarat, Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Uttar Pradesh, Maharashtra, Punjab, Orissa, Chhattisgarh, Jharkhand, Himachal Pradesh	LR-Ic
33.	*Sibynophis collaris* (Gray, 1853)	Collared Black-headed	Shimla	Assam, Himachal Pradesh	LR-nt
34.	*Sibynophis sagittaria* (Cantor, 1839)	Cantor's Black Headed Snake	Shimla	Madhya Pradesh, Gujarat, Himachal Pradesh	LR-nt
35.	*Xenochrophis piscator* (Schneider, 1799)	Checkered Keelback water Snake	Throughout state except Trans-Himalaya	Tamil Nadu, Madhya Pradesh, Maharashtra, Kerala, Arunachal Pradesh, Assam West Bengal, Goa, Uttar Pradesh Meghalaya Orissa, Manipur, Punjab Gujarat, Himachal Pradesh	LR-Ic
36.	*Xenochrophis sanctjohannis* (Boulenger, 1890)	St. John's Keelback water Snanke	Kullu	Kashmir, Himachal Pradesh	LR-nt
37.	*Leopeltis rappii* (Gunther, 1860)	Himalayan Striped-necked Snake	Shimla	Sikkim, Darjeeling, Himachal Pradesh	VU
38.	*Amphiesma stolatum* (Linnaeus, 1758)	Buff-striped Keelback	Throughout state except Trans-Himalaya	Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, Madhya Pradesh, Chhattisgarh, Orissa, Uttar Pradesh, Assam, Bihar, Maharashtra, Arunachal Pradesh, Punjab, Himachal Pradesh	LR-nt
39.	*Amphiesma platyceps* (Blyth, 1854)	Eastern Keel back		Kashmir, Sikkim, Punjab, Assam, Darjeeling, Meghalaya, Arunachal Pradesh, Himachal Pradesh	VU
40.	*Spalerosophis atriceps* Fischer, 1885	Black Headed Royal Snake	-	Punjab, Himachal Pradesh	
41.	*Psammophis leithii* Gunther, 1869	Pakistani Ribbon Snake	Solan	Gujarat, Rajasthan, Uttar Pradesh, Punjab, Jammu Kashmir, Maharashtra, Himachal Pradesh	LR-nt
42.	*Psammophis condanarus* (Merrem, 1820)	Oriental sand Snake	Solan	Punjab, Himachal Pradesh	LR-nt
43.	*Boiga trigonata* (Schneider in: Bechstein, 1802)	Common Indian Cat Snake	Solan, Chamba	Gujarat, Sikkim, Maharashtra, West Bengal, Punjab, Himachal Pradesh	LR-Ic

43.	*Boiga trigonata* (Schneider in: Bechstein, 1802)	Common Indian Cat Snake	Solan, Chamba	Gujarat, Sikkim, Maharashtra, West Bengal, Punjab, Himachal Pradesh	LR-Ic
44.	*Boiga multifasciata* (Blyth, 1861)	Many Banded Cat Snake	Kangra, Solan, Shimla	Sikkim, Arunachal Pradesh, West Bengal, Himachal Pradesh	VU
	Family: Elapidae Boie, 1827				
45.	*Bungaraus caeruleus* (Schneider, 1801)	Common Indian Krait	Solan	Tamil Nadu, Madhya Pradesh, Gujarat, Maharashtra, Karnataka, Himachal Pradesh	LR-nt
46.	*Sinomicreurus macclellandi* (Reinhardt, 1844)	Macclelland's Coral Snake	Solan	Assam, Sikkim, Darjeeling, Arunachal Pradesh, Himachal Pradesh	
47.	*Naja oxiana* (Eichwald, 1831)	Black Cobra	Throughout state except Trans-Himalaya	Throughout India	CR
	Family: Viperidae Bioe, 1827				
48.	*Daboia russelii* (Shaw & Nodder, 1797)	Rassel's Viper	Throughout state except Trans-Himalaya	Tamil Nadu, Madhya Pradesh, Gujarat, Maharashtra, Uttar Pradesh, Bihar, Northern Bengal, Punjab, Himachal Pradesh	LR-nt
49.	*Echis carinatus* (Schneider, 1801)	Saw –scaled Viper	Solan, Sirmour	Madhya Pradesh, Rajasthan, Gujarat, Punjab, Andhra Pradesh, Tamil Nadu, Maharashtra, Himachal Pradesh	LR-nt
50.	*Trimeresurus albolabris* Gray, 1842	White-lipped pit viper	Solan, Shimla, Mandi, Kullu	Arunachal Pradesh, Himachal Pradesh	
51.	*Gloydius himalayanus* (Gunther, 1864)	Himalayan Pit Viper	Kangra, Solan, Shimla	Kashmir, Haryana, Uttar Pradesh, Himachal Pradesh	
	Order: Testudines **Family: Emydidae Gray, 1825**				
52.	*Pangshura smithii* (Gray, 1863)	Brown Roofed Turtle	Shiwalik ranges of state	Assam, Himachal Pradesh	
53.	*Kachuga kachuga* (Gray, 1831)	Red –crowned Roofed Turtle	Sirmour	Himachal Pradesh	VU
54.	*Melanochelys trijuga* (Schweigger,1812)	Indian Black Turtle	Sirmour	Gujarat, Uttarakhand, Himachal Pradesh	LR-nt
	Family: Trionychidae Bell, 1828				
55.	*Lissemys punctata andersoni* Webb, 1980	North Indian Flapshell Turtle	Shiwalik area of state	Tamil Nadu, Sikkim, Gujarat, Maharashtra, Assam, Himachal Pradesh	LR-nt

Table 4: Mammals Diversity of Himachal-Pradesh.

S.N.	Species Name	Common Name	Status		
			IUCN (Red list Category)	IW(P)A (Schedule)	CITES (Appendix)
	Class: Mammalia **Order : EULIPOTYPHLA** **Family : SORICIDAE**				
1	*Soriculus nigrescens* (Gray, 1842)	Himalayan Shrew	LC	-	-
2.	*Crocidura attenuata* Mine-Edwards,1872	Grey Shrew	LC	-	-
3.	*Suncus murinus* Linnaeus,1766	House Shrew	LC	-	-
4.	*Chimarrogale himalayica* Gray, 1842	Himalayan Water Shrew	LC	-	-
	Family : ERINACEIDAE				
5.	*Hemiechinus auritus* (Gmelin,1770)	Long-eared Hedgehog	LC	IV	-
6.	*Paraechinus micropus* (Blyth,1846)	Indian Hedgehog	LC	-	-
	Order : CHIROPTERA **Family : PTEROPODIDAE**				
7.	*Rousettus leschenaulti* (Desmarest,1820)	Fulvous Fruit Bat	LC	V	-
8.	*Pteropus giganteus* Brunnich,1782	Indian Flying Fox	LC	V	II
	Family : MEGADERMATIDAE				
9.	*Me gaderma lyra* Geoffroy,1810	Indian False Vampire	LC	1	-
	Family : RHINOLOPHIDAE				
10.	*Rhinolophus ferrumequinum* (Schreber,1774)	Greater Horseshoe Bat	LC	-	-
11.	*Rhinolophus affinis* Horsefield, 1823	Intermediate Horseshoe Bat		-	-
12.	*Rhinolophus lepidus* Blyth, 1844	Blyth's Horseshoe Bat	LC	-	-
13.	*Rhinolophus luctus* Temminck,1835	Woolly Horseshoe Bat	LC	-	-
14.	*Rhinolophus sinicus* (Anderson,1905)	Chinese Horseshoe Bat	NT	-	-
	Family: HIPPOSIDERIDAE				
15.	*Hipposideros armiger* Hodgson,1835	Great Himalayan Leaf-nosed Bat	LC	-	-
16.	*Barbastella leucomelas*Schmar,1826)	Eastern Barbastella	NT	-	-

17.	*Miniiopterus schreibesrsii* (Kuhl, 1819)	Schreiber's Long Fingered Bat	NT	-	-
18.	*Murina tubinaris* (Scully, 1881)	Scully Tube Nosed Bat	NT	-	-
19.	*Myotis blythi* (Tomes, 1857)	Lesser Mouse-eared Bat	LC	-	-
20.	*Myotis formosus* (Hodgson,1835)	Hodgson's Bat	LC	-	-
21.	*Myotis muricola* (Gray,1846)	Nepalese Whiskered Bat	LC	-	-
22.	*Myotis nipalensis* (Dobson, 1871)	Nepal Nyotis	LC	-	-
23.	*Myotis siligorensis*(Horsefield,1855)	Himalayan Whiskered Bat	NT	-	-
24.	*Nyctalus leisleri* (Kuhl, 1890)	Leiler's Bat	EN		
25.	*Nyctalus montanus* (Barrett-Hamilton,1906)	Mountain Noctule	NT	-	-
26.	*Nyctalus noctula* (Schreber,1774)	Noctule	LC	-	-
27.	*Nyctalus noctula* (Schreber,1774)	Kellart's Pipistrelle	LC		
28.	*Pipistrellus coromandra* (Gray,1838)	Coromandel Pipistrelle	LC	-	-
29.	*Pipistrellus dormeri* (Dobson,1785)	Dormer's Bat	LC	-	-
30.	*Pipistrellus javanicus* (Gray, 1838)	Javan Pipisterile	LC	-	-
31.	*Pipistrellus tenuis* (Temminck,1840)	Indian Pygmy Bat	LC	-	-
32.	*Plecotus homochrous* Hodgson,1847	Brown Long-eared Bat	NT		
33.	*Scotophilus kuhlii* Leach,1821	Asiatic Lesser Yellow House Bat	LC	-	-
34.	*Scotoecus pallidus* Dobson,1876	Desert Yellow Bat	NT	-	-
	Order : PRIMATES **Family : CERCOPITHECIDAE**				
35.	*Macaca mulatta* (Zimmermann,1780)	Rhesus macque	LC	-	-
36.	*Semnopithecus entellus* (Dufresne,1797)	Common langur	LC	II	I
	Order : CARNIVORA **Family : CANIDAE**				
37.	*Canis aureus* Linnaaaeus,1758	Jackal	LC	II	III
38.	*Canis lupus* Linnaeus,1758	Indian Wolf	LC	I	I
39.	*Vulpes bengalensis* (Shaw,1800)	Bengal Fox	LC	II	III
40.	*Vulpes vulpes* (Linnaeus,1758)	Red Fox	LC	II	III
41.	*Cuon alpines* (Pallas, 1811)	Indian Wild Dog	EN	II	-

42.	*Herpestes edwardsii* (E. Geoffroy Saint-Hilaire,1818)	Grey Mongoose	LC	IV	III
43.	*Herpestes javanicus* (E. Geoffroy Saint-Hilarie, 1818)	Small Indian Mongoose	LC	IV	III
	Family : VIVERRIDAE				
44.	*Paguma larvata* (C.E.H. Smith,1827)	Himalayan Palm Civet	LC	II	III
45.	*Viverricula indica* (E. Geoffroy Saint-Hilaire,1803)	Small Indian Civet	LC	II	III
46.	*Paradoxurus hermaphrodites* (Pallas,1777)	Common Palm Civet	LC	II	-
	Family : MUSTELIDAE				
47.	*Lutra lutra* (Linnaeus, 1758)	Common Otter	NT	II	I
48.	*Lutrogale perspicillata* (I. Geoffroy Saint-Hilaire,1826	Smooth Indian Otter	VU	II	II
49.	*Aonyx cinerea* (Illiger,1815)	Clawless Otter	VU	I	II
50.	*Martes foina* (Erxleben,1777)	Stone Marten	LC	II	III
51.	*Martes flavigula* (Boddaert,1785)	Yellow-throated Marten	LC	II	III
52.	*Mustela sibirica* Pallas, 1773	Himalayan Weasel	LC	II	III
53.	*Mustela altaica*, Pallas, 1811	Pale Weasel	NT	II	III
54.	*Mustela kathiah* Hodgson,1835	Yellow-bellied Weasel	LC	II	III
55.	*Mellivora capensis* (Schreber,1776)	Honey Badger or Ratel	LC	I	-
	Family: URSIDAE				
56.	*Ursus arctos* Linnaeus,1758	Brown Bear	LC	I	I
57.	*Ursus thibetarus* G. (Baron) Cuvier,1823	Asiatic Black Bear	VU	II	I
	Family : HYAENIDAE				
58.	*Hyaena hyaena* (Linnaeus,1758)	Striped Hyaena	NT	III	-
	Family : FELIDAE				
59.	*Prionailurus bengalensis* (Kerr,1792)	Leopard Cat	LC	I	I
60.	*Felis chaus* Schreber,1777	Jungle Cat	LC	II	II
61.	*Panthera pardus* (Linnaeus,1758)	Leopard	NT	I	I
62.	*Panthera tigris* (Linnaeus,1758)	Tiger	EN	I	I
63.	*Panthera uncia* (Schreber,1775)	Snow Leopard	EN	I	I
64.	*Lynx lynx* (Linnaeus,1758)	Lynx	LC	I	II
	Order : PHOLIDATA **FAMILY : MANIDAE**				
65.	*Manis crassicaudata* E. Geoffroy,1803	Indian Pangolin	NT	-	II

	Order : PERISSODACTYLA **Family : EQUIDAE**				
66.	*Equus kiang* Moorcroft,1841	Kiang or Tibetian Wild Ass	LC	-	II
	Order : CETARTIODACTYLA **Family : CERVIDAE**				
67.	*Cervus elaphus hanglu* Linnaeus,1758	Kashmir Stag	LC	I	I
68.	*Rusa unicolor* (Kerr,1792)	Sambar	VU	III	-
69.	*Axis axis* (Erxleben, 1777)	Spotted Deer	LC	III	-
70.	*Muntiacus muntjac* (Zimmermann,1780)	Barking Deer	LC	III	-
	Family : MOSCHIDAE				
71.	*Moschus chrysogaster* (Hodgson, 1839)	Musk Deer	EN	I	I
	Family : BOVIDAE				
72.	*Capra sibirica* (Pallas, 1776)	Siberian Ibex	LC	I	-
73.	*Hemitragus jemlahicus* (C.H. Smith,1826)	Himalayan Tahr	NT	I	-
74.	*Procapra picticaudata* Hodgson,1846	Tibetan Gazelle	NT	I	-
75.	*Gazella bennettii* (Sykes,1831)	Indian Gazelle or Chinkara	LC	I	-
76.	*Capricornis sumatraensis* (Bechstein,1799)	Serow	VU	I	I
77.	*Naemorhedus goral* (Hardwicke,1825)	Goral	NT	III	I
78.	*Pseudois nayaur* (Hodgson,1833)	Bharal/Blue Sheep	LC	I	-
79.	*Ovis ammon* (Linnaeus,1758)	Argali or Nayan	NT	I	I
80.	*Boselaphus tragocamelus* (Pallas, 1766)	Nilgai	LC	III	-
81.	*Bos mutus* (Przewalskt,1883)	Wild Yak	VU	I	I
	Order : RODENTIA **Family : SCIURIDAE**				
82.	*Marmota caudate* (Geoffrroy,1844)	Long-tailed Marmot	LC	II	III
83.	*Petaurista petaurista* (Pallas,1766)	Common Giant Flying Squirrel	LC	II	-
84.	*Eupataurus cinereus* Thomas,1888	ɔly Flying Squirrel	EN	II	-
85.	*Eoglavcomys fimbriatus* (Gray, 1837)	Smaller Kashmir Flying Squirrel	LC	II	-
86.	*Funambulus pennant* Wroughton, 1905	Northern Palm Squirrel	LC	IV	-
	Family : HYSTRICIDAE				
87.	*Hystrix indica* Kerr,1792	Indian Porcupine	LC	IV	-
88.	*Hystrix brachyuran* Linnaeus,1758	Himalayan Crestless Porcupine	LC	II	-

	Family : CRICETIDAE				
89.	*Alticola roylei* Gray,1842	Royle's High Mountain Vole	NT	-	-
90.	*Alticola roylei* Gray,1842	Blyth's Vole	NT	-	-
	Family: MURIDAE				
91.	*Apodemus sylvaticus* (Linnaeus,1758)	Wood Mouse	LC	V	-
92.	*Bandicota indica* (Bechstein,1800)	ge Bandicoot Rat	LC	V	-
93.	*Bandicota bengalensis* (Gray, 1835)	Lesser Bandicoot Rat	LC	V	-
94.	*Nesokia indica* (Gray, 1830)	Short-tailed Bandicoot Rat	LC	-	-
95.	*Rattus rattus* (Linnaeus,1758)	House Rat	LC	V	-
96.	*Rattus pyctoris* (Hodgson,1845)	Turkestan Rat	LC	V	-
97.	*Niviventer fulvescens* (Gray, 1847)	Chestnut Rat	LC	V	-
98.	*Niviventer niviventer* (Hodgson, 1836)	White-bellied Rat	LC	V	-
99.	*Cremnomys cutchicus* Wroughton, 1912	Cutch Rat	LC	V	-
100.	*Millardia meltada* (Gray)	Soft furred Metad	LC	V	-
101.	*Golunda ellioti* Gray, 1837	Indian Bush rat	LC	V	-
102.	*Vandeleruria oleracea* (Bennett, 1832)	Indian-Long tailed Mouse		V	-
103.	*Mus musculus* Linnaeus, 1758	House Mouse	LC	V	-
104.	*Mus cervicolor* Hodgson, 1845	Fawn-coloured Mouse	LC	V	-
105.	*Mus booduga* (Gray, 1837)	Little Indian Field Mouse	LC	V	-
106.	*Mus platythrix* Bennett,1832	Spiny Field Mouse	LC	V	-
107.	*Tatera indica* (Hardwicke, 1807)	Indian Gerbil	LC	-	-
	Order : LAGOMORPHA **Family : LEPORIDAE**				
108.	*Lepus oistolus* Hodgson, 1840	lack- naped e	LC	IV	-
109.	*Lepus oistolus* Hodgson, 1840	Wooly Hare	NE	-	-
	Family: OCHOTONIDAE				
110.	*Ochotona ladacensis* (Gunther,1875)	Ladak Pika	LC	IV	-
111.	*Ochotona macrotis* (Gunther, 1875)	Large-eared Pika	LC	IV	-
112.	*Ochotona roylei* (Ogilby,1839)	Royle's Pika	LC	IV	-

3. Scientific evidence and perceptions:

The base line data of faunal diversity of vertebrates has been studied. Though the data is scattered and not well documented. Through this communication, attempt has been made to document the vertebrate fauna of the state. Work has been done on **Pisces fauna** of the state from the different ecological niches *viz.* Rivers, streams, reservoirs etc. The fish fauna has been explored by various workers and among them important contributors are McClelland, 1839, 1842; Steindachner, 1867; Day, 1875-1878; Prasad, 1919; Fowler, 1924; Hora, 1927,1937; Khan, 1935; Menon, 1951, 1954, 1962,1974,1987, 1999; Bhatanagar, 1973; Seghal, 1974; Sharma, 1991; Uniyal, 1995; Johal, 1998, 2002; Johal, *et al.* 2002, 2003; Dhanze and Dhanze, 2004, Mehta and Uniyal, 2005, Sharma, 2010. Present status of the fishes has been given as per the Diversity of the fishes submitted in the ZSI by (Sharma, 2013) according to present environmental scenario. The status of 81 fish species comprising of 49 genera, 18 families and 6 orders along with distribution, conservation and abundance status has been discussed.

However, Mehta (2005) reported 104 species from the state and the fishes *viz*. *Barilius modestus* Day, *Tor mosal* (Hamilton), *Puntius phutunio* (Hamilton), *P. waageni* (Day), *P. stigma* (Hamilton), *P. tetrapagus* (McClelland), *P. punjabensis* (Day), *Labeo gonius* (Hamilton), *L. pangusia* (Hamilton), *Noemacheilus carletoni* Fowler, *N. corica*, *N. himachalensis* Menon, *N. Punjabensis* (hora), *N. nilgriensis* (Menon), *Botia dayi* Hora, *Botia birdi* Chaudhari, *B. geto* (Hamilton), *Glyptothorax gahwali* Tilak, *G. gracile* (Gunther), *G. Kashmirensis* Hora, *G. stoliczkae* (Steindachner), *G. horai*, *Channa orientalis* Bloch and Steindachner, *C. striatus* (Bloch) reported by him has not included in the present studies. Nine fish species *viz*. *Carassius auratus* (Linnaeus), *C. carassius* (Linnaeus), *C. carpio communis* Linnaeus, *C. carpio specularis* Lacepede *C. carpio nudus* Bloch, *Ctenopharyngodon idella* (Val.), *Hypophthalmichthys molitrix* (Val.), *Oncorhynchus mykiss* (Smith & Stearby) and *Salmo trutta fario* Linnaeus are the introduced species in the water bodies of the state. The carp fishes are well established in the reservoirs and their aqua culturing has boosted up the commercial fish production from the dam-reservoirs, but the diversity and population abundance of the indigenous fish-fauna have been greatly affected (Sharma, 2013).

Frogs, toads, newts, salamanders and caecilians comes under Amphibia. They have varied habitat *viz.* terrestrial, fossorial, arboreal and freshwater. Dinesh *et al*. (2012) has given an annotated checklist of 342 species under 50 genera and 14 families. Amphibia comprises 17 species representing 4 families *viz. Bofonidae*, *Ranidae*, *Microhylidae* and *Rhacophoridae* from different parts of the state Himachal-Pradesh with varied mountainous ranges, altitudes and diverse ecological niches (Mehta, 2005). Present status of the Amphibia has been given as per the Diversity of the Amphibia submitted in the ZSI by (Sharma, 2013). During the present studies 16 species comprising of 11 genera *Duttaphrynus*, *Pseudepidalea*, *Euphlyctis*, *Fejervarya*, *Holobatrachus*, *Nanorana*, *Sphaerotheca*, *Microhyla*, *Uperodon*, *Amolops*, *Polpedates* and 5 families *viz*. Bufonidae, Dicroglossidae, Microhylidae, Ranidae and Rhacophoridae with their conservation status has been documented. Reptiles are the cold-blooded animals. Of the 19 orders of reptiles, 03 orders have been recorded from the India *viz.* Crocodylia (Crocodiles), Tesudines (turtles and tortoises) and Squamata (lizards and snakes). The monumental works on the Indian reptiles are, The Reptiles of British India" by Gunther (1864), Fauna of British India- "Reptilia and Batrachia" By Boulenger (1890) and Smith (1931, 1935, 1943). An updated checklist of Indian Reptiles have shown that there are 518 species of reptiles which includes 3 species of crocodiles, 34 species of turtles and tortoises, 202 species of lizards and 279 species of snakes belonging to 28 families recorded till date from India. No earlier published information is available on the reptilian fauna of Himachal Pradesh. However, scanty work has been undertaken on the Reptilian fauna of the state. Some recent contributions (Saikia *et al*. 2007, Saikia *et al.* 2010a, b) on the reptilian fauna show that a reptile constitutes a noteworthy portion of vertebrate fauna of Himachal Pradesh comprising 55 species. Reptilian diversity of a very few conservation areas of Himachal Pradesh has been reported earlier (Mehta, 2000; Sharma, *et al.* 2008; Sharma and Saikia 2009; Saikia, *et al.* 2010). During the present studies 55 species comprising of 41 genera 14 families with their conservation status has been reported. According to Wilson and Reeder (2005), there are 5416 species of mammals belonging to 154 families and 29 orders have been reported from globe. Sharma *et al.* (2013) has recorded 423 species in India, which is about 7.81% of the global mammalian species representing 48 families and 14 orders. The diversity of mammalian species of the Himachal Pradesh has mainly contributed by Hinton and Lindsay (1926), Pocock (1939, 1941), Ellerman and Morrison-Scott (1951), Gaston *et al.* (1981), Rodgers and Panwar (1988), Singh *et al*. (1990), Julka *et al.* (1990), Chakraborty *et al.* (2005). Some recent contributions on the Mammals (Chiropteran fauna) of the state are of Saikia *et al*. 2011, Saikia and Boro, 2013.

The mammalian diversity of some of the PA's has been undertaken by Sharma and Saikia (2008, 2009), Sharma and Saikia (2013). During the present studies 112 species comprising of 78 genera and 5 families with their conservation status has been compiled.

4. Trends and Impacts: Global surface temperature increased by 0.6^{o}C during the 20th Century and it has been predicted that mean global surface temperature will rise by 1.4 to 5.8°C in the next 100 years or so, mainly depending on the amount of carbon dioxide emission from anthropogenic sources (IPCC, 2001b). Temperature is key stricture to change the trend of biodiversity. Climatic change is well accountable due to synergistic effects owing to anthropogenic stresses *viz.* pollution, over-exploitation, invasive species and habitat loss etc. A case of Pisces fauna of Pong dam which is one of the Ramsar site located in the district Kangra of Himachal Pradesh. The indigenous fish fauna has been disappeared from the dam after stocking it with exotic fishes. *Tor putitora* (Hamilton) (Golden Mahseer) and *Schizothorax richardsonii* (Gray) which were the dominant species has lose the ground and now exotic fish species *Cyprinus carpio* (Linnaeus) is the dominant fish species in the dam (Sharma, 2011). Thus, Warming acts synergistically with the invasive species. Sharma and Mehta (2010) while working on *Schizothorax richardsonii* (Gray) in Beas River System in district Kangra in Himachal-Pradesh reported that the altitude range of the fish has been shifted due to increase of temperature and habitat destruction.

Thomas *et al*., 2004 reported that the effect of future climatic change on biodiversity has been predicted to be unprecedented as well with 15-37% of terrestrial species possibly becoming extinct due to climatic change alone in the next 50 years. Similarly dark futures have been suggested for freshwater species in the next few decades (Xenopoulos *et al*., 2005). The species that has expanded their range due to climatic change is well established in the species that can fly (butterflies and birds). But the species which have little migration/dispersal will have range reduction and their population will ultimately reduced/ vanished.

The impacts of warming are alarming since the biodiversity is directly related with the livelihood and socioeconomic status. There is melting of glaciers in the Himalayas and thus glaciers are disappearing. The range of alpine habitat is shrinking and fauna of that habitat is more under threat. There is more rain in the summer and flood disasters in the Himalayan ecosystems. The natural disasters in the fragile Himalayan ecosystem are also then susceptible in these areas. Examples of the recent disasters in the Himalayan ecosystem are in Ladakh (August, 2010) and Uttarakhand (June, 2013) which have ruined the complete human life then who can think about biodiversity-------. As per Flato & Boer, 2001; ACIA, 2005, high altitude regions are expected to experience even more dramatic warming up to 10^{o}C. There is evidence of prominent increase in the intensity and frequency of many extreme weather events such as heat waves, tropical cyclones, prolonged dry spells, intense rainfall, tornadoes, snow avalanches, thunderstorms and severe dust storms in the region (Cruz *et al*., 2007).

Therefore, the rise in temperature thus wills affect----- Environment------Biodiversity---------Food Security------- Disasters-------Diseases in near future.

5) Status of research, institutions involved:

To know the Biodiversity of the ecosystem taxonomy is the only basic tool. Taxonomic research is decaying or rather it is at the death sentence in India. Biodiversity, Ecological, Agricultural and Fisheries, Medicinal etc. means each research in biology requires correct naming. Hence, taxonomy is the base for all the Researches in biology. The name is a label using which various pieces of information on an organism are retrieved and stored (Narendran, 2000). Physiology, Genetics and Molecular biology etc. are the more fascinating field for the students in present scenario. One of the reasons for this state is that it has becomes fashionable to treat taxonomists as being incapable of analytical thought and deductive logic. On the other hand, research in taxonomy needs hard field-oriented work involving dangerous situations. A taxonomist often needs several hours or days, looking through his microscope for identifying a single specimen. He needs dedications and intelligence for analysis of various characters. To identify a species authentically, expertise developed through years is called for (Narendran, 2001). A checklist from various literature and sources is mostly given by the workers on the name of the taxonomy. Taxonomy Research comprises 3 levels. 1) Alpha Taxonomy is the description of the species and its arrangement in comprehensive genera 2) Beta Taxonomy is the relationships at the species levels 3) Gamma Taxonomy is the intra-specific variations and their evolutionary relationships i.e. study of speciation. Only in a few groups (birds and mammals) taxonomy has been undertaken at the gamma level.

The research on the taxonomy is mainly undertaken in a very few organizations in India *viz.* Zoological Survey of India (ZSI), Botanical Survey of India (BSI), Indian Agricultural Research Institute (IARI), Natural History Museums, some Universities and institutions. There are ZSI, BSI, IARI and Forest Research Institute, Dehradun are the only organizations for the identification services as well as repositories for collections in the country.

Though, the vertebrate fauna is much explored than the invertebrates. But, the Trans Himalayan ecosystem is une**x**plored due to less accessibility and very harsh climatic conditions.

6) Issues & gaps: There is need of basic knowledge about the biodiversity and subsequently how the environmental changes will impact the individual species, communities and ecosystem. There is lack of Systematic research, as the work on the taxonomy is undertaken by a very few students. It is required to increase the number of the systematic researchers. Thus financial support for the research, training programmes in the biosystematics is also one of the important implement to encourage the researchers in this field. There is no any networking of researchers at the regional, state and National level. It requires an association of the workers for documentation of the biodiversity of our country with reference to climatic change. Documentation of the present knowledge of the biodiversity is the utmost requirement, so that gaps can be identified further studies. Further, the data will be useful for the stable monitoring of the biological impacts of the climatic change. There is need to develop the methods to monitor species, communities and ecosystem. There is no standardized method to identify the threatened species and ecosystems.

There should be one platform for the expertise in the taxonomy. In this regard Haritharan and Balaji (2002) narrated that inventory of Indian biodiversity is a mammoth task, and it will be impossible to complete it by few individual specialists placed far and wide. It requires better cooperation and coordination among the researchers is very much needed to exchange the specimens and vital information concerning the identification and systematic position of taxa etc.

However, to fulfill the gap, extensive surveys have been undertaken by Zoological Survey of India to explore the fauna (invertebrate and vertebrate) of the Himalayan Ecosystem. Fauna of Himachal Pradesh includes wetland of Renuka (2000), Pin Valley National Park (2007), Fauna of Simbalbara WLS (2009), Pong Dam Wetland (2009), Fauna of Western Himalaya from Himachal Pradesh (2005). Fauna of Remote Pangi Valley (2013) and Churdhar WLS (2014) has been recently documented. 3156 species has been inventoried from the Himachal Pradesh. Fauna of Cold Desert of Ladakh (2009) has been studied. The study on the status survey of some mammals of the area has also been published. But the fauna of the Jammu Kashmir is least studied. The faunal diversity of Remote areas and Cold Deserts is mostly unexplored. Molecular taxonomy is one of the new approaches to resolve the taxonomic problems. Though the systematic studies on the molecular level has now been undertaken by a few institutes. There are limited facilities to undertake these studies. GIS studies have not undertaken to know the distribution and abundance of the fauna.

There is a gap between science for the conservation and management policies. Many strategies have been discussed and made during workshops and meetings. But there is a gap for the implementation of these plans/policies. However, it requires corporation from down to top level about the threats of climatic change on the biodiversity for the sustainable development in this present scenario.

7) Way forward: Credible Taxonomic Research ----------Networking------Assessment-----Extension—---- Conservation (Mass Awareness)

Biodiversity is under threat due to climatic change. Himalayan glaciers are source of freshwater for the main river system and lifeline in Asia for human beings. Global warming is leading the melting of glaciers in Himalayas. As per Cruz *et al.* 2007 in long term, global warming could lead to disappearance of many glaciers and causing serious impacts on the populations relying on the 7 main rivers in Asia fed by melt water from the Himalayas. Throughout Asia one billion people could face water shortage leading to drought and land degradation by the 2050s.

Therefore, in the present scenario the firm steps should be undertaken to save biodiversity. The utmost parameter to save the wealth of fauna is to stop the development and tourism in this fragile Himalayan Ecosystem of the state. The development is requisite for the growth of the nation but it should not be at the cost of the environment. There is need of awareness among the poor and neglected people of the community living in and around the biodiversity rich zones. This will go in a long way to conserve our traditional knowledge about the biodiversity. There should be strict laws so that anthropogenic stresses due to human interference can be fully stopped.

Afforestation: Deforestation is leading to alteration in the rainfall, soil erosion along the river beds and vanishing the habitats of the fauna. The main causes of this deforestation are high population, poverty and thus requirement for agricultural and industrial land. Approximately 45% of India's land is degraded primarily due to deforestation, unsustainable agricultural practices, mining and excessive groundwater extraction.

Pollution in the form of solid waste, sewage disposal, pesticides, insecticides used in agricultural fields etc. which washed out in the water and result in the decreased oxygen and cause mortality of all aquatic fauna in totality.

In situ Conservation: In situ conservation should be enhanced by creation of more fish sanctuaries/ reserve areas/parks/protected areas. More areas should be brought under PA network.

Management system needs to be refined and strengthened. The importance of protected areas has also been emphasized by international conventions and programmes such as Convention on Biological Diversity (CBD), the World Heritage Convention (WHC), the Ramsar Convention on Wetlands, the UN law of the Sea Convention, UNESCO's Man and Biosphere (MAB), programme of the United Nations Educational, Scientific and Cultural organization (UNESCO) and the global Programme of WCPA. These programmes are backbone for the management of protected areas for biodiversity conservation and their sustainable use.

Ex situ Conservation: The animals which are endangered or at the verge of extinction, they can be conserved by establishment of the Gene Bank in the laboratory.

Monitoring and Management of Biodiversity: Biodiversity monitoring is very important and it is only the way to evaluate the diversity and disturbances in the ecosystem as a whole and accordingly action can be taken to recover the biodiversity. Thus, long term standardized monitoring assessment is helpful to know the status and management of the biodiversity.

Mass awareness: The awareness to conserve the biodiversity should be recognized very well at root level. The decision should be based on collaborative good research by taking care of both climate change solutions and to conserving biodiversity. There should be equitable way so that essential services with the basic needs could be fulfilled in all sections of the society. Thus, by only communally attending the biodiversity loss and climatic Change issues solutions can be developed.

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