

Conservation Area Series, 37

Fauna of Lonar Wildlife Sanctuary



ZOOLOGICAL SURVEY OF INDIA

Conservation Area Series : 37

Fauna of Lonar Wildlife Sanctuary

Edited by the Director, Zoological Survey of India, Kolkata



सत्यमेव जयते

**Zoological Survey of India
Kolkata**

CITATION

Editor-Director. 2008. *Fauna of Lonar Wildlife Sanctuary, Conservation Area Series, 37* : 1-208. (Publishd by the Director, *Zool. Surv. India*, Kolkata).

Published : December, 2008

ISBN : 978-81-8171-203-5

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PRICE

Indian Rs. 400.00

Foreign \$ 30 £ 25

Published at the Publication Division, by the Director, Zoological Survey of India, 234/4 A.J.C. Bose Road, 2nd MSO Building, Nizam Palace (13th floor), Kolkata - 700 020 and printed at Krishna Printing Works, Kolkata - 700 006.

Fauna of
FAUNA OF LONAR WILDLIFE SANCTUARY
Conservation Area Series

No. 37	2008	Pages 1-208
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AN OVERVIEW

ANIL MAHABAL

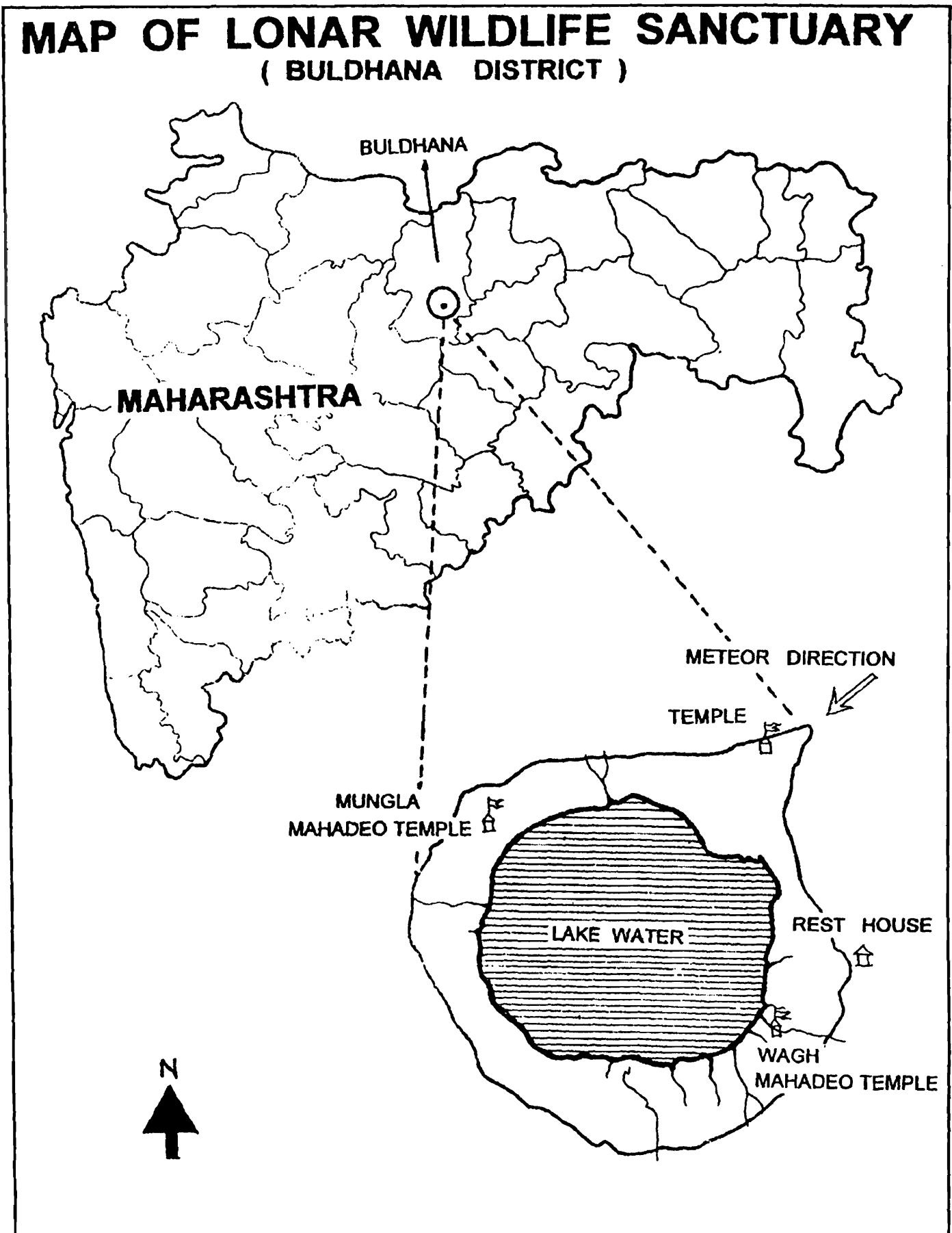
*Zoological Survey of India, Western Regional Station,
Rawet Road, PCNT Post, Pune 411 044.*

INTRODUCTION

Lonar crater is believed to be formed out of the impact of a large meteoric body about 50 to 60 thousand years ago. Buldhana District Gazetteer, (Kunte (Ed.), 1976) gives detailed account of Lonar crater and lake. Mythology associated the crater with the underground abode of demon Lonasura, who was killed by Lord Vishnu. The scientific studies carried out in recent times attribute the probable origin of Lonar crater by the impact of a large meteoric body. Energy equivalent to the explosion of a six-megaton atom bomb would have been generated by the impact. The crater was noticed by an Englishman, C J E Alexander in 1823, who recorded its existence. In 1896, American geologist G.K. Gilbert conducted studies to prove that Lonar crater was created by the meteorite impact, the results of which were published in 1973 (Anon. 1999).

Present Status : The crater had been the place of tourist attraction and a study site for people with scientific interest. In recent times, Maharashtra Government constructed a tourist resort for promotion of tourism. Western Regional Station of the Zoological Survey of India surveyed the area from 2002 to 2004 and conducted faunistic studies of this unique ecosystem. It was noticed that people of village Lonar, used to axe the trees and shrubs on the bank and the slopes of the crater to meet their fuel needs. A large freshwater stream mixed with polluted water of nearby drainage empties in to the crater. This could have caused permanent damage to the ecosystem. Heavy increase in the water level of the crater was already noticed as compared to that existed in 1970's when one of the officers of the survey (Dr. S.G. Patil) visited the crater for scientific studies. Dr. Patil had seen large portion of the bottom of the crater exposed in summer, and deposition of the solid salt over it. He measured salinity of the water to be 14. Presently it has depleted to 10 to 11. Water has risen to such a height that surrounding trees and temples are almost submerged throughout the year.

The Government of Maharashtra, declared an area of 383.32 hectares including the crater lake and its surrounding as 'Lonar Wildlife Sanctuary, vide their Order No. WLP/1089/FK 48/F 1 Dated 8th June 200



Location and Area : Lonar crater is situated in District Buldhana of Maharashtra State (19° 59' N : 76° 34' E), 165 Kms. eastwards to Aurangabad, which is the nearest air port. Lonar can be reached by road from other districts also, viz. Jalna, 105 Kms.; Akola, 150 Kms and Parbhani 185 Kms.

Accommodation : Accommodation near the Lonar crater is available. The Maharashtra State, Forest Department and Public Works Departments have small rest houses. Drinking water in summer months is a scarcity, and is to be fetched from the distribution tank of the municipal corporation. The Tourism Development Corporation of Maharashtra Government has a tourist centre. Accommodation can be booked through tourist centers from all over Maharashtra. Some hotels and lodges are also available in Lonar town.

GEOLOGY AND PHYSICAL FEATURES

The Lonar crater has almost a circular outline of about 1830 meter diameter and a depth of 150 meters, with vertical slopes. It has a rim, characteristic of meteorite craters, rising to a height of 20 meters above the surrounding ground level. The crater is created in the basalt rock and is the second largest crater in such a rock in the world. The plagioclase feldspar in the basaltic rock was transformed to maskelnite, which is possible only after the pressure created by the meteoric impact. During 1972 to 1976 the Smithsonian Institute, Washington, U.S.A. and Geological Survey of India excavated samples of the rock from base of the crater and established presence of maskelite in it. The crater has five distinguishable zones.

- 1) The outermost ejecta blanket or the slightly elevated periphery of the crater formed by the molten lava which was ejected out of the crater as a result of the meteorite impact.
- 2) The crater rim or an elevated crest around the crater resulted from the upward lifting of rock beds due to the impact
- 3) The slopes of the crater
- 4) The crater basin and
- 5) The Crater Lake formed by accumulation of water in the deeper parts of the basin.

SEASONS

The area experiences four distinct seasons in the year. The Rainy season due to South-West Monsoon from June to September; Post - Monsoon in October-November Winter from December to February and Summer from March to June. Average annual rainfall in the Buldhana District is 796.6 mm. and mean maximum and minimum temperatures are 27.6° C and 15.1° C respectively.

WATER SOURCE

“Rain Water” is the only source of water accumulated in the crater. However, a small stream with its possible origin in the near vicinity flows perennially from the northern wall of the crater. The stream has recently been diverted to the outside area. In recent years water level of the crater has risen considerably which might be due to shifting of ground water table.

FOLRA

The slopes of crater were devoid of any noticeable vegetation as indicated in the past records. Plantation mainly by the forest department has given it a green look at least on the periphery of the water. The principal vegetation of the area is of a dry deciduous type, mainly of *Acacia nilotica* trees, thorny bushes and different types of grasses. Teak, Neem, *Acacia* species and Babul are the other trees of common occurrence. The eastern and western parts of the crater are covered with teak forests. The southern and southeastern parts of the crater represent natural forest vegetation with considerable undergrowth. There is a patch of about 22 hectares of land under cultivation. Different vegetables, crops like banana and fruit trees like lemon, papaya etc. are grown there. These fields are in close vicinity of the crater water.

Previous studies by the scientific institutions have established that the lake water has a diverse micro flora and fauna, which includes algae, protozoa, rotifers, bacteria etc., Those are responsible for the precipitation of salts and creation of H_2S gas in the lake. The algal fauna of the lake water is dominated by the blue green algae *Spirulina* sp. About 14 types of algae are reported from the lake water. Occurrence of *Spirulina* sp. imparted a green color to the lake water. Other major blue green algae, found in the lake water, are *Arthrospira*, *Oscillatoria* and *Dactylococopsis* (Badve *et.al.* 1993). The eastern and northeastern parts or the lake basin support a good amount of freshwater marshy vegetation on the mud flats, formed due to the inflowing springs.

LITERATURE ON LONAR CRATER

Few research papers have been published mainly on flora of the crater. Badve *et. al.* (1993) while describing the eutrophication of the lake, recorded presence of blue green algae *Spirulina*, *Arthrospira*, *Oscillatoria*, diatoms and marshy macrophytes. An account of butterflies of Lonar Crater Lake (Jafar and Sonia, 2003) comprising of 48 species shows the dominance of members of families Pieridae and Heliconiinae. Government of Maharashtra published information from the Tourist point of view mainly in the form of leaflets and pamphlets. Ghanekar (1956) published a small book in local language, ‘Marathi’ signifying the scientific, geological and geographical aspects of Lonar. He described the temples along the crater and

also provided a map. Occasionally, the news papers publish details of the crater highlighting its importance and the issues for its proper conservation (Joshi, 2002; Kulkarni and Patil, 2003).

Fauna : The crater supports rich entomofauna, of which butterflies and dragonflies are dominant. Jafer and Sonia (2003) reported 48 species of butterflies from the Lonar Crater. During the surveys conducted by the scientists of the Western Regional Station of Zoological Survey of India, during 2002 – 2004, following observations were recorded.

Among the hymenopterous insects, hives of the smaller honey bee (*Apis florea*), rock honey bee (*Apis dorsata*) and the Indian honey bee (*Apis indica*) were observed in the crater forests. Aquatic insects, mainly *Gerris* sp. and *Ranatra* sp. were found in the streams and the lake water. Arachnid fauna of the area is represented by scorpions and spiders.

Snakes and lizards commonly occur in the forested tracts of the slopes. During the period of survey, Russel's viper, (*Vipera russellii*) and trinket snakes were observed in the teak forests of the eastern part. Local people narrated occurrence of monitor lizard during night hours. Frogs and toads occurring in the marshy banks of the lake and in the course of the streams represent the amphibian fauna of the area. The fish fauna has a few species, in the perennial stream alone. The lake water and the adjacent area represent a good habitat for avifauna, both resident and migratory. Roosting of Cattle-Egrets, Peacocks and Indian Mynas were observed on the submerged treetops and trees near the crater Lake. Lake water provides good breeding ground for many water birds like Coots and Dabchick. Other water birds found in the area were White-necked Stork, Pond Heron, Indian Moorhen, Little Egret, Flamingo, Sandpiper, Brahminy Duck, Spoonbill etc. Among the terrestrial bird species found in the Lonar sanctuary were Peafowl, Quail, Black Drongo, Weaverbird, Gray Tit, Small Green Bee-eater, Tailor bird, Jungle Crow, Robin, White-spotted Flycatcher, Golden Oriole, Crow Pheasant, Black-shouldered Kite, Parakeet, Owl etc. The sanctuary supports a good population of peafowl, which were found mainly in the southern and western parts of the forest.

The crater forest attracts a good number of bat species due to several fruit bearing plants in the area. Roosts of the bats belonging to *Cynopterus* sp. were of a common sight in the abandoned temples inside the sanctuary. A good population of Hanuman Langur (*Semnopithecus entellus*) living inside the forest patches in the south-eastern and western parts of the crater forests was observed. They were seen feeding mainly on the fruits of the babul trees. During the period of the survey a pair of Black-buck (*Antelope cervicapra*) was observed in the western part of the crater forests. Rats, shrews, squirrel, and civets were the other mammal species occurring in the area.

Representative samples of faunal groups collected during the surveys were worked out in the laboratory of the Western Regional Station at Pune. The results of the studies are summarized in Table 1 (Total species recorded : 352).

PRESSURES ON THE CRATER FAUNA AND FLORA

Recent observations indicate that the water of the Lonar Lake is getting gradually diluted for its salinity and alkalinity. The reasons for these phenomena have been attributed to the rise in the water level mainly due to the seepage from the nearby freshwater reservoir built for irrigation. The lake also receives fresh water inflow from perennial springs. The crater has some land under cultivation. The continuous inflow of plant nutrients, cow dung, pesticides etc, into the lake due to farming activities also cause higher level of eutrophication in the lake water. The foul smell of H_2S gas around the lake is also very common.

Destruction of forest cover on the slopes of the crater is the other major threat to Lonar wildlife sanctuary. Cutting of trees for firewood by local people caused considerable damage to the ecosystem. The temples inside the sanctuary also attract hundreds of pilgrims. The devotees carry material for offerings in plastic carry bags, which lie scattered in the surrounding area of the temples. These bags later get drifted to the banks of the crater water. Food items are carried in plastic container. Dumping of used plastic and other non degradable wastes is a matter to worry.

CONSERVATION MEASURES

Multilevel protective measures are to be adopted for conservation of the ecology of Lonar crater and Wildlife Sanctuary. Priority would be to create awareness amongst the local residents and visitors about the uniqueness and importance of the crater. Dependency of the local population on vegetation of the crater, mainly for firewood, should be reduced. Further, a complete check is necessary on the activities of the pilgrims who visit the temples on the bank of the crater.

ACKNOWLEDGEMENTS

I am grateful to Dr. J.R.B. Alfred, Director (Retd.) and Dr. Ramakrishna, Director-in-Charge, Zoological Survey of India, Kolkata for facilities and encouragement to carry out this work. I am also thankful to the Chief Conservator of Forests, Government of Maharashtra, for providing the special purpose permit to collect the samples of fauna for study from the Lonar Wildlife Sanctuary. Co-Operation by the Deputy Conservator of Forests, Buldhana and In-charge, Lonar Wildlife Sanctuary during the surveys is gratefully acknowledged. I extend my sincere thanks to all colleagues at the Western Regional Station, Pune and also to the contributors of the articles included in this document.

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TABLE 1
FAUNAL DIVERSITY OF LONAR WILDLIFE SANCTUARY

No.	Name of the group	Orders	Families	Genera	Species
1.	Mammalia	7	9	11	12
2.	Aves	17	46	113	160
3.	Reptilia	3	13	32	46
4.	Amphibia	1	4	7	7
5.	Mollusca	4	9	11	14
6.	Rotifera	1	1	1	2
7.	Ostracoda	1	1	2	2
8.	Chilopoda	1	1	5	7
9.	Arachnida	2	13	20	23
10.	Hymenoptera	1	1	14	17
11.	Odonata	1	2	7	9
12.	Lepidoptera	1	7	36	53
Total					352

MAMMALIA

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Rawet Road, PCNT Post, Pune 411 044.*

INTRODUCTION

Lonar crater is situated on the outskirts of Lonar town in Buldhana district of Maharashtra State. It is believed to be formed due to the collision of a large meteoric body with great force on the surface of the earth about some 50 to 60 thousand years ago. Government of Maharashtra has declared this lake and adjacent area as Lonar Wildlife Sanctuary in 2000. The principal vegetation of the area is of a dry deciduous type on the slopes of the crater and dry bushy type on the rim of the crater.

Lonar wildlife sanctuary exhibits one of the peculiar geological formations on the earth. No consolidated account is available on its faunal diversity. Hence, an attempt has been made, here, to record and focus on mammal species from this region in the present article. The account is based on the material collected and species sighted during the project period.

SYSTEMATIC LIST OF MAMMAL SPECIES REPORTED FROM LONAR WILDLIFE SANCTUARY, DIST. BULDHANA, MAHARASHTRA STATE

Phylum CHORDATA
Class MAMMALIA
Order SORICOMORPHA
Family SORICIDAE
Subfamily CROCIDURINAE

1. *Suncus murinus murinus* (Lin.)

Order CHIROPTERA
Suborder MEGACHIROPTERA
Family PTEROPODIDAE
Subfamily PTEROPODINAE

2. *Rousettus l. leschenaulti* (Desmarest)

Present Address : Ex-Scientist-E, B-2, Kalpanamati Hs, Aundh Gaon, Pune-411007

3. *Cynopterus sphinx sphinx* (Vahl)

Suborder MICROCHIROPTERA

Family EMBALLONURIDAE

4. *Taphozous l. longimanus* Hardwicke

Order PRIMATES

Family CERCOPITHECIDAE

Subfamily COLOBINAE

5. *Semnopithecus entellus* (Dufresne)

Order CARNIVORA

Family VIVERRIDAE

Subfamily PARADOXURINAE

6. *Paradoxurus h. hermaphroditus* (Pallas)

Order ARTIODACTYLA

Family BOVIDAE

Subfamily ANTILOPINAE

7. *Antilope cervicapra cervicapra* (Linn.)

Order RODENTIA

Suborder SCIUROMORPHA

Family SCIURIDAE

Subfamily CALLOSCIURINAE

8. *Funambulus palmarum robertsoni* Wroughton9. *Funambulus pennantii* Wroughton

Suborder MYOMORPHA

Family MURIDAE

Subfamily MURINAE

10. *Mus booduga booduga* (Gray)11. *Rattus rattus rufescens* (Gray)

Order LAGOMORPHA

Family LEPORIDAE

12. *Lepus nigricollis nigricollis* Cuvier

SPECIES-WISE BRIEF SYSTEMATIC ACCOUNT OF MAMMALS OF LONAR WILDLIFE SANCTUARY

Phylum CHORDATA
Class MAMMALIA
Order SORICOMORPHA
Family SORICIDAE
Subfamily CROCIDURINAE

1. *Suncus murinus murinus* (Lin.)

1766. *Sorex murinus* Linnaeus, *Syst. Nat.*, 12th ed., 1 : 74.

1992. *Suncus murinus murinus* (Linnaeus) Corbet and Hill *The Mammals of the Indomalayan region* : 36-37.

Common name : English : House shrew, Marathi : Chichundri.

Locality : Lonar Wildlife Sanctuary.

Material Examined / Sightings : Collected one female specimen from Rest House premises in Lonar Wildlife Sanctuary.

Distribution Elsewhere : Throughout India.

Status : Common locally.

Conservation Status : IUCN : Least Concern (National) and Least Concern (South Asia) (Molur *et. al.*, 2005).

Remarks : Large-sized Indian house shrew, being insectivorous in habit, is considered to be a farmer's friend.

Order CHIROPTERA
Suborder MEGACHIROPTERA
Family PTEROPODIDAE
Subfamily PTEROPODINAE

2. *Rousettus l. leschenaulti* (Desmarest)

1820. *Pteropus leschenaulti* Desmarest, *Encycl. Meth. Mammal.*, 1 : 110.

1997. *Rousettus l. leschenaulti* (Desmarest) Bates & Harrison, *Bats of The Indian Subcontinent* : 6-9.

Common name : English : Fulvous fruit bat, Marathi : Watwaghul.

Locality : Old deserted temples near water line of the lake viz., Bhormahadev, Waghmandir in Lonar Wildlife Sanctuary.

Material Examined/Sightings : 4♂♂ and 3♀♀ specimens collected from the above mentioned localities in sanctuary area.

Distribution Elsewhere : Throughout India.

Status : Fairly common locally.

Conservation Status : IUCN : Least Concern (Molur *et. al.*, 2002), *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule V.

Remarks : Bates and Harrison (1997) reports widespread distribution of the species in Asia.

3. *Cynopterus sphinx sphinx* (Vahl)

1797. *Vespertilio sphinx* Vahl, *Skr. Nat. Selsk Copenhagen*, 4(1) : 123.

1997. *Cynopterus s. sphinx* (Vahl) Bates & Harrison, *Bats of The Indian Subcontinent* : 18-22.

Common name : English : Short-nosed fruit bat, Marathi : Watwaghul.

Locality : Lonar Wildlife Sanctuary.

Material Examined/Sightings : Sighted a few examples during evening hours in the sanctuary area.

Distribution Elsewhere : Throughout India.

Status : A common species locally.

Conservation Status : IUCN : Least Concern (Molur *et. al.*, 2002), *Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule* : Schedule V.

Remarks : Prater (1980) reports that its usefulness as a cross-pollinator and seed dispersal agent is perhaps offset by its destructiveness in orchards.

Suborder MICROCHIROPTERA Family EMBALLONURIDAE

4. *Taphozous l. longimanus* Hardwicke

1820. *Taphozous longimanus* Hardwicke, *Trans. Linn. Soc. Lond.*, : 14 : 525.

1997. *Taphozous l. longimanus* Hardwicke, Bates & Harrison, *Bats of The Indian Subcontinent* : 39-42.

Common name : English : Long-winged tomb bat/Long-armed Sheath-tailed Bat; Marathi : Watwaghul.

Locality : Old deserted temple in Lonar Wildlife Sanctuary.

Material Examined / Sightings : One male specimen in ZSI, Pune collection was collected from the above mentioned locality.

Distribution Elsewhere : Throughout India (Bates and Harrison, 1997).

Status : Bates and Harrison (1997) have listed many localities from India. The species appears to be common.

Conservation Status : IUCN : Least Concern (Molur *et. al.*, 2002).

Remarks : Bates and Harrison (1997) report that *T. longimanus* appears to be unable to compete with the other members of the genus such as *T. melanopogon* and/or *T. perforatus* and is not found in the same diurnal roost

Order PRIMATES
Family CERCOPITHECIDAE
Subfamily COLOBINAE

5. *Semnopithecus entellus* (Dufresne)

1797. *Simia entellus* Dufresne, *Bull. Soc. Philom. Paris*, 1(7) : 49.

1989. *Semnopithecus entellus entellus* (Dufresne), Groves C. P. In *Mammal Species of the World*, Wilson D. R. and Reeder 1993 (Eds). : 273.

Common name : English : Common or Hanuman Langur; Marathi : Vanar.

Locality : Lonar Wildlife Sanctuary.

Material Examined/Sightings : Sighted troops at different times in Lonar Wildlife Sanctuary by ZSI Survey parties during the project period.

Distribution elsewhere : Practically whole of India.

Status : Roonwal and Mohnot (1977) and Prater (1980) have reported the status of the species as common and widespread in peninsular India.

Conservation Status : IUCN : Near Threatened (Molur *et. al.*, 2003), *Indian Wildlife (Protection) Act* (1972, as amended up to 2002) *Schedule* : II Part : I *CITES* : Appendix : I.

Remarks : The species is known to be worshipped by Hindus. Napier (1985) (In Corbet and Hill, 1992) reviewed the taxonomy of the species under Subfamily *Colobinae* and

separated previously known *Presbytis entellus* as *Semnopithecus entellus* on the basis of Head and Body and Tail length and colour of Neonatal coat.

Order CARNIVORA
Family VIVERRIDAE
Subfamily PARADOXURINAE

6. *Paradoxurus h. hermaphroditus* (Pallas)

1777. *Viverra hermaphrodita* Pallas, In Schreber, *Die Säugethiere*, 3 : 426.

1992. *Paradoxurus hermaphroditus hermaphroditus* (Pallas), Corbet and Hill, *The Mammals of the Indomalayan region* : 207-208.

Common Name : English : Common Palm civet or Toddy cat; Marathi : Ud Manjar.

Locality : Common Palm civet or Toddy cat was sighted in Lonar Wildlife Sanctuary area by the ZSI Survey parties during the project period.

External Distribution : Throughout India excluding deserts.

Status : The distribution is wide and the populations are many. However, the populations are fragmented. Though they are fairly common in distribution, but, now its population is declining due to the destruction of its habitat, hunting for making traditional medicine and also for local illegal trade for body parts (Pradhan, 1997).

Conservation statues : IUCN : Lower risk-Least concern (National) and Data Deficient (Global) (Molur *et. al.*, 1998); Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule : Schedule II Part II, CITES : Nil; Red Data Book (International, 1994) : Vulnerable.

Remarks : The young ones are born in all seasons and are usually offered shelter in tree holes or under a rock. The civets can easily be tamed. Some are kept under domestication for the regular extraction of the secretion from the scent glands.

Order ARTIODACTYLA
Family BOVIDAE
Subfamily ANTILOPINAE

7. *Antelope cervicapra cervicapra* (Linn.)

1758. *Capra cervicapra* Linnaeus, *Syst. Nat.* 10th Ed. I : 69.

1992. *Antelope cervicapra cervicapra* (Linnaeus), By Peter Grubb In Wilson & Reeder, *Mammal Species of the World* : 395.

Common Name : English : Blackbuck or Indian Antelope, Marathi : Kalvit.

Locality : Blackbuck was sighted in Lonar Wildlife Sanctuary area by the ZSI Survey parties during the project period.

External Distribution : Throughout the drier parts of peninsular India except in North-East India.

Status : Uncommon in Lonar Wildlife Sanctuary.

Conservation Status : *IUCN* : Lower risk-Least concern (National) and Data Deficient (Global) (Molur *et. al.*, 1998), Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule : Schedule I Part I, CITES Appendix : III (Nepal), Red Data Book, National (1994) : Vulnerable.

Remarks : Blackbuck is hunted for its meat for food, skin and body parts for various purposes including making trophies (Pradhan, 1997). Threats to the survival of the species are also due to the habitat destructions, human interference and domestic commercial trade. In some areas it is reported to be responsible for the crop damage.

Order RODENTIA
Suborder SCIUROMORPHA
Family SCIURIDAE
Subfamily CALLOSCIURINAE

8. *Funambulus palmarum robertsoni* Wroughton

1916. *Funambulus robertsoni* Wroughton, *J. Bombay N. H. Soc.*, **24** : 647.

1993. *Funambulus palmarum robertsoni* Wroughton, Wilson & Reeder, *Mammal Species of the World* : 426.

Common Name : English : Indian three striped palm squirrel, Marathi : Pateri Khar.

Locality : Collected one female specimen from Rest House premises in Lonar Wildlife Sanctuary.

External Distribution : The subspecies is endemic to Central India.

Status : Not very uncommon in the region.

Conservation Status : *IUCN* : Least concern (National) (Molur *et. al.*, 2005).

Remarks : Corbet and Hill (1992) synonymised *Funambulus palmarum robertsoni* Wroughton in *Funambulus palmarum* (Lin.) under Subfamily *Funambulinae* without any comments on key characters. However *Funambulus palmarum robertsoni* Wroughton has been retained here under Subfamily Callosciurinae following Wilson and Reeder (2005).

9. *Funambulus pennantii* Wroughton

1905. *Funambulus pennantii* Wroughton, J. Bombay N. H. Soc., 16 : 411.

1992. *Funambulus pennantii* : Wroughton, Agrawal, V. C. et al., *Fauna of West Bengal*, Part 1, ZSI, Publ., Calcutta, : 128-129.

Common Name : English : Indian five striped northern palm squirrel, Marathi: Pateri Khar.

Locality : Small groups were sighted in forest area near Lonar crater lake in Lonar Wildlife Sanctuary.

External Distribution : Peninsular India south of Himalaya.

Status : Not very uncommon in the region.

Conservation Status : IUCN : Least concern (National) and Least Concern (South Asia) (Molur et. al., 2005), Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule : IV.

Remarks : Indian squirrel is hunted for its meat, food and skin and body parts for various purposes including making small trophies and some other articles such as brushes etc. Threats to the survival of the species are also due to habitat destructions and isolation, human interference and domestic commercial trade.

Suborder MYOMORPHA

Family MURIDAE

Subfamily MURINAE

10. *Mus booduga booduga* (Gray)

1837. *Leggada booduga* Gray, Charlesworth's Mag. Nat. Hist., 1 : 586.

2000. *Mus booduga booduga* (Gray), Agrawal, V. C., *Rec. zool. Surv. India, Occ. Paper No.*, 180 : 122-126.

Common Name : English : Little Indian Field Mouse, Marathi : Shetatil Undir.

Locality : Collected one male specimen from Lonar Wildlife Sanctuary area during the project period.

External Distribution : Throughout India.

Status : common in fields.

Conservation Status : IUCN : Least concern (National) and Least Concern (South Asia) (Molur et. al., 2005), Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule: Schedule : V (Vermin).

Remarks : Agrawal (2000) has pointed out number of anomalies in the taxonomy of *booduga* complex and rightly concluded that till the confusions were removed, *Mus dunni*, *Mus terricolor* and *Mus booduga* should be treated as synonyms of *Mus booduga* as was done earlier by Ellerman (1961) due to lack of proper demarcation between the populations under study. The species is a prolific breeder and considered to be a pest species since it causes damage to the crops. It is also responsible to cause extensive damage to the public as well as private properties due to its habit of gnawing by its ever-growing chisel-shaped incisors.

11. *Rattus rattus rufescens* (Gray)

1837. *Mus rufescens* Gray, *Ann. Mag. Nat. Hist.*, **1** : 585.

2000. *Rattus rattus rufescens* (Gray), Agrawal, V. C., *Rec. zool. Surv. India, Occ. Paper No.*, **180** : 135.

Common Name : English : House Rat, Marathi : Undir.

Locality : Collected 2 male specimens from the forest rest house of Lonar Wildlife Sanctuary during the project period.

External Distribution : Throughout India.

Status : common.

Conservation Status : IUCN : Least concern (National) (as *Rattus rattus*, Molur *et. al.*, 2005), Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule : Schedule : V (Vermin).

Remarks : The species is a prolific breeder and considered to be a pest species since it causes damage to the food grains stored in godowns. It is also responsible to cause extensive damage to the public as well as private properties and articles of merchandise due to its habit of gnawing by its ever-growing chisel-shaped incisors. The species is also known to be responsible for causing number of diseases, including rat bite fever, plague, leptospirosis etc.

Order LAGOMORPHA
Family LEPORIDAE

12. *Lepus nigricollis nigricollis* Cuvier

1823b. *Lepus nigricollis* Cuvier, F. *Dictionnaire des sciences naturelle*, Strasbourg & Paris : **26** : 299-316.

1992. *Lepus nigricollis nigricollis* Cuvier, F., Corbet and Hill, *The Mammals of the Indomalayan region* : 413-415.

Common Name : English : Indian black-naped hare or Indian Hare, Marathi : 'Sasa'

Locality : Indian blacknaped hare was sighted in many places in Lonar Wildlife Sanctuary during the project period.

External Distribution : Throughout India.

Status : Common.

Conservation Status : IUCN : Least concern (National) (Molur *et. al.*, 2005), Indian Wildlife (Protection) Act (1972, as amended up to 2002) Schedule : Schedule : IV.

Remarks : *Lepus nigricollis* is considered to be causing damage to the agricultural fields, orchards etc. The species is a prolific breeder.

RESULTS AND DISCUSSION

The systematic list of mammalian species given above reports the occurrence of 12 mammalian species/subspecies in Lonar Wildlife Sanctuary. The list clearly indicates that Lonar Wildlife Sanctuary area possesses fairly good mammalian species diversity within the limited region.

If the species are sorted out in various categories given in Table 1, it will be seen that 12 species/subspecies of 11 genera belonging to 7 sub-families in 9 families grouped under seven mammalian orders have been reported from this region. The table further shows a broad spectral diversity at all the levels at every stage.

It is a belief that the crater water is alkaline and does not support any aquatic life. However, some floating aquatic insects were observed near the shore line. Further, roosts of some insectivorous bats in large numbers were also sighted in the deserted temples close to the shore line. Is it the indication of beginning of change in ecosystem structure? It needs to be studied thoroughly.

Table 1 : Mammalian Diversity in Lonar Wildlife Sanctuary

Sr. No.	Orders	Families	Subfamilies	Genera	Species	Subspecies
1.	SORICOMORPHA	1	1	1	1	1
2.	CHIROPTERA	2	1	3	3	2
3.	PRIMATES	1	1	1	1	1
4.	CARNIVORA	1	1	1	1	1
5.	ARTIODACTYLA	1	1	1	1	1
6.	RODENTIA	2	2	3	4	3
7.	LAGOMORPHA	1	-	1	1	1
TOTAL	7	9	7	11	12	11

ACKNOWLEDGEMENTS

The authors are grateful to Dr. J.R.B. Alfred, Director, Zoological Survey of India, Kolkata, for giving them the opportunity to undertake the assignment. Thanks are also due to Dr. Anil. S. Mahabal, Scientist-E and Officer-in-Charge, ZSI, Western Regional Station, Pune, for providing the facilities.

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AVES

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INTRODUCTION

Lonar Lake (19° 59'N and 74° 34'E) created by the impact of a large meteoric body, is a world famous crater in basaltic rock. This inland saline lake is situated in Mehkar taluka of Buldhana district of Maharashtra. The lake has almost circular outline, with the rim crest having vertical slopes descending upto water level. On the rim crest and on vertical slopes there is vegetation of grass, bushes and shrubs with deciduous type of trees. There is good vegetation along the banks of two fresh water perennial streams flowing into the lake. At the basin and elevated flat area of lake there are natural and planted trees. There is a patch of land under cultivation of different vegetables and fruits. Surrounding the crater there are open dry areas as well as patches of agricultural fields and a substantially larger crater body.

All these various micro-habitat provide a very good fauna with substantial number and species of resident and migratory birds. There are two publications on the birds of this Lonar Crater Lake by Palot (2007) and Vyawahare (2008). Palot (2007) recorded 110 species of birds alongwith their status and occurrence in different parts of the lake during November, 2000. One of the authors (PMV) studied the avifauna of this lake during 1999 to 2001 and recorded 109 species of birds alongwith their residential status and approximate population Vyawahare (2008). Govt. of Maharashtra declared this unique ecosystem including the crater lake and its surrounding 383.32 hectares as "Lonar Wildlife Sanctuary" vide their order No. WLP/1089/FK 48/F1 dated 8th June, 2000. First author (AM) while conducting the faunistic survey of this Lonar Wildlife Sanctuary during 21 to 25.9.2003 has also observed and recorded various birds in different habitat of the lake and sanctuary.

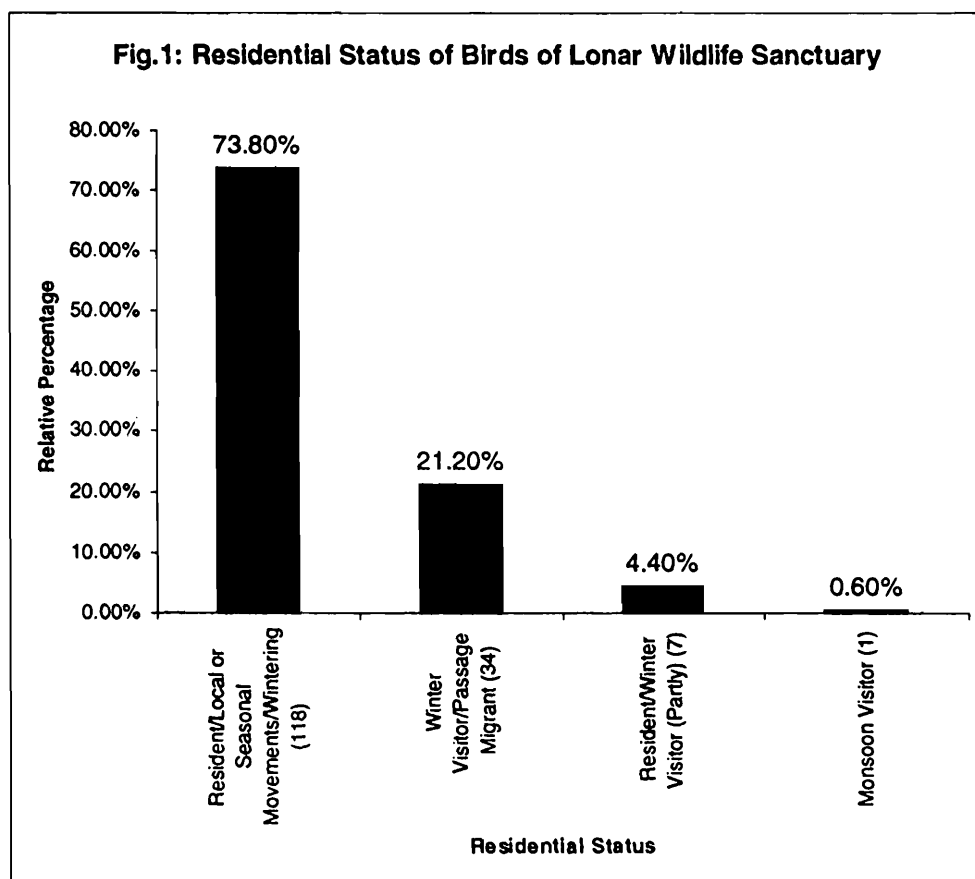
The identification of birds, their species account alongwith their status, distribution, habit, habitats, feeding, breeding season, and systematic list in tabular form is based on Abdulali (1981); Ali and Ripley (1968-1974 and 1995), and Grimmett *et al* (2000). The common names, scientific names and evolutionary sequence have been followed as per Manakadan and Pittie (2001) in preparation of systematic checklist and systematic account. The analysis of residential status, feeding habits and conservation status has also been discussed in this paper.

OBSERVATIONS AND RESULTS

The inventory of birds of Lonar Wildlife Sanctuary comprises 160 bird species of which about 82 species have been observed by first author (AM), whereas the rest of the species are compiled on the basis of published literature by Palot (2007) and Vyawahare (2008). Systematic list of these birds is provided in the form of (Table-1), which also indicates the Hand Book number, common names and residential status of each species given by Ali and Ripley, 1968-1974. This is followed by a systematic account of all the species from this wildlife sanctuary alongwith their common name, literature reference, status and distribution, habit and habitats, food, breeding season, etc.

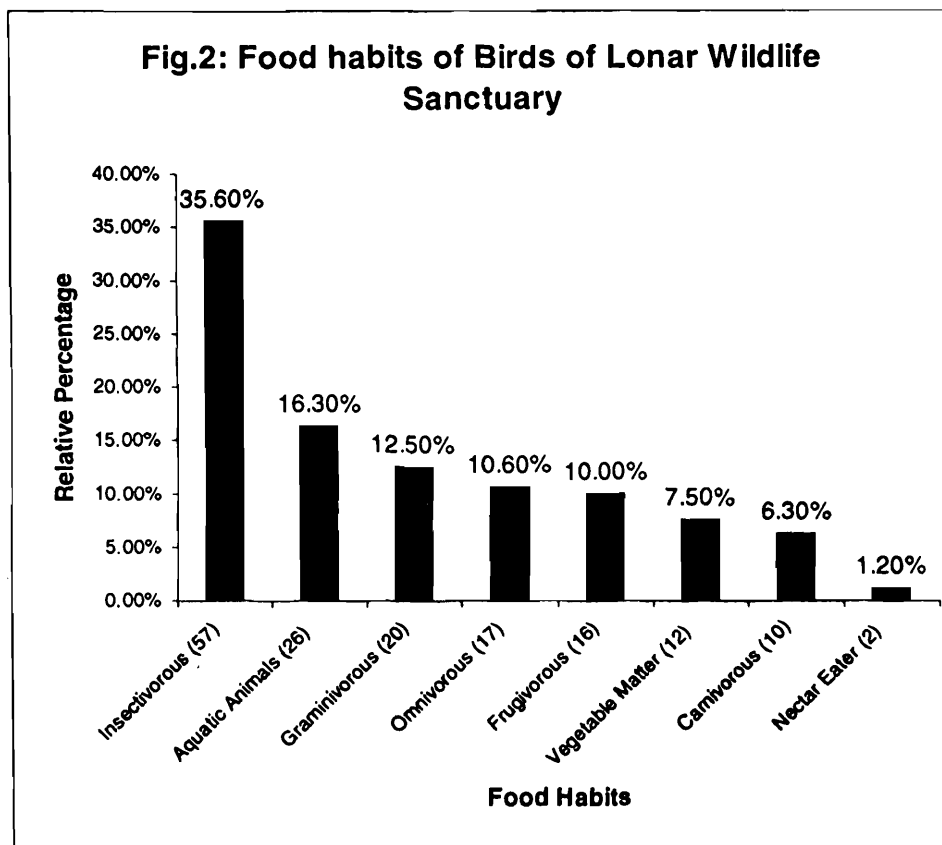
This avian diversity is analysed in terms of classification and has been shown in Table-2. It shows that these 160 species belongs to 113 genera under 46 families which are grouped into 17 avian orders. Further, it can be pointed out that at the generic and species level orders like Passeriformes, Anseriformes and Charadriiformes are well represented in forested and aquatic area of this sanctuary.

Residential status of birds of Lonar Wildlife Sanctuary is plotted in Fig.1. It shows that 73.8 % bird species are residential showing local, seasonal local and wintering movements depending upon various factors such as seasons, water conditions, availability of food,



ripening of the fruits, suitable nesting places, breeding etc. About 21.2 % are winter visitors and or passage migrants, migrating during September / October to March in this area. Some of the bird species are partly resident and partly winter visitors. A single monsoon visitor species has also been recorded in the sanctuary area.

In order of food preference histogram has been plotted for birds of this sanctuary (Fig. 2). The figure indicates that about 35.6 % are insectivorous birds followed by Aquatic animal eaters (16.3%) and Graminivorous (12.5 %). The percentage of nectar eaters is very less and Scavenger species like vultures were not recorded in the sanctuary area. This analysis on residential status and food habits of birds is based on the account given by Ali and Ripley (1968-1974).



In general the maximum number of birds were observed on the rim of the crest and on the vertical slopes having good vegetation. Less number of species were recorded from the lake and its basin area. A mixed communal roost of Cattle Egrets and Little Egrets was noticed on trees near the lake. A roosting population of about 15 (+) Indian Peacocks in two groups was noticed near Banana plantation and near Mahadev temple on west side. A number of insectivorous birds such as Small Bee-eaters, Wagtails, Pipits, Babblers, Warblers, Flycatchers were found in vegetation along the two fresh water streams. All the temple sites were also noticed to provide good spot for bird community.

Table 1 : The Avifauna of Lonar Wildlife Sanctuary showing residential status.

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
1	5*	Class : AVES Order : PODICIPEDIFORMES Family : PODICIPEDIDAE <i>Tachybaptus ruficollis</i> (Pallas)	Little Grebe	R
2	28*	Order : PELECANIFORMES Family : PHALACROCORACIDAE <i>Phalacrocorax niger</i> (Vieillot)	Little Cormorant	R/LM
3	49*	Order : CICONIIFORMES Family : ARDEIDAE <i>Egretta garzetta</i> (Linnaeus)	Little Egret	R/LM
4	36	<i>Ardea cinerea</i> Linnaeus	Grey Heron	R/LM
5	46*	<i>Casmerodius albus</i> (Linnaeus)	Large Egret	R
6	47*& 48	<i>Mesophoyx intermedia</i> (Wagler)	Median Egret	R/LM (Nomadic)
7	44*	<i>Bubulcus ibis</i> (Linnaeus)	Cattle Egret	R/LM
8	42*	<i>Ardeola grayii</i> (Sykes)	Indian Pond-Heron	R/LM
9	52	<i>Nycticorax nycticorax</i> (Linnaeus)	Black-crowned Night-Heron	R/LM
10	61	Family : CICONIIDAE <i>Anastomus oscitans</i> (Boddaert)	Asian Openbill-Stork	R/LM
11	62	<i>Ciconia episcopus</i> (Boddaert)	White-necked Stork	R
12	69	Family : THRESKIORNITHIDAE <i>Threskiornis melanocephalus</i> (Latham)	Oriental White Ibis	R/LM
13	72	<i>Platalea leucorodia</i> Linnaeus	Eurasian Spoonbill	WV/R (Partly Nomadic)
14	88	Order : ANSERIFORMES Family : ANATIDAE <i>Dendrocygna javanica</i> (Horsfield)	Lesser Whistling-Duck	R/LM
15	90	<i>Tadorna ferruginea</i> (Pallas)	Brahminy Shelduck	WV
16	115	<i>Sarkidiornis melanotos</i> (Pennant)	Comb Duck	R/LM
17	114	<i>Nettapus coromandelianus</i> (Gmelin)	Cotton Teal	R
18	103	<i>Anas penelope</i> Linnaeus	Eurasian Wigeon	WV

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
19	100	<i>Anas platyrhynchos</i> Linnaeus	Mallard	WV
20	97	<i>Anas poecilorhyncha</i> J. R. Forester	Spot-billed Duck	R/LM (Nomadic)
21	105	<i>Anas clypeata</i> Linnaeus	Northern Shoveller	WV
22	93	<i>Anas acuta</i> Linnaeus	Northern Pintail	WV
23	104*	<i>Anas querquedula</i> Linnaeus	Garganey	WV
24	94	<i>Anas crecca</i> Linnaeus	Common Teal	WV
25	107	<i>Rhodonessa rufina</i> (Pallas)	Red-crested Pochard	WV
26	108	<i>Aythya ferina</i> (Linnaeus)	Common Pochard	WV
27	111	<i>Aythya fuligula</i> (Linnaeus)	Tufted Pochard	WV
		Order : FALCONIFORMES Family : ACCIPITRIDAE		
28	130	<i>Pernis ptilorhyncus</i> (Temminck)	Oriental Honey-Buzzard	R/LM
29	124*	<i>Elanus caeruleus</i> (Desfontaines)	Black-shouldered Kite	R
30	133*	<i>Milvus migrans</i> (Boddaert)	Black Kite	R/LM
31	193	<i>Circus aeruginosus</i> (Linnaeus)	Western Marsh-Harrier	WV
32	138*	<i>Accipiter badius</i> (Gmelin)	Indian Shikra	R
33	157	<i>Butastur teesa</i> (Franklin)	White-eyed Buzzard	R
		Family : FALCONIDAE		
34	222*	<i>Falco tinnunculus</i> Linnaeus	Common Kestrel	WV
		Order : GALLIFORMES Family : PHASIANIDAE		
35	245	<i>Francolinus pondicerianus</i> (Gmelin)	Grey Francolin	R
36	255*	<i>Perdica asiatica</i> (Latham)	Jungle Bush-Quail	R
37	260	<i>Perdica argoondah</i> (Sykes)	Rock Bush-Quail	R
38	301*	<i>Gallus sonneratii</i> Temminck	Grey Junglefowl	R
39	311*	<i>Pavo cristatus</i> Linnaeus	Indian Peafowl	R
		Order : GRUIFORMES Family : RALLIDAE		
40	343*	<i>Amaurornis phoenicurus</i> (Pennant)	White-breasted Waterhen	R
41	349*	<i>Porphyrio porphyrio</i> (Linnaeus)	Purple Moorhen	R/LM
42	347	<i>Gallinula chloropus</i> (Linnaeus)	Common Moorhen	R/WV (Partly)

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
43	350	<i>Fulica atra</i> Linnaeus	Common Coot	R/WV (Partly)
44	380	Order : CHARADRIIFORMES Family : CHARADRIIDAE <i>Charadrius dubius</i> Scopoli	Little Ringed Plover	R/LM
45	381	<i>Charadrius alexandrinus</i> Linnaeus	Kentish Plover	WV
46	370	<i>Vanellus malabaricus</i> (Boddaert)	Yellow-wattled Lapwing	R/LM
47	366*	<i>Vanellus indicus</i> (Boddaert)	Red-wattled Lapwing	R/LM
48	406*	Family : SCOLOPACIDAE <i>Gallinago stenura</i> (Bonaparte)	Pintail Snipe	WV
49	394	<i>Tringa totanus</i> (Linnaeus)	Common Redshank	WV
50	395	<i>Tringa stagnatilis</i> (Bechstein)	Marsh Sandpiper	WV
51	397*	<i>Tringa ochropus</i> Linnaeus	Green Sandpiper	WV
52	398	<i>Tringa glareola</i> Linnaeus	Wood Sandpiper	WV
53	401	<i>Actitis hypoleucos</i> Linnaeus	Common Sandpiper	WV
54	416	<i>Calidris minuta</i> (Leisler)	Little Stint	WV
55	430	Family : RECURVIROSTRIDAE <i>Himantopus himantopus</i> (Linnaeus)	Black-winged Stilt	R/WV (Partly)
56	463	Family : LARIDAE <i>Sterna aurantia</i> J. E. Gray	River Tern	R
57	517*	Order : COLUMBIFORMES Family : COLUMBIDAE <i>Columba livia</i> Gmelin	Blue Rock Pigeon	R
58	533*	<i>Streptopelia orientalis</i> (Latham)	Oriental Turtle-Dove	R
59	541*	<i>Streptopelia senegalensis</i> (Linnaeus)	Little Brown Dove	R/LM
60	537*	<i>Streptopelia chinensis</i> (Scopoli)	Indian Spotted Dove	R/LM SM
61	534*	<i>Streptopelia decaocto</i> (Frisvaldszky)	Eurasian Collared Dove	R/LM SM
62	542	<i>Chalcophaps indica</i> (Linnaeus)	Emerald Dove	R
63	496	<i>Treron pompadora</i> (Gmelin)	Pompadour Green-Pigeon	R/LM SM

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
64	504*	<i>Treron phoenicoptera</i> (Latham)	Yellow-legged Green-Pigeon	R/LM
65	545*	Order : PSITTACIFORMES Family : PSITTACIDAE <i>Psittacula eupatria</i> (Linnaeus)	Alexandrine Parakeet	R/LM
66	550*	<i>Psittacula krameri</i> (Scopoli)	Rose-ringed Parakeet	R/LM
67	558*	<i>Psittacula cyanocephala</i> (Linnaeus)	Plum-headed Parakeet	R/LM
68	571	Order : CUCULIFORMES Family : CUCULIDAE <i>Clamator jacobinus</i> (Boddaert)	Pied Crested Cucko	MV
69	573*	<i>Hierococcyx varius</i> (Vahl)	Brainfever Bird	R/LM
70	590*	<i>Eudynamys scolopacea</i> (Linnaeus)	Asian Koel	R/LM
71	602*	<i>Centropus sinensis</i> (Stephens)	Greater Coucal	R
72	606*	Order : STRIGIFORMES Family : TYTONIDAE <i>Tyto alba</i> (Scopoli)	Indian Barn Owl	R
73	627	Family : STRIGIDAE <i>Bubo bubo</i> (Linnaeus)	Eurasian Eagle-Owl	R
74	652*	<i>Athene brama</i> (Temminck)	Spotted Owlet	R
75	680*	Order : CAPRIMULGIFORMES Family : CAPRIMULGIDAE <i>Caprimulgus asiaticus</i> Latham	Common Indian Nightjar	R/SM
76	703*	Order : APODIFORMES Family : APODIDAE <i>Apus affinis</i> (J. E. Gray)	Indian House Swift	R/LM
77	723*	Order : CORACIIFORMES Family : ALCEDINIDAE <i>Alcedo atthis</i> (Linnaeus)	Indian Small Blue Kingfisher	R
78	736*	<i>Halcyon smyrnensis</i> (Linnaeus)	Indian White-breasted Kingfisher	R/LM
79	719*	<i>Ceryle rudis</i> (Linnaeus)	Lesser Pied Kingfisher	R
80	750*	Family : MEROPIDAE <i>Merops orientalis</i> Latham	Small Bee-eater	R/SM

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
81	755*	Family : CORACIIDAE <i>Coracias benghalensis</i> (Linnaeus)	Indian Roller	R/SM
82	765	Family : UPUPIDAE <i>Upupa epops</i> Linnaeus	Common Hoopoe	WV/R (Partly)
83	767*	Family : BUCEROTIDAE <i>Ocyrceros birostris</i> (Scopoli)	Indian Grey-Hornbill	R/LM
84	781	Order : PICIFORMES Family : CAPITONIDAE <i>Megalaima zeylanica</i> (Gmelin)	Brown-headed Barbet	R
85	790	<i>Megalaima rubricapilla</i> (Gmelin)	Crimson-throated Barbet	R
86	792*	<i>Megalaima haemacephala</i> (P.L.S. Muller)	Coppersmith Barbet	R
87	847*	Family : PICIDAE <i>Dendrocopos mahrattensis</i> (Latham)	Yellow-fronted Pied Woodpecker	R
88	830	<i>Dryocopus javensis</i> (Horsfield)	Great Black Woodpecker	R
89	819	<i>Dinopium benghalense</i> (Linnaeus)	Lesser Golden-backed Woodpecker	R
90	878*	Order : PASSERIFORMES Family : ALAUDIDAE <i>Eremopterix grisea</i> (Scopoli)	Ashy-Crowned Sparrow-Lark	R/SM
91	882*	<i>Ammomanes phoenicurus</i> (Franklin)	Southern Rufous-tailed Finch-Lark	R/SM
92	886	<i>Calandrella brachydactyla</i> (Leisler)	Greater Short-toed Lark	WV
93	899	<i>Galerida cristata</i> (Linnaeus)	Common Crested Lark	R/SM
94	902	<i>Galerida deva</i> (Sykes)	Sykes's Crested Lark	R/SM
95	907*	<i>Alauda gulgula</i> Franklin	Indian Small Skylark	R/SM
96	914*	Family : HIRUNDINIDAE <i>Hirundo concolor</i> Sykes	Dusky Crag-Martin	R/LM
97	917	<i>Hirundo rustica</i> Linnaeus	Common Swallow	WV/R/ Wintering (Partly)

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
98	921	<i>Hirundo smithii</i> Leach	Wire-tailed Swallow	R/LM
99	925*	<i>Hirundo daurica</i> Linnaeus	Red-rumped Swallow	R/SM/ Wintering
100	1885	Family : MOTACILLIDAE <i>Motacilla alba</i> Linnaeus	White Wagtail	WV
101	1891*	<i>Motacilla maderaspatensis</i> Gmelin	Large Pied Wagtail	R
102	1883	<i>Motacilla citreola</i> Pallas	Citrine Wagtail	WV
103	1884*	<i>Motacilla cinerea</i> Tunstall	Grey Wagtail	WV
104	1857	<i>Anthus richardi</i> Vieillot	Richard's Pipit	WV
105	1859*	<i>Anthus rufulus</i> Vieillot	Paddy-field Pipit	R/LM
106	1854	<i>Anthus trivialis</i> (Linnaeus)	Eurasian Tree Pipit	WV
107	1852	<i>Anthus hodgsoni</i> Richmond	Oriental Tree Pipit	WV
108	1072*	Family : CAMPEPHAGIDAE <i>Coracina macei</i> (Lesson)	Indian Large Cuckoo-Shrike	R/LM
109	1070	<i>Tephrodornis pondicerianus</i> (Gmelin)	Common Woodshrike	R
110	1128*	Family : PYCNONOTIDAE <i>Pycnonotus cafer</i> (Linnaeus)	Red-vented Bulbul	R
111	1099*	Family : IRENIDAE <i>Aegithina tiphia</i> (Linnaeus)	Common Iora	R
112	940	Family : LANIIDAE <i>Lanius vittatus</i> Valenciennes	Bay-backed Shrike	R/SM
113	947*	<i>Lanius schach</i> Linnaeus	Rufous-backed Shrike	R/SM
114	933*	<i>Lanius meridionalis</i> Temminck	Southern Grey Shrike	R/LM
115	1726	Family : MUSCICAPIDAE Subfamily : TURDINAE <i>Monticola solitarius</i> (Linnaeus)	Blue Rock-Thrush	Wintering/ R
116	1661*	<i>Copsychus saularis</i> (Linnaeus)	Oriental Magpie-Robin	R
117	1719*	<i>Saxicoloides fulicata</i> (Linnaeus)	Indian Robin	R
118	1672	<i>Phoenicurus ochruros</i> (Gmelin)	Black Redstart	Wintering/ R
119	1701*	<i>Saxicola caprata</i> (Linnaeus)	Pied Bushchat	R
120	1692	<i>Cercomela fusca</i> (Blyth)	Indian Chat	R /SM

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
		Subfamily : TIMALIINAE		
121	1173	<i>Pomatorhinus horsfieldii</i> Sykes	Indian Scimitar-Babbler	R
122	1231*	<i>Chrysomma sinense</i> (Gmelin)	Yellow-eyed Babbler	R
123	1254	<i>Turdoides caudatus</i> (Dumont)	Common Babbler	R
124	1258*	<i>Turdoides malcolmi</i> (Sykes)	Large Grey Babbler	R
125	1262*	<i>Turdoides striatus</i> (Dumont)	Peninsular Jungle Babbler	R
		Subfamily : SYLVIINAE		
126	1498	<i>Cisticola juncidis</i> (Rafinesque)	Streaked Fantail-Warbler	R/LM
127	1517*	<i>Prinia socialis</i> Sykes	Ashy Prinia	R
128	1511	<i>Prinia inornata</i> Sykes	Plain Prinia	R
129	1556	<i>Acrocephalus dumetorum</i> Blyth	Blyth's Reed-Warbler	WV
130	1550	<i>Acrocephalus stentoreus</i> (Hemprich & Ehrenberg)	Indian Great Reed-Warbler	WV/ PM
131	1535*	<i>Orthotomus sutorius</i> (Pennant)	Indian Tailor Bird	R
132	1602	<i>Phylloscopus trochiloides</i> (Sundevall)	Greenish Leaf-Warbler	WV
133	1606	<i>Phylloscopus occipitalis</i> (Blyth)	Western Crowned Warbler	WV
134	1567	<i>Sylvia curruca</i> (Linnaeus)	Common Lesser Whitethroat	WV/ PM
135	1565	<i>Sylvia hortensis</i> (Gmelin)	Orphean warbler	WV
		Subfamily : MUSCICAPINAE		
136	1407	<i>Muscicapa daurica</i> Pallas	Asian Brown Flycatcher	WV/R/ Wintering (Partly)
137	1442*	<i>Cyornis tickelliae</i> Blyth	Tickell's Blue-Flycatcher	R/LM
		Subfamily : MONARCHINAE		
138	1461	<i>Terpsiphone paradisi</i> (Linnaeus)	Asian Paradise Flycatcher	R
		Subfamily : RHIPIDURINAE		
139	1458*	<i>Rhipidura albicollis</i> (Vieillot)	White-throated Fantail- Flycatcher	R/LM
140	1451*	<i>Rhipidura aureola</i> Lesson	White-browed Fantail-Flycatcher	R/LM
		Family : PARIDAE		
141	1794*	<i>Parus major</i> Linnaeus	Great Tit	R/LM

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
142	1892*	Family : DICAEDIDAE <i>Dicaeum agile</i> (Tickell)	Thick-billed Flowerpecker	R
143	1907*	Family : NECTARINIIDAE <i>Nectarinia zeylonica</i> (Linnaeus)	Indian Purple-rumped Sunbird	R
144	1917*	<i>Nectarinia asiatica</i> (Latham)	Indian Purple Sunbird	R/LM
145	1933*	Family : ZOSTEROPIDAE <i>Zosterops palpebrosus</i> (Temminck)	Oriental White-eye	R/SM
146	1966*	Family : ESTRILDIDAE <i>Lonchura malabarica</i> (Linnaeus)	White-throated Munia	R
147	1974*	<i>Lonchura punctulata</i> (Linnaeus)	Indian Spotted Munia	R
		Family : PASSERIDAE Subfamily : PASSERINAE		
148	1938*	<i>Passer domesticus</i> (Linnaeus)	House Sparrow	R/LM
149	1949	<i>Petronia xanthocollis</i> (Burton)	Yellow-throated Sparrow	R/LM
150	1957	Subfamily : PLOCEINAE <i>Ploceus philippinus</i> (Linnaeus)	Baya Weaver	R/SM
151	994*	Family : STURNIDAE <i>Sturnus pagodarum</i> (Gmelin)	Brahminy Starling	R/SM
152	996	<i>Sturnus roseus</i> (Linnaeus)	Rosy Starling	WV
153	1006*	<i>Acridotheres tristis</i> (Linnaeus)	Common Myna	R
154	953	Family : ORIOLIDAE <i>Oriolus oriolus</i> (Linnaeus)	Eurasian Golden Oriole	Wintering/ R/SM
155	963*	Family : DICRURIDAE <i>Dicrurus macrocerus</i> Vieillot	Black Drongo	R/SM
156	965	<i>Dicrurus leucophaeus</i> Vieillot	Ashy Drongo	Wintering/ R
157	967	<i>Dicrurus caerulescens</i> (Linnaeus)	White-bellied Drongo	R/SM/ LM

Sr. No.	Hand Book No.	Name of the Species	Common Name	Residential Status
158	1031*	Family : CORVIDAE <i>Dendrocitta vagabunda</i> (Latham)	Indian Treepie	R
159	1049*	<i>Corvus splendens</i> Vieillot	Indian House Crow	R/SM
160	1057*	<i>Corvus macrorhynchos</i> Wagler	Jungle Crow	R

ABBREVIATIONS

R/ LM/ SM/ Wintering : Resident with local, seasonal and wintering movements (depending upon availability of food, water conditions, suitable nesting places, breeding, etc.)

WV/ PM : Winter Visitor and or Passage Migrant.

MV : Monsoon Visitor.

Hand Book No. : As per Ali & Ripley (1968-1974)

***** : Birds observed and recorded by first author (AM).

The remaining birds are compild from Palot (2007) and Vyawahare (2008).

Table-2 : Avian Diversity in Lonar Wildlife Sanctuary.

	ORDERS	FAMILIES	SUBFAMILIES	GENERA	SPECIES
1.	PODICIPEDIFORMES	1	-	1	1
2.	PELECANIFORMES	1	-	1	1
3.	CICONIIFORMES	3	-	11	11
4.	ANSERIFORMES	1	-	7	14
5.	FALCONIFORMES	2	-	7	7
6.	GALLIFORMES	1	-	4	5
7.	GRUIFORMES	1	-	4	4
8.	CHARDRIIFORMES	4	-	8	13
9.	COLUMBIFORMES	1	-	4	8
10.	PSITTACIFORMES	1	-	1	3
11.	CUCULIFORMES	1	-	4	4
12.	STRIGIFORMES	2	-	2	3
13.	CAPRIMULGIFORMES	1	-	1	1
14.	APODIFORMES	1	-	1	1
15.	CORACIIFORMES	5	-	7	7
16.	PICIFORMES	2	-	4	6
17.	PASSERIFORMES	18	8	46	71
	Total 17 Orders (21)	46 (88)	8 (11)	113 (423)	160 (1342)

*Bird diversity in Indian Subcontinent is given in parenthesis

CONSERVATION STATUS

The species of birds of Lonar Wildlife Sanctuary were evaluated considering various schedules of Wildlife (Protection) Act, 1972 (as amended upto 2002) and also in categories of Red Data Book on Indian Animals by Director, ZSI (1994) in (Table-3). The table also indicates the birds included in CITES (2005).

Table-3 : Birds of Lonar Wildlife Sanctuary under different conservation status.

Sr. No.	Scientific Name	Common Name	WL (P) Act, 1972 (as amended up to 2002)	Red Data Book ZSI (1994)	CITES (2005)
1.	Family THRESKIORNITHIDAE <i>Platalea leucorodia</i> Linnaeus	Eurasian Spoonbill	Schedule-I, Part III (Birds)	Endangered	App. II
2.	Family ACCIPITRIDAE	Hawks	—do—	—	—
3.	Family PHASIANIDAE <i>Gallus sonneratii</i> Temminck	Grey Jungle Fowl	Schedule-II, Part-II (Birds)	—	App. II
4.	<i>Pavo cristatus</i> Linnaeus	Indian Peafowl	Schedule-I, Part III (Birds)	Vulnerable	—

Abbreviations :

WL (P) Act, 1972 : Wildlife (Protection) Act, 1972 (as amended up to 2002).

Red Data Book, ZSI (1994) : Red Data Book on Indian Animals Part I : Vertebrata.

CITES (2005) : Convention on International Trade in Endangered Species of Flora and Fauna.

The area of Lonar Wildlife Sanctuary falls under Indo-Malayn Tropical Dry Zone as per the Important Bird Area Programmes in India (Jhunjhunwala *et al.*, 2001) in a category called Biome 11. Out of the 160 birds species recorded from this sanctuary, 21 species falls under this category of Biome 11, which are listed in Table 4.

Further, the Lonar Wildlife Sanctuary has not been included under Important Bird Area (IBA site) Programme in India (Islam and Rahmani, 2004). Being a good potential site for residential and migratory birds both in number and diversity and there being no IBA site in the vicinity of 300-400 kms radius of this area, it is suggested that this wildlife sanctuary may be catagorised as an IBA site.

Table-4 : The Birds of Lonar Wildlife Sanctuary falling under BIOME 11: Indo-Malayan Tropical Dry Zone.†

*Sr. No.	*Hand Book No.	Scientific Name	Common Name
36	255	<i>Perdica asiatica</i> (Latham)	Jungle Bush-Quail
37	260	<i>Perdica argoondah</i> (Sykes)	Rock Bush-Quail
39	311	<i>Pavo cristatus</i> Linnaeus	Indian Peafowl
46	370	<i>Vanellus malabaricus</i> (Boddaert)	Yellow-wattled Lapwing
64	504	<i>Treron phoenicoptera</i> (Latham)	Yellow-legged Green-Pigeon
67	558	<i>Psittacula cyanocephala</i> (Linnaeus)	Plum-headed Parakeet
83	767	<i>Ocyrocus birostris</i> (Scopoli)	Indian Grey-Hornbill
84	781	<i>Megalaima zeylanica</i> (Gmelin)	Brown-headed Barbet
87	847	<i>Dendrocopos mahrattensis</i> (Latham)	Yellow-fronted Pied Woodpecker
89	819	<i>Dinopium benghalense</i> (Linnaeus)	Lesser Golden-backed Woodpecker
90	878	<i>Eremopterix grisea</i> (Scopoli)	Ashy-Crowned Sparrow-Lark
94	902	<i>Galerida deva</i> (Sykes)	Sykes's Crested Lark
109	1070	<i>Tephrodornis pondicerianus</i> (Gmelin)	Common Woodshrike
117	1719	<i>Saxicoloides fulicata</i> (Linnaeus)	Indian Robin
120	1692	<i>Cercomela fusca</i> (Blyth)	Indian Chat
124	1258	<i>Turdoides malcolmi</i> (Sykes)	Large Grey Babbler
125	1262	<i>Turdoides striatus</i> (Dumont)	Peninsular Jungle Babbler
127	1517	<i>Prinia socialis</i> Sykes	Ashy Prinia
140	1451	<i>Rhipidura aureola</i> Lesson	White-browed Fantail-Flycatcher
151	994	<i>Sturnus pagodarum</i> (Gmelin)	Brahminy Starling
157	967	<i>Dicrurus caerulescens</i> (Linnaeus)	White-bellied Drongo

† : Compiled from IBA Programme in India (Jhunjhunwala *et al.*, 2001)

* : Serial Number and Hand Book Number w. r. t. Table-1.

SYSTEMATIC ACCOUNT

Class AVES
Order PODICIPEDIFORMES
Family PODICIPEDIDAE

1. *Tachybaptus ruficollis* (Pallas, 1764)
Little Grebe

1968. *Podiceps ruficollis* : Ali & Ripley, H.B. No. 5, Vol. 1 : 6.

2001. *Tachybaptus ruficollis* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 1.

Status and Distribution : Resident but shows local and long distance movements depending upon draught and or flood. Throughout the Indian subcontinent, from plains to 1800 m altitude.

Habits and Habitats : Keeps in pairs or in scattered small parties. All types of inland waters with or without floating vegetation or reeds, irrigation reservoirs, tanks, ponds, flood ditches, but hardly ever rivers or the sea.

Food : Aquatic animals-fish, frogs, tadpoles, crustacean, molluscs and aquatic insects.

Breeding Season : Varies depending upon rainfall, chiefly from April to October

Order PELECANIFORMES

Family PHALACROCORACIDAE

2. *Phalacrocorax niger* (Vieillot, 1817)
Little Cormorant

1968. *Phalacrocorax niger* : Ali & Ripley, H.B. No. 28, Vol. 1 : 41.

Status and Distribution : Resident bird shows local movements depending upon water conditions. Found throughout the subcontinent.

Habits and Habitat : Generally solitary or in small flocks during feeding, some time congregate in large numbers. Communal roosting during night. Nesting in small colonies. Found near jheels, rivers, irrigated reservoirs, canals, tanks and tidal estuaries.

Food : Aquatic animals-mainly fish and to small extent tadpoles, frogs and crustaceans.

Breeding Season : July to September.

Order CICONIIFORMES
Family ARDEIDAE

3. *Egretta garzetta* (Linnaeus, 1766)
Little Egret

1968. *Egretta garzetta*; Ali & Ripley, H.B. No. 49, Vol. 1 : 72.

Status and Distribution : Resident with local movements depending upon water conditions. Throughout the subcontinent from plains to 900m in Peninsular India, 1400m in the Himalayas.

Habits and Habitats : More gregarious than Large Egrets, usually in flocks wading in shallows. Colonial and mixed heronries during nesting. All types of inland waters, marshes, jheels, paddy fields.

Food : Aquatic animals-fish, frogs, crustaceans and water insects.

Breeding Season : July to September.

4. *Ardea cinerea* Linnaeus, 1758
Grey Heron

1968. *Ardea cinerea* : Ali & Ripley, H.B. No. 36, Vol. 1 : 35.

Status and Distribution : Resident and found all over India

Habits and Habitats : Solitary but occasionally in small flocks, colonial when nesting. Largely crepuscular in habit. Seen near inland water, jheels, marshes, river banks, tidal creeks, estuaries, mangrove swamps and rocky offshore islets.

Food : Aquatic animals, insects, molluscs, crustaceans, fish, frogs, small rodents and birds.

Breeding Season : July to November.

5. *Casmerodius albus* (Linnaeus, 1758)
Large Egret

1968. *Egretta alba modesta*; Ali & Ripley, H.B. No. 46, Vol. 1 : 69.

2001. *Casmerodius albus*; Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 2.

Status and Distribution : Resident and nomadic with local movements depending upon water conditions. Throughout the subcontinent.

Habits and Habitats : Usually solitary and in scattered feeding groups of same species or other egrets. More gregarious in mixed heronries when nesting and less common, less

abundant than any other egrets. All low level country, at jheels, marshes, rice fields, rivers and tidal estuaries.

Food : Aquatic animals-fish, frogs, crustaceans and water insects

Breeding Season : July to October.

6. *Mesophoyx intermedia* (Wagler, 1829)
Median Egret

1968. *Egretta intermedia intermedia* : Ali & Ripley, H.B. No. 47, 48, Vol. 1 : 71.

2001. *Mesophoyx intermedia* : Manakadan & Pittie, *Buceros*, Vol. 6, (No. 1) : 2.

Status and Distribution : Resident and nomadic with local movements depending upon water conditions. Throughout the subcontinent.

Habits and Habitats : Usually solitary but occurs in small scattered flocks along with other egrets. Colonial and in mixed heronries during nesting. Low level country, affects jheels, marshes, paddy fields, coastal backwaters and mangrove swamps.

Food : Aquatic animals-fish, frogs, crustaceans and water insects

Breeding Season : July to October.

7. *Bubulcus ibis* (Linnaeus, 1758)
Cattle Egret

1968. *Bubulcus ibis* : Ali & Ripley, H.B. No. 44, Vol. 1 : 66.

Status and Distribution : Resident with local movements. Throughout the subcontinent.

Habits and Habitats : Generally seen alongwith grazing village cattle, wild animals. Gregarious, collect in large gatherings at ploughed fields, and form communal roost at night shared with mynas, crows, parakeets and other birds. Affects all possible habitats at low-level country.

Food : Mainly insects but also earthworms, tadpoles, small frogs and lizards to some extent.

Breeding Season : June to October.

8. *Ardeola grayii* (Sykes, 1832)
Indian Pond-Heron

1968. *Ardeola grayii* : Ali & Ripley, H.B. No. 42, Vol. 1 : 63.

Status and Distribution : Resident bird showing local movements with draught and food conditions. Throughout the subcontinent.

Habits and Habitats : Usually solitary but also found in small-scattered parties. Roost communally at night and colonial during nesting season, in mixed heronries. Found near streams, jheels, marshes, paddy fields, roadside ditches, paddies and near tidal mudflats. Mostly in plains but upto 1000m in the peninsular hills.

Food : Aquatic animals-fish, frogs, crustaceans, water beetles and other insects like grasshoppers, dragonfly larvae, crickets, ants etc.

Breeding Season : June to September.

9. *Nycticorax nycticorax* (Linnaeus, 1758)
Black-crowned Night-Heron

1968. *Nycticorax Nycticorax* : Ali & Ripley, H.B. No. 52, Vol. 1 : 78.

Status and Distribution : A resident bird showing some local movements depending upon water conditions. Patchily distributed throughout the subcontinent.

Habits and Habitats : In small parties, gregarious. Crepuscular and nocturnal in habits except in breeding season. Roost communally from a dozen to hundreds at daytime roosting. Generally pure or in mixed heronries at time of nesting. Found near jheels, tanks, streams, ponds, and also near estuaries, tidal creeks, coastal lagoons and backwaters.

Food : Aquatic animals-water insects, dragonfly larvae, fish, frogs, etc.

Breeding Season : June to October.

Family CICONIIDAE
10. *Anastomus oscitans* (Boddaert, 1783)
Asian Open bill-Stork

1968. *Anastomus oscitans* Ali & Ripley, H.B. No. 61, Vol. 1 : 95.

Status and Distribution : It is a resident bird shows local movements depending upon water conditions. It is distributed throughout the Indian subcontinent.

Habits and Habitats : Mostly in single or in small parties and flocks during feeding. Pure as well as in large mixed heronries during nesting season. Generally found near jheels, marshes, river banks, tidal mudflats etc

Food : Aquatic animals-mostly molluscs but also eat crabs, frogs and other small animals found near marshes.

Breeding Season : July to October.

11. *Ciconia episcopus* (Boddaert, 1783)
White-necked Stork

1968. *Ciconia episcopus* : Ali & Ripley, H.B. No. 62, Vol. 1 : 98.

Status and Distribution : A resident bird, distributed sparsely throughout the well-watered parts of India. Locally common.

Habits and Habitats : Generally solitary or pairs or in small parties, wading in water, feeds at dry and marshy lands. Roosts at night in tall trees. It is found in flooded grassland, fallows, ploughed fields, banks of streams and river, marshy places and rarely on tidal creeks

Food : Aquatic animals-large insects, crabs, molluscs, fish and frogs.

Breeding Season : July to October.

Family THRESKIORNITHIDAE
12. *Threskiornis melanocephalus* (Latham, 1790)
Oriental White Ibis

1968. *Threskiornis melanocephalus* : Ali & Ripley, H.B. No. 69, Vol. 1 : 110.

Status and Distribution : It is a resident bird, nomadic and or partially local migratory depending on water conditions. Distributed throughout the India.

Habits and Habitats : Generally in small parties as well as in large flocks; often associated with storks and spoonbills. Gregarious. Roost in trees. Colonial during nesting and associates with other birds like storks, herons, cormorants etc. Found along rivers, jheels, marshes, ploughed fields, fallows and occasionally near tidal mudflats.

Food : Aquatic animals like fish, frogs, molluscs, water insects, worms and also vegetable matters.

Breeding Season : June to October.

13. *Platalea leucorodia* Linnaeus, 1758
Eurasian Spoonbill

1968. *Platalea leucorodia* : Ali & Ripley, H.B. No. 72, Vol. 1 : 116.

Status and Distribution : Partly resident and nomadic, partly winter visitor. Distributed all over India.

Habits and Habitat : Wading bird, quite sociable and gregarious, keeps in small parties and in flocks of 50-70 birds associating with ibises, egrets and marsh birds. Mostly found near marshes, shallow jheels, rivers, occasionally at tidal creeks and mangrove forest. Colonial and in mixed heronries during nesting.

Food : Aquatic animals-fish, tadpoles, frogs, molluscs, crustaceans, aquatic insects and to some extent vegetable matter.

Breeding Season : July to October.

Order ANSERIFORMES
Family ANATIDAE

14. *Dendrocygna javanica* (Horsefield, 1821)
Lesser Whistling-Duck

1968. *Dendrocygna javanica* : Ali & Ripley, H.B. No. 88, Vol. 1 : 138.

Status and Distribution : Resident bird shows local movements depending upon drought and flood situation. Distribution is throughout the India.

Habits and Habitat : In small parties of 10-12 birds, occasionally in large flocks, quite sociable, feeding is nocturnal. Birds avoid open waters and large rivers, but found near reedy and vegetation or lotus-covered tanks, jheels, back water lagoons in coastal areas, paddy fields in plains country.

Food : Vegetable matters-aquatic weeds, tender shoots, grains of wild and cultivated rice and to certain extent fish, frogs, snails and worms.

Breeding Season : June to October but varies locally.

15. *Tadorna ferruginea* (Pallas, 1764)
Brahminy Shelduck

1968. *Tadorna ferruginea* : Ali & Ripley, H.B. No. 90, Vol. 1 : 141.

Status and Distribution : Winter visitor but also breeding in our area in Ladakh. Distributed to all over India during winter.

Habits and Habitat : Birds are less gregarious than other ducks. Usually seen in pairs, small parties or in scattered flocks. These ducks are found on large open lakes and rivers, dry riverbanks, mud pits. Walks well and with ease in grassy lake margins like geese.

Food : Omnivorous-feeds on grain, tender shoots and tubers, aquatic insects, crustacean, molluscs, reptiles, etc.

Breeding Season : Extralimital, but during May-June in Ladakh.

16. *Sarkidiornis melanotos* (Pennant, 1769)
Comb Duck

1968. *Sarkidiornis melanotos* : Ali & Ripley, H.B. No. 115, Vol. 1 : 192.

Status and Distribution : Resident but shows local movements depending upon water conditions. Practically throughout the India.

Habits and Habitat : In family parties of 4 to 10 birds, but occasionally in flocks. A good walker, perches freely on branches of trees and can dive for food. Generally found near reedy bunded tanks, jheels, in well-wooded plains country.

Food : Mostly vegetable matter : corns, shoots, seeds of aquatic and marsh plants, grains of wild and cultivated rice, also aquatic insects and their larvae, sometimes fish and frogs.

Breeding Season : Mainly July to September coinciding with SW monsoon.

17. *Nettapus coromandelianus* (Gmelin, 1789)

Cotton Teal

1968. *Nettapus coromandelianus* : Ali & Ripley, H.B. No. 114, Vol. 1 : 190.

Status and Distribution : Resident with some local movements. Throughout the Indian Union.

Habits and Habitat : Usually found in pairs, or in small flocks and occasionally in larger flocks. Feeds on surface but can dive in water for food. Occurs mainly vegetation-covered jheels, village tanks, ponds and shallow lagoons.

Food : Vegetarian : Shoots, corns, seeds of aquatic plants, grains of cultivated and wild rice, and to some extent feeds on crustaceans, worms, insets and their larvae.

Breeding Season : June to September.

18. *Anas penelope* Linnaeus, 1758

Eurasian Wigeon

1968. *Anas penelope* : Ali & Ripley, H.B. No. 103, Vol. 1 : 167.

Status and Distribution : Winter visitor. Throughout the India, but more common in northern India, and less common in peninsular and eastern India.

Habits and Habitat : Gregarious bird. Occurs in large flocks. Feeds by walking, grazing on grassy edges of ponds and paddy fields. Found near shallow reedy jheels and marshes, mangrove-swamps and sometimes on salt-water creeks.

Food : Mainly vegetarian: corns, seeds and shoots of marsh and aquatic plants. Also insects, molluscs.

Breeding Season : Extralimital.

19. *Anas platyrhynchos* Linnaeus, 1758

Mallard

1968. *Anas platyrhynchos* : Ali & Ripley, H.B. No. 100, Vol. 1 : 160.

Status and Distribution : Mainly winter visitor; but breeds in small numbers in Kashmir. Common in northern part of India and decreasing eastward and southwards up to Maharashtra.

Habits and Habitat : Gregarious in habits. Also found in small parties and medium sized flocks. A surface feeder or dabbling duck. Feeds mostly during night. Not a under water feeder but can dive effectively. Frequently found near shallow water-reedy jheels and marshes. Rarely near rivers and ponds.

Food : Mainly vegetarian : corns, seeds, shoots of aquatic plants, wild and cultivated rice, and to some extent molluscs, tadpoles, fish spawn, worms, etc.

Breeding Season : Extralimital, May to June in Kashmir.

20. *Anas poecilorhyncha* J.R. Forester, 1781

Spot-billed Duck

1968. *Anas poecilorhyncha* : Ali & Ripley, H.B. No. 97, Vol. 1 : 157.

Status and Distribution : Resident, nomadic and local migratory bird distributed throughout the Indian subcontinent.

Habits and Habitat : A non-diving duck but can dive effectively. Usually seen in pairs, family parties or in small medium-sized flocks. It walks about grubbing on marshland or in wet paddy fields. It occurs in reedy and vegetation covered jheels, shallow irrigation tanks, ponds and sometimes in rivers.

Food : Mostly vegetarian-shoots, corns, aquatic plants, seeds, grains of wild and cultivated rice. Sometime water-snails.

Breeding Season : Chiefly July to October depending upon water conditions.

21. *Anas clypeata* Linnaeus, 1758

Northern Shoveller

1968. *Anas clypeata* : Ali & Ripley, H.B. No. 105, Vol. 1 : 172.

Status and Distribution : Winter visitor, commonly occurring all over India.

Habits and Habitat : Generally in small parties and mostly in associations with Common and Garganey Teals. Found in all types of inland waters, jheels, reservoir, village tanks, flooded ditches and sometimes in rivers.

Food : Water insects, larvae, worms, crustaceans, molluscs, fish spawn; and also vegetable matter like shoots, corns, aquatic weeds.

Breeding Season : Extralimital.

22. *Anas acuta* Linnaeus, 1758
Northern Pintail

1968. *Anas acuta* : Ali & Ripley, H.B. No. 93, Vol. 1 : 149.

Status and Distribution : Winter visitor. Common, widespread and locally abundant all over India.

Habits and Habitat : Mostly in small flocks from 10 to 20 birds, and sometimes in large congregations. Largely a crepuscular and nocturnal in habitat. Occurs in reedy and vegetation covered jheels, back water, rivers, brackish lagoons and estuaries.

Food : Mainly vegetable matter like grass, corns, shoots, seeds of aquatic plants, wild and cultivated rice. Sometimes water insects, worms and molluscs.

Breeding Season : Extralimital.

23. *Anas querquedula* Linnaeus, 1758
Garganey

1968. *Anas querquedula* : Ali & Ripley, H.B. No. 104, Vol. 1 : 169.

Status and Distribution : Winter visitor. Common and widespread throughout the Indian subcontinent.

Habits and Habitat : Gregarious, non-dividing, can dive very effectively to evade capture when wounded. Largely a nocturnal feeder where persecuted. Marshes, reservoirs and lakes.

Food : Mainly vegetation-seeds and tender shoots of marsh plants, grasses and sedges and grains of wild and cultivated rice. Also insects, larvae, worms and molluscs.

Breeding Season : Extralimital.

24. *Anas crecca* Linnaeus, 1758
Common Teal

1968. *Anas crecca* : Ali & Ripley, H.B. No. 94, Vol. 1 : 151.

Status and Distribution : Winter visitor. Found throughout India and locally abundant.

Habits and Habitat : Keeps in small parties and large flocks of up to 200 or more, congregating at times in swarms (together chiefly with the Garganey). Affects tanks, lakes and marshes.

Food : Entirely vegetarian : shoots, tubers and seeds of aquatic plants and grains of wild and cultivated rice.

Breeding Season : Extralimital.

**25. *Rhodonessa rufina* (Pallas, 1773)
Red-crested Pochard**

1968. *Netta rufina* : Ali & Ripley, H.B. No. 107, Vol. 1 : 177.

2001. *Rhodonessa rufina* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 3.

Status and Distribution : Winter visitor. Common and locally abundant in North India, decreasingly in the peninsula.

Habits and Habitat : Keeps more to fairly deep open water than to reedy marginal shallows, obtains food by diving, sometimes remains submerged for seconds. Affects vegetation covered tanks and jheels.

Food : Shoots and roots of water plants, molluscs, crustaceans, insects, etc.

Breeding Season : Extralimital.

**26. *Aythya ferina* (Linnaeus, 1758)
Common Pochard**

1968. *Aythya ferina* : Ali & Ripley, H.B. No. 108, Vol. 1 : 180.

Status and Distribution : Winter visitor. Widespread in India.

Habits and Habitat : Commonest diving duck, collecting in flocks and rafts of up to 300-400 birds, or in large congregations of several thousand. Feeds chiefly under water. Largely nocturnal. Affects lakes and reservoirs with large areas of open water deep enough to allow diving, occasionally on rivers.

Food : Largely vegetarian, occasionally molluscs, aquatic insects and crustaceans.

Breeding Season : Extralimital.

27. *Aythya fuligula* (Linnaeus, 1758)
Tufted Pochard

1968. *Aythya fuligula* : Ali & Ripley, H.B. No. 111, Vol. 1 : 185.

Status and Distribution : Winter visitor. Widespread in India.

Habits and Habitat : Diving duck. Rides rather low on water, as in cormorant. Collecting in flocks of several hundred. Feeds chiefly under water. Mostly nocturnal. Affects open and deeper tanks and irrigation reservoirs with large areas of open water deep enough to allow diving.

Food : Largely vegetarian, occasionally molluscs, aquatic insects and crustaceans.

Breeding Season : Extralimital.

Order FALCONIFORMES
Family ACCIPITRIDAE

28. *Pernis ptilorhyncus* (Temminck, 1821)
Oriental Honey-Buzzard

1968. *Pernis ptilorhyncus* : Ali & Ripley, H.B. No. 130, Vol. 1 : 222.

Status and Distribution : Resident with local movements. Throughout the Indian plains, up to 1800 m in the Himalayas.

Habits and Habitat : Usually seen singly or in pairs soaring aloft and circling on motionless wings, or perched on a tree-top. Roosts in numbers at night in groves of large leafy trees, e.g. *Dalbergia*. Well-wooded country, forest glades, also groves of trees about towns, villages and cultivation.

Food : Mainly honey and larvae of bees.

Breeding Season : From February to July.

29. *Elanus caeruleus* (Desfontaines, 1789)
Black-shouldered Kite

1968. *Elanus caeruleus* : Ali & Ripley, H.B. No. 124, Vol. 1 : 212.

Status and Distribution : Resident. Widely distributed in India, common in plains and hills.

Habits and Habitat : Keeps singly or in widely scattered pairs. Somewhat crepuscular. Roosts communally at night in leafy trees. Grassland interspersed with cultivation or with scattered trees, open dry scrub and scrub forest.

Food : Mainly large insects and reptiles.

Breeding Season : Nearly all year, varying locally.

30. *Milvus migrans* (Boddaert, 1783)

Black Kite

1968. *Milvus migrans* : Ali & Ripley, H.B. No. 133, Vol. 1 : 227.

Status and Distribution : Resident with local movements. Throughout India.

Habits and Habitat : Gregarious about towns and villages. Roosts communally at night in selected trees. Around human habitation, mainly in cities, also in mountains.

Food : Feeds mainly on refuse and offal, but is omnivorous.

Breeding Season : From September to May.

31. *Circus aeruginosus* (Linnaeus, 1758)

Western Marsh-Harrier

1968. *Circus aeruginosus* : Ali & Ripley, H.B. No. 193, Vol. 1 : 324.

Status and Distribution : Winter visitor. Throughout the Indian Union.

Habits and Habitat : Not gregarious. Single bird sails lightly and gracefully on outspread motionless wings. Marshes, flooded rice fields, up to 2000 m. in hilly areas.

Food : Mice and voles, wounded birds, lizards, frogs and large insects.

Breeding Season : Extralimital.

32. *Accipiter badius* (Gmelin, 1788)

Indian Shikra

1968. *Accipiter badius* : Ali & Ripley, H.B. No. 138, Vol. 1 : 235.

Status and Distribution : Resident. Found throughout India.

Habits and Habitat : Uses surprise tactics to hunt. Soars high in circle. Open wooded country and groves around villages and cultivation.

Food : Small mammals, birds, lizards, frogs and large insects.

Breeding Season : From January to June.

33. *Butastur teesa* (Franklin, 1832)
White-eyed Buzzard

1968. *Butastur teesa* : Ali & Ripley, H.B. No. 157, Vol. 1 : 257.

Status and Distribution : Resident. Throughout Indian subcontinent.

Habits and Habitat : Sluggish and usually tame. Single birds seen frequently in a chosen locality. Open dry forest, scrub and cultivation.

Food : Rats and mice, small snakes, lizards, frogs, crabs and large insects.

Breeding Season : From February to May.

Family FALCONIDAE
 34. *Falco tinnunculus* Linnaeus, 1758
Common Kestrel

1968. *Falco tinnunculus* : Ali & Ripley, H.B. No. 222, Vol. 1 : 365.

Status and Distribution : Wintering throughout the Indian subcontinent.

Habits and Habitat : Usually seen singly. Grassland, hill and plain, also cultivation and semi desert.

Food : Chiefly large insects, frogs, lizards, small rodents and rarely nestlings or small birds.

Breeding Season : From April to June in the W. Himalayas.

Order GALLIFORMES
 Family PHASIANIDAE

35. *Fracolinus pondicerianus* (Gmelin, 1789)
Grey Francolin

1969. *Fracolinus pondicerianus* : Ali & Ripley, H.B. No. 245, Vol. 2 : 30.

Status and Distribution : Resident. Throughout the northern India, east to W. Bengal, Orissa.

Habits and Habitat : Mainly in pairs, in small family parties or in groups of 5 to 8 birds. Roosts in thorny trees or in bushes at night time. Affects dry open grass plains and xerophytic thorn-scrub near villages, in cultivations of Jowar, bajra and other crops.

Food : Mainly weed seeds, cereal grains, shoots of grass, berries and insects. Rarely snakes.

Breeding Season : More or less throughout the year but chiefly during April to September.

36. *Perdicula asiatica* (Latham, 1790)

Jungle Bush-Quail

1969. *Perdicula asiatica* : Ali & Ripley, H.B. No. 255, Vol. 2 : 45.

Status and Distribution : Resident. From Gujarat east to Orissa through Madhya Pradesh, north to Himachal Pradesh and south throughout the peninsula from plains to 1250m.

Habits and Habitat : Generally in small groups of 6 to 20 birds. Affects dry grass and scrub jungle and both open and fairly dense deciduous forests, preferably on dry, stony ground and in standing crops.

Food : Grass and weed seeds, bajra, millets and small insects particularly termites.

Breeding Season : Almost all months, varying locally.

37. *Perdicula argoondah* (Sykes, 1832)

Rock Bush-Quail

1969. *Perdicula argoondah* : Ali & Ripley, H.B. No. 260, Vol. 2 : 49.

Status and Distribution : Resident. Throughout the peninsular India.

Habits and Habitat : Generally in small groups of 6 to 20 birds. Affects dry stony scrub-and-bush country.

Food : Grass and weed seeds, bajra, millets and small insects particularly termites.

Breeding Season : Almost all months, varying locally.

38. *Gallus sonneratii* Temminck, 1813

Grey Junglefowl

1969. *Gallus sonneratii* : Ali & Ripley, H.B. No. 301, Vol. 2 : 106.

Status and Distribution : Resident. Chiefly Western peninsular India and south of a line Mt. Abu-Pachmarhi-mouth of the Godavari to Madhya Pradesh, Maharashtra to Kerala.

Habits and Habitat : Generally in pairs, singly or in small parties of 5 to 6 birds. Large numbers gather in areas of bamboo flowering. A shy bird. Affecting dry-deciduous to moist-evergreen biotope, broken country interspersed with cultivation patches, mixed bamboo jungle, tea, coffee and rubber plantations.

Food : Grain, shoots of grass, seeds of crops, tubers, berries, wild figs and insects.

Breeding Season : From February to May.

39. *Pavo cristatus* Linnaeus, 1758
Indian Peafowl

1969. *Pavo cristatus* : Ali & Ripley, H.B. No. 311, Vol. 2 : 123.

Status and Distribution : Resident. Throughout the Indian subcontinent; locally up to 1800 m. elevation.

Habits and Habitat : Mostly in small flocks of a cock and 4 to 5 hens. Roosts at night in tall trees. In the wild state, in undergrowth in deciduous forest near streams, where semi-feral, lives in villages and cultivation.

Food : An omnivorous bird. Seeds, grain, groundnuts, lentils, shoots, flower buds, berries, figs, insects, arachnids, lizards and snakes.

Breeding Season : Generally between April and June.

Order GRUIFORMES
Family RALLIDAE

40. *Amaurornis phoenicurus* (Pennant, 1769)
White-breasted Waterhen

1969. *Amaurornis phoenicurus* : Ali & Ripley, H.B. No. 343, Vol. 2 : 168.

Status and Distribution : Resident. Throughout the northern India south to an arbitrary boundary along 20° N Latitude and to peninsular India.

Habits and Habitat : Singly or in pairs on the margin of jheels and ponds, marshy ground. Swims buoyantly.

Food : Insects, worms, molluscs, grain and shoots of paddy and marsh plants.

Breeding Season : Coincide with monsoon from June to October.

41. *Porphyrio porphyrio* (Linnaeus, 1758)
Purple Moorhen

1969. *Porphyrio porphyrio* : Ali & Ripley, H.B. No. 349, Vol. 2 : 178.

Status and Distribution : Resident and local migrant. Almost throughout India, in terai and plains.

Habits and Habitat : Keeps in parties of 5 to 10 birds, sometime congregations up to 50 birds at large swampy area. Stalks through the marshy reed-beds, or wades over floating vegetation or around large swaps, jheels and in rice fields.

Food : Mainly seeds, grain and vegetable matter, sometimes insects and molluscs.

Breeding Season : Coincide with monsoon from June to September.

42. *Gallinula chloropus* (Linnaeus, 1758)
Common Moorhen

1969. *Gallinula chloropus* : Ali & Ripley, H.B. No. 347, Vol. 2 : 175.

Status and Distribution : Resident and partly winter visitor. All over India.

Habits and Habitat : Keeps in pairs or in small parties, sometime congregations up to 50 birds at large swampy area. Stalks through the marshy reed-beds, mostly paddles over floating vegetation or around large swaps, jheels.

Food : Mainly seeds, fruits and vegetable matter, sometimes insects and molluscs, young frogs and small fish.

Breeding Season : Coincide with monsoon from June to September.

43. *Fulica atra* Linnaeus, 1758
Common Coot

1969. *Fulica atra* : Ali & Ripley, H.B. No. 350, Vol. 2 : 180.

Status and Distribution : Resident as well as common winter visitor. Throughout much of the Indian subcontinent, practically the plains.

Habits and Habitat : Gregarious usually in small parties and flocks. Abundant in winter due to northern immigrants, congregates in thousand on the large weedy jheels, lakes, along the rivers and irrigation tanks with large areas of open water and marginal emergent vegetation. They paddle on water and are expert in diving.

Food : Mainly vegetarian, also molluscs, worms, insects and occasionally small fish.

Breeding Season : In peninsula July to August and also extralimital.

Order CHARADRIIFORMES
Family CHARADRIIDAE

44. *Charadrius dubius* Scopoli, 1786
Little Ringed Plover

1969. *Charadrius dubius* : Ali & Ripley, H.B. No. 380, Vol. 2 : 231.

Status and Distribution : Resident with local movements depending upon water conditions. Throughout the Indian subcontinent.

Habits and Habitat : Keeps in pairs or in small-scattered flocks of 6 to 10 birds or more, also forms feeding parties mixed with other waders. Sand, shingle and mud margins of lakes, pools and rivers, wet grasslands and paddy fields, intertidal areas on seashore, mudflats and tidal creeks.

Food : Mainly small insects, larvae, crustaceans and worms.

Breeding Season : In peninsular India mostly between March and May.

45. *Charadrius alexandrinus* Linnaeus, 1758
Kentish Plover

1969. *Charadrius alexandrinus* : Ali & Ripley, H.B. No. 381, Vol. 2 : 235.

Status and Distribution : Winter visitor. All over India.

Habits and Habitat : Keeps in small parties or in mixed flocks with other waders. Mostly sea shores sandy banks of freshwater wetlands and saltpans.

Food : Small crabs, sand hoppers and insects.

Breeding Season : Extralimital but breeds in northern India-north Bihar and Porbunder in Gujarat from March to July.

46. *Vanellus malabaricus* (Boddaert, 1783)
Yellow-wattled Lapwing

1969. *Vanellus malabaricus* : Ali & Ripley, H.B. No. 370, Vol. 2 : 218.

Status and Distribution : Resident showing local migratory and nomadic movements away from wetter areas in monsoon. Throughout the India.

Habits and Habitat : Keeps in pairs or in small parties of 5 to 6 birds. Less dependent upon proximity of water; away from muddy shores, near jheels keeps to a higher zone. Affects barren wasteland, stubbles and fallow fields in drier biotopes.

Food : Mainly insectivorous.

Breeding Season : From March to July.

47. *Vanellus indicus* (Boddaert, 1783)
Red-wattled Lapwing

1969. *Vanellus indicus* : Ali & Ripley, H.B. No. 366, Vol. 2 : 212.

Status and Distribution : A resident bird with local spreading out in monsoon. Throughout the India from Kashmir to Kanyakumari and up to 1800 m elevation.

Habits and Habitat : Mostly in pairs or sometimes loose flocks of 6 to 10 birds. In open well watered country, grassy glades, cultivation, jheels, tanks, rivers, ditches.

Food : Mainly Insects: ants, beetles, caterpillars; molluscs, crustaceans, worms and vegetable matter.

Breeding Season : From March to September.

Family SCOLOPACIDAE
48. *Gallinago stenura* (Bonaparte, 1830)
Pintail Snipe

1969. *Capella stenura* : Ali & Ripley, H.B. No. 406, Vol. 2 : 282.

2001. *Gallinago stenura* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 6.

Status and Distribution : Winter visitor. All over India from plains to 2500 m elevation.

Habits and Habitat : Usually in singles or in small parties of 3 to 4 birds. Mainly found near marshy edges of jheels, wet paddy stubbles, harvested paddy fields, reservoirs, grazing grounds, etc.

Food : Mainly worms, larvae and tiny molluscs.

Breeding Season : Extralimital.

49. *Tringa totanus* (Linnaeus, 1758)
Common Redshank

1969. *Tringa totanus* : Ali & Ripley, H.B. No. 394, Vol. 2 : 257.

Status and Distribution : Winter visitor. Throughout the India.

Habits and Habitat : Keeps solitary, in small parties and large flocks, often in association with other small waders. Runs and feeds at water edge. Occasional swimmer. Affects river banks, Jheel margins inland, puddles and streams.

Food : Aquatic insects, molluscs, crustaceans and other invertebrates.

Breeding Season : Extralimital.

50. *Tringa stagnatilis* (Bechstein, 1803)
Marsh Sandpiper

1969. *Tringa stagnatilis* : Ali & Ripley, H.B. No. 395, Vol. 2 : 259.

Status and Distribution : Winter visitor. Throughout the India.

Habits and Habitat : Keeps in parties or small flocks, in company with other sandpipers. Runs and feeds at water edge. Occasional swimmer. Affects swampy edges of freshwater ponds and jheels.

Food : Aquatic insects, molluscs, crustaceans and other invertebrates.

Breeding Season : Extralimital.

51. *Tringa ochropus* Linnaeus, 1758
Green Sandpiper

1969. *Tringa ochropus* : Ali & Ripley, H.B. No.397, Vol. 2 : 263.

Status and Distribution : Winter visitor. Throughout the India.

Habits and Habitat : Less gregarious than most sandpipers. Keeps singly or in twos and threes, and seldom in voluntary association with other species. Runs and feeds at water edge. Jheels, village tanks, puddles and streams.

Food : Aquatic insects, molluscs, crustaceans and other invertebrates.

Breeding Season : Extralimital.

52. *Tringa glareola* Linnaeus, 1758
Wood Sandpiper

1969. *Tringa glareola* : Ali & Ripley, H.B. No.398, Vol. 2 : 265.

Status and Distribution : Winter visitor. Throughout the India.

Habits and Habitat : More gregarious than most sandpipers, seen in flocks of 20 to 30 birds. Occasionally solitary or in small parties. Runs and feeds at water edge. Marshes, village tanks, lakes, wet paddy fields, irrigation tanks, mudflats along tidal creeks.

Food : Insects, crustaceans and worms.

Breeding Season : Extralimital.

53. *Actitis hypoleucos* Linnaeus, 1758
Common Sandpiper

1969. *Tringa hypoleucos* : Ali & Ripley, H.B. No. 401, Vol. 2 : 271.

2001. *Actitis hypoleucos* : Manakadan & Pittie. *Buceros*, Vol. 6, (No.1) : 7.

Status and Distribution : Winter visitor. Throughout the India.

Habits and Habitat : Keeps solitary or in scattered twos and threes. Runs and feeds at water edge. Village tanks, banks of streams, rivers, canals, lakes, tidal creeks and coastal wetlands.

Food : Molluscs, crustaceans and Insects.

Breeding Season : Extralimital and also breeds in Kashmir, Ladakh, Garhwal Himalaya.

54. *Calidris minuta* (Leisler, 1812)
Little Stint

1969. *Calidris minuta* : Ali & Ripley, H.B. No. 416, Vol. 2 : 301.

Status and Distribution : Winter visitor. Chiefly to the coasts of India.

Habits and Habitat : A sociable wader often in large flocks of several hundred. Runs and feeds at water edge. Affects marshy ground-paddy fields, jheels, estuaries, coastal lagoons and mudflats along tidal creeks.

Food : Molluscs, crustaceans, insects and worms. Occasionally seeds of marsh plants.

Breeding Season : Extralimital.

Family RECURVIROSTRIDAE
55. *Himantopus himantopus* (Linnaeus, 1758)
Black-winged Stilt

1969. *Himantopus himantopus* : Ali & Ripley, H.B. No. 430, Vol. 2 : 329.

Status and Distribution : Resident as well as partly winter visitor. Throughout the Indian Union.

Habits and Habitat : Gregarious in small parties or fair-sized flocks and larger congregations of a hundred or more. Freshwater and brackish marshes, pools, village tanks, reservoirs, saltpans, lagoons, shallow margins of lakes and sometimes inundated ploughed fields.

Food : Fishes, insects and other aquatic invertebrates and small seeds of sedges and marsh plants.

Breeding Season : From April to August and also extralimital.

Family LARIDAE
56. *Sterna aurantia* J.E. Gray, 1831
River Tern

1969. *Sterna aurantia* : Ali & Ripley, H.B. No. 463, Vol. 3 : 48.

Status and Distribution : Resident. Throughout the Indian Union.

Habits and Habitat : Keeps singly or in twos and threes, or small scattered parties. Roosts at night on sandbanks. Large inland waters, sandy islets in rivers and estuaries.

Food : Mostly fish, also crustaceans, tadpoles and aquatic insects.

Breeding Season : Colonial. March to May.

Order COLUMBIFORMES
Family COLUMBIDAE

57. *Columba livia* Gmelin, 1789
Blue Rock Pigeon

1969. *Columba livia* : Ali & Ripley, H.B. No. 517, Vol. 3 : 125.

Status and Distribution : Resident and locally abundant. Throughout the Indian Union.

Habits and Habitat : In the wild state lives in colonies, roosts on ledges, and in fissures and holes in rock scraps, hill forts, ancient ruins, or down the shafts of old wells. Keeps in small parties or large flocks of several hundred strong to feed in the mornings and afternoons. Short flights from ledge to ledge on nesting cliffs. Feral birds inhabit villages, towns and cities; wild birds frequent rocky cliffs, gorges and ruins, forts.

Food : Grains of maize, jowar and other cereals, pulses, groundnuts, weed seeds, also small tubers and green shoots of ground crops.

Breeding Season : Almost whole year.

58. *Streptopelia orientalis* (Latham, 1790)
Oriental Turtle-Dove

1969. *Streptopelia orientalis* : Ali & Ripley, H.B. No. 533, Vol. 3 : 146.

Status and Distribution : Resident. Breeds in peninsular India from Bihar and Orissa south to Karnataka.

Habits and Habitat : A ground feeding bird keeps in pairs and in small parties or in flocks during migration. Open mixed deciduous forest, bamboo forest in vicinity of cultivation.

Food : Cereals, weed and bamboo seeds, green shoots.

Breeding Season : November to February (not well defined.)

59. *Streptopelia senegalensis* (Linnaeus, 1766)
Little Brown Dove

1969. *Streptopelia senegalensis* : Ali & Ripley, H.B. No. 541, Vol. 3 : 155.

Status and Distribution : Resident, with local movements (but not so clear.) Throughout India from western Himalaya to Kanyakumari.

Habits and Habitat : A ground feeding dove keeps in pairs or in small parties. Dry deciduous biotope, stony scrub and bush, country along cultivation, also village surrounding.

Food : Jowar, bajra and other cereals and lentils, grains of paddy, grass and weed seeds.

Breeding Season : Practically all year but chiefly January to October.

60. *Streptopelia chinensis* (Scopoli, 1786)
Spotted Dove

1969. *Streptopelia chinensis* : Ali & Ripley, H.B. No. 537, Vol. 3 : 152.

Status and Distribution : Resident with local and altitudinal migrant in some areas. Almost all over India, from lower Himalayas to Assam, south through Peninsula to Kanyakumari.

Habits and Habitat : A ground feeding bird keeps in pairs or in small parties. Moist deciduous forest, gardens, groves and cultivation; better wooded and better watered bodies than Ring and Little Brown Doves.

Food : Jowar and other cereals, lentils and other pulses, grains of paddy, grass and weed seeds.

Breeding Season : Throughout the year.

61. *Streptopelia decaocto* (Frivaldszky, 1838)
Eurasian Collared-Dove

1969. *Streptopelia decaocto* : Ali & Ripley, H.B. No. 534, Vol. 3 : 147.

Status and Distribution : Resident with marked seasonal, local and altitudinal movements. All over India from Kashmir to Kanyakumari.

Habits and Habitat : Keeps in pairs or in small parties and in large flocks during local migration. Dry deciduous forest, with semi-deserted country; open cultivation, groves, scattered Acacia, Butea and similar trees. Commonly sharing the habitat with Little Brown Dove.

Food : Wheat, barley, paddy grains, seeds of mustard, linseed and other weeds.

Breeding Season : Practically throughout year in the peninsular India.

62. *Chalcophaps indica* (Linnaeus, 1758)
Emerald Dove

1969. *Chalcophaps indica* : Ali & Ripley, H.B. No. 542, Vol. 3 : 157.

Status and Distribution : Resident (and sedentary). Patchily throughout India up to 1800 m. in the lower Himalayas.

Habits and Habitat : A ground-feeding dove. Keeps singly or in pairs, locally abundant. Affects thick secondary and mixed bamboo jungle and outskirts of forest clearings, chiefly in foothills country.

Food : Grains, seeds, and fallen berries of lantana being a favourite. Termites on ground.

Breeding Season : Locally variable covering practically the whole year.

63. *Treron pompadora* (Gmelin, 1789)
Pompadour Green-Pigeon

1969. *Treron pompadora* : Ali & Ripley, H.B. No. 496, Vol. 3 : 99.

Status and Distribution : Resident, subject to some local and altitudinal movements with ripening of fruits. Western and southwestern India-the Western Ghats complex from about lat. 20° N. southward through Western Karnataka and Kerala.

Habits and Habitat : Keeps in small flocks of up to a dozen or sometimes-large congregations on fruiting trees. Roost at night. Exclusively arboreal bird descending to ground for drink or pickup the earth. Affects forest and well-wooded country in evergreen and wet deciduous biotope with fruiting trees; lowlands and up to 1200 m. altitude.

Food : Various kinds of wild figs, berries and drupes.

Breeding Season : Mainly December to March.

64. *Treron phoenicoptera* (Latham, 1790)
Yellow-legged Green-Pigeon

1969. *Treron phoenicoptera* : Ali & Ripley, H.B. No. 504, Vol. 3 : 108.

Status and Distribution : Resident. Local movements with ripening of fruits. All peninsular India.

Habits and Habitat : Keeps in flocks. Exclusively arboreal bird descending to ground for drink or pickup the earth. Dry and moist deciduous forest with fruiting trees, groves on open countryside, around villages, cultivation, gardens and roadside avenues.

Food : Various kinds of wild figs, berries and drupes.

Breeding Season : May to June.

Order PSITTACIFORMES
Family PSITTACIDAE

65. *Psittacula eupatria* (Linnaeus, 1766)
Alexandrine Parakeet

1969. *Psittacula eupatria* : Ali & Ripley, H.B. No. 545, Vol. 3 : 164.

Status and Distribution : Resident with local movements. Common and widespread in N. India, sporadic south of latitude 18° N through Madhya Pradesh and Orissa (the arbitrarily fixed boundary with the northern race); plains up to 1600 m. in Himalayas and up to 900 m. in peninsular hills.

Habits and Habitat : Keeps in small parties. Roosts communally at night. Moist and dry deciduous forest and well-wooded areas; parks, gardens and trees around human habitation.

Food : Fruits and seeds.

Breeding Season : From December to May.

66. *Psittacula krameri* (Scopoli, 1769)
Rose-ringed Parakeet

1969. *Psittacula krameri* : Ali & Ripley, H.B. No. 550, Vol. 3 : 171.

Status and Distribution : Resident with local movements. All peninsular India south of latitude 20° N-(the arbitrarily fixed boundary with the northern race.)

Habits and Habitat : Keeps in small parties or in enormous swarms during ripening of fruits and crops. Roosts communally sharing with other birds such as myna, crow. Moist and dry deciduous forest biotope, highly wooded country around cultivation and human habitation.

Food : Fruits, cereals, all varieties of seeds, wild and cultivated, groundnuts, chilies, flower-petals and nectar.

Breeding Season : From January to May.

67. *Psittacula cyanocephala* (Linnaeus, 1766)
Plum-headed Parakeet

1969. *Psittacula cyanocephala* : Ali & Ripley, H.B. No. 558, Vol. 3 : 179.

Status and Distribution : Resident with local movements depending upon mainly food supply. All peninsular India south of latitude 20° N-(the arbitrarily fixed boundary with the northern race.)

Habits and Habitat : Keeps in small parties. Roosts communally at night. Moist and dry deciduous forest biotope, light forest, well-wooded compounds, cultivation, low lands and hills up to 1300 m.

Food : Fruits of all kinds, grains, paddy, gram, buds, flower-petals and nectar.

Breeding Season : From December to April.

Order CUCULIFORMES
Family CUCULIDAE

68. *Clamator jacobinus* (Boddaert, 1783)
Pied Crested Cuckoo

1969. *Clamator jacobinus* : Ali & Ripley, H.B. No. 571, Vol. 3 : 197.

Status and Distribution : Resident and migratory population (SW monsoon-breeding visitor) intermingling in Madhya Pradesh, Andhra Pradesh & elsewhere. Throughout much of the Indian peninsula.

Habits and Habitat : Largely arboreal and insectivorous. Usually seen in loose parties of 5 or 6. Affects lightly wooded country in dry- and moist-deciduous biotope, lowlands and hills.

Food : Mainly caterpillars, beetles, ants, flying termites, terrestrial molluscs, fruits, seeds and leaves.

Breeding Season : Brood-parasitic on babblers. Whole year but mainly June to September in the peninsular India.

69. *Hierococcyx varius* (Vahl, 1797)
Brainfever Bird

1969. *Cuculus varius* : Ali & Ripley, H.B. No. 573, Vol. 3 : 200.

2001. *Hierococcyx varius* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 9.

Status and Distribution : Resident with local migratory and nomadic movements. Throughout much of the Indian subcontinent.

Habits and Habitat : Arboreal bird. In single or in pairs. Well wooded deciduous and semi-evergreen country, favouring groves, mangroves, orchards, gardens and cultivation.

Food : Fruits and insects.

Breeding Season : Brood-parasitic on babblers mostly jungle babblers; laying depending on local host from March to June.

70. *Eudynamys scolopacea* (Linnaeus, 1758)
Asian Koel

1969. *Eudynamys scolopacea* : Ali & Ripley, H.B. No. 590, Vol. 3 : 227.

Status and Distribution : Resident with local movements. Throughout the India.

Habits and Habitat : Arboreal bird. In single or in pairs, normally silent except in breeding. Open woodland groves, orchards, gardens around cultivation and villages, parks and areas with scattered trees in towns and cities.

Food : Mainly fruits and berries, also invertebrates and bird eggs.

Breeding Season : Brood-parasitic exclusively on house and jungle crows. Synchronous with hosts from March to August.

71. *Centropus sinensis* (Stephens, 1815)
Greater Coucal

1969. *Centropus sinensis* : Ali & Ripley, H.B. No. 602, Vol. 3 : 243.

Status and Distribution : Resident. Throughout peninsular India including Madhya Pradesh, Andhra Pradesh and Orissa. Plains and hills up to 2200 m. altitude.

Habits and Habitat : Largely terrestrial bird; keeps in singles or in pairs. Tall grasslands, bamboo or scrub jungle, in cultivation and gardens, orchards, groves and thick cover adjacent to wetlands.

Food : Wide variety of small animal prey, also eggs and nestlings.

Breeding Season : Practically all year but chiefly November to May.

Order STRIGIFORMES
Family TYTONIDAE

72. *Tyto alba* (Scopoli, 1769)
Indian Barn Owl

1969. *Tyto alba* : Ali & Ripley, H.B. No. 606, Vol. 3 : 250.

Status and Distribution : Resident. Throughout the India.

Habits and Habitat : Largely crepuscular and nocturnal. Usually in single or in pairs. Plains and peninsular hills to c. 1000m.- ruins of ancient forts, crumbling archaeological structures, caves, disused wells, and buildings both deserted and occupied in towns and city suburbs and neighborhood of cultivations.

Food : Small birds, rats and mice.

Breeding Season : Covering practically the entire year.

Family STRIGIDAE
73. *Bubo bubo* (Linnaeus, 1758)
Eurasian Eagle-Owl

1969. *Bubo bubo* : Ali & Ripley, H.B. No. 627, Vol. 3 : 273.

Status and Distribution : Resident. Throughout the subcontinent.

Habits and Habitat : Largely nocturnal. Bush-covered rocky hills, well-wooded country without scoured steep-sided ravines, groves of ancient trees in the neighbourhood of cultivation and villages.

Food : Predominantly field rats and mice also small birds, lizards, frogs, crabs, and large insects.

Breeding Season : From November to May.

74. *Athene brama* (Temminck, 1821)
Spotted Owlet

1969. *Athene brama* : Ali & Ripley, H.B. No. 652, Vol. 3 : 302.

Status and Distribution : Resident. Peninsular India, south of 20°N latitude the boundary fixed to convenience between northern and southern populations.

Habits and Habitat : The crepuscular and nocturnal habit. Keeps in party or in small family parties. Neighborhood of cultivations and human habitation; mango tops, groves and ruins. Semi-desert areas, avoids heavy forest.

Food : Mostly beetles, locusts and other insects, also earthworms, small birds, lizards, rats and mice.

Breeding Season : From November to March.

Order CAPRIMULGIFORMES
Family CAPRIMULGIDAE

75. *Caprimulgus asiaticus* Latham, 1790
Common Indian Nightjar

1970. *Caprimulgus asiaticus* : Ali & Ripley, H.B. No. 680, Vol. 4 : 21.

Status and Distribution : Mainly resident; seasonal visitor to some parts. Found in entire Indian Union.

Habits and Habitat : Crepuscular and nocturnal. Generally in pairs or in loose flocks. Affects scrub jungle, fallow land, stony nallas, near cultivation and gardens in rural localities.

Food : Insects, water-beetles, crickets.

Breeding Season : Between February and September.

Order APODIFORMES
Family APODIDAE

76. *Apus affinis* (J.E. Gray, 1830)
Indian House Swift

1970. *Apus affinis* : Ali & Ripley, H.B. No. 703, Vol. 4 : 51.

Status and Distribution : Resident and quite common and shows local movements in some areas. Practically all over India from Punjab to West Bengal, south through the entire peninsula except Kerala. Plains and hills up to 2000 m. in Himalayas and peninsular hills.

Habits and Habitat : Predominantly aerial, paroichial and gregarious in habit. Generally in neighborhood of urban habitations, old forts, buildings, ruins and cliffs.

Food : Insects like bugs, beetles, winged ants, air-borne spiders, etc.

Breeding Season : Practically all year except coldest month.

Order CORACIIFORMES
Family ALCEDINIDAE

77. *Alcedo atthis* (Linnaeus, 1758)
Indian Small Blue Kingfisher

1970. *Alcedo atthis* : Ali & Ripley, H.B. No. 723, Vol. 4 : 76.

Status and Distribution : Resident, common. Throughout the India.

Habits and Habitat : Usually seen singly or in pairs. Streams, rivers, canals, ditches, ponds and lakes in open country; also mangrove swamps and the seashore in winter.

Food : Mainly small fish, tadpoles and invertebrates.

Breeding Season : From March to June.

78. *Halcyon smyrnensis* (Linnaeus, 1758)
Indian White-breasted Kingfisher

1970. *Halcyon smyrnensis* : Ali & Ripley, H.B. No. 736, Vol. 4 : 90.

Status and Distribution : Resident with local movements. Throughout India.

Habits and Habitat : Keeps singly or in separated pairs. Wide-ranging-cultivation, wet paddy fields, forest-edge, gardens, dry deciduous forest, streams, rivers, pools, canals, village tanks, and coast.

Food : Largely insects-grasshoppers and other insects, fish, tadpoles, and lizards.

Breeding Season : From January to August.

79. *Ceryle rudis* (Linnaeus, 1758)
Lesser Pied Kingfisher

1970. *Ceryle rudis* : Ali & Ripley, H.B. No. 719, Vol. 4 : 71.

Status and Distribution : Resident. Throughout India, common below 1800 m.

Habits and Habitat : Usually keeps in pairs, sometimes singly and periodically in family parties of 4 or 5. Slow-moving streams and rivers, ponds, lakes, canals, irrigation tanks, ditches- in open country. Occasionally tidal creeks and intertidal rock pools.

Food : Mainly fish then tadpoles, frogs, and aquatic insects.

Breeding Season : Almost whole year varying locally; chiefly February to April.

Family MEROPIDAE
80. *Merops orientalis* Latham, 1801
Small Bee-eater

1970. *Merops orientalis* : Ali & Ripley, H.B. No. 750, Vol. 4 : 109.

Status and Distribution : Resident with marked seasonal local movements. Throughout India.

Habits and Habitat : Keeps in loose parties and flocks of 15 to 20 or more. Have communal roosts in leafy trees or bamboo clumps. Open country with scattered trees, cultivation; on coasts, favours sandy areas above high-water mark; also semi-desert and grazing land.

Food : Mainly Hymenoptera-ants, bees and wasps; also moths, butterflies, small beetles, dragonflies, termites.

Breeding Season : Overall February to June varying locally.

Family CORACIIDAE

81. *Coracias benghalensis* (Linnaeus, 1758)

Indian Roller

1970. *Coracias benghalensis* : Ali & Ripley, H.B. No. 755, Vol. 4 : 116.

Status and Distribution : Resident with seasonal local movements. Throughout India.

Habits and Habitat : Keeps singly or in pairs. Has a very noisy and spectacular display during breeding season. Open cultivation, gardens, groves of mango and other trees near villages; also light deciduous forest.

Food : Mainly insects.

Breeding Season : From March to July.

Family UPUPIDAE

82. *Upupa epops* Linnaeus, 1758

Common Hoopoe

1970. *Upupa epops* : Ali & Ripley, H.B. No. 765, Vol. 4 : 128.

Status and Distribution : Winter visitor and partly Resident. Throughout India.

Habits and Habitat : Keeps singly or in pairs; in loose parties of 8 to 25 or more during migration. Open country, light forest in deciduous biotope, cultivation and villages: plains and hills to 1700 m.

Food : Insects.

Breeding Season : Extralimital and from April to June in Himalayas (Kashmir to Kumaon), January to March in the south.

Family BUCEROTIDAE

83. *Ocyrceros birostris* (Scopoli, 1786)

Indian Grey-Hornbill

1970. *Tockus birostris* : Ali & Ripley, H.B. No. 767, Vol. 4 : 130.

2001. *Ocyrceros birostris* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 11.

Status and Distribution : Resident with local movements. Widespread in India and locally common up to 1000 m.

Habits and Habitat : Largely arboreal. Keeps in pairs or small parties of 5 or 6 birds. Open deciduous forest, groves, cultivation, gardens, roadside avenues and orchards.

Food : Largely fruits-wild figs, berries, flower petals, insects, lizards and young mice.

Breeding Season : From March to June.

Order PICIFORMES
Family CAPITONIDAE

84. *Megalaima zeylanica* (Gmelin, 1788)
Brown-headed Barbet

1970. *Megalaima zeylanica* : Ali & Ripley, H.B. No. 780, Vol. 4 : 150.

Status and Distribution : Resident. Lower Himalayas; continental India east through Madhya Pradesh, northern Maharashtra to Orissa and W. Bengal, south to Godavari River.

Habits and Habitat : Arboreal and eminently frugivorous. Keeps singly or in small loose feeding parties. Well-wooded moist and dry deciduous trees, especially fig; open forest, groves near habitation and gardens.

Food : Fruits-figs, drupes and berries, flower petals and nectar, also flying insects.

Breeding Season : From February to June.

85. *Megalaima rubricapilla* (Gmelin, 1788)
Crimson-throated Barbet

1970. *Megalaima rubricapilla* : Ali & Ripley, H.B. No. 790, Vol. 4 : 161.

Status and Distribution : Resident. Northern Maharashtra, the Western Ghats complex; low country, foothills and up to 1200 m.

Habits and Habitat : Arboreal and eminently frugivorous. Keeps singly or in pairs and parties of a dozen. Well-wooded evergreen biotope, moist deciduous trees, especially fig.

Food : Fruits-figs, drupes and berries, also flying insects.

Breeding Season : From January to March.

86. *Megalaima haemacephala* (P.L.S. Muller, 1776)
Coppersmith Barbet

1970. *Megalaima haemacephala* : Ali & Ripley, H.B. No. 792, Vol. 4 : 163.

Status and Distribution : Resident. Throughout the Indian Union.

Habits and Habitat : Arboreal and eminently frugivorous. Keeps singly or in pairs and parties of a dozen. Lightly wooded countryside, roadside avenues and groves of *figus* trees near villages and cultivation, and in urban gardens and compounds.

Food : Fruits-figs, drupes and berries, also flying insects.

Breeding Season : Overall November to June, mainly February to April.

Family PICIDAE

87. *Dendrocopos mahrattensis* (Latham, 1801)
Yellow-fronted Pied Woodpecker

1970. *Picoides mahrattensis* : Ali & Ripley, H.B. No. 847, Vol. 4 : 226.

2001. *Dendrocopos mahrattensis* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 12.

Status and Distribution : Resident. Throughout India along Himalayas and southward through the Peninsula.

Habits and Habitat : Keeps in pairs, family parties of 3 or 4 birds. Affects all types of lightly wooded country from arid semi-desert to moist-deciduous biotope; plains, foothills, and up to 1300 m.

Food : Insects and grubs.

Breeding Season : From February to May.

88. *Dryocopus javensis* (Horsfield, 1821)
Great Black Woodpecker

1970. *Dryocopus javensis* : Ali & Ripley, H.B. No. 830, Vol. 4 : 208.

Status and Distribution : Resident. The Western Ghats complex from Kerala northward to the Tapti river up to 21°N. and extending along the Satpura mountain range.

Habits and Habitat : Keeps in pairs, loose family parties of 3 or 4 birds. Affects climax and secondary forest in evergreen and moist-deciduous biotope.

Food : Insects and grubs.

Breeding Season : From January to March.

89. *Dinopium benghalense* (Linnaeus, 1758)
Lesser Golden-backed Woodpecker

1970. *Dinopium benghalense* : Ali & Ripley, H.B. No. 819, Vol. 4 : 197.

Status and Distribution : Resident. Subcontinent up to Orissa and Madhya Pradesh, N. Maharashtra, Gujarat, and Rajasthan.

Habits and Habitat : Keeps in pairs, family parties. Light forest, plantations and groves of mango, Palmyra palms about villages and cultivation, urban compounds, roadside avenues, etc.

Food : Mainly ants, also ripe fruits, and flower nectar.

Breeding Season : From February to July.

Order PASSERIFORMES
Family ALAUDIDAE

90. *Eremopterix grisea* (Scopoli, 1786)
Ashy-Crowned Sparrow-Lark

1972. *Eremopterix grisea* : Ali & Ripley, H.B. No. 878, Vol. 5 : 9.

Status and Distribution : Resident with local seasonal movements in monsoon. Widespread throughout India but apparently absent from Himalayas.

Habits and Habitat : Keeps in pairs or small parties, in winter sometimes in large scattered flocks. Uncultivated tracts with scattered thorn bushes and grass clumps, cultivation, fallow and ploughed fields around villages, stony scrub and dry tidal mudflats.

Food : Grass and weed seeds, and insects.

Breeding Season : Almost whole year, chiefly February to September in the Peninsula.

91. *Ammomanes phoenicurus* (Franklin, 1831)
Southern Rufous-tailed Finch-Lark

1972. *Ammomanes phoenicurus* : Ali & Ripley, H.B. No. 882, Vol. 5 : 14.

Status and Distribution : Resident with local seasonal movements in monsoon. The greater part of peninsular and continental India, north to the Ganga river and south to a line from Hugli through Bellary (parallel to 15°N Latitude).

Habits and Habitat : Keeps in pairs (very often trios) or small loose parties- sometimes in larger flocks of up to 50 or more. Open, stony scrub and bush country, fallow land, ploughed fields and the neighbourhood of cultivation.

Food : Seeds, grains and insects.

Breeding Season : From February to May.

92. *Calandrella brachydactyla* (Leisler, 1814)

Greater Short-toed Lark

1972. *Calandrella brachydactyla* : Ali & Ripley, H.B. No. 886, Vol. 5 : 21.

Status and Distribution : Winter visitor. Throughout India.

Habits and Habitat : Keeps in straggly flocks. Roosts at night on bare open flats. Affects open stony scraggy grass-covered country, cultivated tracts, ploughed fields, paddy stubbles, and dry tidal mudflats.

Food : Seeds, grains and insects.

Breeding Season : Extralimital.

93. *Galerida cristata* (Linnaeus, 1758)

Common Crested Lark

1972. *Galerida cristata* : Ali & Ripley, H.B. No. 899, Vol. 5 : 37.

Status and Distribution : Resident with some seasonal local movements. Northern India from Kashmir foothills to northern Maharashtra.

Habits and Habitat : Keeps in pairs or small-scattered flocks. Affects open sandy or salt-encrusted semi-desert country, chiefly plains, and dry tidal mudflats.

Food : Grains, weed seeds and insects.

Breeding Season : Overall March to August.

94. *Galerida deva* (Sykes, 1832)

Sykes's Crested Lark

1972. *Galerida deva* : Ali & Ripley, H.B. No. 902, Vol. 5 : 40.

Status and Distribution : Resident with some seasonal local movements. Eastern Rajasthan, northern Gujarat and Kutch, east through the Gangetic plain to 82°E. long. And south through the Peninsula, chiefly the central plateau to southern Karnataka; plains and hills to 1000 m.

Habits and Habitat : Keeps in pairs or small-scattered flocks. Affects stony, sparsely scrubbed ghat and plateau country, dry cultivation, etc.-usually dark coloured soils.

Food : Weed seeds and insects.

Breeding Season : Overall March to September.

95. *Alauda gulgula* Franklin, 1831
Indian Small Skylark

1972. *Alauda gulgula* : Ali & Ripley, H.B. No. 907, Vol. 5 : 46.

Status and Distribution : Resident with local seasonal movements. Peninsular India from northern Maharashtra (20°N.), east through Orissa, Bihar, W. Bengal, Assam.

Habits and Habitat : Keeps in twos and threes or small scattered parties. Grassland on the edge of jheels and tanks, young wheat cultivation and ground crops, stretches of rank grass bordering salt pans and tidal mudflats, even playing fields in urban localities.

Food : Weed seeds, tiny root bulbs and insects.

Breeding Season : From March to August.

Family HIRUNDINIDAE
96. *Hirundo concolor* Sykes, 1833
Dusky Crag-Martin

1972. *Hirundo concolor* : Ali & Ripley, H.B. No. 914, Vol. 5 : 55.

Status and Distribution : Resident with local movements. Along the base of Himalayas and southward through the entire Peninsula; plains and hills up to 1800 m.

Habits and Habitat : Usually seen in pairs or small parties. Affects neighbourhood of rocky hills with crags and ancient fortifications; old buildings of stone, even in the midst of noisy populous cities.

Food : Dipterous insects, small flying beetles, etc.

Breeding Season : More or less the entire year.

97. *Hirundo rustica* Linnaeus, 1758
Common Swallow

1972. *Hirundo rustica* : Ali & Ripley, H.B. No. 916, Vol. 5 : 57.

Status and Distribution : Winter visitor. Winters, throughout Indian union.

Habits and Habitat : Highly gregarious in winter. Cultivation, towns, villages, lakes and rivers in open country; usually near water in winter.

Food : Chiefly midges, gnats and other dipterous insects.

Breeding Season : Extralimital and also, chiefly mid April to end May in Kashmir, Himachal Pradesh and Garhwal Himalayas.

98. *Hirundo smithii* Leach, 1818

Wire-tailed Swallow

1972. *Hirundo smithii* : Ali & Ripley, H.B. No. 921, Vol. 5 : 63.

Status and Distribution : Resident with local movements. Widespread in peninsular India.

Habits and Habitat : Highly gregarious in winter. Open country, cultivation and habitations near lakes, rivers and canals; also wet paddy fields in summer.

Food : Mainly flying insects including Diptera.

Breeding Season : From March to September.

99. *Hirundo daurica* Linnaeus, 1771

Red-rumped Swallow

1972. *Hirundo daurica* : Ali & Ripley, H.B. No. 927, Vol. 5 : 70.

Status and Distribution : Resident with seasonal local movements. Throughout much of the Indian subcontinent. Also wintering population.

Habits and Habitat : Much less gregarious. Keeps in pairs, family parties or small flocks. Summer in upland cultivation and grassy hills, winters in open country and clearings in light deciduous forest, near archaeological ruins and rocky hills.

Food : Mainly flying insects.

Breeding Season : From April to August.

Family MOTACILLIDAE

100. *Motacilla alba* Linnaeus, 1758

White Wagtail

1973. *Motacilla alba* : Ali & Ripley, H.B. No. 1885, Vol. 9 : 288.

Status and Distribution : Winter visitor. Throughout peninsular India.

Habits and Habitat : Keeps singly, in pairs or in small loose flocks. Large numbers gather in the evenings to roost in red-beds, sugarcane or leafy trees. Winters near marshes, canals, lakes and rivers.

Food : Mainly insects.

Breeding Season : Extralimital.

101. *Motacilla maderaspatensis* Gmelin, 1789

Large Pied Wagtail

1973. *Motacilla maderaspatensis* : Ali & Ripley, H.B. No. 1891, Vol. 9 : 296.

Status and Distribution : Resident. Throughout peninsular India, from Himalayan foothills south through Kutch to Kanyakumari.

Habits and Habitat : Usually in pairs. Gather in flocks to roost in reeds or trees. Banks of rivers, pools, lakes, canals and around irrigation barrages.

Food : Mainly insects.

Breeding Season : From December to June in the Peninsula.

102. *Motacilla citreola* Pallas, 1776

Citrine Wagtail

1973. *Motacilla citreola* : Ali & Ripley, H.B. No. 1883, Vol. 9 : 284.

Status and Distribution : Winter visitor. Throughout northern India, south to kutch, Madhya Pradesh and east to Bengal, and Assam.

Habits and Habitat : Gregarious in winter. Keeps in scattered pairs or parties. Winters at freshwater wetlands, marshes and irrigated rice-fields.

Food : Mainly insects.

Breeding Season : Extralimital and also in Himalayas.

103. *Motacilla cinerea* Tunstall, 1771

Grey Wagtail

1973. *Motacilla cinerea* : Ali & Ripley, H.B. No. 1884, Vol. 9 : 285.

Status and Distribution : Winter visitor. Winters from Himalayan foothills to south throughout the Indian Peninsula.

Habits and Habitat : Keeps singly at all seasons, but in winter gather to roost in trees. Affects placid rocky streams and trickles in the plains and foothills. Rock pools in dry stony river beds.

Food : Chiefly insects.

Breeding Season : Extralimital.

104. *Anthus richardi* Vieillot, 1818
Richard's Pipit

1973. *Anthus richardi* : Ali & Ripley, H.B. No. 1857, Vol. 9 : 251.

Status and Distribution : Winter visitor. Throughout India.

Habits and Habitat : Keeps in pairs or small loose flocks. Affects cultivation, stubble fields, bare hillsides and sandy areas; preference for damp grassy ground-jheel margins.

Food : Beetles and other insects and larvae.

Breeding Season : Extralimital.

105. *Anthus rufulus* Vieillot, 1818
Paddy-field Pipit

1973. *Anthus rufulus* : Ali & Ripley, H.B. No. 1859, Vol. 9 : 253.

Status and Distribution : Resident with local movements. Eastern and Peninsular India.

Habits and Habitat : Keeps in pairs or small loose flocks. Affects open grass and stony country, fallow fields, low dry crops, edges of cultivation, roadsides, village grazing grounds.

Food : Beetles and other insects and larvae.

Breeding Season : From November to June.

106. *Anthus trivialis* (Linnaeus, 1758)
Eurasian Tree Pipit

1973. *Anthus trivialis* : Ali & Ripley, H.B. No. 1854, Vol. 9 : 246.

Status and Distribution : Winter visitor. The greater part of the Peninsular India from Himalayan foothills up to 1400 m.

Habits and Habitat : Keeps singly, in pairs or in small loose flocks in winter. Affects cultivation, stubble fields, shady country roads, and open country with a few trees, lowlands and open ground.

Food : Insects and grass- and weed seeds.

Breeding Season : Extralimital.

107. *Anthus hodgsoni* Richmond, 1907
Oriental Tree Pipit

1973. *Anthus hodgsoni* : Ali & Ripley, H.B. No. 1852, Vol. 9 : 243.

Status and Distribution : Winter visitor. The entire Peninsular India from Himalayan foothills.

Habits and Habitat : Keeps singly, in pairs or in loose flocks in winter. Affects grass and bracken-covered slopes, rocky ground and glades in open forest of oak, fir, pine. Abandoned cultivation and scrub with isolated trees. In winter common in coffee and cardamom plantations, evergreen woodland or in the lowlands. In north in the plains in mango groves.

Food : Insects and their larvae, grass- and weed seeds and other vegetable matter.

Breeding Season : Extralimital.

Family CAMPEPHAGIDAE
108. *Coracina macei* (Lesson, 1830)
Indian Large Cuckoo-Shrike

1971. *Coracina novaehollandiae macei* : Ali & Ripley, H.B. No. 1072, Vol. 6 : 14.

2001. *Coracina macei* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 14.

Status and Distribution : Resident with local movements in breeding season. Throughout peninsular India except northwest of a line from Kutch to Kumaon.

Habits and Habitat : Keeps in pairs or loose parties. Woodland, secondary forest, scrub, gardens, and groves.

Food : Insects, berries, and wild figs.

Breeding Season : From January to October.

109. *Tephrodornis pondicerianus* (Gmelin, 1789)
Common Woodshrike

1971. *Tephrodornis pondicerianus* : Ali & Ripley, H.B. No. 1070, Vol. 6 : 11.

Status and Distribution : Resident. Throughout India except parts of the northwest.

Habits and Habitat : Keeps in pairs or small parties of 5 or 6 birds. Lightly wooded country, secondary growth, avenues along side canals and roads, gardens and forest plantations.

Food : Insects and caterpillars.

Breeding Season : From March to July.

Family PYCNONOTIDAE

110. *Pycnonotus cafer* (Linnaeus, 1766)

Red-vented Bulbul

1971. *Pycnonotus cafer* : Ali & Ripley, H.B. No. 1127, Vol. 6 : 86.

Status and Distribution : Resident. NW India to Central India, Madhya Pradesh, south to a line running from Jagdalpur to Mumbai.

Habits and Habitat : Keeps in pairs or small parties. Deciduous forest, secondary growth, gardens, roadside avenues and light scrub.

Food : Fruits, berries and insects.

Breeding Season : Overall February to October, mostly during the monsoon.

Family IRENIDAE

111. *Aegithina tiphia* (Linnaeus, 1758)

Common Iora

1971. *Aegithina tiphia* : Ali & Ripley, H.B. No. 1099, Vol. 6 : 50.

Status and Distribution : Resident. From Saurashtra, plains of Uttar Pradesh, Bihar, south to 20°N Latitude, east to W. Bengal through Orissa and Madhya Pradesh.

Habits and Habitat : Keeps in pairs often in the mixed hunting parties. Open country, groves about villages, light deciduous forest.

Food : Insects and their larvae; spiders.

Breeding Season : From May to September.

Family LANIIDAE

112. *Lanius vittatus* Valenciennes, 1826

Bay-backed Shrike

1972. *Lanius vittatus* : Ali & Ripley, H.B. No. 940, Vol. 5 : 85.

Status and Distribution : Resident with seasonal movements. Mainly from NW India east to W. Bengal and south throughout most of the peninsula.

Habits and Habitat : Usually seen solitary or in separated pairs. Dry country, open scrub and bushes at the edge of cultivation and Acacia groves.

Food : Insects, caterpillars, small reptiles, mammals and birds.

Breeding Season : From February to September.

113. *Lanius schach* Linnacus, 1758
Rufous-backed Shrike

1972. *Lanius schach* : Ali & Ripley, H.B. No. 947, Vol. 5 : 96.

Status and Distribution : Resident with seasonal local movements and also winters. Throughout much of the peninsular India, extreme south to Saurashtra, Madhya Pradesh and Andhra Pradesh.

Habits and Habitat : Pugnacious, bold and rapacious. Keeps singly or in widely separated pairs. Bushes in cultivation, gardens, canal side and roadside tree plantations, orchards, open forest and tall grassland with scattered trees.

Food : Insects, small reptiles, mammals and birds.

Breeding Season : From May-July in Himalayas, March to June in plains.

114. *Lanius meridionalis* Temminck, 1820
Southern Grey Shrike

1972. *Lanius meridionalis* : Ali & Ripley, H.B. No. 933, Vol. 5 : 79.

Status and Distribution : Resident with local movements with winter dispersal. More or less entire peninsular India.

Habits and Habitat : Keeps singly or in widely separated pairs. Affects open semi-desert country, sparse scrub jungle, edges of desert cultivation, and thorn- and dry-deciduous forest.

Food : Entirely carnivorous- Insects: black ants and other Hymenoptera, caterpillars, also lizards, young rodents, and young or sickly birds.

Breeding Season : Overall January to October.

Family MUSCICAPIDAE
 Subfamily TURDINAE

115. *Monticola solitarius* (Linnacus, 1758)
Blue Rock-Thrush

1973. *Monticola solitarius* : Ali & Ripley, H.B. No. 1726, Vol. 9 : 73.

Status and Distribution : Winters from the Himalayan foothills to south throughout India.

Habits and Habitat : Solitary in winter, pairs in summer. Affects barren rocky hills, precipitous hillsides, boulder hillocks, cliffs and rocks along sea shore, quarries, brick kilns, precincts of villages, old forts, ruined or inhabited buildings.

Food : Chiefly insects, spiders and centipedes, lizards and small frogs.

Breeding Season : April to July.

116. *Copsychus saularis* (Linnaeus, 1758)
Oriental Magpie-Robin

1973. *Copsychus saularis* : Ali & Ripley, H.B. No. 1661, Vol. 8 : 239.

Status and Distribution : Resident. Most of India.

Habits and Habitat : Keep singly or in pairs. Mainly in gardens and groves, open dry forest and secondary growth.

Food : Insects and worms.

Breeding Season : From February to August.

117. *Saxicoloides fulicata* (Linnaeus, 1776)
Indian Robin

1973. *Saxicoloides fulicata* : Ali & Ripley, H.B. No. 1719, Vol. 9 : 62.

Status and Distribution : Resident. Central India from the Tapti river, southern Madhya Pradesh and Orissa south to the Krishna river; plains and hills up to 900 m.

Habits and Habitat : Keeps singly or in pairs. Affects gardens, groves, village precincts, boulder and cactus country, cultivation and open scrub jungle, and stony deciduous forest.

Food : Chiefly insects and their larvae.

Breeding Season : From end of February to July.

118. *Phoenicurus ochruros* (Gmelin, 1774)
Black Redstart

1973. *Phoenicurus ochruros* : Ali & Ripley, H.B. No. 1672, Vol. 8 : 255.

Status and Distribution : Wintering. Winters from Kumaon foothills south through the Peninsula.

Habits and Habitat : Solitary outside the breeding season. Affects stony, sparsely scrubbed, broken country, dry water-courses and the neighbourhood of villages and cultivation.

Food : Insects, largely small beetles.

Breeding Season : From May to August.

119. *Saxicola caprata* (Linnaeus, 1766)

Pied Bushchat

1973. *Saxicola caprata* : Ali & Ripley, H.B. No. 1701, Vol. 9 : 34.

Status and Distribution : Resident with seasonal movements. From Gujarat south to Karnataka and Tamil Nadu to the Cauvery river, east through Madhya Pradesh and NE India.

Habits and Habitat : Usually seen singly but invariably with its mate. Affects open fields, scrubland, cultivation; partial to hedges of *Agave*.

Food : Ants, beetles, larvae, and some vegetable matter.

Breeding Season : Overall March to August.

120. *Cercomela fusca* (Blyth, 1851)

Indian Chat

1973. *Cercomela fusca* : Ali & Ripley, H.B. No. 1692, Vol. 9 : 20.

Status and Distribution : Resident with some seasonal local movements. From the Punjab foothills south through eastern Rajasthan to northern Gujarat, Madhya Pradesh to the Narmada river.

Habits and Habitat : Keeps singly or in pairs. Affects boulder and scraps in rocky hills, ravines, quarries, ruins, old buildings, walls and bungalows in towns and suburbs.

Food : Beetles, ants and other insects.

Breeding Season : From February to August.

Subfamily TIMALIINAE

121. *Pomatorhinus horsfieldii* Sykes, 1832

Indian Scimitar-Babbler

1973. *Pomatorhinus schisticeps horsfieldii* : Ali & Ripley, H.B. No. 1173, Vol. 6 : 134.

2001. *Pomatorhinus horsfieldii* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 17.

Status and Distribution : Resident. Southern Gujarat from the Tapti river south through Maharashtra in the Western Ghats complex to Goa and northern Karnataka; eastern Orissa hills from about 21°N. lat. South through the Eastern Ghats complex.

Habits and Habitat : Very elusive. Found in pairs during the breeding season or in small parties of 4 to 10 birds. Affects bamboo patches, thorn scrub, dense bush jungle, deciduous and evergreen forest.

Food : Mainly insects, also berries and flower-nectar.

Breeding Season : From February to May.

122. *Chrysomma sinense* (Gmelin, 1789)
Yellow-eyed Babbler

1973. *Chrysomma sinense* : Ali & Ripley, H.B. No. 1231, Vol. 6 : 190.

Status and Distribution : Resident. India south and east of a line Nasik-Indore-Sagar-Gorakhpur.

Habits and Habitat : Very elusive. Keeps in small parties of 5 to 15 birds. Affects scrub, bush-clad grassy hillsides, secondary growth, tall grass and bushes, sugarcane fields, hedges and bamboo.

Food : Mainly insects, also berries and flower-nectar.

Breeding Season : From June to November, chiefly July and August.

123. *Turdoides caudatus* (Dumont, 1823)
Common Babbler

1973. *Turdoides caudatus* : Ali & Ripley, H.B. No. 1254, Vol. 6 : 215.

Status and Distribution : Resident. India from foothills of Dehra Dun and eastern Madhya Pradesh and the whole Peninsula.

Habits and Habitat : Keeps in flocks of 6 to 20 birds. Roosts at night. In semi-desert and dry plains and stony lower hills. Affects xerophytic thorn scrub jungle, sandy flood plains and ber bushes, etc.

Food : Mainly insects-and spiders, grains and berries, also nectar.

Breeding Season : Almost the entire year mostly March to July, extending into October.

124. *Turdoides malcolmi* (Sykes, 1832)**Large Grey Babbler**

1973. *Turdoides malcolmi* : Ali & Ripley, H.B. No. 1258, Vol. 6 : 220.

Status and Distribution : Resident. From Punjab South through Rajasthan to Kutch and Saurashtra, and south through the Peninsula.

Habits and Habitat : Very Gregarious, keeps in parties usually of five to twelve birds. Affects dry, open, sparsely scrubbed country, cultivation, city gardens and village environs.

Food : Mostly insects, also grains, seeds and berries. Sometimes ripening Jowar.

Breeding Season : From March to September.

125. *Turdoides striatus* (Dumont, 1823)**Peninsular Jungle Babbler**

1973. *Turdoides striatus* : Ali & Ripley, H.B. No. 1262, Vol. 6 : 226.

Status and Distribution : Resident. Gujarat and western half of Madhya Pradesh south through the Peninsula. In the plains and hills up to 1500 m.

Habits and Habitat : Very Gregarious, keeps in parties usually of six to twelve birds. Affects deciduous forest, bamboo and cultivation.

Food : Mostly insects, also grains, seeds and berries, nectar.

Breeding Season : From March to September.

Subfamily SYLVIINAE

126. *Cisticola juncidis* (Rafinesque, 1810)**Streaked Fantail-Warbler**

1973. *Cisticola juncidis* : Ali & Ripley, H.B. No. 1498, Vol. 8 : 33.

Status and Distribution : Resident with local movements. Himalayan foothills and south throughout much of the subcontinent, except parts of the northwest.

Habits and Habitat : Keeps singly or in loose 'colonies' of 10 to 15 birds. Wet paddy fields, dry and marshy grassland, crops of cereals, sugarcane.

Food : Insects, also spiders and rarely green tender seeds.

Breeding Season : From March to October.

127. *Prinia socialis* Sykes, 1832
Ashy Prinia

1973. *Prinia socialis* : Ali & Ripley, H.B. No. 1517, Vol. 8 : 59.

Status and Distribution : Resident and unevenly distributed. Entire Indian peninsula south of Narmada river, southern Madhya Pradesh and Bihar to Tamil Nadu and Kerala.

Habits and Habitat : Keeps singly or in pairs. Tall grass, Forest, scrub, reed beds and gardens, outskirts of cultivation, mangroves.

Food : Insects, larvae, spiders and flower nectar.

Breeding Season : From March to November; in central India mostly July-September.

128. *Prinia inornata* Sykes, 1832
Plain Prinia

1973. *Prinia subflava* : Ali & Ripley, H.B. No. 1511, Vol. 8 : 53.

2001. *Prinia inornata* : Manakadan & Pittie. *Buceros*, Vol. 6, (No.1) : 19.

Status and Distribution : Resident. Central India from Gangetic plain to W. Bengal and south to Tamil Nadu through Madhya Pradesh and Andhra Pradesh.

Habits and Habitat : Found in pairs or small parties. Paddy fields, marshes, canals, rivers, grassland, mixed bamboo and scrub jungle, mangrove and salt marshes.

Food : Insects, also flower nectar.

Breeding Season : From June to October.

129. *Acrocephalus dumetorum* Blyth, 1849
Blyth's Reed-Warbler

1973. *Acrocephalus dumetorum* : Ali & Ripley, H.B. No. 1556, Vol. 8 : 109.

Status and Distribution : Winter visitor. Throughout India.

Habits and Habitat : Keeps singly. Affects, bushes, hedges, orchards, gardens, bamboo clumps and grain fields near and away from water; in winter mostly found in deciduous biotope.

Food : Insects.

Breeding Season : Extralimital.

130. *Acrocephalus stentoreus* (Hemprich & Ehrenberg, 1833)**Indian Great Reed-Warbler**

1973. *Acrocephalus stentoreus* : Ali & Ripley, H.B. No. 1550, Vol. 8 : 101.

Status and Distribution : Winter visitor, passage migrant. Breeds mostly in northwestern India up to Rajasthan, West Khandesh (Tapti river) and sporadically elsewhere in the Peninsula. Winters over most of the subcontinent.

Habits and Habitat : Keeps singly or in pairs. Affects reed-beds and tall bushes around lakes, ponds, jheels and irrigation canals; on the Arabian sea coast mangrove swamps,

Food : Grasshoppers and other insects.

Breeding Season : Overall May to August, in Kashmir chiefly June and July. Also extralimital.

131. *Orthotomus sutorius* (Pennant, 1769)**Indian Tailor Bird**

1973. *Orthotomus sutorius* : Ali & Ripley, H.B. No. 1535, Vol. 8 : 81.

Status and Distribution : Resident. India from Himalayan foothills to Kanyakumari, except parts of the northeast.

Habits and Habitat : Found singly or in pairs. Tame and confiding near human dwellings. Gardens, edges of cultivation, deciduous scrub, forest edges, orchards and irrigated plantations.

Food : Mainly insects, larvae and also flower nectar.

Breeding Season : From March to December.

132. *Phylloscopus trochiloides* (Sundevall, 1837)**Greenish Leaf-Warbler**

1973. *Phylloscopus trochiloides* : Ali & Ripley, H.B. No. 1602, Vol. 8 : 166.

Status and Distribution : Winter visitor. Winters from Himalayan foothills south throughout the peninsular India.

Habits and Habitat : Keeps singly or among mixed foraging parties. Affects gardens, orchards, wooded compounds, lowland acacia groves, open deciduous and evergreen jungle.

Food : Insects.

Breeding Season : Extralimital.

133. *Phylloscopus occipitalis* (Blyth, 1845)
Western Crowned Warbler

1973. *Phylloscopus occipitalis* : Ali & Ripley, H.B. No. 1606, Vol. 8 : 172.

Status and Distribution : Winter visitor. Winters in the peninsular India from southern Gujarat and northwestern Maharashtra, Madhya Pradesh and Eastern Ghats.

Habits and Habitat : Keeps singly or in pairs, in parties up to 30 birds in winter. Affects moist-deciduous and evergreen biotope.

Food : Insects and spiders.

Breeding Season : Extralimital.

134. *Sylvia curruca* (Linnaeus, 1758)
Common Lesser Whitethroat

1973. *Sylvia curruca* : Ali & Ripley, H.B. No. 1567, Vol. 8 : 126.

Status and Distribution : Winter visitor and passage migrant. Winters from Himalayan foothills south throughout the peninsular India.

Habits and Habitat : Quite and unobtrusive. Keeps singly. Affects scrub jungle and undergrowth; in semi-desert biotope.

Food : Insects, also Babool and *Prosopis* nectar.

Breeding Season : Extralimital.

135. *Sylvia hortensis* (Gmelin, 1789)
Orphean warbler

1973. *Sylvia hortensis* : Ali & Ripley, H.B. No. 1565, Vol. 8 : 122.

Status and Distribution : Winter visitor. Indus valley, Uttar Pradesh east and south to Bihar, through Deccan, to Karnataka and Tamil Nadu.

Habits and Habitat : Very skulking. Affects semi-desert biotope, shrubs, stony country, and ravines with sparse vegetation.

Food : Mainly insects, and flower nectar.

Breeding Season : Extralimital.

Subfamily MUSCICAPINAE

136. *Muscicapa daurica* Pallas, 1811**Asian Brown Flycatcher**

1972. *Muscicapa latirostris* : Ali & Ripley, H.B. No. 1407, Vol. 7 : 145.

2001. *Muscicapa daurica* : Manakadan & Pittie. *Buceros*, Vol. 6, (No.1) : 21.

Status and Distribution : Winter visitor. Most of the peninsular India.

Habits and Habitat : More crepuscular than other flycatchers. Usually solitary, quite and very unobtrusive. Open, mixed deciduous forest, teak plantations, bamboo jungles, near streams.

Food : Chiefly dipterous insects.

Breeding Season : Extralimital. Also from May to July along Himalayan foothills, Vindhya Range and southern Western Ghats.

137. *Cyornis tickelliae* Blyth, 1843**Tickell's Blue-Flycatcher**

1972. *Muscicapa tickelliae* : Ali & Ripley, H.B. No. 1442, Vol. 7 : 193.

2001. *Cyornis tickelliae* : Manakadan & Pittie. *Buceros*, Vol. 6, (No.1) : 21.

Status and Distribution : Resident, showing local movements. The Indian peninsula from Uttar Pradesh, S. Bihar, SW West Bengal south to Kerala and west to a line from Kutch, Mt. Abu to Mussorree.

Habits and Habitat : More or less singly, often in mixed hunting parties. Thick bushes near or streams, deciduous scrub, bamboo jungles, village groves, gardens and orchards.

Food : Insects, chiefly dipterans.

Breeding Season : April to August.

Subfamily MONARCHINAE

138. *Terpsiphone paradisi* (Linnaeus, 1758)**Asian Paradise-Flycatcher**

1972. *Terpsiphone paradisi* : Ali & Ripley, H.B. No. 1461, Vol. 7 : 218.

Status and Distribution : Resident/partly Wintering in northern part. Indian peninsula from Kathiawar, western Rajasthan, Madhya Pradesh to southern peninsula to Kerala.

Habits and Habitat : Usually seen in pairs or mixed hunting parties. Forest and well wooded areas, bamboo clad nullahs, plantations and village groves, gardens and scrub.

Food : Winged insects.

Breeding Season : From March to August.

Subfamily RHIPIDURINAE

139. *Rhipidura albicollis* (Vieillot, 1818)

White-throated Fantail-Flycatcher

1972. *Rhipidura albicollis* : Ali & Ripley, H.B. No. 1458, Vol. 7 : 214.

Status and Distribution : Resident with local movements. Indian peninsula from Mt. Abu, Vindhya Ranges, Madhya Pradesh southward to Kerala.

Habits and Habitat : Keeps singly or in pairs. Forest, groves, secondary growth, ravines and gardens.

Food : Insects.

Breeding Season : From March to July occasionally extending upto September.

140. *Rhipidura aureola* Lesson, 1830

White-browed Fantail-Flycatcher

1972. *Rhipidura aureola* : Ali & Ripley, H.B. No. 1451, Vol. 7 : 207.

Status and Distribution : Resident, subject to local movements in winter. Himalayan foothills to W. Bengal and south through Gujarat, Madhya Pradesh, central Maharashtra and east to Orissa.

Habits and Habitat : Keeps singly or in pairs or family parties. Forest and wooded areas.

Food : Insects, chiefly diptera and hemiptera.

Breeding Season : From February to August, chiefly March to June.

Family PARIDAE

141. *Parus major* Linnaeus, 1758

Great Tit

1973. *Parus major* : Ali & Ripley, H.B. No. 1794, Vol. 9 : 169.

Status and Distribution : Resident, with local movements in winter. Peninsular India from central Rajasthan, Gujarat, Madhya Pradesh, to Orissa and south to Tamil Nadu.

Habits and Habitat : Keeps in pairs or in small-scattered parties. Deciduous forest, groves, trees, around cultivation and gardens.

Food : Insects, seeds, flower buds and berries.

Breeding Season : From February to November.

Family DICAEDIDAE
142. *Dicaeum agile* (Tickell, 1833)
Thick-billed Flowerpecker

1974. *Dicaeum agile* : Ali & Ripley, H.B. No. 1892, Vol. 10 : 2.

Status and Distribution : Resident. Throughout Indian subcontinent.

Habits and Habitat : Keeps singly or in pairs. Affects large flowering or fruiting trees and shrubs in a variety of biotopes-dry to moist-deciduous or semi-evergreen forest and cultivated country-orchards, village groves and suburban gardens.

Food : Chiefly figs of peepul, banyan, gulair and berries of lantana, also insects, spiders and flower, fruit nectar.

Breeding Season : Overall January to June.

Family NECTARINIIDAE
143. *Nectarinia zeylonica* (Linnaeus, 1766)
Indian Purple-rumped Sunbird

1974. *Nectarinia zeylonica* : Ali & Ripley, H.B. No. 1907, Vol. 10 : 22.

Status and Distribution : Resident. Peninsular India south of a line from Nasik (NW Maharashtra), Jabalpur (M.P.) and Lohardaga (Bihar) to southern Bengal.

Habits and Habitat : Usually keeps in pairs the year round. Territorial and very pugnacious, especially on its feeding tree. Affects scrub, light secondary jungle and dry cultivated country in the vicinity of villages with tamarind and Babool trees, cactus hedges and gardens; prefers deciduous biotope.

Food : Nectar of large-petalled flowers like *loranthus*, fleshy blossoms of mhowa.

Breeding Season : Entire year, from February to April in southern India.

144. *Nectarinia asiatica* (Latham, 1790)
Indian Purple Sunbird

1974. *Nectarinia asiatica* : Ali & Ripley, H.B. No. 1917, Vol. 10 : 35.

Status and Distribution : Resident with local movements. Throughout the Indian Union.

Habits and Habitat : Usually keeps singly or in pairs the year round. Pugnacious on its feeding tree. Affects light deciduous forest, semi-cultivation, gardens and compounds.

Food : Nectar of large-petalled flowers like *loranthus*, fleshy blossoms of mhowa.

Breeding Season : Entire year, from February to June in most parts of the Peninsula.

Family ZOSTEROPIDAE

145. *Zosterops palpebrosus* (Temminck, 1824)

Oriental White-eye

1974. *Zosterops palpebrosus* : Ali & Ripley, H.B. No. 1933, Vol. 10 : 57.

Status and Distribution : Resident subject to seasonal movements. Throughout the Indian subcontinent.

Habits and Habitat : Keeps in pairs or in parties comprising up to 50 birds or more. Entirely arboreal. Forest, groves, gardens, orchards and mangrove.

Food : Insects, caterpillars, berries, buds, seeds and nectar.

Breeding Season : From April to September, mainly June-July.

Family ESTRILDIDAE

146. *Lonchura malabarica* (Linnaeus, 1758)

White-throated Munia

1974. *Lonchura malabarica* : Ali & Ripley, H.B. No. 1966, Vol. 10 : 105.

Status and Distribution : Resident. Throughout India.

Habits and Habitat : Usually in flocks, up to 60 birds. Roosts in family parties of 5 or 6 huddled together in old nests. Cultivation, dry grassland, open thorn scrub and scrub desert.

Food : Seeds of grasses, also ants, beetles and other small insects.

Breeding Season : From January to March in Central India.

147. *Lonchura punctulata* (Linnaeus, 1758)

Indian Spotted Munia

1974. *Lonchura punctulata* : Ali & Ripley, H.B. No. 1974, Vol. 10 : 113.

Status and Distribution : Resident. Most of India except parts of northeast and northwest.

Habits and Habitat : Usually in flocks, up to 100 birds or more. Large congregations roost in lantana thickets, sugarcane fields. Affects open country with scrub and trees, bush-clad hill-sides, secondary jungle with patches of grassland, gardens and cultivation.

Food : Grass seeds, rice, lantana berries, etc.

Breeding Season : From May to September (chiefly during the monsoon).

Family PASSERIDAE
Subfamily PASSERINAE

148. *Passer domesticus* (Linnaeus, 1758)
House Sparrow

1974. *Passer domesticus* : Ali & Ripley, H.B. No. 1938, Vol. 10 : 63.

Status and Distribution : Resident with local movements. Throughout India.

Habits and Habitat : Keeps in pairs when breeding, otherwise in noisy flocks. Human habitation, cultivation and edge of forest.

Food : Mostly grass-and weed-seeds and cereal grains. Also fruit- and flower-buds, tender shoots, kitchen scraps and insects.

Breeding Season : Throughout the year.

149. *Petronia xanthocollis* (Burton, 1838)
Yellow-throated Sparrow

1974. *Petronia xanthocollis* : Ali & Ripley, H.B. No. 1949, Vol. 10 : 80.

Status and Distribution : Resident with marked local movements. Throughout India.

Habits and Habitat : Collects in flocks after breeding up to 100 birds. Open dry-deciduous forest, thorn scrub, groves, hedges and trees at the edge of cultivation and riverain forest.

Food : Rice and other cereal grains, grass-and weed-seeds, vegetable matter, lantana berries, ants, beetles and other insects.

Breeding Season : From February to May.

Subfamily PLOCEINAE
150. *Ploceus philippinus* (Linnaeus, 1766)
Baya Weaver

1974. *Ploceus philippinus* : Ali & Ripley, H.B. No. 1957, Vol. 10 : 88.

Status and Distribution : Resident subject to seasonal movements. Most of India and Himalayas up to 1200 m.

Habits and Habitat : Highly gregarious, keeps in flocks the year round and breeding in colonies. Roosts in swarms in swampy reed-beds and sugarcane fields. Cultivation, paddy fields, grassland and secondary scrub with scattered trees and mangroves.

Food : Chiefly grass-and weed-seeds, cereal grains (rice, jowar, bajra, etc), insects, spiders and flower nectar.

Breeding Season : Overall April to October.

Family STURNIDAE

151. *Sturnus pagodarum* (Gmelin, 1789)

Brahminy Starling

1972. *Sturnus pagodarum* : Ali & Ripley, H.B. No. 994, Vol. 5 : 160.

Status and Distribution : Resident with marked seasonal movements in monsoon. All over India.

Habits and Habitat : Sociable; less arboreal. Keeps in family parties of 4 to 7 banding into larger flocks where food is plenty and at the communal roosts. Roosts in large congregations in leafy trees and shrubs such as mango and palas or in reed-beds. Affects open deciduous forest and scrub jungle, and the neighbourhood of cultivation and human habitations, wooded urban gardens and compounds.

Food : Fruits and berries, fleshy flower petals of mhowa (*Madhuca indica*), flower nectar, and also insects.

Breeding Season : Overall February to September.

152. *Sturnus roseus* (Linnaeus, 1758)

Rosy Starling

1972. *Sturnus roseus* : Ali & Ripley, H.B. No. 996, Vol. 5 : 163.

Status and Distribution : Winter visitor. Throughout India, abundant in Gujarat and the Deccan.

Habits and Habitat : Keeps in small parties or large flocks, sometimes of swarm proportions. Affects open cultivation, grassland, and low thorn jungle in semi-desert. Avoids forest.

Food : Fruits and berries, flower nectar, cereal grains and insects, also centipedes, molluscs and spiders.

Breeding Season : Extralimital.

153. *Acridotheres tristis* (Linnaeus, 1766)
Common Myna

1972. *Acridotheres tristis* : Ali & Ripley, H.B. No. 1006, Vol. 5 : 177.

Status and Distribution : Resident. Throughout the Indian subcontinent.

Habits and Habitat : Along with the crow and sparrow a confirmed commensal of man. Sociable disposition, omnivorous and successful colonist. Except in breeding season keeps in family parties of 5 or 6 birds. Roosts communally in large leafy trees, coconut groves, reed-beds and sugarcane fields.

Food : Chiefly fruits, grains, insects and grubs, also small animals.

Breeding Season : Overall March to September.

Family ORIOLIDAE
154. *Oriolus oriolus* (Linnaeus, 1758)
Eurasian Golden Oriole

1972. *Oriolus oriolus* : Ali & Ripley, H.B. No. 953, Vol. 5 : 103.

Status and Distribution : Status difficult to define. Resident, wintering, local or seasonal visitor or extralimital passage migrant. Patchily breeding in North India and W. Bengal; migrating south into the Peninsula in winter.

Habits and Habitat : Keeps singly or in pairs. Chiefly arboreal. Affects well-wooded country, secondary deciduous and semi-evergreen forest, urban gardens, groves and orchards in cultivation and around villages.

Food : Wild figs, lantana and other berries, flower nectar, insects and caterpillars.

Breeding Season : Overall April to August.

Family DICRURIDAE
155. *Dicrurus macrocercus* Vieillot, 1817
Black Drongo

1972. *Dicrurus adsimilis macrocercus* : Ali & Ripley, H.B. No. 963, Vol. 5 : 117.

2001. *Dicrurus macrocercus* : Manakadan & Pittie, *Buceros*, Vol. 6, (No.1) : 25.

Status and Distribution : Resident with some seasonal, local migration. Throughout peninsular India south of a line from Kutch eastward through Madhya Pradesh, Orissa to southwest Bengal.

Habits and Habitat : Arboreal, usually seen singly. Open cultivation, around villages, towns and cities.

Food : Insects, flower nectar and occasionally small birds.

Breeding Season : From March to June.

156. *Dicrurus leucophaeus* Vieillot, 1817
Ashy Drongo

1972. *Dicrurus leucophaeus* : Ali & Ripley, H.B. No. 965, Vol. 5 : 119.

Status and Distribution : Winters in northern plains and peninsula east to west Bengal and south to Kerala.

Habits and Habitat : Keeps singly, in pairs or small noisy parties. Moist deciduous, semi-evergreen and pine forest, plantations, etc.

Food : Mainly insects, occasionally reptiles and small birds.

Breeding Season : Chiefly April to June. Breeds in Himalayas.

157. *Dicrurus caerulescens* (Linnaeus, 1758)
White-bellied Drongo

1972. *Dicrurus caerulescens* : Ali & Ripley, H.B. No. 967, Vol. 5 : 122.

Status and Distribution : Resident with some seasonal local movements. Throughout subcontinent.

Habits and Habitat : Keeps in noisy twos or threes. Clearings and edges of light forest, well wooded country, gardens and tea and rubber plantations.

Food : Insects and flower nectar.

Breeding Season : From March to June.

Family CORVIDAE

158. *Dendrocitta vagabunda* (Latham, 1790)
Indian Treepie

1972. *Dendrocitta vagabunda* : Ali & Ripley, H.B. No. 1031, Vol. 5 : 217.

Status and Distribution : Resident. The Himalayan submontane tract eastward to NEFA, southward through Assam, W. Bengal, Uttar Pradesh, Madhya Pradesh, Andhra Pradesh, Maharashtra south to 17°N Latitue.

Habits and Habitat : Social, arboreal and omnivorous. Keeps in noisy pairs or family parties of 4 or 5 birds. Open wooded country, moist deciduous biotype, gardens, groves and roadside avenues.

Food : Fruits, nectar, invertebrates, small animals, bird eggs and nestlings.

Breeding Season : From March to July.

**159. *Corvus splendens* Vieillot, 1817
Indian House Crow**

1972. *Corvus splendens* : Ali & Ripley, H.B. No. 1049, Vol. 5 : 244.

Status and Distribution : Resident and seasonal movements in northern cold-winter areas. Throughout India except parts of Himalayas.

Habits and Habitat : Commensal of man. A municipal scavenger. Roosts communally near human habitation in villages, towns and cities.

Food : Grains, fruits, Invertebrates, nestlings, lizard and small rodents; practically everything.

Breeding Season : From March-April and July to August.

**160. *Corvus macrorhynchos* Wagler, 1827
Jungle Crow**

1972. *Corvus macrorhynchos* : Ali & Ripley, H.B. No. 1057, Vol. 5 : 256.

Status and Distribution : Resident. Most of India, south to Kanyakumari.

Habits and Habitat : Less gregarious and sociable than House crow, keeps singly or in pairs and small scattered parties. Roosts communally around human habitation, - in well-wooded country and at forest edges.

Food : Grain, Invertebrates, carrion and practically everything.

Breeding Season : From February to June.

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REPTILIA

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INTRODUCTION

Following is the systematic list of reptilian species possibly occurring in Lonar Wildlife Sanctuary region and its surrounding environs of Buldhana district in Maharashtra State. Present list is based on the material collected & species sighted during 1997-2000 and also on the available bibliographic records (Deoras, 1976, Daniel, 1983; Sharma, 1998, 2002 and 2003; Whitaker and Captain 2004).

SYSTEMATIC LIST OF REPTILIAN SPECIES POSSIBLY OCCURRING IN LONAR WILDLIFE REGION AND ITS SURROUNDINGS, DIST. BULDHANA, MAHARASHTRA STATE

(*Asterisk indicates species actually collected and/or sighted during project period)

Phylum CHORDATA

Class REPTILIA

Order TESTUDINES (CHELONIA)

Suborder CRYPTODIRA

Family EMYDIDAE (BATAGURIDAE)

1. Indian Pond Terrapin or Indian Snail-Eating Turtle : *Melanochelys trijuga trijuga* (Schweigger)

Family TESTUDINIDAE

2. Star Tortoise or Indian Starred Tortoise : *Geochelone elegans* (Schoepff)

Order SQUAMATA

Suborder SAURIA (LACERTILIA)

Family GEKKONIDAE

3. Small Gecko : *Hemidactylus gracilis* Blanford

4. Reticulated Gecko : *Hemidactylus reticulatus* Beddome
5. Ticticky House Gecko : *Hemidactylus frenatus* Schlegel
6. Common Bark Gecko : *Hemidactylus leschenaulti* Dum. & Bibr.
- * 7. Yellow-Bellied House Gecko : *Hemidactylus flaviviridis* Ruppell
8. Colourful Gecko : *Hemidactylus triedrus* (Daudin)
- * 9. Spotted House Gecko : *Hemidactylus brooki* Gray

Family AGAMIDAE

- *10. India Fan-Throated Lizard : *Sitana ponticeriana* Cuvier
- *11. Indian Garden Lizard : *Calotes versicolor* (Daudin)

Family CHAMAELEONIDAE

- *12. Indian Chamaeleon : *Chamaeleo zeylanicus* Laurenti

Family SCINCIDAE

13. Bornzy Grass Skink : *Mabuya macularia* (Blyth)
- *14. Common Indian Skink : *Mabuya carinata* (Schneider)
- *15. Five Striped Skink : *Mabuya trivittata* (Hardwicke & Gray)

Family LACERTIDAE

16. Jerdon's Snake-Eyed Lacerta : *Ophisops jerdoni* Blyth

Family VARANIDAE

17. Common Indian Monitor Lizard : *Varanus bengalensis* (Daudin)

Suborder SERPENTES (OPHIDIA)

Family TYPHLOPIDAE

- *18. Common Worm or Blind Snake : *Ramphotyphlops braminus* (Daudin) = *Typhlops braminus* (Daudin)
19. Slender Worm or Blind Snake : *Typhlops porrectus* Stoliczka
20. Beaked Worm or Blind Snake : *Typhlops acutus* (Dum. & Bibr.) = *Grypotyphlops acutus* (Dum. & Bibr.)

Family BOIDAE

21. Common or Russel's Sand Boa : *Eryx conicus* (Schneider) = *Gongylophis conicus* (Schneider)
22. Indian or Red Sand or John's Sand Boa : *Eryx johani johani* (Russell)

Family COLUBRIDAE
Subfamily COLUBRINA

- *23. Common Trinket Snake : *Elaphe helena* (Daudin) = *Coelognathus helena* (Daudin)
- *24. Indian Rat Snake or Dhaman : *Ptyas mucosus* (Linnaeus)
- 25. Banded Racer : *Argyrogena fasciolatus* (Shaw)
- 26. Russell's Kukri Snake : *Oligodon taeniolatus* (Jerdon)
- 27. Common Kukri Snake : *Oligodon arnensis* (Shaw)
- 28. Painted Bronzeback Bronzeback Tree snake : *Dendrelaphis pictus* (Gmelin) = *Ahaetulla ahaetulla* (Linnaeus)
- 29. Common Bronze-Back Tree Snake : *Dendrelaphis tristis* (Daudin)
- 30. Northern or Barred Wolf Snake : *Lycodon striatus* (Shaw)
- 31. Common Wolf Snake : *Lycodon aulicus* (Linnaeus)
- 32. Light Brown or Dumeril's Black-headed Snake : *Sibynophis subpunctatus* (Dum. & Bibr.)
- 33. Striped Keelback : *Amphiesma stolata* (Linnaeus) = *Natrix stolata* (Linnaeus)
- *34. Checkered Keelback : *Xenochrophis piscator* (Schneider) = *Natrix piscator* (Schneider)
- 35. Green Keelback : *Macropisthodon plumbicolor* (Cantor)
- 36. Indian Gamma or Common Cat Snake : *Boiga trigonata* (Schneider)
- 37. Indian Sand or Condanarus Sand Snake : *Psammophis condanarus* (Merrem)
- 38. Stout Sand Snake : *Psammophis longifrons* (Boulenger)
- 39. Indian Ribbon or Leith's Sand Snake : *Psammophis leithi* (Gunther)
- *40. Common Green Whip or Vine Snake : *Ahaetulla nasutus* Lacep.

Family ELAPIDAE

- 41. Common Indian Krait : *Bungarus caeruleus* (Schneider)
- 42. Slender Coral Snake : *Callophis melanurus* (Shaw)
- *43. Spectacled Indian Cobra : *Naja naja naja* (Linnaeus)

Family VIPERIDAE
Subfamily VIPERINAE

- 44. Russell's Viper or Daboia : *Vipera russelli* (Shaw) = *Daboia russelii* (Shaw)
- *45. Saw-scaled Viper or Phoorsa : *Echis carinatus* (Schneider)

Subfamily CROTALINAE

- 46. Bamboo Pit Viper : *Trimeresurus gramineus* (Shaw)

SUMMARY

The above-mentioned systematic list of reptilian species reports possible occurrence of 46 species/subspecies in Lonar Wildlife Sanctuary region. Out of these 46, fourteen species have been sighted and/or collected during the study period while the rest have been listed after consulting the bibliographic records. The list clearly indicates that Lonar Wildlife Sanctuary area possesses a fairly good representation of reptilian species.

If the species are sorted out in various categories given in Table 1, it will be seen that 46 species/subspecies of 32 genera belonging to 13 families of three sub-orders grouped under two reptilian orders can be reported from this region. The snake and lizard diversities are apparently well expressed due to the semi-arid and drier climatic conditions of the region.

Table 1 : Reptilian Diversity in Lonar Wildlife Sanctuary

Sr. No.	Orders	Suborders	Families	Genera	Species
1.	Order:TESTUDINES (CHELONIA) Suborder: CRYPTODIRA (TURTLES & TORTOISES)	1	2	2	2
2.	Order : SQUAMATA Suborder : (LACERTILIA) (LIZARDS)	1	6	7	15
3.	Order : SQUAMATA Suborder : (SERPENTES/ OPHIDIA) (SNAKES)	1	5	23	29
	TOTAL	3	13	32	46

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AMPHIBIANS

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INTRODUCTION

The present study was undertaken to study the amphibian fauna of Lonar sanctuary. In India the work on amphibians has been started by Boulenger (1890), thereafter a number of workers studied the amphibians in the Indian region viz. Inger & Dutta (1986), Chanda (1994), and Dutta 1997. Daniel (1963 a,b), 1975 and Daniel & Sekar 1989, in their field guide to the Amphibians of Western India, have listed 29 species of amphibians from the western ghat section of the Maharashtra state with details of identification. Ravichandran and Pillay (1990) have recorded the occurrence of 16 species of amphibians from Maharashtra including 1 new species. Sekar (1999) has enlisted 34 species of amphibians from Maharashtra. Padhye and Ghate (2002) have given 43 species of amphibia from Maharashtra. Kamble (2002, 2005a, 2005b) has given the occurrence of 11 species of Amphibians from Ujani Wetland, 7 species from Nathsagar wetland (district Aurangabad and Ahmednagar) and 8 species from Melghat Tiger project (district Amravati). There is no record of any amphibians from the Lonar sanctuary, however records of amphibians from neighbouring districts viz. Amravati (Melghat tiger project) and Aurangabad (Nathsagar wetland) were taken into consideration while preparing the list of amphibians found in this region.

1. Systematic list of Amphibian species from Lonar sanctuary dist. Beed.

Phylum Chordata
Class Amphibia
Order Anura
Family Bufonidae

1. *Bufo melanostictus* Schn.

Family Microhylidae

2. *Microhyla ornata* (Dum. & Bibr.)

Family Ranidae

3. *Euphlyctis cyanophlyctis* (Schn.)
4. *Fejervarya limnocharis* (Gravenhorst)
5. *Hoplobatrachus tigerinus* Daudin 1ex.
6. *Sphaerotheca breviceps* (Schn.)

Family Rhacophoridae

- vii) *Polypedates maculatus* (Gray)

SYSTEMATIC ACCOUNT

Family BUFONIDAE

1. *Bufo melanostictus* Schn
Common Indian Toad

Material examined : Source - Kamble (2005a, 2005b)

Diagnostic Characters : Snout to vent length between 60 to 75mm. Head, upper lip, tips of fingers, toes and metatarsal tubercles with prominent bony ridges. Tympanum 2/3 diameter of the eye. Skin with spine tipped warts. Colour of the dorsal side varying from grayish to brownish. Venter whitish with black striplings on the chin. Toes about ½ webbed with small subarticular tubercles. Inner metatarsal tubercle large and elliptical, outer metatarsal tubercle small.

Distribution : Throughout the Indian subcontinent and Malaysia.

Family MICROHYLIDAE

2. *Microhyla ornata* Dumeril & Bibr.
Ornate Microhylid

Material examined : Source - Kamble (2005a, 2005b).

Diagnostic Characters : Size small, snout to vent length about 25-28 mm. Dorsal surface reddish brown with a characteristic marking on the back giving it an ornate look. Throat and chest whitish. Toes webbed feebly. Subarticular tubercles small and distinct. Tibio-tarsal articulation reaches between the shoulder and the eye. Inner and outer metatarsal tubercles are small and round.

Distribution : Throughout Southeast Asia.

Family RANIDAE

3. *Euphlyctis cyanophlyctis* (Schn.)**Skipper Frog**

Materials examined : Source - Kamble (2005a, 2005b).

Diagnostic Characters : Medium sized frogs of 40 to 50 mm snout to vent length. Tympanum about two-thirds the diameter of the eye. Tibiotarsal articulation reaches between the eye and the nostril. Toe tips swollen and rounded, toes fully webbed, a line of porous warts on the flanks. Inner metatarsal tubercle finger like, outer metatarsal tubercle absent. Skin warty dorsally, a 'U' shaped line of warts around anus, ventrally smooth. Colour green above with darker marblings, ventrally white.

Distribution : Throughout the Indian Union.

4. *Fejervarya limnocharis* (Gravenhorst.)**Indian Cricket Frog**

Material examined : Source - Kamble (2005a, 2005b).

Diagnostic Characters : Small to medium sized frogs. Toes are half webbed. Tympanum half the diameter of the eye. Tibiotarsal articulation reaches the nostril when the legs are held alongside of the body. Subarticular tubercles small, both inner and outer metatarsal tubercles present. Skin warty above, grayish or brownish coloured with darker markings and a dorsal vertebral band.

Distribution : Throughout the Indian Union.

5. *Hoplobatrachus tigerinus* (Daudin)**Indian bull frog**

Material examined : Temple near crater lake 2 exs. 23 Sept 2003, Dr. S.G. Patil.

Diagnostic Characters : Large sized amphibians, snout to vent length 120 mm. Skin with longitudinal folds dorsally, ventrally smooth. Tympanum equal to the eye in diameter. Fingers moderately long and obtusely pointed. Heels overlap strongly when the hindlimbs are folded. Toes fully webbed and with swollen tips. Inner metatarsal tubercle obtusely pointed, no outer metatarsal tubercle. Colour olive green above with a vertebral streak in some specimens, limbs spotted, ventrally white.

Distribution : Throughout the Indian union except Meghalaya; Nepal, Pakistan and Bangladesh.

6. *Sphaerotheca breviceps* (Schnieder.)
Indian Burrowing Frog

Materials examined : Source - Kamble (2005a, 2005b).

Diagnostic Characters : Medium sized Frogs. Snout short and rounded. Tympanum is $\frac{3}{5}$ the diameter of the eye. First finger is longer than the second finger. Tibiotarsal articulation reaching the shoulder when the leg is held by the side of the body. Toes are $\frac{3}{4}$ webbed. Inner metatarsal tubercle strong, large, crescent shaped and equal in length to the inner toe. Skin smooth or finely granular on the back, coarsely granular on the belly and thighs. Colour grayish above with white marblings. Thighs marbled with yellow ventrally, throat sometimes brownish, rest of the venter white.

Distribution : Throughout the Indian Peninsula, Nepal, Myanmar, Shri Lanka.

Family RHACHOPHORIDAE

7. *Polypedates maculatus* (Gray.)
Common Tree Frog

Material examined : Source - Kamble (2005a, 2005b).

Diagnostic Characters : Slender frog of a medium size of about 35 to 45 mm. Vomerine teeth are present in two equal rows. Tympanum is $\frac{3}{4}$ th the diameter of the eye. First finger equal to the second. Toes are $\frac{3}{4}$ th webbed. Tips of the fingertips and toes with discs inner metatarsal tubercle oval and prominent. Skin smooth above and granular on belly and thighs. Colour yellowish white above with darker spots, ventrally dull white. Lanka.

Distribution : Throughout India, Except Haryana, Punjab and Rajasthan

SUMMARY

The water in the crater lake of Lonar is highly saline therefore there are no amphibians present in the lake as such. However the surrounding area of the crater has a fairly good amount of vegetation and some freshwater streams which supports the amphibian fauna. The area in general is dry and arid. There are 7 species of amphibians belonging to 4 families and 7 genera.

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MOLLUSCA

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INTRODUCTION

The important studies on Indian non marine Mollusca were made by several earlier worker like Blanford & Godwin Austin, (1908), Gude, (1914 & 1921) and Preston, (1915), Subba Rao (1989) and recently by Ramakrishna & A. Dey (2007) on Indian freshwater Mollusca. Many workers attempted to study the Molluscan fauna of Maharashtra like Annandale and Prasad (1919), Hora (1926), Subba Rao & Mitra (1979), Tonapi (1971), Tonapi and Mulherkar (1963), Surya Rao *et. al.* (2002). Patil & Ramakrishna (2004) studied freshwater Mollusca of Pench National Park, district Nagpur. However, the present area of Lonar Crater Lake Wild Life Sanctuary, dist. Buldana was not surveyed earlier hence it was thought to survey this conservation area. In all 14 species belonging to 11 genera, 9 families and 4 Orders have been studied.

GENERAL ACCOUNT OF LAKE & LONAR WILD LIFE SANCTUARY

Lonar crater is believed to be formed out of the impact of a large meteoric body, about some 50 to 60 thousand years ago. In the recent times, considering the importance and uniqueness of this crater, the Government of Maharashtra had declared the area including the crater and its periphery as a Wildlife Sanctuary. Lonar wildlife sanctuary comprises a total area of 383.32 hectares, around the Lonar Crater, which is one of the world's five largest craters and third largest natural saltwater lake. It is situated in the Buldhana district of Maharashtra, about 165 km away from Aurangabad (19° 59' N: 76° 34' E). The lake water is salty and highly alkaline. It holds a unique micro ecosystem and biota besides supporting large number of fauna and flora in the forested tracts in and around the crater. Maharashtra State has declared the crater and the adjacent forest areas as Lonar Wild life sanctuary, vide their order No. WLP/1089/FK A8/F1 dtd. 8 th June 2000 in order to protect the fauna and flora of this unique ecosystem. Lonar crater is the only natural hypervelocity-impact crater in basaltic rock in the world.

Physical characteristics of Lonar Crater : The Lonar crater has almost a circular outline with a diameter of 1830 meter and a depth of 150 metre with steep vertical sides. It has a

raised rim characteristic of meteorite craters rising to a height of 20 meters above the surrounding ground level. The crater has the five following distinguishable zones.

The outermost ejecta blanket or the slightly elevated periphery of the crater was formed by the molten lava which was ejected out of the crater as a result of the meteorite impact.

The crater rim or an elevated crest around the crater resulted from the upward lifting of rock beds due to the impact.

Lonar crater is a deep circular open depression with its rocky walls having steep slopes of about 60° to the ground. The rain water has accumulated in the crater for years and it has no exit. Annual loss of the water occurs only through evaporation. The lake is confined from all the sides by the walls of the crater and there is not a single channel of water draining away from it, thereby leaving the lake water stagnant for thousands of years. The lake is never known to have dried up completely except in the year 1971. The most striking feature of the lake water is its extreme salinity and high alkalinity (PH reaches the mark of 11). The salinity and the alkalinity of this inland lake are attributed to several causes, which were discussed differently by scientists. The evidence obtained from the analysis of the country rocks, feeder springs, lake water and silts suggest that the alkalinity of the lake is due to the underground springs feeding the lake. These influents while passing through the volcanic rocks, which are sources of sodium salts, dissolve the soluble salts and bring them to the lake. Evaporation and interactions of the salts in the lake water aided by the inorganic compounds added by the rain and organisms growing in the lake have resulted in the concentration of salts found today in this closed ecosystem. About 30 years back, the water level in summer almost exposed the bottom of the crater and concentration of the salts yielded solid deposits in form of cakes, which had local commercial value. Pinch of this salt was used in preparation of dried "Papads" and the salt was known as "Papad Khar"

LIST OF MOLLUSCA

Phylum MOLLUSCA
 Class GASTROPODA
 Subclass PROSOBRANCHIA
 Order MESOGASTROPODA
 Family VIVIPARIDAE
 Subfamily BELLAMYINAE

1. *Bellamya bengalensis f. typica* (Lamarck)
2. *B. bengalensis f. annandalei*, (Kobelt)
3. *B. dissimilis* (Mueller)

Family BYTHYNIIDAE
Subfamily BYTHYNIEINAE

4. *Bithynia (Digoniostoma) pulchella* (Benson)

Family THIARIDAE
Subfamily THIARINAE

5. *Tarebia lineata* (Gray)

6. *Melanoides tuberculata* (Mueller)

Order BASOMMATOPHORA
Family LYMNAEIDAE

7. *Lymnaea (P) luteola typica* Lamarck

Family BULLINIDAE

8. *Indoplanorbis exustus* (Deshayes)

Family PLANORBIDAE

9. *Gyraulus convexiusculus* (Hutton)

Class BIVALVIA
Order TRIGOINOIDA
Family UNIONIDAE
Subfamily AMBLEMINAE

- 10*. *Lamellidens consobrinus* Lea

11. *Parreysia (P) favidens* (Benson)

Order VENEROIDA
Family CORBICULIDAE

12. *Corbicula striatella* Deshayes

LAND MOLLUSCA

Class GASTROPODA
Order STYLOMMATOPHORA
Family ARIOPHANTIDAE
Subfamily ARIOPHANTINAE

13. *Ariophanta laevipes* (Mueller)

14. *Ariophanta bajadera* (Pfeiffer)

SYSTEMATICS ACCOUNT

Class GASTROPODA
 Order MESOGASTROPODA
 Family VIVIPARIDAE
 Genus *Bellamya* Jousseaum 1886

1. *Bellamya bengalensis f. typica* (Lamarck)

1822. *Paludina bengalensis* Lamarck, *Hist. nat. Anim. Sans. Vert.*, 6, 2 : 174.

1921. *Vivipara bengalensis* : Annandale, *Rec. Indian. Mus.*, 22 : 267.

Material Examined : 50 exs., Lonar Crater Lake Wild Life Sanctuary, Date 16-2-2003, Coll. D.B. Bastawade.

Distribution : India : Maharashtra : Buldana dist. Lonar Crater Wild Life Sanctuary Amaravati dist., Melghat Tiger Reserve, Pench National Park, Nagpur dist., Tadoba Andhari Tiger Reserve Chandrapur dist, Ujani Wetland, Solapur dist. common through out rest of India.

Elsewhere : Bangladesh, Myanmar, Sri Lanka.

Remarks : Body whorl perfectly rounded with a conical spires aperture subcircular.

2. *Bellamya bengalensis f. annandalei* (Kobelt)

1909. *Vivipara annandalei*, Kobelt, *Nachar. Malak. gesell.*, Frunkfurt, 60 : 161-162.

1980. *Vivipara bengalensis* race *annandale* : Annandale & Sewell, *Rec. Indian Mus.*, Calcutta, 22 : 276, pl. 2, figs. 5-8.

Material examined : 10exs., Lonar Crater Wild Life Sanctuary, Date 29-9-2003, Coll. S.G. Patil

Distribution : Maharastra : Buldana dist. : Lonar Crater Wild Life Sanctuary, Chandrapur dist. : Tadoba Andhari Tiger reserve, Nagpur dist : Pench National Park; Orissa, Rajasthan, Bihar, West Bengal, Andhra Pradesh and Tamil Nadu.

3. *Bellamya dissimilis* (Mueller)

1980. *Nerita dissimilis* Muller, *Hist. Verm., Terr, Fluv.*, 2, 184.

1960. *Viviparus dissimilis*, Satyamurti, *Bull. Madras Govt. Mus.*, 6(4) : 33-34.

Material examined : 8 exs., Lonar Crater Wild Life Sanctuary, Date 18-2-2002., Coll. P.P. Kulkarni, 25 exs., Lonar Crater Wildlife Sanctuary, date 25-9-2003, Coll. S.G. Patil.

Distribution : Maharastra : Buldana Dist. : Lonar Crater Wildlife Sanctuary, Chandrapur Dist. : Tadoba Andhari Tiger Reserve, Nagpur Dist. : Pench National Park; Orissa, West Bengal, Penninsular and Northern India.

Remarks : Body whorl subangulate at the periphery.

Family BYTHYNIIDAE
Subfamily BITHYNIINAE
Genus *Bithynia* Leach, 1818

4. *Bithynia (Digoniostoma) pulchella* (Benson)

1960. *Paludina pulchella* Benson 1836, *J. Asiat. Soc. Beng.*, 5 : 746.

Type locality : Mirzapur U.P. Hanley and Theobald, *Conch*, India pl. 38, fig.

1921. *Digoniostoma pulchella*, Annandale, *Rec. Indian. Mus.*, 22 : 541.

Material examined : 5exs, Lonar Crater Lake Wildlife Sanctury, Date 18-2-2002, Coll. P.P. Kulkarni., 5 exs., Lonar Crater Lake Wildlife Sactuary Buldana dist.

Distribution : Maharashtra : Buldana Dist. : Lonar Crater wildlife Sanctuary, Nagpur Dist. : Pench National Park, common throughout including Maharashtra as above.

Family THIARIDAE
Subfamily THIARINAE
Genus *Thiara* Roeding, 1798
5. *Tarebia lineata* (Gray)

1921. *Helix lineata* Gray, 1828 in wood's Index Test supp., p. 24, fig. 68. **Type locality** : Ganges.

1921. *Thiara (Tarebia) lineata* : Preston, 1915, *Fauna British India. Mollusca* (Freshwater Gastropoda and Pelecypoda), p.34.

Material examined : 2 exs, Lonar Crater Lake Wild Life Sanctuary Buldana, Date 18-2-2002, 1ex, Lonar Crater WildLife Sanctuary, Date 16-2-2003, D.B. Bastawade.

Distribution : Maharashtra : Buldana dist. : Lonar Crater Wildlife Sanctuary, Chandrapur Dist. : Tadoba Andhari Tiger Reserve, West Bengal, Bihar, Madhya Pradesh, Uttar Pradesh, Assam.

Elsewhere : Myanmar, Bhutan; Sri Lanka.

Remarks : Absence of rows of nodules and presence of distinct dark spiral lines.

6. *Melanoides tuberculata* (Muller)

1921. *Nerita tuberculata* Mueller, 1874. *Hist. verm Torr Fluv.*, 2 : 191.

Type locality : Coromandel coast.

1921. *Melania pyramis* Benson, 1836. *J. Asiat. Soc. Beng.* 5, 357.

Type locality : Ganges.

1989. *Thiara (Melanoides) tuberculata* : Subba Rao, *Hand book Freshwater Molluscs of India* p. 103.

Material examined : 2 exs., Lonar Crater Wildlife Sanctuary, date 26-9-2003, Coll. S.G. Patil.

Distribution : Maharashtra : Buldana Dist. : Lonar Crater Wildlife Sanctuary, Amaravati Dist. : Melghat Tiger Reserve, Chandrapur Dist. : Tadoba Andhari Tiger Reserve, Nagpur Dist. : Pench National Park, Solapur Dist. : Ujani Wetland, throughout India except Kashmir.

Elsewhere : North and South Africa, Eastern Mediterranean countries, South east Asia, Southern China, Malaysia, Malay Archipelago, North Australia, various Pacific Islands and North to Ryukyu Islands of Japan, New Hebrides.

Remarks : Shells are typically narrowly elongate and distinctly sculptured with rounded whorls vertical ribs and spiral striae and also with dark brown dots or streaks here and there. These shells collected from stagnant water ponds slightly differ from those collected from sandy beds.

Family LYMNAEDAE Genus *Lymnaea* LAMARCK, 1799

7. *Lymnaea (Pseudosuccinea) luteola* f. *typica* Lamarck

1882. *Limnaea luteola* Lamarck, 1882, *Hist. nat. Anim. Sans Vert.*, 6 pt 2; 160.

1925. *Limnaea (Pseudosuccinea) luteola* : Annandale & Rao 1925, *Rec. Indian Mu*

Material examined : 4 exs, Lonar Crater Lake Wild Life Sanctuary, Date 18-2-2002, Coll. P.P. Kulkarni.

Distribution : Maharashtra : Buldana Dist. : Lonar Crater Lake Wild Life Sanctuary, Amravati Dist. : Melghat Tiger Reserve, Nagpur Dist. : Pench National Park, Chandrapur Dist. : Tadoba Andhari Tiger Reserve, common throughout.

Family BULLINIDAE
Genus *Indoplanorbis* Annandale & Prashad, 1921
8. *Indoplanorbis exustus* (Deshayes, 1834)

1834. *Planorbis exustus* Deshayes, 1834, in Belanger, *Voy Indes. orientalis*, p. 417, pl.1, figs.11-13.

Type locality : Malabar coast.

1956. *Indoplanorbis exustus* Benthem Jutting, *Treubia*, 23(2) 471 Rajgopal and Subba Rao, 1968. *Proc. Symposium on Mollusca*, pl.1, p.110.

Material examined : 5 exs., Lonar Crater Wildlife Sanctuary, Date 18-2-2002 Coll. P.P. Kulkarni.

Distribution : Maharashtra : Dist. Buldana : Lonar Crater Wild Life Sanctuary, Amaravati Dist. : Melghat Tiger Reserve, Chandrapur Dist. : Tadoba Andhari Tiger Reserve, Nagpur Dist. : Pench National Park. Throughout the plains of India, Jammu and Kashmir.

Elsewhere : Pakistan, Persia, Sri Lanka, Myanmar, Malaya, Indo China, Thailand, Sumatra, Java, Celebes.

Remarks : This species is a known vector snail is implicated as intermediate host for the largest number of parasites.

Family PLANORBIDAE
Subfamily PLANORBINAE
Genus *Gyraulus* Charpentier, 1837

9. *Gyraulus convexiusculus* (Hutton)

1849. *Planorbis convexiusculus* Hutton 1849, *J. Asiat. Soc. Bengal*; 18(2) : 657.

Type locality : Afghanistan.

1956. *Gyraulus convexiusculus* Benthem Jutting, *Treubia*, 23(2) : 463.

Material examined : 2 exs. Lonar Crater Wildlife Sanctuary, Date 26-9-03, Coll. S.G. Patil.

Distribution : India : Buldhana Dist. : Lonar Crater wild life Sanctuary. Common throughout, including Chandrapur Dist. : Tadoba Andhari Tiger Reserve.

Elsewhere : Extends from Iran to Philippines.

Remarks : Maximum diameter, rarely exceeds 5 mm., whorls 4 or 5 rounded, suture well defined periphery subangulate, closely and obliquely striate, umbilicus wide, all the whorls distinctly seen above, aperture ovate lunate.

Class BIVALVIA
 Order TRIGONOIDA
 Family UNIONIDAE
 Subfamily AMBLEMINEAE

Genus *Lamellidens* Simpson, 1900
 10. *Lamellidens consorbrinus* (Lea)

1859. *Unio consorbrinus* Lea, 1859, *Proc. Acad. Nat. Sci. Philad.* 3 : 331.

Type locality : China.

1921. *Lamellidens consorbrinus* : Prashad, 1921, *Rec. Indian. Mus.*, 22 : 608.

Material Examined : 3 exs, Lonar Crater Wild life Sanctuary Date 29-9-03 Coll. S.G. Patil.

Distribution : Maharashtra : Buldhana Dist. : Lonar Crater Wildlife Sanctuary, Nagpur Dist. : Pench National Park, Amravati Dist. : Melghat Tiger Project, Maharashtra, India and Sri Lanka.

Remarks : Shell rhomboidal, thick, umbones more inflated than in *L. marginalis*, dorsal margin curved and obliquely truncate, posterior side obtusely angled, anterior side rounded, left valves with two ragged cardinal

Genus *Parreysia* Conrad, 1858
 11. *Parreysia (Parreysia) favidens* (Benson)

1860. *Unio favidens* Benson, 1860. *Ann. Mag. nat. Hist.*, 10, 188.

Thicker larger more inequilateral, both anterior and posterior margins angulate, cardinal teeth strong and broad.

Material examined : 2 exs., Lonar crater Wild life Sanctuary., Date 25-9-2003 Coll. S.G. Patil.

Distribution : common throughout India

Elsewhere : Bangladesh, Myanmar and Pakistan

Order VENEROIDA
 Family CORBICULIDAE

Genus *Corbicula* Megerle Von Muehlfeld
 12. *Corbicula striatella* Deshayes

1854. *Corbicula striatella* Deshayes, 1854. *Proc. Zool. Soc. Lond.*, 22 : 344.

Type *Locality* : Pondicherry.

1861. *Corbicula subradiata*, Prime 1861, *Proc. Acad. Nat. Sci. Phila* : P.128, Prashad,

1921. *Rec. Indian Mus.* **22** : 613.

Material examined : 2 exs. Lonar Crater Lake Wildlife Sanctuary, Date 25-9-2003, Coll. S.G. Patil.

Shell thick, large, tumid, triangular ovate to ovate, dorsal margin arched, more on the anterior side than on the posterior, umbones prominent, Periostracum shining lemon yellow in young, darker and often brownish in full grown specimens, striae regular, concentric and raised into ridges, pallial line with trace of sinus; muscle scars fairly deeply developed.

Distributions : Maharashtra : Buldhana Dist. : Lonar Crater Lake wildlife Sanctuary, Amravati Dist. : Melghat Tiger Reserve, Nagpur Dist. : Pench National Park, Chandrapur Dist. : Tadoba Andhari Tiger Reserve, Commonest Indian species and occurs throughout India.

Elsewhere : Pakistan, Peshawar, Sindh and Myanmar

LAND MOLLUSCA

Class GASTROPODA

Order STYLOMMATOPHORA

Family ARIOPHANTIDAE

Subfamily ARIOPHANTINAE

Genus *Ariophanta* Desmoulins, 1829

13. *Ariophanta Laevipes* (Muller)

1850. *Helix bajadera* Pfeiffer, 1850, *Zeitschr. Nat.* P 69

1963. *Ariophanta bajadera* : Tonapi and Mulherkar, 1963, *J. Bom. Nat. Hist. Soc.*, **60**(1) : 116.

Material examined : 2 exs., Lonar Crater Wildlife Sanctuary, Date 16-2-2003 Coll S.G. Patil.,

Distribution : Maharashtra : Dist. : Lonar Crater Lake Wild Life Sanctuary, Mumbai, South of Narbada, ranging east to Nagpur, Western Ghat near Bombay.

14. *Ariophanta bjadera* (Pfeiffer)

1850. *Helix bajadera* (Pfeiffer), *Zeitschr. Nat. P.* 69.

1963. *Ariophanta bajadera* (Tonapi and Mulherkar), *J. Bombay History Society* : **60**(1), 116.

Material Examined : 8exs., Lonar Crater Lake Wildlife Sanctuary, Date 18-2-2002, coll. P.P. Kulkarni.

Distribution : Maharashtra : Bombay Presidency south of Narmada, Common in Western Ghats near Bombay.

SUMMARY

A total of 14 species with 11 genera and 9 families are recorded from Lonar Crater Lake Wild Life Sanctuary Buldana district. Out of this 14 species, 2 species belonging 2 genera, 1 family are Land Mollusca. As such the Mollusca fauna of this area is quite poor however, more extensive surveys to this area may reveal the existence of some more species than what is known now.

ACKNOWLEDGEMENTS

I am thankful to Director, Zoological Survey of India, Kolkata for giving opportunity to do this work. Thanks are also due to Dr. Anil S. Mahabal, Officer-in -Charge, Western Regional Station, Zoological Survey of India, Pune for the facilities. I would like to record my thanks to Maharashtra State Forest Officer & Staff of Lonar Crater Lake Wild Life Sanctuary, Buldana for help during this work.

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ROTIFERA

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INTRODUCTION

Majority of the Rotifers are found in freshwater and only few are found in the sea. Rotifers are small, usually microscopic, pseudocoelomate animals. They are also called wheel animalcules or Rotatoria. In some respect they resemble the Molluscan "trochophore larva". The range of the length is from 40 microns to 240 microns in size. They are generally elongated and spherical in shape and size. Corona is important in this group for identification. The unsegmented body can be divided into three parts head, trunk and foot having superficial segments. A cuticular structure called lorica helps in identification of loricate rotifers. These groups can be easily transported and usually regarded potentially cosmopolitan. Many species are world wide in their distributions but some species show a distinctly limited geographical distribution.

The general plankton can be collected by silk bolting cloth net and preserved in 5% formalin. This group is badly distorted after preservation therefore a small amount of hot water may be added to allow the specimen to fix in a natural condition. Later on a suitable preservative may be added. Out of the two classes of Rotifera the only subclass Eurotatoria is represented in India and the other sub-class seisona are not yet attempted.

Number of workers have contributed in this field like Sewell (1934), Arora (1962, 1963), Nayar (1965), Wulfert (1966), Vasisht and Gupta (1967), Patil (1976, 1978, 1988), Sharma (1979) and Sharma and Michael (1980).

During the survey of Lonar crater lake and wildlife sanctuary, interesting observations were made. The water of the lake is highly alkaline. However, two species of Rotifers were observed in the water of this lake. Besides some Ostracods and algal mat, consisting of *Spirulina*, *Oscillatoria*, *Navicula*, *Pinnularia*, *Spirogyra* etc.

During the present investigation plankton samples were collected from Lonar crater lake with the help of plankton net (200 mesh size/cm). Fixation was made in 4% formaline.

The rotifers are important in the aquatic food chain and play important role in biological productivity and they form the major part of freshwater plankton. They are important as food

of fingerlings and fry of fishes. The rotifers are also used as bioindicators to depict the trophic status of water quality. They are used in toxicological and bioassay experiment.

SYSTEMATIC ACCOUNT

Phylum ROTIFERA
Class MONOGONONTA
Order PLOIMIDA
Family BRACHIONIDAE

1. *Brachionus calyciflorus* Pallas 1766

1766. *Brachionus calyciflorus* Pallas. Ench. zoo., p. 93 Haring. 1913, bull. U.S. Natl. Mus., vol. 81 p.19.

It is well known that this species is exceedingly variable in size and regarding the length of spines. lorica flexible and oval; with four broad based occipital spines of various length, Posterolateral spine present or absent of variable length.

Material : Lonar crater lake, Buldana Dist., 29.ix.2003. Coll. S.G. Patil.

Distribution : Maharashtra : Nagpur, Lonar crater lake, Dist. Buldana, Ujani Wetland; Punjab, Kashmir, Delhi, Rajasthan, Bihar, Chandigarh, Orissa, Meghalaya, Assam and Manipur.

2. *Brachionus rubens* Ehrenberg, 1838

1838. *Brachionus rubens* p. 513 pl. LXIII. Fig. 4. Ahlstorm. 1940. P. 170. Pl. 15. fig. 1-9 Kutikova. 1970. P. 586 fig. 921.

1978. *Brachionus urceolans* var *rubens* (Ehrenberg) : Koste. P. 79, Fig. 9 : 2a,e.

This species showed its occurrence in the present collection in small number. Lorica compressed dorsoventrally anterior margin with six occipital spines. Median and intermediate occipital spines with peculiar asymmetrical shape each spine showing a narrow anterior part then rounding towards and forming broad base; Median occipital spines longer than others.

Material : Lonar crater lake, Dist. Buldana, 25.ix.2003, Coll. S.G. Patil.

Distribution : Cosmopolitan. Maharashtra : Lonar crater lake, Dist. Buldana, Ujani wetland; West Bengal, Rajasthan, North-West India, Assam.

ACKNOWLEDGEMENTS

The author is thankful to Director, Zoological Survey of India, Kolkata for allowing to undertake this work and to officer-in-Charge, Western Regional Station, Zoological Survey of India, Pune for facilities.

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OSTRACODS

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INTRODUCTION

Ostracods inhabit in standing and running waters. However, these are not the true planktonic forms. Some of these are limnetic with surface habits, free swimming below the surface, creeping on plants and burrowing.

They look like seed hence are called seed shrimps. Indian species range between 0.5 mm to 2 mm. in length. They have bivalve shell which opens dorsally and posteriorly. There are nearly about 1700 species of which about one third occur in freshwater. Some Ostracoda are also reported from the intestinal tracts of fish and Amphibia. Undoubted parasitism however is unknown.

Our knowledge on Ostracods fauna of Maharashtra is rather poor. The sub-class Ostracoda belongs to class Crustacea and Phylum Arthropoda. Studies on Indian Ostracods made by Victor and Fernando (1979) is helpful for identification of Ostracods of this region. In India, freshwater Ostracods are common among benthic collections, vegetation, algal mat and plankton collection. They form an important link in the food chain of aquatic microanimals. Some Ostracods are also parasitic in the gills of various species of freshwater cray fishes. In geologic record they are used as stratigraphic markers. Paleo-ecological determination has been proved beyond doubt. They are good food for fishes.

The important contributions in this field are of Baird (1859), Arora (1931), Hartmann (1964), Harshey (1985), Deb (1972) and Badve *et al.* (1993).

Harshey *et. al.* (1984) and Harshey (1985) made taxonomic and ecological study of Ostracods of Madhya Pradesh and made an important contribution to the Ostracod fauna of India. Harshey and Patil (1988) erected a new species *Strandensia jabalpurensis* from Jabalpur, Madhya Pradesh.

During the survey of Lonar crater lake and Wildlife Sanctuary, Dist. Buldana an interesting observations were made. The water of the lake is alkaline however, two species of Ostracods were found in the water of this lake. This is in contrast to the observations of Delorme (1965)

who divided Ostracod in two groups on the basis of pH. One group below pH 8.3 and above pH 8.3. And further concluded that no Ostracods were found above pH 8.8. The algae like *Spirulina*, *Oscillatoria* and *Pinnularia* were common in the water.

The specimen were collected from Lonar crater lake water belongs to two species.

SYSTEMATIC ACCOUNT

Subclass OSTRACODA
Order POPOCOPIDA
Family CYPRIDIDAE
Subfamily CYPRIDINAE

1. *Cypris subglobosa* Sowerby, 1840

1840. *Cypris subglobosa* Sowerby, : Baird, Phylum 232, pl. 63, Fig. 2.

1964. *Cypris subglobosa* Sowerby, : Hartmann, p. 62 Abb. 34 a,b.

Material : 2 ♀ ♀, Lonar Crater lake, Maharashtra, 29.ix.2003, Coll. S.G. Patil.

Distribution : Maharashtra : Nagpur, Mumbai, Lonar crater lake, Dist. Buldana; Andhra Pradesh : Chittoor, Guntur, Yanam and Godavari; Tamil Nadu : Madurai district, Trichy district, Kanyakumari; Kerala : Trivendrum.

Status : Common.

Subfamily STENOCYPRINAE 2. *Stenocypris major* (Baird, 1859)

1859. *Cypris cylindrica major* Baird, p. 233, Fig. 1, 4a, f

1979. *Stenocypris major* (Baird), Victor and Fernando, *Rec. zool. Surv. India*, 74(2) : 193-194.

Material : 1 ♀, Lonar Crater lake, 25.ix.2003, Coll. S.G. Patil.

Distribution : Maharashtra : Mumbai, Lonar crater lake, Dist. Buldana; Tamil Nadu : Palni Hill, Madurai, Trichy district, Ramnad Dist., Chennai and vicinities; Karnataka : Mysore; Andhra Pradesh : Guntur and Hyderabad; Kerala : Trivendram; Gujarat : Giner reservoir; Madhya Pradesh : Bhopal and West Bengal.

ACKNOWLEDGEMENTS

The authors are thankful to Director, Zoological Survey of India, Kolkata for allowing to undertake this work and to officer-in-Charge, Western Regional Station, Zoological Survey of India, Pune for facilities.

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ARACHNIDA : SCORPIONIDA, ARANEAE AND OPILIONES

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INTRODUCTION

The Arachnid fauna belonging to the orders Scorpionida, Araneae and Opiliones is being reported on the basis of collections made through 5 survey parties of Zoological Survey of India, Western Regional Station, Pune lead by different experts in different seasons and months of the period of two consecutive years i.e. 2002-2004. Approximately 150 Arachnid specimens were received for studies, identification and recording. Two Scorpions, Ten Araneae and One Opilione families have been reported hitherto for the first time, the details of which are provided below.

SYSTEMATIC LIST

Order SCORPIONIDA

Family BUTHIDAE

Genus *Mesobuthus* Vachon

1. *Mesobuthus tamulus tamulus* (Farb.) 7 ♀ ♀, 5 ♀ ♀ sa and 6ys.
?

Family SCORPIONIDAE

Genus *Heterometrus* Hemp. & Ehrenb.

2. *Heterometrus (Chersonesometrus) granulomanus* Conzijn 1 ♀, 6 ♀ ♀, 3sa

Order ARANEAE

Family ARANEIDAE

Genus *Chorizopes* O.P. Cambridge

3. *Chorizopes anjanes* Tikader

Genus *Cyclosa* Menge

4. *Cyclosa hexatuberculata* Tikader 1 ♀

Genus *Larinia* Simon

5. *Larinia pthisica* (L. Koch) 1 ♀ Imm.

Genus *Argiope* Audouin

6. *Argiope aemula* (Walckenaer) 1 ♀ mm.

Genus *Zygiella* F.O.P. Cambrigde

7. *Zygiella melanocrania* (Thorell) 1 ♀ sa

Genus *Neoscona* Simon

8. *Neoscona muckerjei* Tikader 1 ♀ sa

Family OXYOPIDAE
Genus *Oxyopes* Latreille

9. *Oxyopes shwetae* Tikader 1 ♀, 2 ♀ ♀ ys

Genus *Peucetia* Thorell

10. *Peucetia yogeshi* Gajbe 1 ♀, 1 ♀ sa, 2ys.

Family THOMISIDAE
Genus *Thomisus* Walkenaer

11. *Thomisus pooneus* Tikader 1 ♀
12. *Thomisus sarojaii* Basu 1 ♀

Family PHOLCIDAE
Genus *Crossopriza* Simon

13. *Crossopriza lyoni* Blackwall 1 ♀

Family OONOPIDAE
Genus *Triaeris* Cambridge

14. *Triaeris nagarensis* Tikader & Malhotra 2 ♀ ♀,

Family ERESIDAE
Genus *Stegodyphus* Simon

15. *Stegodyphus sarassinorum* Karsch 8 ♀ ♀,

Family STENOCHILIDAE
Genus *Stenochilus* Cambridge

16. *Stenochilus crocatus* Simon 2 ♀ ♀ exuviae's of cephalothorax from under tree bark.

Family LYCOSIDAE
Genus *Hippasa* Simon

17. *Hippas madhuae* Tikader & Malhotra 1 ♀
18. *Hippasa olivacea* (Thorell) 3 ♀ ♀, 1 ♂.

Genus *Pardosa* Koch

19. *Pardosa birmanica* Simon 2 ♀ ♀

Genus *Lycosa* Latrielle

20. *Lycosa nigrotibialis* Simon 4 ♀ ♀

Family TETRAGNATHIDAE
Genus *Tetragnatha* Walckenaer

21. *Tetragnatha mandibulata* Walckenaer 2 ♀ ♀.

Family TETRABLEMMIDAE
Genus *Tetrablemma* Cambridge

22. *Tetrablemma deccanensis* Tikader, 12 ♀ ♀, 1 ♂.

Order PHALANGIDA (=Opiliones)
Family GAGRELLIDAE
Genus *Metagagrella* Roewer

23. *Metagagrella koyamai* Suzuki 22 ♂ ♂, 17 ♀ ♀.

TAXAWISE SYSTEMATIC ACCOUNT

Order SCORPIONIDA
Family BUTHIDAE
Subfamily BUTHINAE

Genus *Mesobuthus* Vachon

1. *Mesobuthus tamulus tamulus* (Fabr.)

1798. *Buthus tamulus* : Frabricius, Syst. Suppt., : 294.

1900. *Buthus tamulus tamulus* : Pocock, Fauna of Brit. India, Arachnida, : 24-25.

1973. *Mesobuthus tamulus tamulus* : Vachon, Bull. Mus. natn. Hist. nat., paris, 3e ser., Zool. 104(140) : 857-958.

1983. *Mesobuthus tamulus tamulus* : Tikader & Bastawade, Fauna of India, Scorpions, 3 : 216-222.

Common name : Yellow Scorpion

Local name : Pivala Vinchu (Marathi), Chol (Karnataka), Bichhi (Bangla).

Diagnostic Characters : Body yellowish-red, darker on middle and sub-lateral portions of mesosomal tergites and prosomal and metasomal carinae. Body size ranges between 60-80 mm, males smaller, slender and more active than females. Prosoma carinated and posterior median forming Lyre-form configuration with central median carinae. Granular on prosoma and mesosomal tergites, tergites I–VI tri-carinated. Pectinal teeth count 25-35, may reach up to 40 in case of ♂. Pedipalps slender, narrow on manus in ♀ but more robust and globular in ♂, with, A' type Trichobothria of β pattern on femora. Metasomal segment I always longer than wide, all metasomal segments carinated and telson with robust vesicle and strongly curved, acutely pointed aculeus.

Habits and habitats : Mostly found in drier areas, hiding under small to medium sized stones and boulders; occasionally under bricks, cow dung and rarely in burrows and loose crevices. Common intruders of human settlements, remain in dark and undisturbed corners of houses. Sting haemotoxic, some times fatal to children and weak persons. Females give birth to baby scorpions during May and October months; number may range between 45-70.

Material examined : 12♀♀, 1♂, 4♀♀ sub adults, 2youngs. Loc. : Lonar crater and around, Dist. : Buldhana, Maharashtra. Coll. : D. B. Bastawade, 16.ii.2003, Reg. No. I/3350; 17.ii.2003, R. No. I/3353; 18.ii.2003, Reg. No. I/ 3351; 19.ii.2003, Reg. No. I/3352. Coll. : P. M. Sureshan, 19.xi.2003, Reg. No. I/3376.

Distribution : India : Maharashtra, except coastal Konkan area, Andhra Pradesh and Karnataka.

Family SCORPIONIDAE
Subfamily SCORPIONINAE

Genus *Heterometrus* Hemp. & Ehrenb.

2. *Heterometrus (Chersonometrus) granulomanus* Couzijn

Heterometrus (Chersanometrus) granulomanus Couzijn, Zool. Verin., 184 : 142.

Heterometrus (Chersanometrus) granulomanus : Tikader & Bastawade, *Fauna of India, Scorpions*, 3 : 577-582.

Common Name : Black Scorpion.

Local Name : Ingali (Marathi), Bichhava (Hindi), Kakada Bichhi (Bangla).

Diagnostic Characters : Large Scorpion, body measuring up to 100 -115 mm in length, color dark black except yellowish-brown telson and legs. Pedipalp manus flat and more enlarged, fully and almost evenly granular on dorsal surface. Legs carinated on femur.

Carapace weakly granular on lateral portions. Mesosomal tergites granular on lateral and posterior lateral portions. Spine formula on legs I -IV 3/5 3/5, 3/4 3/5, 3/5 3/5 & 3/53/5. Pectinal teeth 15/15.

Habits and habitats : Burrowing in habits, Occasionally many individuals occupy the same burrow. Burrow is seen normally in soft soil and deepens up to 100-150 mm on the ground, ending in a widened living chamber. Usually feeds on medium size arthropods and rarely on small rodents and gastropods.

Material examined : 1 ♀, 6 ♂♂ and 3 sub-adults, *Coll.* : D. B. Bastawade, *Loc.* : Lonar Crater proper, from burrows in support of large stones, 19.ii.2003, Reg. No. I/3352 and 17.ii.2003, Reg. No I/3353.

Distribution : India : Podicherry; Tamil Nadu (Type-locality); Palni Hills and Kodai Kanal, Kerala; Maharashtra and Madhya Pradesh.

Order ARANEAE
Family ARANEIDAE

Genus *Chorizopes* O.P. Cambridge
3. *Chorizopes anjanas* Tikader

1965. *Chorizopes anjanas* Tikader, *Proc. Indian Acad. Sci.*, 62(2): 94.

1982. *Chorizopes anjanas* : Tikader, *Fauna of India, Araneae : Araneidae*, 2(1) : 162-164.

Common name : Orb weaving spider.

Local name : Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 5-7 mm in length, color yellowish with brownish patches grayish on abdomen but blackish on cephalothorax and legs. Cephalothorax longer than wide, roundish and broader on anterior portion, highly elevated and convex dorsally, ocular quad nearly as long as wide, eyes pearly white, anterior medians larger than posterior medians, laterals placed close and both rows of eyes strongly recurved. Chelicerae strong and stout with indistinct boss. Legs moderately strong with brownish patches. Abdomen slightly longer than wide, with one pair of lateral tubercles and posterior end with two vertically arranged blunt caudal processes. Dorsum with five pairs of sigillae. Epigyne plate like with a pair of darker roundish patches, internal genitalia with a pair of round spermathecae each with thick posterior duct opening on posterior margin.

Habits and habitats : It is an Orb-weaving spider but much details are not known.

Material examined : 1 ♀ *Coll.* D. B. Bastawade, *Loc.* Lonar Crater proper N 'O' FRS, Lonar, Dist. Buldhana, 17.ii.2003, Reg. No. I/3363.

Genus *Cyclosa* Menga4. *Cyclosa hexatuberculata* Tikader & Bal

1980. *Cyclosa hexatuberculata* Tikader & Bal, *Fauna of India, Arancae : Araneidae*, 2(1) : 197-199.

Common Name : Orb-weaving spiders.

Local Name : Koli(Marathi), Makadi (Hindi).

Diagnostic Characters : Body thin and elongated about 7 -10 mm in length. Cephalothorax yellowish with some blackish patches, legs yellowish banded with blackish brown colour, abdomen yellowish brown with silvery and blackish patches, cephalothorax elongated narrowed anteriorly, anterior and posterior pair of eyes recurved, abdomen also elongated with two dorsal humps, two pairs of lateral humps, epigynum with a prominent cone shaped scape with basal bulged portion, internal genitalia with a pair of rounded sperm thecae.

Habits and Habitats : Spins smaller, delicate, geometrical webs on bushes and shrubs; prefer to sit in the center camouflaging the thickened threads of the web; feeds on smaller and tiny insects caught in the web.

Material Examined : 1 ♀ *Coll. D. B. Bastawade*, Loc. Lonar Crater proper N 'O' FRS, Lonar, Dist. Buldhana, 17.ii.2003, I/3363.

Distribution elsewhere : INDIA : BSI garden, Pune, Pench National Park, Nagpur, Maharashtra.

Genus *Larinia* Simon5. *Larinia phtisica* (L. Koch)

1871. *Epeira phtisica* L. Koch, *Die Arachniden Australiens*, 1(1) : 193.

1887. *Larinia phtisica* : Simon, *Annls. Soc. Ent. Fr.*, 2 : 171.

1975. *Larinia chhagani* : Patel, *Oriental Inst.*, 9(1) : 113-116.

1982. *Larinia phtisica* : Tikader, *Fauna of India, Araneae, Araneidae*, 2(1) : 208-209.

Common name : Orb weaving spider.

Local name : Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 9-11 mm in length, color light brownish to yellowish. Cephalothorax nearly one and half times longer than wide, narrowing in front, a characteristic dark double line running from posterior median eyes to middle portion and ending before the deep longitudinal thoracic furrow, ocular quad forming trapezium much wider in front than behind, anterior medians much larger than posterior medians, both rows of eyes recurved but anterior row much more recurved than the posterior. Chelicerae strong and stout with distinct boss and anterior margin armed with four teeth. Legs long and slender. Abdomen

elongated, longer than wide, pointed anteriorly over the carapace, dorsum light yellowish white with some grayish lines and double row of blackish spots; ventrum with a median longitudinal whitish patch guarded laterally with blackish patches between epigastric furrow and spinnerets. Epigynum plate like with small scape truncate distally, internal genitalia complicated, appears like butter fly shape with a pair of smaller globular spermathecae each opening posteriorly by a duct emerging from inner portion and opening at the base of scape.

Habits and habitats : Orb weaving in nature; prepare small and delicate geometrical webs. Details unknown.

Material examined : 1 ♀ Imm. Coll. D. B. Bastawade, Loc. Lonar Crater proper N 'O' FRS, Lonar, Dist. Buldhana, 17.ii.2003, Reg. No. I/3363.

Distribution : INDIA : Kolkata, West Bengal; Ahmedabad, Gujarat; Buldhana, Maharashtra. AUSTRALIA. NEW GUINEA.

Genus *Argiope* Audouin
6. *Argiope aemula* (Walkenaer)

1841. *Epeira aemula* Walckenaer, *Hist. Nat. Ins. Apt.*, 2 : 118.

1871. *Argiope magnifica* : L. Koch, *Arachn. Austrat.*, 1(1) : 27.

1877. *Argiope aemula* : Thorell, *Annoli Mus. Civ. Geneva*, 25 : 164.

1900. *Argiope aemula* : Pocock, *Fauna Brit. India, Arachnida*, : 223.

1982. *Argiope aemula* : Tikader, *Fauna of India, Araneae : Araneidae*, 2(1) : 119 -121.

Common name : Signature spider.

Local name : Koli (Marathi), Makadi (Hindi).

Diagnostic Characters : Medium size body about 20-25 mm in length, general body colour Yellowish gray, yellowish brown on cephalothorax, deep brown on legs and grayish white with blackish stripes and reticulation on abdomen, cephalothorax narrowing in front, anterior and posterior rows of eyes strongly pro-curved, legs long, spined and femur bearing yellowish patch ventrally, abdomen oval, truncated in front and partly overlapping cephalothorax, pair of ventral longitudinal yellow stripes between gastric furrow and spinnerets, epigyne roughly triangular, narrowing in front with a pair of basal round bulging, internal genitalia with a pair of single pouched spermathecae.

Habits and habitats : Prefers to inhabit forested areas; prepares medium sized geometrical webs in a vertical plane, typically strengthening the web by preparing X shaped stabilimentum due to which they are known as "Signature Spiders" keeps facing towards ground; feeds on small to medium sized insects that get caught in the web.

Material examined : 1♀, *Coll.* : P. M. Sureshan, *Loc.* : NW of Forest Rest House Nr. Lonar Crater, 19.xi.2003, *Reg. No.* I/3371.

Distribution : India : Kerala, Tamil Nadu, Maharashtra, West Bengal, Andaman and Nicobar Islands; SRI LANKA; MYANMAR; INDO-AUSTRO-MALAYSIA.

Genus *Zygeilla* F. O. P. Cambridge

7. *Zygeilla melanocrania* (Thorell)

1887. *Epeira melanocranis* Thorell, *Annali Mus. civ. Genova*, **25** : 209.

1935. *Araneius melanocranis* : Dyal, *Bull. Dep. Zool. Punjab Univ.*, **1** : 183.

1982. *Zygeilla melanocrania* : Tikader, *Fauna of India, Arancae : Araneidae*, **2(1)** : 215-217.

Common Name : Orb weaving Spiders.

Local Name : Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body 5-6 mm in length, typically black on cephalic region but yellowish on thoracic part, abdomen with dorsal black marking forming folium, otherwise whitish. Cephalothorax longer than wide narrowing in front, ocular quad more wider anteriorly, anterior medians larger and situated on a prominent tubercle and both rows re-curved. Chelicerae with distinct boss. Abdomen oval with out humps, epigynum with out scape with an semicircular opening, internal genitalia with a pair of spherical sperma thecae, each connected with convoluted ducts separately to the opening.

Habits and habitats : Prefers to prepare smaller webs between thin twigs; remains hidden in rolled up dried pieces of leaves, possibly prone to catch by sphecid wasps as the pray for developing larvae.

Material Examined : 1♀ *Coll.* : P. M. Sureshan, *Loc.* : NW of Forest Rest House Nr. Lonar Crater, 19.xi.2003, *Reg. No.* I/3371.

Distribution : INDIA : Barkud Island (Chilka Lake), Orissa, Chandrapur, Maharashtra; PAKISTAN : Model Town, Lahor; BURMA.

Genus *Neoscona* Simon

8. *Neoscona mukerjei* Tikader

1980. *Neoscona mukerjei* Tikader, *Proc. Indian Acad. Sci.*, **89(3)** : 247.

1982. *Neoscona mukerjei* : Tikader, *Fauna of India, Araneae : Araneidae*, **2(1)** : 248-253.

Common name : Orb-weaving spider.

Local name : Koli (Marathi), Makadi (Hindi).

Diagnostic Characters : Small spiders of body size 8-12 mm., carapace longer than wide, narrowed in front, cephalic region with conspicuous 'V' shaped dark brown patch, thoracic region with deep longitudinal groove, anterior median eyes slightly larger than posterior medians, lateral eyes placed closer to each other, both rows recurved and ocular quadrangle wider in front; chelicerae strong, yellowish with moderate boss; abdomen sub-triangular, longer than wide, tapering posteriorly, dorsum with a club shaped grayish white patch, arranged longitudinally, 5 pairs of sigilla prominent mid-dorsally, epigynum provided with a moderately long scape with a deep constriction and a pair of indistinct lateral lobes.

Habits and habitats : Mostly observed to spin a thin threaded small sized radial geometric web through tall grasses and bushes. When disturbed drops down at once to avoid predation. There is tremendous color variation specially the color pattern on dorsal portion of abdomen, almost 18 colour variations have been reported by Tikader (1982).

Material examined : 1 ♀, *Coll. :* P. M. Sureshan, *Loc. :* NW of Forest Rest House Nr. Lonar Crater, 19.xi.2003, *Reg. No.* I/3374.

Distribution : Through out Indian subcontinent.

Family OXYOPIDAE
Genus *Oxyopes* Latreille
9. *Oxyopes shwetae* Tikader

1970. *Oxyopes shwetae* Tikader, *Rec. zool. Surv., India*, 64(1-4) : 78.

1999. *Oxyopes shwetae* : Gajbe, *Rec. zool. Surv., India*, 97(3) : 46-47.

Common Name : Lynx spiders.

Local Name : Koli (Marathi), Makadi (Hindi).

Diagnostic Characters : Body 10-13 mm long, robustly spiny on all legs, light brownish green on cephalothorax and legs while chalk white on abdomen; cephalothorax longer than wide, narrowed anteriorly, strongly convex cephalic region, eyes situated in two rows, all eyes encircled with black at the base, anterior row strongly recurved, medians being pulled forwards where as laterals placed in one group with posterior forming a circle; clypeus high with two black stripes extend from anterior median eyes to base of chelicerae; femora of all legs with longitudinal black line; abdomen much more longer than wide, narrowed behind, with lance shaped brown patch mid-dorsally and blackish line extending from anterior to posterior end of abdomen, dorsum mosaiced with chalk white, ventral portion with broad brown stripe; epigynum simple with a broad butterfly wing shaped dark patch, supplemented with a pair of interior black spots; male palp with much more extended cymbium paracymbium short with anterior short spine while short tegulum ending in to sharp point.

Habits and habitats : Non orb weavers, prefer to move around the branches of shrubs and trees, common during rainy seasons, prefer to hunt through direct attack, feed on small insects sheltering on plants.

Material examined : 1 ♀, 2 ♀ ♀ Imm., *Coll.* : P. M. Sureshan, *Loc.* : SW 'O' FRH Nr. Crater lake, 19.xi.2003, *Reg. No.* I/3371..

Distribution : INDIA : Sikkim, Karanataka, Kerala, Tamil Nadu (unpublished data).

Genus *Peuctia* Thorell
10. *Peuctia yogeshi* Gajbe

1999. *Peuctia yogeshi* Gajbe, *Rec. zool. Surv. India*, 97(3) : 66-68.

Common name : Lynx spider.

Local name : Koli (Marathi), Makadi (Hindi).

Dignostic characters : Body size 9-12 mm in length, color light green to yellowish green. Cephalothorax longer than wide, narrowing in front, thoracic region with sharp median longitudinal fovea with radiating light brown stripes towards lateral margins. Eyes placed in two rows, anteriors strongly recurved, medians smaller than laterals; posterior row procurved, all of same size and placed at equidistance. Clypeus long, vertical and with a pair of deep brown lines. Chelicerae elongated and narrowed distally with short and delicate fang, fang furrow armed on inner margin with a minute tooth. Legs long, stout and armed with longer conspicuous spines and with darker spots. Abdomen nearly elliptical, narrowing behind, dorsum with light brown median reticulation. Ventrums lighter and with mid ventral black stripe. Epigynum with a broad plate narrowed anteriorly, a pair of lighter elongated patches placed mid laterally, each with a curved dark band on posterior portion with lateral posterior dark black spots. Internal genitalia complicated with a pair of elongated spermathecae each with inner mid ventral duct.

Habits and habitat : Non orb weaving; of wandering nature, generally roaming through grasses and foliages for prey hunting. Obtains prey through direct attacks. Able to change body color according to foliage color.

Material examined : 1 ♀, 1 ♀ sa, 2ys. *Coll.* : P. M. Sureshan, *Loc.* : Forest patch W of Kamalja temple, 20.xi.2003, *Reg. No.* I/3372.

Distribution : INDIA : Maharashtra (new report), Chhattisgarh and Madhya Pradesh.

Family THOMISIDAE
Genus *Thomisus* Walckenaer
11. *Thomisus pooneus* Tikader

1965. *Thomisus pooneus* Tikader, *Proc. Indian Acad. Sci.*, Bangalore, 61(5) : 283.

Common name : Crab spider.

Local name : Kark Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 5-8 mm in length, color light brown cephalothorax, whitish grey with brownish patches on abdomen and greenish on legs. Cephalothorax almost as long as wide, high and anterior-lateral portions with conspicuous longitudinal black patches. Eyes placed on prominent conical protuberance, round and black, anterior row strongly recurved, anterior medians larger than posterior medians, ocular area chalk white. Clypeus long, sub-rectangular, margins pointed with spiny hair. Legs long and stout, I and II longer than III and IV, femora and tibiae with dark blackish brown spots. Tibiae I with 2 pairs and metatarsi I with 6 pairs of ventral spines. Abdomen round, slightly overlapping posterior portion of thoracic region, broadest just behind the middle, broadest portion with a pair of lateral muscular tubercle and from this region abdomen abruptly bends down to the spinnerets. Epigynum small, triangular, pointed anteriorly and with a tuberculate out growth on lateral margin, spermathecae with a pair of dark inverted W shaped structure and a pair of elliptical blackish spots at the lateral base. Internal genitalia not known.

Habits and habitats : These are foliage inhabitants that keep on moving through twigs of flowering plants for prey. Hunt by direct attack and prefer to feed on inflorescence visiting insects, mainly the Dipterans and Hymenopterans.

Material examined : 1 ♀, *Coll.* : P. M. Sureshan. Loc. Lonar Wildlife Sanctuary, NW of L. Crater, 22.xi.2003, Reg. No. I/3374.

Distribution : INDIA : Pune and Buldhana Districts, Maharashtra.

12. *Thomisus sarojii* Basu

1963. *Thomisus sarojii* Basu, *Sic. & Cult.*, Kolkata, 29(2) : 606.

1980. *Thomisus sarojii* : Tikader, *Fauna of India, Araneae : Thomisidae*, 1(1) : 46-48.

Common name : Crab spider.

Local name : Kark Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 15-18 mm in length, color yellowish white and greenish on legs. Cephalothorax longer than wide, sub-quadrangular, slightly narrowed anteriorly. Eyes black, almost equal in size except large posterior medians, ocular quad white in color. Clypeus rectangular, whitish in frontal area while yellowish on rear. Cephalic region high with an elongated white streak projecting forward and narrow at the base. Legs I & II longer than III & IV and spines on digits of I & II as in original description. Abdomen almost round, projecting anteriorly on thoracic region, widest on 2/3rd posterior region and laterally tuberculate with black spots, connecting between with black narrow transverse band, dorsum with few irregular transverse ridges well developed laterally but incomplete in middle portion

except one complete band. Epigynum small, triangular, pointed anteriorly and truncate on posterior margin with three serration laterally, spermathecae quite smaller and placed on anterior portion. Internal genitalia not known.

Habits and habitats : These are foliage inhabitants that keep on moving through twigs of flowering plants for prey. Hunt in direct attack and prefer to feed on inflorescence visiting insects, mainly the Dipterans and Hymenopterans.

Material examined : 1 ♀, *Coll. : P. M. Sureshan*. Loc. Lonar Wildlife Sanctuary, NW of L. Crater, 22.xi.2003, Reg. No. I/3374.

Distribution : INDIA : Maharashtra and West Bengal.

Family PHOLCIDAE
Genus *Crossopriza* Simon
13. *Crossopriza lyoni* (Blackwall)

1867. *Pholcus lyoni* Blackwall, *Ann. Mus. Nat. Hist.*, 19(3) : 392.

1900. *Crossopriza lyoni* : Pocock, *Fauna Brit. India, Arachn.*, 240.

1996. *Crossopriza lyoni* : Tikader, *Handbook of Indian Spiders*, : 170.

Common name : Seller spider.

Local name : Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 5-7 mm in length, color grayish to yellowish brown, carapace with median brown stripe, legs spotted and streaked with black, extremities of femora and tibiae paler. Abdomen yellowish brown with clouded spots, ventral surface black with pale markings. Male much like female but with legs longer, abdomen smaller and chelicera with a tooth on fang furrow. Femur I with row of long spines. Male palp thick and much complicated.

Habits and habitat : A typical Orb weaver; mostly an intruder of human habitations, seen in the corners of houses; build small and delicate geometrical webs. No other biological details known.

Material examined : 1 ♀, *Coll. : D. B. Bastawade*, Loc. : Forest Rest House Nr. L. Crater, 17.ii.2003, Reg. No. I/3363.

Distribution : INDIA : Tamil Nadu, Andhra Pradesh, Maharashtra, Uttaranchal, Uttar Pradesh. MYANMAR.

Family OONOPIDAE
Genus *Triaeris* Cambridge
14. *Triaeris nagarensis* Tikader & Malhotra

1974. *Triaeris nagarensis* Tikader & Malhotra, *Oriental Insects*, 8(4) : 500-501.

Common name : Minute Red Spider.

Local name : Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 1-2 mm in length, color dark reddish brown or some times yellowish brown. Cephalothorax longer than wide, convex and high dorsally, narrowed in front. Cephalothorax with two longitudinal mid-dorsal and one posterior transverse rows of spine like hair. Eyes six, pearly white, arranged in two rows, anterior two eyes larger than the others, posterior medians almost elliptical in shape and posterior row almost straight or slightly procurved. Ocular area with conspicuous black patch. Abdomen longer than wide, nearly elliptical, posterior portion slightly wider than anterior portion. Dorsal and ventral portions covered with scutum. Epigynum small and simple with a minute plate. Internal genitalia not known.

Habits and habitats : Mainly ground dwelling creatures; hide in thinner crevices in dry season where as coming out in wet seasons take shelter in gaps of tree barks. Many individuals inhabit the same bark but not social. They are usually encountered on Neem, Banyan, Kusum, Mango, Termarind and Eucalyptus trees. *Tetrablemma deccenensis* (Tikader) (Tetrablemmidae), a minute red spider, stays mixed with this species.

Material examined : 2 ♀♀, Coll. D. B. Bastawade, Loc. Lonar Crater, N 'O' FRH, Buldhana, Maharashtra, 19.ii.2003, Reg. No. I/3364.

Distribution : INDIA : Sangli, Kolhapur, Satara, Pune, Raigad, Ahmadnagar, Buldhana and Nagpur Dists., Mharashtra.

Family ERESIDAE
Genus *Stegodyphus* Simon
15. *Stegodyphus sarassinorum* Karsch

1892. *Stegodyphus sarasinorum* Karsch, *Berl. ent. Zeits.*, **36** : 275.

1900. *Stegodyphus sarasinorum* : Pocock, *Fauna of Brit. India, Arachnida*, : 209.

1964. *Stegodyphus sarasinorum* : Bradoo & Joseph, *Indian J. Ent.*, **32**(1) : 16-21.

1987. *Stegodyphus sarasinorum* : Tikader, *Handbook of Indian Spiders*, : 150-151.

Common Name : Social Spiders.

Local Name : Koli (Marathi), Makadi (Hindi).

Diagnostic Characters : Medium sized spiders, about 10-12 mm in length, cephalothorax longer than wide, truncated on anterior margin, four median eyes forming quadrangle, narrowed in front, posterior laterals far behind, legs short and strong, abdomen oval with a typical median grayish mark on dorsum, stumpy spinnerets with exceptionally large cribellum, spin thick, sticky labyrinthine tube ending blindly at one end and the other expands in to a broad sheet of web, involving leaves and twigs of the selected plant.

Habits and habitats : These are social spiders and gregarious in their habits; they feed on the captive alive, and all members of a colony share the prey. They are most active in pre and post monsoon season and hibernate in web-tubes in winter. Their webs are too sticky and compactly spun for the prey to escape once entangled in the web. Their webs provide shelter to many arthropods as common commensals.

Material examined : 8 ♀ ♀, Coll. Dr. D. B. Bastawade, Loc. Lonar Crater, N 'O' FRH, Buldhana, 19.ii.2003, Reg. No. I/3364.

Distribution : Widely distributed in INDIA : Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Goa and Maharashtra.

Family STENOCHILIDAE
Genus *Stenochilus* Cambridge
16. *Stenochilus crocatus* Simon

1884. *Stenochilus crocatus* Simon, Ann. Mus. Civ. Stor. Nat. Genova, 20 : 325-372.

1974. *Stenochilus crocatus* : Platnick & Shadab, Amer. Mus. Novitates, 2556 : 12.

The pinkish red spiders belonging to the family Stenochilidae are rarely encountered in the Indian subcontinent. These spiders are so far known by the only genus *Stenochilus* O. P. Cambridge 1870, under which two species have been described as *Stenochilus hobsoni* O. P. Cambridge 1870, the type species of the genus and *Stenochilus scutillatus* Platnick and Shadab 1974. The third species *Stenochilus crocatus* Simon (1884) has been reported from Myanmar, Cambodia and Sri Lanka. According to Platnick and Shadab (1974) these species belong to two distinct groups namely *hobsoni* and *crocatus*, mainly on the basis of nature of the carapace as follows

1. Carapace with moderate undulations on the surface and the posterior tip of carapace remains flat and with out a central notch *hobsoni*.
2. Carapace with distinct and deep undulations on the surface and the posterior tip of the carapace deeply notched medially and produced in to a pair of pointed curved horn like structures *crocatus*.

Material examined : 2 ♀ ♀ (exuviae's of cephalothorax and broken abdominal portion from under two different tree barks) Coll. : D. B. Bastawade, 19.ii.2003, Reg. NO. I/3364.

Remarks : During the survey program, The material came as a surprise collection. One exoskeleton of the *Crocatus* group was collected from under the debris of small stones, 5 to 6 mts. away from the water level of the lake. The exoskeleton was attached to a small stone. The second exoskeleton was found attached under the bark of plant a *Ficus religiosa*, about 4 to 5 feet above the ground level. This plant was present in the piece of agricultural land in the NE corner of the Lake, about 50 to 60 mts. from the water level.

The microscopic observations and further studies revealed that these might belong to some unknown species of *crocatus* group from the Indian state Maharashtra and happens to be the first report of this group from our country. The nearest country where this group is known to occur is Sri Lanka, about 2000 Kms south of the present locality. The present report is thus important and indicates the need to further explore our country for its faunal wealth.

Family LYCOSIDAE

Genus *Hippasa* Simon

17. *Hippas madhuae* Tikader & Malhotra

1980. *Hippas madhuae* Tikader & Malhotra, *Fauna of India, Araneae, Lycosidae*, 1(2) : 298-299.

Common name : Wolf spider.

Local name : Landaga Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 8-12 mm in length, color light brown but greenish black with pale patches on abdomen. Cephalothorax longer than wide and convex dorsally, cephalic region slightly high and abruptly narrowing in front, thoracic region with a central longitudinal sharp fovea and 5-6 pairs of brown band radiate on lateral sides, lateral margins with few black patches. Anterior row of eyes slightly pro-curved, wider than the second, eyes of second and third row sub-equal in size, ocular quad wider behind and narrowing in front, bases of eyes with black patches, ocular quadrangle black. Chelicerae dark brown and bear three strong teeth on inner margin of fang furrow. Legs thin and long, spined and femora, patellae and tibiae with conspicuous but irregular greenish brown patches. Abdomen longer than wide, pointed posteriorly, anterior mid dorsal portion with lens shaped light brown marking and followed posteriorly by irregular greenish black and pale patches. Ventral side chalk white. Epigynum small, roughly triangular with regular narrow weak folds on lateral portion, two pairs of dark spots on an invaginated posterior margin, median posterior portion with an orifice on short, swollen part. Internal genitalia with a pair of smaller spermathecae each continued posteriorly in to short duct, dorsal branch turning around itself and the other opening in to central orifice.

Habits and habitats : Practically unknown.

Material examined : 1 ♀, *Coll. D. B. Bastawade*, Loc : Lonar crater proper, S 'O' FRH, Lonar, Buldhana; 16.ii.2003, Reg. No. I/3362.

Distribution : INDIA : Ahmadnagar and Buldhana, Maharashtra.

18. *Hippasa olivacea* (Thorell)

1887. *Dipontia olivacea* Thorell, *Ann. Mus. Civ. Stor. Nat. Genova*, 5(2) : 297.

1895. *Hippasa olivacea* : Thorell, *Spiders of Burma*, : 217.

1924. *Hippasa olivacea* : Gravely, *Rec. India Mus.*, 26 : 593.

1980. *Hippasa olivacea* : Tikader & Malhotra, *Fauna of India, Araneae : Lycosidae*, 1(2) : 283-285.

Common name : Wolf spider.

Local name : Landaga Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 11-15 mm in length, color, light brown on cephalothorax and legs while brownish green on abdomen. Cephalothorax longer than wide, convex dorsally, thoracic fovea distinct, elongated and brownish bands radiate to lateral sides. Anterior row of eyes procurved and laterals larger than medians. Eyes of second row larger than others, bases of second and third row with dark black patches, ocular quad wider than long, more wider on posterior portion. Chelicerae strong and inner margin of fang furrow with three teeth. Legs thin and long and IV pair conspicuously longer. Abdomen longer than wide, tapering on posterior portion. Dorsum with dark greenish and pale patches arranged alternately, ventrum pale with few spines. Posterior spinnerets longer than anterior and terminal portion as long as basal portion. Epigynum simple and smaller with a median plate and a pair of lateral patches at the base of median plate. Internal genitalia unknown.

Habits and habitats : Unknown.

Material examined : 3 ♀♀, 1 ♂, *Coll. S. G. Patil*, Loc : Lonar Cretar and Around, 22.xi.2005, Reg. No.I/3454.

Distribution : INDIA : Buldhana Dist., Maharashtra. MYANMAR.

Genus *Pardosa* Koch
19. *Pardosa birmanica* Simon

1884. *Pardosa birmanica* Simon, *Ann. Mus. civ. stor. nat. Genova*, 20 : 333.

1924. *Lycosa birmanica* : Gravely, *Rec. Indian Mus.*, 26 : 607.

1970. *Pardosa bhatnagari* : Sadana, *Ent. Monthly Mag.*, 107 : 226.

1980. *Pardosa birmanica* : Tikader & Malhotra, *Fauna of India, Araneae : Lycosidae*, 1(2) : 329-331.

Common Name : Wolf spider.

Local Name : Landaga Koli (Marathi), Makadi (Hindi).

Diagnostic Charactes : Body size smaller about 5-8 mm in length, color dark brown to blackish brown, cephalothorax and legs dark brown, abdomen with blackish and pale patches, cephalothorax longer than wide, convex, cephalic region narrowing in front and slightly high, median area light brown with a sharp fovea, legs thin, long, spined and all with transverse greenish dark brown patches, abdomen longer than wide, oval, pointed behind, broadest behind the middle, epigyne roughly pentagonal, notched deeply on posterior margin

tucked out medially, marked with a pair of minute elliptical white markings on the posterior median portion, internal genitalia complicated with a median pair of rounded sperm thecae continued in to compact 'S' shaped duct laterally turning in side posterior and opening in middle and supported medially with 'M' shaped plate.

Habits and habitats : Unknown.

Material examined : 2 ♀ ♀, *Coll. S. G. Patil*, Loc : Buldhana Dist., 10.xi.2005, Reg. No I/3453.

Distribution : INDIA : Tamil Nadu, Andhra Pradesh, Maharashtra, Gujarat, Orissa, West Bengal, Bihar, Utter Pradesh, Utteranchal, Himachal Pradesh and Punjab. PAKISTAN. MYANMAR. JAVA.

Genus *Lycosa* Latrielle
20. *Lycosa nigrotibialis* Simon

1884. *Lycosa nigrotibialis* Simon, *Ann. Mus. Stor. Nat. Genova*, **20** : 330.

1924. *Lycosa nigrotibialis* : Gravely, *Rec. Indian Mus.*, **26** : 600.

1980. *Lycosa nigrotibialis* : Tikader, *Fauna of India, Araneae, Lycosidae*, **1(2)** : 405-407.

Common Name : Wolf spider.

Local name : Landaga Koli (Marathi), Makadi (Hindi).

Diagnostic characters : Body size 14-18mm in length, color pale to dark brown. Cephalothorax longer than wide and convex dorsally, centre with distinct fovea. Anterior row of eyes shorter than the second, almost straight, medians larger than lateral. Eyes in second row larger than others and bases with conspicuous black patches, space between posterior eyes narrow in front, longer than wide. Chelicerae strong and inner margin of fang furrow with three minute teeth. Legs long and strong, distal portions of III and IV tibiae ventrally with broad dark brown bands. Abdomen longer than wide, oval, broader behind the middle, anterior dorsum with longitudinal dark patch, ventrum black. Epigynum with broad longitudinal, with median inverted 'T' shape plate supported laterally with elongated whitish tube like structure darker on posterior bases. Internal genitalia with roughly spherical spermathecae, each supported with a median triangular obliquely placed structure and distal margins truncated face each other, each spermathecae continue posteriorly into broader short duct, expand just before opening in the notch of a median plate. Male unknown.

Habits and habitats : Practically unknown.

Material examined : 4 ♀ ♀, *Coll. S. G. Patil*, Loc : Dyanganga Dam and around, 21.xi.2005, Reg. No. I/3449.

Distribution : INDIA : Maharashtra, Himachal Pradesh, West Bengal, Sikkim, Assam and Meghalaya. AFGHANISTAN. PAKISTAN. MAYANMAR.

Family TETRAGNATHIDAE

Genus *Tetragnatha* Latreille

21. *Tetragnatha mandibulata* Walckenaer

1837. *Tetragnatha mandibulata* Walckenaer, *Ins. Apt.*, 2 : 211.

1897. *Tetragnatha mandibulata* : Pocock, *Fauna Brit. India, Arachn.*, : 215.

1977. *Tetragnatha mandibulata* : Tikader, *Res. zool. Surv. India*, 75 : 153-212.

Common name : Spider.

Local name : Koli (Marathi), Makadi (Hindi).

Diagnostic Characters : Body shape narrow more elongated, about 12-15 mm long, yellowish to dark yellowish with greenish tinge and one or two pairs of whitish stripes dorsal surface of abdomen, legs exceptionally long as compared to the body. Carapace flat and narrowed anteriorly with truncated margin, eyes in two slightly procurved rows. Chelicerae large and exceptionally long with large teeth and longer fangs, male palp with exposed round cymbium, female genitalia simple with tubular epigynum.

Habits and habitats : Normally found in the vicinity of water bodies and streams; prepare a radically symmetrical delicate horizontal webs, just about 2 to 3 feet above water surface between available supports and feed on small insects visiting the streams or aquatic bodies that get entangle in the webs.

Material examined : 4 ♀ ♀, *Coll. D. B. Bastawade*, Loc. : Lonar Crater proper S 'O' FRH, 16.ii.2003, Reg. No. I/3362; *Coll. : P. M. Sureshan*, Loc. : Forest patch W 'O' Kamalja Devi Temple, 20.xi.2003, Reg. No. I/3372.

Distribution elsewhere : Almost throughout Indian sub-continent.

Family TETRABLEMMIDAE

Genus *Tetrablemma* Cambridge

22. *Tetrablemma deccanensis* (Tikader)

1974. *Indonops deccanensis* Tikader, *Bull. Brit. Arachn. Soc.*, 3(6) : 174-176.

Common Name : Minute Red Spider.

Local Name : Koli (Marathi), Makadi (Hindi).

Dignostic characters : Body 1-2 mm in length, male and female of same size, color reddish brown to brownish green; cephalothorax longer than wide, narrowing anteriorly and

obtuse on anterior margin, middle portion high and posteriorly provided with a mark or susa and hinder portion of thoracic region sloped down abruptly, eyes four, elliptical, pearly white, placed in compact group, contiguous and middle space conspicuously black, in males eyes shifted much posterior just in front of susa mark. Chelicerae small, simple fang groove with out any teeth but male with conspicuous horn-like projection directed forward up. Legs comparatively stout, femora I narrowed distally and broader on proximal portion, patellae short and broader distally tarsi with strongly curved paired claw armed with four long teeth like structures, legs formula 1423. Abdomen longer than wide, nearly elliptical, slightly overlapping cephalothorax, lateral portions provided with four deep brown longitudinal ridges from end to end, epigastric fold situated far behind the middle portion, epigynum simple as a transverse ridge narrowed and slightly curved posteriorly on lateral sides and bears a arrow like mark on center of anterior margin, internal genitalia unique in having two pairs of finger like tubes on lateral side and a short projection of anterior middle portion.

Habits and habitats : Mostly found under barks of large trees in forested areas; occasionally reported from wet litters in agricultural farms. Nothing is known about their food, feeding habits and other biological aspects in particular.

Material examined : 12 ♀ ♀, 1 ♂, *Coll. Dr. D. B. Bastawade*, Loc. : Lonar crater proper, under smaller stones and pebbles spread on wet substratum near to the water level of the lake, 16.ii.2003, Reg. No. I/ 3362.

Distribution : INDIA : Pune, Raigad, Thane and Buldhana Dists. Maharashtra.

Order PHALANGIDA (= Opiliones)
Suborder PALPATORES
Family SCLEROSOMATIDAE
Subfamily GAGRELLINAE

Genus *Metagagrella* Roewer
23. *Metagagrella koyamai* Suzuki

1979. *Metagagrella koyamai* Suzuki, *Annotationes Zoologicae Japonenses*, 52(2) : 142-145.

Common name : Daddy long legs.

Local name : Zad zankar (Hindi).

Diagnostic characters : Scutum thickly granular. Body blackish brown, whitish patches seen in front of ocularium on carapace and lateral portions of area I and II of scutum. Triangular supra-cheliceral lamellae protrudes forward with 2-3 dentitions on tip. Scutum with long median thorn on area II. Chelicerae normal, dorsally with few (2-3) minute tubercles. Pedipalp: all segments without apophyses. Row of marginal humps present anteriorly on all coxae of legs and posteriorly on first and fourth. Edge of humps straightly blunt. Noduli formula : 0-2-0-0. Penis : Shaft widest at base, progressively narrower distally; glans

little bend towards dorsal side making an obtuse angle with the shaft; glans beset with small spinules. Allate part very long. Shaft at allate part with small spinations. Ovipositor long; seminal receptacle two lobed inner one little longer than the outer one.

Habits and habitats : Practically unknown.

Material examined : 22♂♂, 17♀♀, *Coll.* : D. B. Bastawade, *Loc.* : North 'O' FRH, Lonar Crater, 19.ii.2003, *Reg. No.* I/3364.

Distribution : Mudumalai wildlife Sanctuary, Nilgiris, Tamil Nadu and Lonar crater lake, Buldhana district, Maharashtra.

SUMMARY

The present account deals with 3 Arachnid orders, 13 families, 16 genera and 23 species, which have been actually collected, studied, recorded and reported from this area for the first time. Some of the spiders could be studied only up to generic level and on account of want of proper literature and in some cases availability of mature specimens. They are mentioned separately. It is interesting to record the Stenochelid spider of *crocatu*s group, as first report from India. Like wise some interesting observation are made on Laniatore Opiliones for the first time from the taxonomic point of view.

The Spider collections studied up to family and generic level

Family ARANEIDAE
Genus *Araneus* Clerck

1. *Araneus* sp. 1 ♀ Imm.

Genus *Neoscona* Simon

2. *Neoscona* sp. 1 y

Family GNAPHOSIDAE
Genus *Geodrassus* Chamberlin

3. *Geodrassus* sp. 1 ♀

Family FILISTTIDAE
Genus *Filistata* Latreille

4. *Filistata* sp. 4 ♀♀

Family SCYTODIDAE
Genus *Scytodes* Latreille

5. *Scytodes* sp. 2 ♀♀

Family THERIDIIDAE
Genus *Theridion* Walckenaer

6. *Theridion* sp. 1y.

Family Heteropodidae
Genus *Heteropoda* Latreille

7. *Heteropoda* sp. 1y.

Family OXYOPIDAE
Genus *Oxyopes* Latreille

8. *Oxyopes* sp. 2ys.

Family SALTICIDAE

9. *Undetermined* genus 1 ♂, 2 ♀ ♀ Imm. 12 ♀ ♀, 1 ♂.

Family LYCOSIDAE
Genus *Evipa* Simon

10. *Evipa* sp. 2 ♀ ♀

Genus *Hippasa* Simon

11. *Hippasa* sp. 1 ♀ sa

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CHILOPODA : SCOLOPENDROMORPHA

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INTRODUCTION

Centipede fauna of Maharashtra and Goa State (Sureshan & Yadav, 2008) is fairly well known, Yadav (1993 a,b, 2004,2005,2006), Yadav & Sureshan (2006), Jangi & Dass (1984). The checklist of Indian centipedes by Khanna (2001) treated 102 species belong to 11 genera and 2 families. Khanna (2008) further updated 90 species from India. As part of the exploration of the faunal wealth of Lonar Crater Wild Life Sanctuary, Maharashtra, Zoological Survey of India, Western Regional Station, Pune has conducted surveys in the area during the years 2002- 2004. The present communication is based on the study of the centipede specimens collected from the Sanctuary by ZSI, WRS, Pune. This forms the first detailed account on the centipede fauna of Lonar Crater Wild Life Sanctuary, Maharashtra, which is an important conservation area in the state on account of its great archaeological, evolutionary and topographical significance. Altogether 5 species of centipedes belonging to 5 genera, 2 subfamilies and 3 tribes are reported here to occur in the Lonar Crater Wild Life Sanctuary. All the specimens are deposited with the ZSI, WRS, Pune.

SYSTEMATIC ACCOUNT

Class CHILOPODA
Order SCOLOPENDROMORPHA
Family SCOLOPENDRIDAE
Subfamily SCOLOPENDRINAE
Tribe SCOLOPENDRINI

1. *Scolopendra morsitans* Linnaeus

1758. *Scolopendra morsitans* Linnaeus; Syst. Nat. 10 : 638.

1984. *Scolopendra morsitans* Linnaeus; Jangi & Dass, J. Scient. Indl. Res; 43(2) : 27-54.

Diagnostic characters : 20th pair of legs with or without tarsal spur; anal leg prefemur with 3 longitudinal rows of 3 spines on ventral side.

Material examined : 2 exs., North of Forest Rest House (forest patch in the crater basin), 19.ii.03 coll. D.B. Bastawade & party (Reg. No. I/3357); 1 ex. Forest patch near Kmalaja Devi temple, 30.xi.2003, Coll. P.M. Sureshan (Reg.No. I/3378); 3 exs. S.W. of Forest Rest House (forest patch in the crater basin), 19.xi.2003, coll. P.M. Sureshan (Reg.No. I/3379).

Distribution : Cosmopolitan.

Remarks : This species occurs progressively more abundantly northwards and is the most dominant species of the genus *Scolopendra* of Indo-Gangetic Plains. However, not commonly occurring in the area indicated by the poor representation in the collection.

Tribe ASANADINI

2. *Asanada sukhensis* Jangi & Dass.

1984. *Asanada sukhensis* Jangi & Dass; *J. Scient. Indl. Res*; **43**(2) : 27-54.

2001. *Asanada sukhensis* Jangi & Dass. Khanna. *Ann. For.* **9**(2) : 205.

Diagnostic characters : Anal legs short and thick; paired longitudinal median suture complete on 20th tergite; 21st tergite more than twice as broad as long, longitudinal median groove confined to posterior half of anal leg femur only.

Material examined : 1 ex. S.W. of Forest Rest House, (crater basin forest), 19.xi.2003, coll. P.M. Sureshan (Reg. No. I/3379).

Distribution : India : Kerala, Madhya Pradesh, Maharashtra, Orissa.

Remarks : This is an uncommon species. Yadav & Sureshan (2006) reported this species for the first time from Sanjay Gandhi National Park, Borivalli, Maharashtra.

Subfamily OTOSTIGMINAE

Tribe OTOSTIGMINI

3. *Rhysida immarginata immarginata* (Porath)

1876. *Brachiosoma immarginatum* Porath, *Bth. Svenska Ak.* **4**(7) : 24.

1926. *Rhysida nuda immarginata*, Attems. *Das Tierr. Scolopendromorpha*, **54**(2) : 190.

2001. *Rhysida nuda immarginata* (Porath) : Khanna. *Ann. For.*, **9**(2) : 212.

2008. *Rhysida immarginata immarginata* (Porath) Khanna, *Biosystematica* : **1**(2) : 31-35.

Diagnostic characters : All tergites except anterior with complete paramedian longitudinal sturues, 20th pair of walking legs without tarsal spur; apex of the process of coxoploura with 3 spines; antennae 19 segmented.

Material examined : 1 ex. South West of Forest Rest house (forest patch in crater basin) 19.xi.2003, coll. P.M. Sureshan (Reg. No. I/3379), 1 ex., South of Forest Rest house (forest patch in crater slope) 16.xi.2003, coll. D.B. Bastawade & party (Reg. No. I/3375).

Distribution : India : Assam, Andaman & Nicobar Islands, Delhi, Gujarat, Madhya Pradesh, Maharashtra, Rajasthan, Uttaranchal, Uttar Pradesh and West Bengal.

Remarks : Common species, but of less common occurrence in the sanctuary.

4. *Otostigma politus politus* Karsch

1881. *Otostigma politum*, Karsch, *Berlin ent. Z.*, **25** : 219.

1930. *Otostigma (O.) politus politus* Attems, *Das Tierr., Scolopendromorpha*, **54(2)** : 149.

Diagnostic characters : Claw of second maxillae with a spur; first 5-6 legs with two tarsal spurs and following legs up to 19th with a single tarsal spur; tegites smooth.

Material examined : 1 ex. South of Forest Rest house (forests in crater basin) coll. D.B. Bastawade & party, 16.ii.2003 (Reg. No. I/3375).

Distribution : India : Assam, Delhi, Himachal Pradesh, Kerala, Maharashtra, Meghalaya, Orissa, Sikkim, Uttaranchal, West Bengal.

Remarks : Uncommon species.

5. *Digitipes coonoorensis* Jangi & Dass

1984. *Digitipes coonoorensis* Jangi & Dass, *J. scient. Indl. Res.* **43(2)** : 48.

2001. *Digitipes coonoorensis* Jangi & Dass, *Khanna, Ann. For.*, **9(2)** : 212.

Diagnostic characters : Coxopleural process tipped with 4 spines and bearing 2 lateral spines; tergites punctate and with complete paramedian sutures on 6-20; 21st tergite a little broader than long and having its lateral margins only slightly convex; antennae with 17 articles, 3 basal glabrous.

Material examined : 4 ex. North of Forest Rest House (forest patch in crater slope) 17.ii.2003, (Reg.No.I/3356); 3 exs. North of Forest Rest house, 19.ii.2003, (Reg. No. I/3357); 7 exs, South of Forest rest House, 16.ii.2003, (Reg.No. I/3357) coll. D.B. Bastawade & party; 2 exs, Forest patch near Kmalaja Devi temple, 20.xi.2003, (Reg. No. I/3378); 6 exs, South West of Forest Rest House, 19.xi.2003, (Reg. No. I/3379) coll. Bastawade & party.

Distribution : India : Tamil Nadu, Maharashtra.

Remarks : This is the commonly occurring species of centipede throughout the sanctuary. Specimens are collected mainly under stones and leaf litter from forest patches in the crater slope and basin. Only few records of the species are available from Maharashtra.

DISCUSSION

The present study records 5 species of Scolopendrid centipedes belonging to 5 genera under 2 sub families and 3 tribes from the Lonar Crater Wildlife Sanctuary, Buldhana district, Maharashtra. All the species are reported for the first time from the area. The species *Digitipes coonoorensis* Jangi & Dass is commonly occurring in the area. The record of *Asanada sukhensis* Jangi & Dass from the area is interesting since *Asanada* represents a genus with poor variety and by no means plentiful and the species is rarely occurring in Maharashtra.

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INSECTA : ODONATA

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Abstract : Lonar wildlife sanctuary, Dist. Buldhana, Maharashtra was surveyed by the Western Regional Station of Zoological Survey of India, Pune from 2002 to 2005. Collection of Odonata obtained from the area was studied and identified. A total of nine species distributed amongst seven genera in five subfamilies, representing two families were recorded for the first time from there.

INTRODUCTION

Odonata form the prominent insects while on flight as well as at rest. Being active, on flight, this group attracted attention of workers since long and first record of Indian Odonate dates back to more than 250 years (Mitra, 1999). Fraser (1933-36) published 3 volumes on Fauna of British India : Odonata which are still regarded as most authentic consolidated taxonomic work. Recently Prasad & Varshney (1995) published checklist of Indian Odonata which includes 499 species.

Prasad (1996) published an account of Odonata from Maharashtra state, based on the collections present in National Zoological Collection of Zoological Survey of India, and enlisted 83 species. Later, Kulkarni *et. al.* 2002, 2004, and 2006b added five species to the list, making the total to 88 species known from the state of Maharashtra.

Faunistic Surveys of Lonar Wildlife Sanctuary, Dist. Buldhana, Maharashtra, were undertaken by Western Regional Station, Zoological Survey of India, Pune during the years 2002-2005. A total of 25 (approx.) specimens were collected. All this collection was identified and recorded. There is no earlier record of Odonate species from this area, thus all the nine species are recorded for the first time from here. Breeding of dragonflies in the water of Lonar crater was not observed.

SYSTEMATIC LIST

Order ODONATA

Suborder ZYGOPTERA

Superfamily COENAGRIONOIDEA

Family COENAGRIONIDAE

Subfamily ISCHNEURINAE

Genus *Ischnura* Charp, 1840

1. *Ischnura senegalensis* (Rambur)

Subfamily AGRIOCNEMIDINAE

Genus *Agriocnemis* Selys, 1877

2. *Agriocnemis pygmaea* (Rambur)

Suborder ANISOPTERA

Superfamily LIBELLULOIDEA

Family LIBELLULIDAE

Subfamily LIBELLULINAE

Genus *Orthetrum* Newman, 1833

3. *Orthetrum pruinsum neglectum* (Rambur)

4. *Orthetrum sabina sabina* (Drury)

Subfamily SYMPETRINAE

Genus *Brachythemis* Brauer, 1868

5. *Brachythemis contaminata* (Fabr.)

Genus *Bradinopyga* KIRBY, 1893

6. *Bradinopyga geminata* (Rambur)

Genus *Crocothemis* Brauer, 1868

7. *Crocothemis servilia servilia* (Drury)

Genus *Diplacodes* Kirby, 1889

8. *Diplacodes trivialis* (Rambur)

Subfamily TRAMEINAE

Genus *Tholymis* Hagen, 1867

9. *Tholymis tillarga* (Fab.)

SYSTEMATIC ACCOUNT

Order ODONATA
Suborder ZYGOPTERA
Superfamily COENAGRIONOIDEA
Family COENAGRIONIDAE
Subfamily ISCHNURINAE

Genus *Ischnura* Charp, 1840

1. *Ischnura senegalensis* (Rambur)

1842. *Agrion senegalensis*, Rambur, *Ins. Neurop.*, : 276.

1933. *Ischnura senegalensis*, Fraser, *Fauna Brit. India, Odonata*, 1 : 348-351.

1988. *Ischnura senegalensis*, Prasad & Ghosh, *Rec. zool. Surv. India*, 85(2) : 202.

Diagnostic characters : Head : Labium pale yellow, labrum pale blue, narrowly black along the base. Prothorax black, the anterior collar pale blue, sides pale green; thorax bronzed black on dorsum. Legs black, exterior surfaces of tibiae and tarsi yellow. Wings hyaline, pterostigma of fore-wings very oblique, diamond shaped, black. Abdomen black, marked with yellow and blue. Anal appendages black and yellow. Female : Fraser (1933) described three forms of females with difference in colouration of head, prothorax, thorax and abdomen. All forms having similar wings and pterostigma.

Material examined and locality : North-East of Lonar Lake, 21.xi.2003, 1 ♂; North-West of Lonar Lake, 22.xi.2003, 1 ♂, 3 ♀, Coll. P.M. Sureshan; On the way to Kamalja Temple, 23.xi.2003, 1 ♀, Coll. S.G. Patil.

Distribution : India : Himachal Pradesh, Maharashtra, Manipur, South India, Uttar Pradesh; Australia, New Guinea, Philippines, Samoa and Soudiac Archipelago.

Subfamily AGRIOCNEMIDINAE

Genus *Agrionemis* Selys, 1877

2. *Agriocnemis pygmaea* (Rambur)

1842. *Agrion pygmaea*, Rambur, *Ins. Neurop.*, : 278.

1933. *Agriocnemis pygmaea*, Fraser, *Fauna Brit. India, Odonata*, 1 : 398-401.

1988. *Agriocnemis pygmaea*, Prasad and Ghosh, *Rec. zool. Surv. India*, 85(2) : 203.

Diagnostic characters : Head : Labium palest yellow, labrum metallic blue, anteclypeus, bases of mandibles, genae and frons pale apple green. Prothorax black on dorsum, anterior lobe and extreme edge of posterior lobe apple green. Thorax black on dorsum, marked with narrow antehumeral apple green stripes. Legs yellow, extensor surface of femora black.

Wings hyaline, pterostigma pale yellow. Abdomen segments 1 to 6 pale greenish yellow, terminal segments brick red. Anal appendages brick red. Female more robust than male and is known to exhibit polymorphic forms.

Material examined : North-West of Lonar crater lake, 22.xi.2003, 1♂, 1♀, Coll. P.M. Sureshan.

Distribution : India : Assam, Himachal Pradesh, Chennai, Maharashtra, Malabar, Manipur, Nicobar, Punjab, Rajasthan, Uttar Pradesh, West Bengal; Australia, Myanmar, Sri Lanka, China, Formosa, Java, Malaysia, Manila, North Gunia, Philippines, Singapore and Seychelles.

Suborder ANISOPTERA
Superfamily LIBELLULOIDEA
Family LIBELLULIDAE
Subfamily LIBELLULINAE

Genus *Orthetrum* Newman, 1833

3. *Orthetrum pruinsum neglectum* (Rambur)

1842. *Libellula neglecta*, Rambur, *Ins. Neurop.*, 86.

1936. *Orthetrum pruinsum neglectum*, Fraser, *Fauna Brit. India, Odonata*, 3 : 311-313.

Diagnostic Characters : Head, with reddish brown colour progressively dark from labium to frons and up to vesicle & occiput; eyes blue black above, bluish-gray below during life. Prothorax and thorax reddish brown, legs black, wings hyaline with enfumed pale brown towards apices and with a reddish-brown basal marking in hindwing. Abdomen bright vermilion red in sub adults, purplish red in adults. Anal appendages red. Females differ from males in frons similar to rest of face in colour, eyes yellowish capped with brown. Thorax reddish brown, abdomen dull ochreous with sutures and borders all finely black. Anal appendages dark ochreous and basal markings in wings pale and almost obsolete.

Material examined and Locality : South-West of Forest Rest House, 19.xi.2003, 1♂ Coll. P.M. Sureshan.

Distribution : India : Himachal Pradesh, Maharashtra (Melghat Tiger Reserve, Pench National Park, Tadoba Andhari Tiger Reserve), Bihar and West Bengal; Nepal; Myanmar; Sri Lanka; Hong Kong; Thailand and Malaya.

Remarks : Breeds in small tanks; recorded from altitude of 7,250 from Ooty, Nilgiris.

4. *Orthetrum sabina sabina* (Drury)

1770. *Libellula sabina*, Drury, *Ill. Exot. Int.*, 1 : 114.

1936. *Orthetrum sabina*, Fraser, *Fauna Brit. India, Odonata*, 3 : 300-302.

1995. *Orthetrum sabina sabina*, Prasad and Varshney, *Oriental Ins.*, 29 : 409.

Diagnostic Characters : Head : Labium yellow, middle lobe brownish to black; labrum face and frons yellowish, variably marked on anterior surface with black; frons very deeply notched so as to form two triangular facets in front. Prothorax bright yellow, thorax greenish yellow, legs black. Abdomen greenish yellow with very broad apical black rings on segments 4 to 5, narrow ring on segments 6; segments 7 to 9 and base of 10 black. Segments 1 and 3 enormously swollen dorso ventrally as well as laterally; 4 to 6 narrow, cylindrical, 7 to 9 dilated but compressed laterally; 10th very small. Anal appendages as long as segment 9. Females exactly like males.

Material examined and Locality : Forest patch, West of Kamalja Temple, 20.xi.2003, 1 ♂, Coll. P.M. Sureshan.

Distribution : India : Bihar, Himachal Pradesh, Maharashtra (Melghat Tiger Reserve, Amravati, Tadoba Andhari Tiger Reserve, Chandrapur); Australia; Angola and most of African continent. Indonesia (Java, Sumba, Timor); Egypt; Iraq; Iran; Micronesia (Ocenia); Myanmar; Nepal; Papua (New Guinea); Samoa Island (Pacific Ocean); Somalia (Somali Land); Sri Lanka; Thailand.

Remarks : Found in all parts of India, up to 7000 (Nilgiri's), most predaceous; cannibalism is also recorded and preys on other dragonflies also.

Subfamily SYMPETRINAE

Genus *Brachythemis* Brauer, 1868

5. *Brachythemis contaminata* (Fabr.)

1793. *Libellula contaminata*, Fabricius, *Ent. Syst.*, 2 : 382.

1936. *Brachythemis contaminata*, Fraser, *Fauna Brit. India, Odonata*, 3 : 365-366.

Diagnostic characters : Head : Labium pale ochraceous; labrum reddish; face frons and vesicle olivaceous or pale green yellow, eyes broadly contiguous; prothorax with dark reddish brown stripes traversing anterior and posterior borders of middle lobe, thorax with obscure brownish stripes, wings hyaline, reticulation reddish, with a broad bright orange fascia extending from base within 2-3 cells of pterostigma in fore wing and as far as that organ in the hind; pterostigma rust red. Abdomen reddish-ochraceous, marked with obscure dorsal and sub dorsal brown stripes. Females differ in colour, with hind wings very palely tinted with yellow at extreme base without orange fascia seen in the males, pterostigma bright ochraceous. Abdomen pale olivaceous brown, with narrow black stripe on mid dorsal carina from segment 2 to end. Anal appendages yellow.

Material examined and locality : Forest patch West of Kamalja Temple, 20.xi.2003, 1 ♀; North-East of Lonar crater lake, 21.xi.2003, 1 ♂, 2 ♀ ♀, Coll. P.M. Sureshan; On the way to Kamalja temple, 23.xi.2003, 2 ♀ ♀; On way to Deshmukh Kopra and around, 1 ♂, 1 ♀ Coll. S.G. Patil.

Distribution : India : Maharashtra (Melghat Tiger Reserve, Amravati, Osmanabad, Pune (Khandala, Khed and Lonavala), Tadoba Andhari Tiger Reserve, Chandrapur) Himachal Pradesh, Uttaranchal, Madhya Pradesh, Bihar, West Bengal and East Himalaya; China; Indonesia; Malaysia; Myanmar; Nepal; Philippines; Singapore; Sri Lanka Taiwan and Thailand.

Remarks : It is common species in India and found in large numbers. Seen flying over water surface throughout year and recorded to undergo three generations annually.

Genus *Bradinopyga* Kirby, 1893

6. *Bradinopyga geminata* (Rambur)

1842. *Libellula geminata* Rambur, *Ins. Neurop.* : 90.

1936. *Bradinopyga geminata*, Fraser, *Fauna Brit. India, Odonata*, 3 : 349-350.

Diagnostic characters : Head : Labium, labrum pale yellow or dark brown; rest of face & frons olivaceous, vesicle & occiput brown, prothorax and thorax cinereous or dirty pale yellow marbled with black. Wings hyaline, pterostigma black at center, pure white at distal and proximal ends, discoidal cell in forewing traversed only once, but in hind wing entire. Anal triangle 3 celled, abdomen coloured very similar to thorax. Anal appendages pale-creamy white. Female exactly similar to males.

Material examined and locality : Lonar crater proper, Forest Rest House, Lonar, 17.ii.2003, 1 ♂, 1 ♀, Coll. D.B. Bastawade.

Distribution : India : Bihar, Delhi, Eastern Himalaya, Madhya Pradesh, Maharashtra (Melghat Tiger Reserve, Amravati, Satara, Ambenali, Tadoba Andhari Tiger reserve, Chandrapur), Uttaranchal, West Bengal (Dhanbad), Peninsular India; Sri Lanka.

Remarks : This species is found in open and cultivated areas, near wells, small and cemented walls, and exhibits protective, cryptic colours. It is common in tanks, plastered March to October.

Genus *Crocothemis* Brauer, 1868

7. *Crocothemis servilia servilia* (Drury)

1770. *Libellula servilia*, Drury, *Ill. Ex. Ins.*, 1 : 16.

1936. *Crocothemis servilia servilia*, Fraser, *Fauna Brit. India, Odonata*, 3 : 345-347.

Diagnostic characters : Head : Labium ferruginous; labrum blood red, anteclypeus pale red, rest of face and frons bright blood red; eyes during life blood red above, purple laterally. Prothorax and thorax ferruginous, often blood red on dorsum during life, legs ochreous, Wings, hyaline bases of all wings marked with rich amber yellow up to cubital nervure in forewing and to first antenodal nervure nearly to arc; apices of wings lined narrowly with pale brown in old specimens.

Females differ widely in colouration from the males. Labium pale yellow; labrum, face, frons and vesicle olivaceous; prothorax and thorax olivaceous brown. Wings similar to males but markings paler, abdomen ochreous, segments 8 & 9 blackish along mid dorsal carina.

Material examined and locality : North-East of Lonar crater Lake, 21.xi.2003, 1 ♀, Coll. P.M. Sureshan.

Distribution : India : Bihar, Himachal Pradesh, Madhya Pradesh, Maharashtra (Buldana, Gondhokher, Colaba, Matheran, Osmanabad, Upla, Pune, Khed and Lone, Melghat Tiger Reserve, Amravati, Satara, Lingmal Falls and Tadoba Andhari Tiger reserve, Chandrapur), Uttaranchal, West Bengal; Australia, Indonesia (Sumba); Iraq; Japan; Myanmar; Nepal; Philippines; Sri Lanka and Sundaic Archipelago.

Remarks : Common species in India. Adults are seen throughout the year on wing. Teneral males and females are similar in colour, pale straw-yellow, differ from mature males and may confuse identity of the species.

Genus *Diplacodes* Kirby, 1889

8. *Diplacodes trivialis* (Rambur)

1842. *Libellula trivialis* Rambur, *Ins. Neurop.*; 115.

1936. *Diplacodes trivialis*, Fraser, *Fauna Brit. India, Odonata*, 3 : 336-338.

Diagnostic characters : Head : Labium, labrum and bases of mandibles creamy yellow; face, frons, and vesicle palest azure blue with fine black line at the base of frons; Prothorax pale brown to black; thorax greenish yellow with sutures finely black; the area between mid dorsal carina and humeral sutures olivaceous brown speckled with minute dots, colouration darkens with age. Legs greenish yellow, marked with black in subadults; wings hyaline with a minute yellow point in cubital space of hind wings; abdomen with segments 1 to 3 greenish yellow; remaining segments black with sub dorsal yellow stripes on segments 4-7. Females : Similar to subadult males, abdominal markings broader on segments 8 to 10.

Material examined and locality : South-West of Forest Rest House, 19.xi.2003. 1 ♀; North-West of Lonar crater lake, 22.xi.2003, 1 ♀, Coll. P.M. Sureshan.

Distribution : Throughout India; Indonesia (Sumatra); Myanmar; Nepal; Sri Lanka; Thailand and W. Malaysia (Malacca).

Remarks : Common species found throughout the year near water bodies. Also found in grassy vegetation & agricultural fields.

Subfamily TRAMEINAE

Genus *Tholymis* Hagen, 18679. *Tholymis tillarga* (Fab.)1798. *Libellula tillarga* Fabricius, *Ent. Syst. Suppl.*, : 285.1936. *Tholymis tillarga*, Fraser, *Fauna Brit. India, Odonata*, 3 : 411-413.1988. *Tholymis tillarga*, Prasad & Ghosh, *Rec. zool. Surv. India*, 85(2) : 210.1995. *Tholymis tillarga*, Prasad & Varshney, *Oriental Ins.*, 29 : 413.

Diagnostic characters : Head : Labium, labrum and face oilvaceous or pale yellowish-brown; frons and vesicle ochreous, eyes brown, capped with reddish, olivaceous below. Prothorax and thorax golden yellow, with a bright reddish suffusion on dorsum. Legs ochreous. Wings hyaline, with a broad smoky fan shaped golden brown fascia extending from node to base of hind wing. Deep in colour at node and somewhat longitudinally striated. This fascia bordered distally by a broad oval opalescent white spot, 4 cells deep. Pterostigma reddish brown, between dark nervures, membrane blackish brown. Abdomen bright rust red, specially on dorsum, paler at sides. Anal appendages reddish. Female, similar to male, with wings without opalescent spot and the golden brown fascia very pale and obscure.

Material examined and locality : Gupt Kamalja Temple and around, 26.ix.2003, 2♂♂, Coll. S.G. Patil.

Distribution : India : Himachal Pradesh, Madhya Pradesh, Maharashtra, Punjab, Uttar Pradesh, West Bengal; Australia; Madagascar; Myanmar; Sri Lanka and Tropical Africa.

Remarks : Dragonflies of rather large size and robust built, appearing on wing before dusk. The brown fascia and opalescent white spot of hind wings distinguish this species easily.

SUMMARY

During the faunistic surveys conducted by Western Regional Station of Zoological Survey of India, approximately 25 specimens of Odonata were collected from Lonar Crater and Wildlife Sanctuary, Dist. Buldhana, Maharashtra. Altogether nine species were identified. The species were found to be distributed amongst 2 suborders, 2 superfamilies, 2 families, 5 subfamilies and 7 genera.

ACKNOWLEDGEMENTS

The authors are grateful to the Director Zoological Survey of India, Kolkata and Drs. M.S. Pradhan (Retd.) and Anil S. Mahabal, Officers-in-charge of Western Regional Station,

Z.S.I., for all facilities to undertake surveys and workout the collection. Authorities of state Forest Department Govt. of Maharashtra and Officers and staff members of Lonar crater and Wildlife Sanctuary, Buldhana District, extended their help in all possible ways. The authors are grateful to them.

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INSECTA : HYMENOPTERA : CHALCIDOIDEA : PTEROMALIDAE

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INTRODUCTION

Pteromalidae is one of the largest and taxonomically difficult families of Chalcidoidea (Hymenoptera Parasitica), members of which are distributed in all biogeographical regions of the world. Majority of Pteromalidae are primary or secondary parasitoids attacking a large range of insect orders in their various stages of development, thereby playing a vital role in nature in the control of Insect pests. Many species of Pteromalidae were employed successfully in biological control programmes all over the world hence they also form a rewarding group of insects for various aspects of scientific studies like Systematics, Biology, Ethology, Ecology etc.

Pteromalidae contains over 3500 described species under 558 genera world wide (Noyes, 2004). When compared to the other regions of the world, our knowledge of the Pteromalid fauna of Indian subcontinent is still far from satisfactory. Boucek *et al.* (1979) provided a more complete picture of the Pteromalid fauna of Indian subcontinent, which was supplemented by the works of Farooqi & Subba Rao (1985, 1986). Later Sureshan (2003) attempted a revision of the subfamily Pteromalinae of Pteromalidae followed by the compilation of a Checklist of the species and key to the genera of Pteromalidae of Indian subcontinent (Sureshan & Narendran, 2003, 2004). Currently 195 species of Pteromalidae under 101 genera and 17 subfamilies are known from the Indian subcontinent, out of which Indian fauna is represented by 185 species under 91 genera and 16 subfamilies. The present account is based on the study of a collection of Pteromalidae from the Lonar Crater Wildlife Sanctuary, Buldhana District, (19° 59' N, 76° 34' E) which is one of the important conservation areas in Maharashtra. The collections were made through faunistic surveys conducted by Zoological Survey of India, Western Regional Station, Pune. 17 species of Pteromalidae under 14 genera and 6 subfamilies are reported here from the Lonar Crater Wildlife Sanctuary. All the species are reported for the first time from the area and all except one are reported for the first time from Maharashtra. The collections are deposited in Zoological Survey of India, Estuarine Biological Station, Gopalpur-on-Sea.

The classification of the family Pteromalidae given by Boucek (1988) is followed in the present work.

Following abbreviations are used in the text : BMNH-The Natural History Museum, London, U.K.; F1-F6-Funicular segments 1 to 6; MCSG-Museo Civico di Storia Naturel, Genova, Italy; MV-Marginal vein; OOL-Ocellocular distance; PMV-Post marginal vein; POL-Postocellar distance; QM-Queensland Museum, Australia; SMV-Submarginal vein; STV-Stigmal vein; T1-T4-Gastral tergites 1 to 4. USNM-United States National Museum of Natural History, Washington DC, USA; UZIL-Universitetets Zoologiska Institutionen, Lund. Sweden; ZSI-Zoological Survey of India, Kolkatta, India; ZSIC-Zoological Survey of India, Western Ghats Field Research Station, Calicut, India.

SYSTEMATIC ACCOUNT

Class INSECTA
Order HYMENOPTERA
Superfamily CHALCIDOIDEA
Family PTEROMALIDAE
Subfamily CLEONYMINAE

1. *Soelnura ania* (Walker) (Fig. 3)

1846. *Epistenia ania* Walker. *List of Hym. Insects. In British Mus. I. Chalcidites*. Pp100. (BMNH)

1961. *Solenura ania* (Walker). Hedqvist : *Entomol. Ts. Arg.* 90(3-4) : 174-202.

Diagnostic characters : Female : Length : 8.7 mm. Body black with greenish blue luster, punctuate reticulate. Face with inter antennal ridge with a distinct notch at base of dorsal process; dorso median carina on pronotum distinct; propodeum with posterior margin almost straight, median carina distinct; gaster (length up to tip of syntergum) length 1.8x as long as head plus thorax combined, petiole in the form of a fine thin strip with very short carinule anteriorly.

Material examined : 1 Female : Maharashtra : Lonar Crater Wildlife sanctuary (Forest patch west of Kamalaja Devi temple), 20.xi.2003, ex. Dead wood of *Ficus* sp. Infested with wood boring beetles, coll. P.M. Sureshan (Reg. No. E. 5046).

Distribution: India : Uttaranchal : Dehradun, Assam, Maharashtra; China, Indonesia, Malaysia, Philippines, Sri Lanka, Taiwan, Thailand, Japan.

Remarks : Rare species, parasitizing larvae of wood boring beetles. Sureshan (2005) reported this species from Maharashtra (Lonar Crater Wild life Sanctuary) extending its distribution in Deccan peninsula.

Subfamily CEROCEPHALINAE

2. *Theocolax radhakirshnani* Sureshan & Narendran (Fig.1)

2005. *Theocolax radhakirshnani* Sureshan & Narendran. *Rec. zool. Surv. India* : **104**(1-2) : 141-146. (ZSI)

Diagnostic characters : Female : Length 2 mm. Dark brown, tip of ovipositor brownish black; wings hyaline with a brown transverse infumation below stigma. Head rectangular, mostly smooth and polished, 1.23x as long as wide in front view; POL 1.3x OOL; occipital carina fine; pronotum bell shaped, propodeum uniformly and distinctly reticulate, median area flat, no median carina and plicae; forewing without discal setae, marginal fringe very long; a tuft of black bristles at parastigma; gastral petiole long, only little shorter than hind coxa in profile, gaster (without petiole and with ovipositor) 1.23x as long as head plus thorax combined.

Material examined : 4 Female, 1 Male, Lonar Crater Wildlife sanctuary (South west of forest Rest house), ex. Dead wood infested with wood boring beetles, 19.xi.2003, coll. P.M. Sureshan. (Reg. No. E. 5044)

Distribution : India : Maharashtra.

Remarks : Rare species parasitic on wood boring beetle larvae, described by Sureshan & Narendran (2005) from the sanctuary.

Subfamily SPALANGINAE

3. *Spalangia nigroaenea* Curtis (Fig. 16)

1839. *Spalangia nigroaenea* Curtis : *Brit. Ent.* **16** : fol. 740. P (2). (QM)

Diagnostic characters : Female : Length : 2.9-3. 8mm. Black, often with brassy lusture; head distinctly longer than broad (in male only as long as broad), umbilicately punctate with interspaces about as wide as punctures; pronotum with an isolated crenulate cross-line consisting of close punctures in front of hind margin, disc of collar more or less smooth, impunctate, collar bordered anteriorly by a narrow groove setting off ridge like margin; gaster petiole expanded anteriorly.

Material examined : 1 Female. Lonar Crater Wildlife sanctuary (south west of forest rest house, 19.xi.2003, coll. P.M. Sureshan (Reg. No. E. 5044).

Distribution : Cosmopolitan.

Remarks : Parasitoid of fly puparia, especially of the synanthropic species.

Subfamily HERBERTINAE

4. *Herbertia indica* Burks (Fig. 13)

1959. *Herbertia indica* Burks, *Proc. Ent. Soc. Wash.*, **61**(6) : 252. (USNM)

Diagnostic characters : Female : Length 1.1-1.5 mm. Black, metallic violaceous reflection on face and gaster dorsally; legs whitish except coxae, trochanter and femora bluish black; head and thorax granulate reticulate; antennae inserted on lower face, scape not reaching middle of face, extending 0.75x eye height, F1 shorter than pedicel, club as long as three preceding segments combined; forewing with MV slightly greater than 2x as long as PMV; gaster broad and short, T1 covering most of the gaster.

Material examined : 1 Male, Lonar Crater Wildlife sanctuary (North of forest Rest House), 17.ii.2003, coll. P.M. Sureshan (Reg. No. E 5016).

Distribution : India : Madhya Pradesh, Maharashtra; Sri Lanka.

Remarks : Uncommon species parasitic on leaf mining dipterous larvae. Reported for the first time from Maharashtra.

Subfamily PTEROMALINAE

5. *Acroclisoides maculatus* Sureshan & Narendran (Fig. 5)

2002. *Acroclisoides maculatus* Sureshan & Narendran. *Rec. zool. Surv. India.*, **100**(3-4) : 128. (ZSIC)

Diagnosotic characters : Female : Length 1.5mm. Dark metallic blue, gaster brown; lower posterior corner of gena with a sharp tooth; pronotal collar dorsally shiny behind anterior carina; forewing with basal cell and speculum closed below; STV with an obscure brown spot beneath; gaster (without petiole) 0.8x as long as head plus thorax combined.

Material examined : 1 Female, Lonar Crater Wildlife sanctuary (South west of forest Rest house, 21.ii.2003, coll. P.M. Sureshan (Reg. No. 5047); 1 Female data same as above except 19.xi.2003 (Reg. No. 5044).

Distribution : India : Kerala, Tamil Nadu, Maharashtra.

Remarks : Uncommon species, parasitic on eggs of Pentatomid Heteroptera. Recorded for the first time from Maharashtra.

6. *Agiommatus geethae* Sureshan & Narendran (Fig. 6)

1996. *Agiommatus geethae* Sureshan & Narendran. *J. Bombay Nat. Hist. Soc.*, **93** : 59-61. (ZSIC)

Diagnostic characters : Female : Length 1.8-1.9 mm. Dark metallic blue, gaster brown; head in dorsal view width 1.7x length; temple length 0.4x eye length; POL 3x OOL; gaster length 2.8x width in dorsal view; uniformly brown without yellowish cross bands; T4 only little longer than T3; forewing with basal part almost bare with few setae on basal vein.

Material examined : 1 Female, Lonar Crater Wildlife sanctuary (North east of Crater Lake), 21.ii.2003, coll. P.M. Sureshan (Reg. No. 5047).

Distribution : India : Karnataka, Maharashtra.

Remarks : Uncommon species, parasitic on eggs of cutworm (Lepidoptera : Noctuidae). Recorded for the first time from Maharashtra.

7. *Callitula peethapada* Narendran & Mohana (Fig. 15)

2001. *Callitula peethapada* Narendran & Mohana. *Uttar Pradesh J. Zool.*, **21**(1) : 31. (ZSIC).

Diagnostic characters : Female : Length 1.4-2.1 mm. Head and thorax metallic green with bronzy reflection dorsally; gaster brown with a broad yellowish spot dorsally at base; head 1.4x as wide as thorax, POL 1.6x OOL; anterior margin of clypeus shallowly emarginate, antennal scape reaching well beyond level of vertex, terminal stylus of club long; pronotal collar anteriorly margined, gaster elongate, ovate, 0.84x as long as head and thorax combined.

Material examined : 1 Female, Lonar Crater Wildlife sanctuary (North East of Crater lake forests), 21.xi.2003, coll. P.M. Sureshan (Reg. No. E 5047).

Distribution : India : Kerala, Maharashtra.

Remarks : Uncommon species, reported for the first time from Maharashtra and outside the type locality.

8. *Dinarmus acutus* (Thomson) (Fig. 11)

1878. *Dinarmus (Dinarmus) acutus* Thomson. *Hym. Scand.*, **5** : 56. (UZIL)

Diagnostic characters : Female : Length 2.1-3.3 mm. Dark metallic blue; anterior margin of clypeus with two small teeth; antennae with third anellus not longer than second; propodeum with nucha long; forewing with PMV as long as MV; gaster short, 0.7x as long as head plus thorax.

Material examined : 2 Female : Lonar crater Wild life sanctuary (North of Forest Rest House), 17.ii.2003, coll. P.M. Sureshan (Reg. No. E 5014), 1 Female, data same as above except Reg. No. E 5016.

Distribution : India : Kerala, Maharashtra; Europe.

Remarks : Uncommon species parasitizing bruchid beetles. Recorded for the first time from Maharashtra.

9. *Dinarmus basalis* (Rondani) (Fig. 12)

1877. *Entedon basalis* Rondani. *Boll. Soc. Ent. Ital.*, **9** : 174. (USNM).

Diagnostic characters : Female : Length 2.2-2.7 mm. Dark green with brassy reflection; anterior margin of clypeus slightly produced, shallowly emarginate; POL 1.3x OOL; antennae

with scape hardly reaching median ocellus, third anellus longest, forewing with PMV longer than MV; gaster ovate, dorsally flat.

Material examined : 1 Female, Lonar crater Wild life sanctuary (North of Forest Rest House), 18.ii.2003, coll. P.M. Sureshan (Reg. No. E 5015)

Distribution : India : Kerala, Delhi, Andhra Pradesh, Bihar, Haryana, Karnataka, Rajasthan, Maharashtra; Pakistan.

Remarks : Common species parasitic on bruchid beetles. Recorded for the first time from Maharashtra.

10. *Dinarmus maculatus* (Masi) (Fig. 10)

1924. *Sphaerakis maculatus* Masi. *Ann. Mus. Civ. Stor. Nat. Giacomo Doria*, **51** : 157. (MCSG).

Diagnostic characters : Female : Length 2.5-3 mm. Metallic blue with bronzy patches on vertex and thorax, gaster darker; anterior margin of clypeus almost straight; POL subequal to OOL; antennal scape reaching upto middle of median ocellus; third anellus as long as first and second combined; forewing with PMV as long as or slightly longer than MV; gaster cordiform.

Material examined : 1 Male, Lonar crater Wild life sanctuary (North of Forest Rest House) 17.ii.2003, coll. P.M. Sureshan (Reg. No. E 5016)

Distribution : India : Kerala, West Bengal, Maharashtra; Myanmar.

Remarks : Common species, parastic on Bruchid beetles. Reported for the first time from Maharsashtra.

11. *Kumarella angulus* Sureshan (Fig. 14)

1999. *Kumarella angulus* Sureshan. *Oriental Ins.*, **32** : 100-101. (ZSIC).

Diagnostic characters : Female : Length 3.9-4 mm. Head and thorax dark metallic blue, gaster brown; POL 0.7x OOL; antennal toruli above lower margin of eyes, third anellus little longer, pedicel as long as F2; propodeum with median area in the form of four depressed areas; gaster 1.3x as long as head plus thorax.

Material examined : 1 male : Lonar crater Wild life sanctuary (North of Forest Rest House), 18.ii.2003, coll. P.M. Sureshan (Reg. No. E. 5015).

Distribution : India : Kerala, Karnataka, Maharashtra; Vietnam, Malaysia, Taiwan, Thailand.

Remarks : Uncommon species, having a wider range of distribution in the South east Asia. Sureshan (2004) reported the variations and distributional range of the species.

12. *Metastenus concinnus* Walker (Fig. 8)

1834. *Metastenus concinnus* Walker. *Ent. Mag.*, 2 : 302. (BMNH).

Diagnostic characters : Female : Length : 1.5 mm. Brownish black; anterior margin of clypeus shallowly emarginate, POL little longer than OOL; posterior margin of gena sharp, antennae inserted center of face, with pedicel longer than F1; pronotal collar carinate; scutellum with frenum separated; propodeum with nucha moderate, coarsely reticulate, plicae sharp and complete; gaster as long as head plus thorax combined.

Material examined : 1 Female, Lonar crater Wild life sanctuary (Near Forest Rest House) 16.ii.2003, coll. P.M. Sureshan (Reg. No. E 5013)

Distribution : India : Kerala, Maharashtra; Europe.

Remarks : Uncommon species Parasitic on coccids. This forms the further report of the species from India subsequent after Sureshan (2003).

13. *Pachyneuron aeneum* Masi (Fig. 4)

1929. *Pachyneuron aeneus* Masi. *Ann. Civ. Stor. Nat. Giacomo Doria*, 53 : 229. (MCSG).

1974. *Pachyneuron kamathi* Mani & Saraswat. *Mem. School. Ent. Agra* No. 3 : 95.

1974. *Pachyneuron deccanensis* Mani & Saraswat. *Mem. School. Ent. Agra* No. 3 : 95.

Diagnostic characters : Female : Dark brown to black; anterior margin of clypeus weakly emarginate; antenna with scape not reaching median ocellus; thorax finely reticulate; forewing without marginal fringe, discal ciliation very sparse, indistinct, PMV only slightly longer than STV, MV strongly thickened.

Material examined : 1 Female, Lonar crater Wild life sanctuary (North of Forest Rest House), 16.ii.2003, coll. P.M. Sureshan (Reg. No. E 5013)

Distribution : India : Maharashtra, Uttar Pradesh, Himachal Pradesh.

Remarks : Boucek *et al.* (1979) reported this species from Poona, Maharashtra from Syrphid puparium (Diptera).

14. *Pachyneuron aphidis* (Bouche) (Fig. 2)

1834. *Diplolepis aphidis* Bouche, *Natur. Ins. Berlin.*, 5 : 170. (Type lost?)

1939. *Pachyneuron lali* Mani, *Ind. J. Ent.*, 1 : 81.

1939. *Pachyneuron ferriere* Mani, *Ind. J. Ent.*, 1 : 83.

1974. *Pachyneuron triarticulata* Mani & saraswat. *Mem. School. Ent. Agr.* No., 3 : 98.

Diagnostic characters : Female : Brownish black, gaster with greenish or bluish tinge; anterior margin of clypeus strongly produced and rounded at middle; antennae with three anelli and 5 funicular segments, third anellus nearly as long as first and second combined; forewing with MV thick, about 2.7x as long as maximum width; gaster round, petiole not longer than wide.

Material examined : 1 Female. Lonar crater Wild life sanctuary (North of Forest Rest House), 17.ii.2003, coll. P.M. Sureshan (Reg. No. E 5014).

Distribution : India : Delhi, Haryana, Jammu & Kashmir, Maharashtra; Pakistan, Europe, America, Japan.

Remarks : Uncommon species parasitic on various aphids. Reported for the first time from the Deccan peninsula.

15. *Sphegigaster brunneicornis* (Ferriere) (Fig. 7)

1930. *Trigonogastra brunneicornis* Ferriere. *Bull. Ent. Res.*, **21** : 356-357. (BMNH).

Diagnostic characters : Female : Length : 2-2.5 mm. Body dark green, almost black. Antennal scape, pedicel and anelli yellow, otherwise reddish brown; F1 longer than pedicel, narrowed basally, funicular segments longer than wide except F6 subquadrate, pronotum distinctly carinate; gaster (without petiole) not longer than thorax.

Material examined : 1 Female, Lonar crater Wild life sanctuary (North of Forest Rest House), 17.ii.2003, coll. P.M. Sureshan (Reg. No. E 5014)

Distribution : India : Kerala, Maharashtra; Sri Lanka.

Remarks : Common species parasitic on pupae of Diptera. Reported for the first time from Maharashtra.

16. *Uniclypea kumarani* Sureshan & Narendran (Fig. 9)

1994. *Uniclypea kumarani* Sureshan & Narendran. *Hexapoda*, **6**(2) : 62-63. (ZSIC).

Diagnostic characters : Female : Length 2.9-3.7 mm. Black; gaster dark metallic blue, almost black. Occiput with distinct carina; clypeus tooth broader; forewing with PMV 2.4-2.5 x STV, costal cell 1.4-1.5x MV; gaster elongatedly ovate, not slender, as long as head plus thorax combined and length 2.8x width.

Material examined : 1 Female, Lonar crater Wild life sanctuary (North east of Forest Rest House), 21.ii.2003, coll. P.M. Sureshan (Reg. No. E 5047); 1 Female, South west of Forest Rest House, 19.xi.2003, coll. P.M. Sureshan (Reg. No. E 5044).

Distribution : India : Kerala, Maharashtra.

Remarks : Uncommon species endemic to Indian peninsula. Recorded for the first time outside the type locality.

Subfamily PANSTENONINAE

17. *Panstenon* sp.

Diagnostic characters : Male : Length 2.2 mm. Bright metallic green, antennal scape, legs including coxae, pronotum, petiole and gaster (ventro anteriorly) testaceous; pronotum smooth without anterior carina; propodeum irregularly alvelote- rugulose; plicae not traceable; forewing narrow, long, without speculum; gaster petiole little longer than broad, tapering forwards, sides with erect hairs, with longitudinal rugosity.

Material examined : 1 Male, Lonar crater Wild life sanctuary (North east of Forest Rest House), 21.ii.2003, coll. P.M. Sureshan (Reg. No. E 5047).

Remarks : The specimen closely resembles and most probably belongs *Panstenon collare* Boucek, but species identity couldn't made since female specimens are not examined.

SUMMARY

The present study reveals occurrence of 17 species of *Pteromalidae* (Hymenoptera Parasitica) belonging to 14 genera and 6 subfamilies in the Lonar Crater Wild Life Sanctuary, Buldhana District, Maharashtra. Though the sanctuary comprises a total area of about 383 hectors, the collections were made only from the vegetations found in the basin, slopes and rim of the crater, which is mainly dry deciduous forest type in the slope, bushy type on the rim and basin. Description of a new species of *Theocolax*, viz. *T. radhakrishnani* Sureshan & Narendran and the record of *Solenura ania* Walker, two parasitoids of wood boring beetles from the sanctuary are interesting (Sureshan & Narendran, 2005, Sureshan, 2005). Both the species were emerged from dead wood of *Ficus* tree heavily infested with wood boring beetles. *Soelnura aina* Walker was earlier known only from Assam and Dehradun and the distribution of the species has been extended to the Deccan peninsula by the collection of the specimens from the sanctuary. Occurrence of *Kumarella anugulus* Sureshan and *Uniclypea kumarani* Sureshan & Narendran, two forest dwelling species in the sanctuary is also interesting. Though *Kumarella angulus* Sureshan has a wider distributional range in South East Asia far East up to Taiwan (Sureshan, 2004) it was earlier known only from few localities in Southern Western Ghats. The distribution of *Uniclypea kumarini*, a rare species known only from Kerala Western Ghats has been extended here to northern part of Deccan peninsula. All the other species except *Pachyneuron aeneum* (Masi) are reported here for the first time from Maharashtra. Though the present paper deals with a collection of *Pteromalidae* made form a smaller geographical area, it throws light on the further distribution of some rare species and forms a basis for future work on this rewarding group of insects from the Deccan peninsula and Northern Western Ghats.

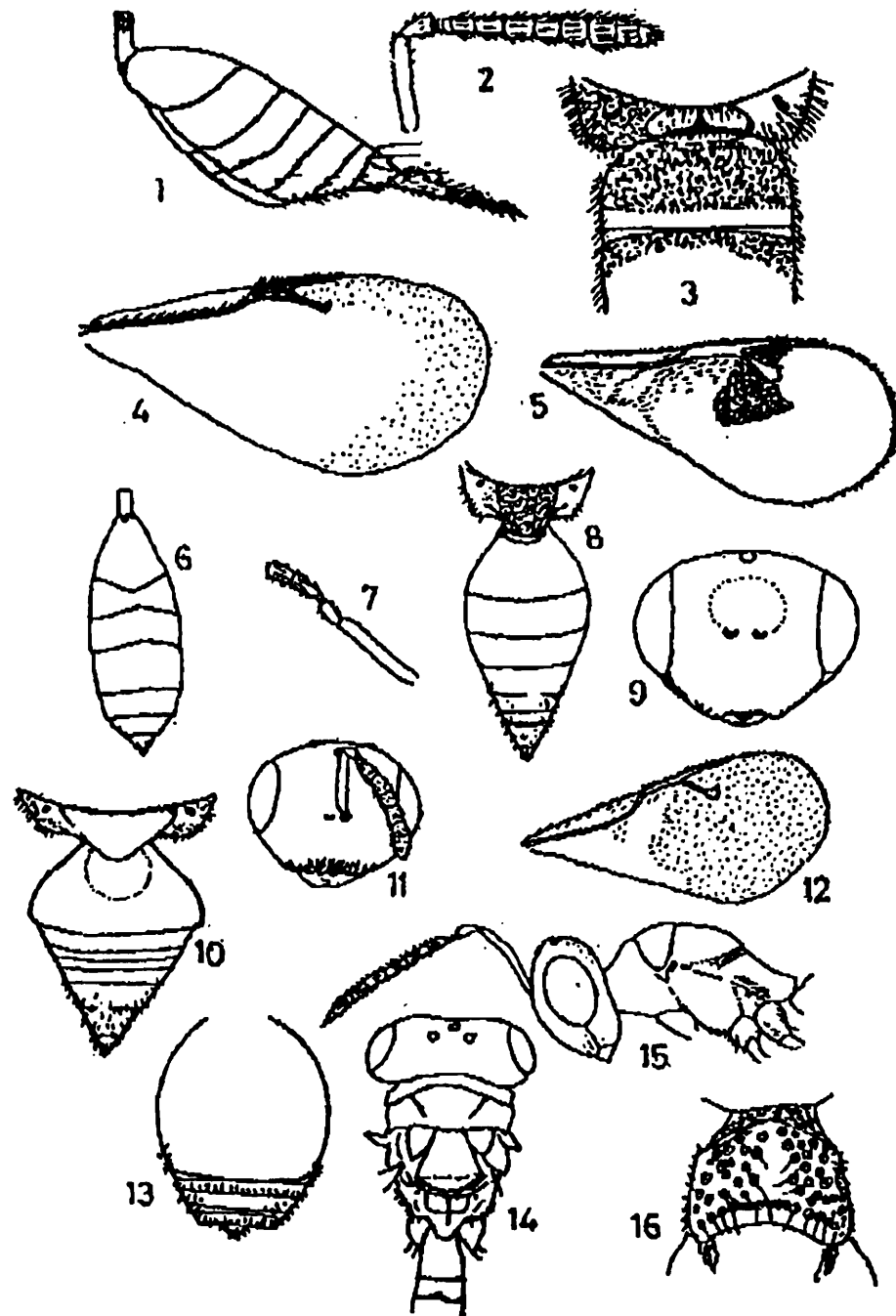


Fig 1-16 : 1. *Theocolax radhakrishnani* Sureshan & Narendran, female gaster, 2. *Pachyneuron aphidis* (Bouche), female antenna, 3. *Solenura ania* (Walker), propodeum and base of gaster dorsal view, 4. *Pachyneuron aeneum* (Masi) forewing., 5. *Acroclisoides maculatus* Sureshan & Narendran, forewing, 6. *Agiommatus geethae* Sureshan & Narendran, female gaster, 7. *Sphegigaster brunneicornis* (Ferriere), female, basal part of antenna, 8. *Metastenus concinnus* Walker, female, propodeum and gaster dorsal view, 9. *Uniclypea kumarani* Sureshan & Narendran, head in front view., 10. *Dinarmus maculatus* (Masi), female propodeum and gaster dorsal view, 11. *Dinarmus acutus* (Thomson), head in front view, 12. *Dinarmus basalis* (Rondani), forewing, 13. *Herberita indica* Burks, female gaster dorsal view, 14. *Kumarella angulus* Sureshan, head and thorax dorsal view, 15. *Callitula peethapada* Narendran & Mohana, head and thorax in profile, 16. *Spalangia nigroaenea* Curtis Pronotum dorsal view.

ACKNOWLEDGEMENTS

I am grateful to the Director, Zoological Survey of India, Kolkatta and the Officer in charge, Zoological Survey of India, Western Regional Station, Pune and Estuarine Biological Station, Gopalpur-on-Sea for providing the facilities.

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INSECTA : LEPIDOPTERA : RHOPALOCERA AND GRYPOCERA

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INTRODUCTION

Butterflies are an integral part of the forest ecosystem. They are sensitive to changes in the habitat and climate, which influence their distribution and abundance (Wynter-Blyth, 1957). Recently, Sharma & Radhakrishnan (2004, 2005 & 2006) and Sharma & Chaturvedi (2006) have studied the butterfly fauna of some major conservation areas in Maharashtra. Barring a report on butterflies of Lonar Crater Lake and its environs by Palot & Soniya (2003), no comprehensive study was undertaken earlier.

The present account depicts the study of Palot & Soniya (48 species of 35 genera) and a very small collection (49 examples) of butterflies from Lonar Wildlife Sanctuary, dist. Buldhana, Maharashtra. Now, the total known species from the sanctuary stands at 53 species under 36 genera spread over seven families. The classification adopted here is after Varshney (1993-1997). Collection data is provided here for those species only which are marked with asterisk (*). The members of families Nymphalidae and Pieridae are species rich as compared to other families.

Systematic Arrangement of Butterflies Recorded from Lonar Wildlife Sanctuary

Order LEPIDOPTERA
Suborder RHOPALOCERA
Family PAPILIONIDAE (Swallow tails)
Subfamily PAPILIONINAE
Tribe LEPTOCIRCINI

1. *Graphium agamemnon* Linn. Tailed Jay

Tribe PAPILIONINI

- *2. *Papilio polytes* Linn. Common Mormon
3. *Papilio demoleus* Linn. Lime Butterfly
4. *Pachliopta aristolochiae* Fab. Common Rose

Family PIERIDAE (Whites & Yellows)
Subfamily PIERINAE
Tribe PIERINI

- 5. *Belenois aurota* Fab. Pioneer
- *6. *Cepora nerissa* Fab. Common Gull
- 7. *Leptosia nina* (Fab.) Psyche

Tribe COLOTINI

- *8. *Ixias marianne* (Cramer) White Orange Tip
- *9. *Ixias pyrene* Linn. Yellow Orange Tip
- *10. *Colotis etrida* Boisduval Small Orange Tip
- 11. *Colotis amata* (Fab.) Small Salmon Arab
- 12. *Colotis danae* (Fabricius) Crimson Tip
- 13. *Colotis eucharis* Boisduval Plain Branded Tip
- 14. *Colotis fausta* (Oliver) Large Salmon Arab
- 15. *Pareronia valeria* Cramer Common Wanderer

Subfamily COLIADINAE

- *16. *Catopsilia pomona* (Fab.) Lemon or Common Emigrant
- 17. *Catopsilia pyranthe* (Linn.) Mottled Emigrant
- *18. *Terias hecabe* (Linn.) Common Grass Yellow
- *19. *Terias laeta* Boisduval Spotless Grass Yellow
- 20. *Terias blanda* (Boisduval) Three Spot Grass Yellow
- 21. *Terias brigitta* Stoll Small Grass Yellow

Family SATYRIDAE (Browns)
Subfamily SATYRINAE
Tribe MELANITINI

- 22. *Melanitis leda* Linn. Common Evening Brown

Tribe MYCALESINI

- 23. *Mycalesis perseus* Fab. Common Bush Brown

Tribe YPTHIMINI

- 24. *Ypthima huebneri* Kirby Common Four ring

Family NYMPHALIDAE
Subfamily BIBLIDINAE

25. *Ariadne merione* (Cramer) Common Castor

Subfamily ARGYNNINAE
Tribe ARGYNNINI

26. *Phalanta phalantha* (Drury) Common Leopard

Subfamily NYMPHALINAE
Tribe VANESSIDI

27. *Precis iphita* Fruhstorfer Chocolate Pansy

28. *Junonia atlites* (Linn.) Grey Pansy

29. *Junonia almana* (Linn.) Peacock Pansy

30. *Junonia hierta* (Fabricius) Yellow Pansy

31. *Junonia orithya* Butler Blue Pansy

*32. *Junonia lemonias* (Fruhstorfer) Lemon Pansy

Tribe HYPOLIMINI

*33. *Hypolimnas bolina* (Linn.) Great Eggfly

34. *Hypolimnas misippus* (Linn.) Danaid Eggfly

Subfamily LIMENITIDINAE
Tribe NEPTINI

35. *Neptis hylas* Moore Common Sailer

Tribe EUTHALIINI

36. *Symphaedra nais* (Forster) Baronet

Subfamily CHARAXINAE
Tribe CHARAXINI

37. *Polyura athamas* (Drury) Common Nawab

Subfamily ACRAEINAE

38. *Acraea terpsicore* (Linn) Tawny Coster

Family DANAIDAE (Milkweed Butterflies)
Subfamily DANAINAE

*39. *Danaus chrysippus* Linn. Common Tiger

*40. *Danaus genutia* Cramer Striped Tiger

*41. *Tirumala limniace* Cramer Blue Tiger

42. *Tirumala septentrionis* Butler Dark Blue Tiger

Subfamily EUPLOEINAE

*43. *Euploea core* Cramer Common Crow

Family LYCAENIDAE (Blues)

Subfamily POLYOMMATINAE

Tribe POLYOMMATINI

*44. *Castalius rosimon* (Fab.) Common Pierrot

45. *Leptotes plinius* (Fabricius) Zebra Blue

46. *Azanus ubaldus* Stoll Bright Babul Blue

*47. *Pseudozizeeria maha* Kollar Pale Grass Blue

48. *Zizula hylax* Fabricius Tiny Grass Blue

49. *Chilades pandava* (Horsfield) Plains Cupid

50. *Freyeria trochilus* Freyer Grass Jewel

51. *Jamides celeno* (Cramer) Common Cerulean

Subfamily APHNAEINAE

52. *Spindasis ictis* Hewitson Shot Silverline

Suborder GRYPOCERA

Family HESPERIIDAE

Subfamily HESPERIINAE

53. *Suastus gremius* (Fabricius) Indian Palm Bob

SYSTEMATIC ACCOUNT

1. *Papilio polytes* Linn. The Common Mormon

1758. *Papilio polytes* Linnaeus, Syst. Nat. ed. 10 : 460

1939. *Papilio polytes* : Talbot, Fauna Brit. India, Butterflies, 1 : 176

1987. *Papilio polytes* : Larsen, J. Bombay nat. Hist. Soc., 84 : 43

1993. *Papilio polytes* : Varshney, Oriental Insects, 27 : 352

Material examined : 1 ex., Lonar crater proper, nr. Forest rest house, 17.ii.2003, D.B.Bastawade & Party, E/5003.

2. *Cepora nerissa* (Fab.) The Common Gull

1775. *Papilio nerissa* Fabricius, *Syst. Ent.*, : 471

1932. *Huphina nerissa* : Evans, *Identification of Indian Butterflies* : 72

1939. *Cepora nerissa* : Talbot, *Fauna Brit. India Butterflies*, 1 : 362

1957. *Huphina nerissa* : Wynter-Blyth, *Butterflies of the Indian Region* : 421

1987. *Cepora nerissa* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 47

1993. *Cepora nerissa* : Varshney, *Oriental Insects*, 27 : 358

Material examined : 2 exs., on the way to Kamalja temple, 23.ix.2003, E/4930; 2 exs., Gupt Kamalja temple and around, 26.ix.2003, S.G. Patil & Party, E/4932; 1 ex., Northeast of Lonar Crater Lake, 21.xi.2003, P.M.Sureshan & Party; E/5024.

3. *Ixias marianne* (Cramer) The White Orange Tip

1779. *Papilio marianne* Cramer, *Pap. Exot.*, iii : 41

1871. *Ixias marianne* : Butler, *Proc. Zool. Soc.*, 250

1939. *Ixias marianne* : Talbot, *Fauna Brit. India Butterflies*, 1 : 440

1957. *Ixias marianne* : Wynter-Blyth, *Butterflies of the Indian Region* : 436

1987. *Ixias marianne* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 51

1993. *Ixias marianne* : Varshney, *Oriental Insects*, 27 : 361

Material examined : 1 ex., on the way to Kamalja temple, 23.ix.2003, S.G. Patil & Party. E/4930.

4. *Ixias pyrene* Linn. The Yellow Orange Tip

1939. *Ixias pyrene* : Talbot, *Fauna Brit. India Butterflies*, 1 : 443

1957. *Ixias pyrene* : Wynter-Blyth, *Butterflies of the Indian Region* : 437

1987. *Ixias pyrene* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 51.

1993. *Ixias pyrene* : Varshney, *Oriental Insects*, 27 : 361.

Material examined : 1 ex., on the way to Deshmukh Kopra & around, 25.ix.2003, S.G. Patil & Party, E/ 4931.

5. *Colotis etrida* Boisduval The Small Orange Tip

1836. *Anthocharis etrida* Boisduval, *Spec. Gen, Lep.* i : 576
 1932. *Colotis etrida* Evans, *Identification of Indian Butterflies* : 83
 1939. *Colotis etrida* : Talbot, *Fauna Brit. India Butterflies*, 1 : 464.
 1957. *Colotis etrida* : Wynter-Blyth, *Butterflies of the Indian Region* : 440
 1987. *Colotis etrida* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 50.
 1993. *Colotis etrida* : Varshney, *Oriental Insects*, 27 : 362

Material examined : 1 ex., on the way to Kamalja temple, 23.ix.2003, E/4930; 1 ex., on the way to Deshmukh kopara & around, 25.ix.2003, S.G. Patil & Party, E/4931;

6. *Catopsilia pomona* (Fab.) The Lemon or Common Emigrant

1775. *Papilio pomona* Fabricius, *Syst. Ent* : 479
 1932. *Catopsilia pomona* : Evans, *Identification of Indian Butterflies*, : 75
 1939. *Catopsilia pomona* : Talbot, *Fauna Brit. India Butterflies*, 1 : 493
 1987. *Catopsilia pomona* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 52
 1993. *Catopsilia pomona* : Varshney, *Oriental Insects*, 27 : 362

Material examined : 1 ex., on the way to Kamalja temple, 23..ix.2003, S.G.Patil & Party, E/4930.

7. *Terias hecabe* (Linn.) The Common Grass Yellow

1758. *Papilio hecabe* Linnaeus, *Syst. Nat. ed.* 10 : 470
 1932. *Terias hecabe* : Evans, *Identification of Indian Butterflies*, : 78
 1939. *Eurema hecabe*; Talbot, *Fauna Brit. India Butterflies*, 1 : 526
 1993. *Terias hecabe* : Varshney, *Oriental Insects*, 27 : 364

Material examined : 1 ex., Lonar Crater proper nr. Forest rest house, 19.ii.2003, D.B. Bastawade & Party; E/5004; 4 exs., Southwest of Forest Rest house, 19.xi.2003, P.M. Sureshan & Party, E/5022; 1 ex., Northeast of Lonar Crater Lake, 21.xi.2003, P.M. Sureshan & Party; E/5024.

8. *Terias laeta* Boisduval The Spotless Grass Yellow

1836. *Terias laeta* Boisduval, *Sp. Gen. Lep.*, 1 : 674

1939. *Eurema laeta* : Talbot, *Fauna Brit. India Butterflies*, 1 : 517

1987. *Eurema laeta* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 53

1993. *Terias laeta* : Varshney, *Oriental Insects*, 27 : 363

Material examined : 2 exs., on the way to Kamalja temple, 27.ix.2003, S.G. Patil & Party, E/4930; 2 exs., Northeast of Lonar Crater Lake, 22.xi.2003, P.M. Sureshan & Party; E/5025.

9. *Junonia lemonias* (Linn.) The Lemon Pansy

1758. *Papilio lemonias* Linnaeus, *Syst. Nat. ed.* 10 : 473

1905. *Junonia lemonias* : Bingham, *Fauna Brit. India Butterflies*, 1 : 357

1987. *Junonia lemonias* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 570

1994. *Junonia lemonias* : Varshney, *Oriental Insects*, 28 : 176

Material examined : 1 ex., Lonar crater proper, nr. Forest rest house, 17.ii.2003, D.B. Bastawade & Party, E/5003; 1 ex., Forest patch west of Kamaljadevi temple, 20.xi.2003, E/5023; 1 ex., Northeast of Lonar Crater Lake, 21.xi.2003, P.M. Sureshan & Party; E/5024; 1 ex., on the way to Kamalja temple, 23.ix.2003, S.G. Patil & Party, E/4930.

10. *Hypolimnias bolina* (Linn.) The Great Eggfly

1758. *Papilio bolina* Linnaeus, *Syst. Nat. ed.* 10 : 479

1886. *Hypolimnias bolina* : de Niceville, *The Butterflies of India, Burma & Ceylon*, 2 : 122

1905. *Hypolimnias bolina* : Bingham, *Fauna Brit. India Butterflies*, 1 : 386

1987. *Hypolimnias bolina* : Larsen, *J. Bombay Nat. Hist. Soc.*, 84 : 572

1994. *Hypolimnias bolina* : Varshney, *Oriental Insects*, 28 : 177

Material examined : 3 exs., Gupt Kamalja temple & around, 26.ix.2003, S.G. Patil & Party, E/4932.

11. *Danaus chrysippus* (Linn.) The Plain or Common Tiger

1758. *Papilio chrysippus* Linnaeus, *Syst. Nat. ed.* 10 : 471

1932. *Danaus chrysippus* : Evans, *Identification of Indian Butterflies*, : 88

1947. *Danaus chrysippus* : Talbot, *Fauna Brit. India Butterflies*, 2 : 20

1987. *Danaus chrysippus* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 313

1993. *Danaus chrysippus* : Varshney, *Oriental Insects*, 27 : 365

Material examined : 2 exs., Lonar crater proper, nr. Forest rest house, 16.ii.2003, D.B. Bastawade & Party, E/5002; 1 ex., Southwest of Forest Rest house, 19.xi.2003, P.M. Sureshan & Party, E/5022; 2 exs., Northeast of Lonar Crater Lake, 21.xi.2003, P.M. Sureshan & Party, E/5024.

12. *Danaus genutia* (Cramer) The Striped Tiger

1779. *Papilio genutia* Cramer, *Pap. Exot.*, 3 : 23

1882. *Danaus genutia* : Distant, *Rhopalocera Malayana* : 18

1947. *Danaus plexippus* : Talbot, *Fauna Brit. India Butterflies*, 2 : 25

1987. *Danaus genutia* : Larsen, *J. Bombay nat. Hist.Soc.*, 84 : 314

1993. *Danaus genutia* : Varshney, *Oriental Insects*, 27 : 36

Material examined : 1 ex., Northeast of Lonar Crater Lake, 21.xi.2003, P.M. Sureshan & Party, E/5024.

13. *Tirumala limniace* (Cramer) The Blue Tiger

1775. *Papilio limniace* Cramer, *Pap. Exot.*, 1 : 92

1883. *Danaus limniace* : de Niceville, *Butterflies of India Burma & Ceylon*, 1 : 47.

1932. *Danaus limniace* : Evans, *Identification of Indian Butterflies* : 87

1947. *Danaus limniace* : Talbot, *Fauna Brit. India Butterflies*, 2 : 31

1987. *Tirumala limniace* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 314

1993. *Tirumala limniace* : Varshney, *Oriental Insects*, 27 : 366

Material examined : 1 ex., Northeast of Lonar Crater Lake, 22.xi.2003, P.M. Sureshan & Party, E/5025.

14. *Euploea core* (Cramer) The Common Crow

1780. *Papilio core* Cramer, *Pap. Exot.*, 3 : 133

1883. *Euploea core* : de Niceville, *Butterflies of India Burma & Ceylon*, 1 : 80

1932. *Euploea core* : Evans, *Identification of Indian Butterflies* : 90

1947. *Euploea core* : Talbot, *Fauna Brit. India Butterflies*, 2 : 67

1987. *Euploea core* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 315

1993. *Euploea core* : Varshney, *Oriental Insects*, 27 : 367

Material examined : 1 ex., Lonar Crater proper nr. Forest rest house, 19.ii.2003, D.B. Bastawade & Party, E/5004; 5 exs., Northeast of Lonar Crater Lake, 21.xi.2003, P.M. Sureshan & Party, E/5024; 3 exs., Northeast of Lonar Crater Lake, 22.xi.2003, P.M. Sureshan & Party, E/5025.

15. *Castalius rosimon* (Fab.) The Common Pierrot

1775. *Papilio rosimon* Fabricius, *Syst. Ent.* : 523

1890. *Castalius rosimon* : deNiceville, *Butterflies of India Burma & Ceylon*, 3 : 197

1957. *Castalius rosimon* : Wynter-Blyth, *Butterflies of the Indian Region* : 259

1987. *Castalius rosimon* : Larsen, *J. Bombay nat. Hist. Soc.*, 84 : 291

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Material examined : 1 ex., on the way to Deshmukh kopara & around, 25.ix.2003, S.G. Patil & Party, E/4931.

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1848. *Lycaena maha* Kollar, in Huegel's *Kaschmir und das Reich der Siek*, 4(2) : 422

1907. *Zizeeria maha* : Bingham, *Fauna Brit. India Butterflies*, 2 : 355

1957. *Zizeeria maha* : Wynter-Blyth, *Butterflies of the Indian Region* : 284

1987. *Zizeeria maha* : Larsen, *J. Bombay Nat. Hist. Soc.*, 84 : 295

1997. *Pseudozizeeria maha* : Varshney, *Oriental Insects*, 31 : 96

Material examined : 1 ex., on the way to Kamalja temple, 23.ix.2003, S.G. Patil & Party, E/4930.

SUMMARY

An updated account of butterflies from the Lonar Wildlife Sanctuary dist. Buldhana, Maharashtra, is presented which stands at 53 species of 36 genera under seven families based on earlier records and a very small collection.

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ECOLOGICAL PROFILE OF IMPACT - CRATER LAKE, LONAR

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INTRODUCTION

Despite extensive Indian studies on lakes and wetlands of various types, from almost all parts of the Indian subcontinent, only few *hyper saline* lake-types were studied earlier. Moreover, very little information is available on impact crater lakes and the lakes of special origins. It was therefore important to study, the only hyper alkaline '*soda water*' impact crater lake in India, 'The Lonar Crater Lake' in Buldhana District of Maharashtra State, which presents almost a closed ecosystem in an atypical habitat.

The Lonar lake (Lonar in vernacular language-"Marathi", implying salty in character) is located in Lonar village (Longitude 19°59'N and 76°34' East Latitude) in Buldana District, in western Maharashtra, is more in news, for its tourist and historical potential than for its unique, spectacular scientific attributes. A high impact meteor Crater Lake, perhaps the second largest in the world, presents more scientific interests from viewpoints of geology and paleolimnology (Cole, 1979, Wetzel, 1983 and Goldman, 1983). The only biological study on the site by Badve, Kumaran, and Rajsekhar, 1993 and later a status report by (Econet, 1999) provides some information. The age of the lake is estimated >52,000 years, its uniqueness, isolation and literally unchanged geomorphology over the years and believed to be formed as a result of a high velocity impact of a huge meteor of extra terrestrial origin (Gopalakrishnan, 2000) has rightly resulted in its declaration as a Wildlife Sanctuary by Government of Maharashtra. Table1 succinctly summarizes broad geomorphic, geographic, ecological profile and current status-land use, vegetation profile, imminent threats and disturbances to the lake. The profile has been compiled from the information received by the State Government Offices like, Land Records, Town Planning', Forest Department, Geological Survey of India (GSI), Central region, Nagpur. and also few Non Government Organizations.

MATERIAL AND METHODS

The Freshwater Biological Station of the Zoological Survey of India, located at Hyderabad, initiated detailed field and laboratory studies, of the Lonar crater lake, during winter and

summer seasons in 2000-2001. Subsurface water and plankton samples were collected from over 6-8 randomly selected limnologically significant, sampling sites. Few ambient parameters were measured *in situ* (pH, temperature, conductivity, *etc.*). Dissolved Oxygen samples, (winklerized pretreated) in field were titrimetrically analysed, immediately on getting back to camp laboratory set in the State Public Works Department, (PWD) and Forests Rest House, (FRH) Buldana, which lies close by. Detailed chemical analysis for conservative parameters *viz* various forms of Phosphorous (P) and Nitrogen (N) metal ions, especially cations-Sodium (Na), Magnesium (Mg), Calcium (Ca) and Potassium (K), besides others, were got analysed from (Environmental Protection Training and Research Institute (EPTRI), Hyderabad as also a private laboratory (environmental engineering consultants) for independent veracity of analytical results. Standard Methods, 1991 and Lind, 1974. (Table 2) were followed. The plankton samples were appropriately preserved separately for identification of phytoplankton (Lugols solution) and zooplankton profile (4% Formalin). Samples of wetland invertebrate fauna associated with the littoral habitats were also collected and duly preserved (wet/dry collections). Further, field observations were recorded on the small numbers of waterfowl and other avifauna inhabiting forest plantations within the rim of the impact crater lake basin. Not surprisingly enough, the hyper alkaline -saline lake was devoid of any form of nekton fauna or the higher forms like, fish, prawns, shrimps, *etc.* save the *neuston*, on the air water interface, and a species or two of littoral molluscs. Patil and Gouder, 1989, Batish 1992 and Pennak, 1989 and Standard Methods, 1991 were used as taxonomic aids to identify the collected fauna from the lake.

Limnologic observations on water quality profile were made *vis-à-vis* a reference to the quality of perennial 'inflows' into crater lake from a freshwater subterranean stream or 'dhara', emerging from the small range of hills on the northern flank of the rim. Yet another small stream also trickles into the lake from the eastern edge. However, the 'inflows' from the dhara into the lake basin (Sampling site-S 1 or Sita Nahani) are significant and ought to exert influence (dilution, density, *etc.*) in the apparently stagnant saline lake. Limnologically, the stream 'flows' or from the subterranean stream to serve as a source of external or *allochthonous* loading, carrying nutrients into the closed basin alkaline seepage lake.

The Crater Lake, in view of its isolated, inaccessible location, offers no scope of sampling from its limnetic or open-water regions. Nonetheless, subsurface water and plankton samples (No. 20/25 mesh plankton net) were collected from *ca.* 5-6 randomly selected sampling sites, for basic limnological parameters like, nutrients-various forms of Phosphorous (P) and Nitrogen (N) and Silica, the major cations, in addition to the BOD load. Incidentally, the station 1 (S 1) was also the main, discreet point source of not just natural 'inflows' but of the untreated organic domestic wastes as a result of washing/bathing too. The lake therefore experiences mild organic pollution and algal bloom. For religious reasons, S1 or Sita Nahani has an incessant flow of bathers from all around the place, throughout the day who indiscriminately use synthetic hair shampoos/bath soaps, and heavily litter BOP sachet/wrappers in Lake Basin, indicating growing pollution threat of solid wastes. Few hutments

within the open area of the basement, cattle grazing, and agriculture fields of banana plantations albeit on a small scale, serve as *non-point* source of nutrient loading mainly of sulphates/phosphate rich fertilizers.

RESULT AND DISCUSSIONS

Even as limnology of alkaline or hyper-saline lake the world over have been documented (Williams, 1972, Bayley, 1972, and others) the physico-chemical and biological profile of the lonar crater Lake was not investigated in detail till date. Contemporary approaches in freshwater ecology categorize aquatic habitat on a variety of spatial and temporal scales, the organisms and or process of interest often dictating the scale of study/analysis (Dodds, 2002). However, the study of biological diversity in this ecosystem may lead to its classification as a unique atypical aquatic habitat.

Limnological Profile : Detailed observations on the entire gamut of physical, chemical and biological limnology of alkaline lake follows here under. Previous studies invariably quote chemical results, in terms of percentage, while recent values are in mg/L., often making inferences difficult to comprehend.

a. Physical Limnology

A brief picture of the physiography / morphometry of the impact crater lake is featured in table 1. Not much published information exists on detailed morphometry specially shore-line development index (SDI), lake volume and such critical factors, except the information furnished hereunder.

Water Movements, Wind Mixing and Circulation Pattern : As indicated earlier, Its physical limnology is interesting too and stands at deviations from known pattern. Invariably, all lakes are known to experience *periodic* or *rhythmic* waves and *non periodic* or *arhythmic* currents. Surface winds are known to distribute surface heat and material down within Lake Ecosystem (*Langmuir circulation*) and further account for patchiness in distribution of plankton and surface nutrients. Surprisingly, there was total absence of normal currents and waves for most part of day when the survey/sampling were carried out (*ca.* 8.00 am to 4.00 pm, during winters and summers.) In fact, no surface and or internal waves were noticed. One possible explanation is the rim height (20-30m) of the hollow crater that shelters wind action and direct sunlight during morning / afternoon prevents temperature stratification and eventually water density in the lake. Yet other plausible explanation seems to be a thick blanket of algal scum eclipsing the entire stretch of water area of the circular lake, makes the upper surface layers or epilimnion thick and heavily resistant to mild winds that eventually reach the hollow within after crossing the rim. Poor transparency and consequently high turbidity levels also leave adequate room for hazarding guess on presence of a possible thermocline in the lake in view of the extreme depth (1150 m). The prevailing heat and wind pattern are bound to profoundly influence the physico-chemical *milieu* and biological structure, which stands in stark contrast to natural lakes where normal wind driven current influences both physico-chemical and biotic profiles.

Colour : Platinum Cobalt Colour Scale. The apparent colour resembles dark green pea or 'algal soup' following massive algal blooms witnessed in winters (Plate III, fig. 5). and results from light scattering from the surface and presence of various living organic and non living particulate/ colloidal matter (abioseston or tripton). Filtrations eliminate entities causing apparent colour, leaving so called true colour of the water. The colour of the water samples was evaluated using the widely used Platinum-Cobalt Units, comparative colour scales of the United States, as also Hazen units for veracity. The colouring platinum units range between 120 - 200 units indicating moderate to heavy stained water colour, in view of high bioseston, abioseston and tripton generated both *autochthonously and allochthonously* in crater lake (clear lakes - 0 Pt. units, heavily stained- 300 units, Wetzel, 1983). The colour of the stream or *dhara* (sampling site I, a reference point). ranged between 4 - 5 Hazen units, an alternate colour scale while samples from crater lake ranged high, varying between 20-30 Hazen units.

Temperature, °C. : The ambient atmospheric and sub-surphase water temperature show marked seasonal pattern, on the known lines-high or peak values during summers (maxima of 35°C and minimum of 23°C respectively) and all time low during winters (23-29°C) though Lonar, Buldana is an semi arid climate region.

Transparency : The unique circular size, huge depth (*circa 600 ft*) and further absence of any mode of floats, *etc.* within the crater lake rendered Secchi disc estimation of transparency, extremely difficult. The 'walled' well around the 'Deshmukh ka kunta' offered support for using Secchi disc with poor success, the 20 cm black/white paint Secchi disc immediately disappears on immersion indicating nil or zero transparency. Therefore, Secchi disk transparency (Zsd) estimations of water to uincident light in crater lake were not feasible. Apparently the huge amount of bioseston, abioseston, and other nonliving particulate/ collidal matter within thr crater lake, together with year round algal bloom render transparency values nil in the lake.

Turbidity : Turbidity values ranged between 52-161 Nephelometer Turbidity Units (NTU), indicating high values of turbidity due to a combination if various a biotic / biotic factors. The high amount of particulate and dissolved detrital organic matter generated autochthonously, by biogeochemical transformation / biotic interaction by bacteria/fungi, also inhibits transparency to water, enhancing turbidity.

Electrical Conductance : While the conductivity values in the reference dhara' waters (sample site S 1), ranged around to 41 $\mu\text{S}/\text{cm}$ at all times/seasons (winters and summers), the corresponding values in lake brine varied widely from 11,600 - 13,820 during winters and to 15,000 $\mu\text{mhos}/\text{cm}$ indicating exceptionally high amount of dissolved/colloidal ions in lake waters. The electrical conductivity range of values in the 'dhara', flowing in to saline lake down below may be rightly described as excellent (250 $\mu\text{S}/\text{cm}$) while the comparative values at S4 (Mungad ka mandir, west and S5 (Deshmukh ka kunta) too (11,600- 15,100 $\mu\text{S}/\text{cm}$) are well with in the limits of natural waters (Boyd. 1990, Table 2).

Dissolved Solids : The total number of chemical ions in water is estimated differently as total dissolved solids, salinity or conductivity. Total solids, an estimation of inorganic materials in water by evaporation to dryness (105°C) are not a satisfactory criterion. Nonetheless, the total dissolved solids, computed from conductivity readings ranged between 950- mg/l. Total suspended solid (TSS) estimated at 105°C varied from 56-265 mg/lit. while the total volatile solids in crater lake waters ranged between 320-430 mg/lit. at 550°C during winters (Table 2).

b. Chemical Limnology

Dissolved Oxygen content, DO mg/L, in the subsurface littoral waters in the over 05-06 sampling sites each of the *circa* 3 square kilometer water spread area prevailing during two field visits, shows a minima of 5-6 mg/L and a maxima of 15.8 mg/L, due perhaps among other factors, to good phytoplankton productivity by bloom forming algal community and clear bright sun light hours prevailing during summers/ winters. The comparable dissolved oxygen values for dhara, a reference for influent water quality were *free* CO₂ values, mg/L, estimated, *in situ*, were invariably nil.

pH. : Invariably, the pH ranged between 9.19 - 10.5 during the study period (winter / summer) indicating pronounced seasonality. Contrasting enough, the comparative pH values for subterranean springs (feeder channels - *dhara*, others) ranged at around pH7-7.41 and ones for freshwater *pits* between pH 7.6 - 7.81. The high pH content in soda lake therefore imposes a natural environmental barrier or deterrent to free expression of normal lacustrine fauna. The extreme aquatic environment 'alkali lake' (Smith 2001) therefore is naturally capable of playing host only to biologically limited plethora of aquatic life- forms - extremophiles, as evidenced by limited biotic profile (Table 4). Deleterious, lethal effects of pH begin to show at pH 9.5 and above, therefore the 'hyper alkaline' soda lake is devoid of any fish life forms (Table 4).

Alkalinity : Lethal deleterious effects of alkalinity begin to show at pH on or above 9.5.. Explanation offered varied from legendary beliefs to existence of two saline springs at lakes bottom (Smith, 1857), two springs towards western sides (Mackenzie, 1870), evaporations from hydrologically closed basin (Blanford , 1870), unknown salt source in lake bed (Plymen, 1909) to action of percolating water and unlimited supply of carbonic acid from atmosphere (Christie, 1910). Cole (1979) groups arid land waters as *tholassohaline* and *athalossohaline* depending upon ionic concentration as similar to sea / ocean or different. The high sodium content (2490-2805 mg/L) as also chlorides (2300-2800 mg/L) permit grouping of crater waters as sodium chlorides water. Recent explanation treats high alkalinity resulting from a number of reactions (juvenile springs, with traces of boron, getting mixed with meteorite water plus further mixing with other feeder streams in the cliff, besides conversion of sulphate to carbonate through intermediate sulphide formed and its concentration in lake water (Jhingran and Rao, 1951).

Alkalinity values estimated ranged between 444.00 to 519.0 mg CaCO₃/l are in tandem with pH. In fact pH>10 are lethal and therefore the 'alkali' lake is devoid of any fish life. Kanekar, Sarnaik and Kelkar (1999) report extremely high alkalinity values (2605 mgCaCO₃/

L). High range of pH and alkalinity further corroborate known hydrological facts that lake in endorheic region containing high concentration soda (Na_2CO_3) have high pH values.

High alkalinity values have been reported from lakes where carbonate is known to combine with sodium resulting in high photosynthetic productivity.

Salinity : Clarke, 1924 classified the crater lake water under the group carbonate-chloride, on the basis of dominant anionic concentrations. Jhingran and Rao (1954) record high chloride content (31.32-40.70%) from 06 samples, while Nandy and Deo (1961) reported 30.87% chloride in samples of brine and 7.42% from the sub-terranean spring - Sita nahani, a reference point by the author for evaluation of influent water quality into the main craters basin. Badve, Kumaran and Rajshekar (1993) reported relatively lower range of values of chloride content in the brine samples (19.17-25.40%) while Kanekar, Sarnaik and Kelkar (1999) record high saline values. (2649 mg Cl/L). The different prevailing values have been furnished in table 3. The range of chloride content values in littoral waters (limnetic and or open water regions inaccessible, fraught with life threatening risk) in over 06 samples estimated varied between 2300-2800 Cl mg/L (2.3-2.8g/l or 2.3-2.8 % or 23-28 ‰). In view of the exceedingly high concentrations of other relative anions-sulfur and major cations viz. Sodium (2490-3840 mg/L) and Potassium (8.16-25.00 mg/l) the lake water may safely categorized as sodium chloride waters and thalassohaline (Cole, 1989) relatively hard waters containing large concentration of alkaline earth metals.

Few other saline lakes are known to have high, indeed extraordinary range of salinity - 200,000 mg/L, Salt lake of Utah, United States, and the Dead Sea, Russia. Borax lake, California is reported to exhibit salinity range of 28,000-60,000 mg/L (Wetzel, 2001).

Chloride : It significantly influences general osmotic balance and ion exchange and consequently biotic growth and diversity. It is exceedingly high (2490-3840 mg/L, Table 3), perhaps unprecedented. Earlier study (Kanekar, Sarnaik and Kelkar 1999) also records high sodium chloride content (2649 NaCl mg/L). Clearly crater waters may be categorised as sodium chloride waters and *thalassohaline*. The comparative values of chloride in dhara (S1) was 25 mg/L, about 2000 times lower than the brine content (summer 2001) or 0.25% or 0.025 ‰.

Sulphates : Extreme aquatic environment, like the sulphate rich crater lake in Lonar, India offer unique opportunity for understanding the importance of sulphur cycle and its influence in trophic relationship on atypical or specialized biota, in view of its rich, unexplored microfloral diversity of extremophiles (bacteria - phytoplankton and their ecological role through bacterial metabolism). Viewed from overall trophic perspectives, sulphur as sulphate ions (SO_4^-) was estimated in samples from epilimnion during winter season. Sulphates are known to occur in all natural waters, more so alkali lakes in arid /semiarid regions where lakes have high salt content. World over, the range of values of sulphate ions varies between 5 -30 mg/l, an average of about 11mg SO_4^- /l, and with 50 g/l as extreme. In the closed, highly saline lonar lake, Buldana, sulphate ion, the predominant form of dissolved sulphur, range

between 106 - 117 mg/l (Table 3) indicating high natural abundance of SO_4 ions, in lakes may be attributed to regional lithology, washing of sulphate containing fertilizers (from small cultivations in lake basin) and atmosphere.

Inorganic Ionic composition. Cations : The 'alkali' hyper saline crater lake has unusual ionic composition and related proportions of both cations and anions from view point of limnochemistry and the same are analyzed in brief detail *vis-à-vis* availability of biota. Ecologically, the anions help induce chemical divergence and thus influence growth and abundance of various life forms in not just freshwater and marine habitats by extremes of one or more ecological parameters like pH and salinity.

Pennak 1989, pioneered the concept of 'carbonate' or freshwaters and the "carbonate fauna" associated with it and (Smith, 2001) emphasized the importance of sulphates and potassium as major ions of biological significance in distribution of biota in a typical freshwater habitats like soda, alkali crater lake.

Sodium : Lonar also witnesses massive algal blooms (Plate III, figs. 5 and 6) due to high sodium levels and pH concentrations (> 10.5). Pravasoli, 1969 sites strong possibility of sodium in triggering eutrophication in aquatic ecosystems. High nutrient concentrations, among others and consequent year round phytoplankton bloom. Indicate to an nexus between high sodium levels and eutrophication. Table 3 corroborates high sodium concentrations in the lake from classical studies over a near nine decades.

Potassium : Potassium values in dhara (subterranean stream) or the influent water also varies at the sampling sites in crater lake varied between 2.00 - 8.16 K mg/L to 8.16 - 25.00 mg/L respectively., substantially higher than the average freshwater limits of less than 10mg/lit. Rarely, potassium concentrations surpasses sodium levels in closed basins (Cole, 1979). It is substantially high and perhaps influences distribution of quite a few euryhaline invertebrates in crater lake, inducing chemical divergence in tandem with high pH and salinity.

Magnesium : Magnesium ion values estimated are high, varying between 27.22 to 35.95 Mg+ mg/L in littoral waters, in line with known values in closed saline lakes around the world. The high magnesium content in crater lake implies a high biotic demand for the ion by the vast assemblages of extremophiles and other biota for their metabolic pathways.

Calcium : Calcium content in soft and hard water lakes show minor to pronounced seasonal variations. Calcium content in lonar lake varied between 2.04-4.8 mg/L and appear to be on the lower side, compared to other major anionic concentrations in natural lakes, and appears to be fully utilised biotically as luxuriant diatoms blooms indicate.

Inorganic Plant Nutrients : Nitrogen, often in concentration with the other naturally occurring element,- Phosphorous, are known as inorganic plant nutrients, serving as biostimulants. In most natural aquatic ecosystems, often nitrogen is limiting to plant production, being second only to phosphorous.

Phosphorus and its forms : Phosphorus values for different chemical forms like orthophosphate (P-PO₄, mg/L) or soluble reactive phosphorus (SRP), total phosphorus (P-tot. mg/L) and in organic phosphorus - (Inorg. P,) were estimated and ranged between 0.25-0.56 and 11.45- 3.04 P-PO₄ mg/L, 2.8-2.9 P-tot and 0.50-0.75 Inorg. P mg/L respectively, indicating good biotic utilization by the variety of aquatic biotic life forms and that it is not a limiting factor to biological growth in crater lake. Further, the phosphorus values indicate increasing eutrophication trends in crater lake.

Nitrogen and its forms : The important common forms of nitrogen were determined by Kjeldahl digestion process. The range of values of nitrate (N-NO₃ mg/l) recorded for sampling sites ranged between 13.7-19.4 mg/l. Natural concentrations rarely exceed 10mg/l N-NO₃ (Lind, 1979) and higher concentrations (>20mg/l) are a health hazard to juvenile mammals, including infants where it causes *methemoglobinemia*. Nitrites (N-NO₂) are in relatively lower concentrations-0.02-0.023 in lake waters. while organic nitrogen (Org-N) and total nitrogen (N) values ranged between 53.8-54.1 and 68.6-77.0 mg/l respectively.

MICRO NUTRIENTS - SILICA, IRON AND BORON

Silica : Ample data exists on the range of values, temporal and spatial variations of Silica (Silica- SiO₂, Silicic acid- H₄SiO₄) and their biogeochemical importance in succession of phytoplankton community in aquatic environments, but not any in extreme, atypical alkaline, saline environments as in impact crater lake. The range of value of silica, or particulate silica, SiO₂, in Lonar, varied widely and showed pronounced seasonal pattern varying from low range - 3.48-3.58 to 10-11 mg/L, the reported world average values for surface water is 13mg/l. Enriched loading of phosphorus and nitrogen into the lake basin stimulate diatom bloom and removal of silica through sedimenting diatoms at faster rates then is renewed (Wetzel, 2001) The soda lake too receives allochthonous loading of phosphorus and nitrogen through synthetic detergents at Sita Nahani (S1) and fertilizers used for and small horticulture cultivations in lake basin (Plate IV, fig. 11).

Iron : Among other factors, the overall spatial and temporal variations in iron cycle is regulated by bacterial metabolism in eutrophic aquatic ecosystems. An attempt was therefore made to evaluate the range of values of various soluble forms of iron in crater lake, in view of its rich extreme microbial biota/diversity. Total iron values range between 0.627 - 13.95 Fe mg/L, reduced ferrous ion-0.46 to 0.50 Fe+++ mg/L and oxidized ferric ion, the most common species in natural waters varied between 0.627 - 13.95 mg Fe++ in crater lake (Table 2). Often higher total iron levels naturally occur, among others, in alkaline closed basin lakes rich in organic matter while it varies from 50-200 g/L in oxygenated lakes with pH range 5-8 (Wetzel, 1983). Again here, the temporal (seasonal) and spatial variation and the role of various forms of iron in crater lakes trophy are a little difficult to speculate in view of extreme high pH (>10.5), poor dissolved oxygen content (5-6 mg/L), complex biotic interaction, even more complex chemical ionic balance (biogeochemical cycling) and above all high microbial diversity (bacteria - phytoplankton), other aquatic biota, *etc.* Limnologically, the hypolimnion in lakes acts as an iron trap, retaining most iron entering it, permitting biological fluctuations between mobile soluble and immobile insoluble states (Cole, 1979).

Boron : Natural waters are known to have relatively higher boron concentrations (average 0.01 mg/L, Wetzel, 2001) and apparently have a terrestrial origin than sea (Nishimura, *et al.*, 1973). Interestingly enough, all previous studies on its geochemistry as also water quality report boron traces. Jhingran and Rao (1954) reported traces of boron, attributing some juvenile springs as its sources, further suggesting that the trap contains some boron in traces which may have accumulated in due course. However, Nandy and Deo (1996) attribute traces of boron to rains, ruling out its volcanic origin. Christie (1910) too also records boron traces. Boron, a micro nutrient, perhaps regulates biotic growth in crater lake. The boron concentrations crater lake-a closed, were not high and the year around algal blooms observed (Plate III, figs.5 and 6) also indicate its biotic utilization by rampant, blue green phytoplankton / microbial growth.

c. Biological profile : Microbial Diversity. Bacterioplankton. Kanekar, Sarnaik and Kelker, 1999 undertook isolation of alkaliphilic bacteria for assessing their impact on bioremediation of phenol by few alkaliphilic strains, thereby establishing first time ever report on the bacterial life forms from the only inland saline lake in Asia. (Table 4). A brief account and inventory of recently reported microbial extremophiles - alkaliphilic bacteria follows. The following alkaliphilic strains were isolated from the alkaline sediments by phenol enrichment at pH 10.0 and phenol concentration of 500 mg/l at high saline level (2649 mg/l) and high alkalinity (2605 mg/CaCO₃). in Lonar lake: *Arthobacter spp.*, *Bacillus cereus*, *B. laterosporous*, *Citrobacter freundii*, *Micrococcus agilis*, and *Pseudomonas putida* biovar. b, *P. pseudoalcaligenes* (ob).

PHYTO-AND ZOOPLANKTON DIVERSITY

A panoramic view of circular lake basin reveals a picture of algal soups in a bowl (Plate III, figs. 5 and 6) - the entire water spread area blanketed by filamentous algae due to year round algal bloom by the blue-greens (Cyanophyceae). The world over, soda lakes are known to play host to luxuriant population of blue-green algae (Cole, 1979). The high natural range of monovalent cations like sodium (Na) and Potassium (K) in the lake water act as inorganic essential nutrients triggering blooms. The conducive range of high pH (> 10) and carbonate ions in the soda lake, are known to encourage blue-green blooms (Provosoli, 1969). A near similar scenario was witnessed in case of impact crater lake.

The phytoplankton samples collected all around the littoral reaches and few feet beyond, all through the year, revealed blooms of *Microcystis*. A qualitative profile of the phytoplankton community is furnished. (Table 4). The predominant algal community profile is not just species rich, both in content (no. of spp.) and equitability (distribution), indeed highly diverse - *ca.* > 12-15 spp. evenly distributed all through the lake and year. Badve, Kumaran and Rajshekar (1993) reported bloom forming *Spirulina*. The succession in numerically dominant bloom forming algal community, over space (*spatial*) and time (*temporal*) changes in crater lake *vis-a-vis* change in the prevalent physicochemical *milieu* needs further detailed investigations / analyses.

Zooplankton Profile : The zooplankton community profile in the Lonar lake is relatively poor with only single ostracod species, besides the two ubiquitous species of water mites - *Hydrachna kloomi* (Red water mite) & *Arrenurus rouxi* (Green water mite), few dipterous (Culicid) larvae, a species or two of *neuston* (Table 5) inhabiting the air- water interface (Table 4). Only ostracods (seed shrimps) were represented by *Cypris subglobosa*. in the alkali lake (Badve, Kumaran and Rajeshekar, 1993). The exposed littoral beds in crater basin are inhabited by a species or two of euryhaline crab.

No rotifer genera were observed, including the predominant alkaline genus *Brachionus*, As pointed earlier, the high pH (>10.5), hyper salinity and unusually high potassium content (over 10 mgK/l) cumulatively exert toxic influence, inhibiting survival of other invertebrates.

NEKTON FAUNA : ABSENCE OF FISHES, ONLY BIRD NEKTON

The total absence of decapod crustaceans, isopods (pill or sow bugs) and other invertebrates needs thorough confirmation. Total absence of any fish forms, even the hardiest ones (Cyprinodonts, etc.) is due to extremely high alkalinity, pH, salinity, temperature. Apparent absence of normal aquatic food chain component (diverse plankton community) in Lonar lake are factors significant enough to discourage presence of any nektonic fauna. Absence of even Cypridont fishes, otherwise extremely euryhaline, is a notable feature. Further, the absence of brine shrimps- *Artemia* or *Parartemia*, *Salina* (Anostraca), known to stand/tolerate 30% salinity is a clear indication of the extreme environment that crater lake is notable for. Deleterious lethal effects of pH begin to show at pH 9.5 and above, attendant high alkalinity imposes restrictions on lower life forms-plankton fish food, in fact pH shock and mortality

Bird Nekton : Surprisingly enough, the inaccessible swampy marshy patches play host to a number of resident and winged visitors, serving as a feeding / breeding habitat to a small diversity of water fowl - grebes, shovellers, teals, brahmany shelducks, etc. (Badve, Kumaran and Rajesekhar, 1993) The *Spirulina* bloom provides a mix of trophic (food)/ habitat *niche*.to the avifauna.

CONCLUSION : CONSERVATION MEASURES AND SUGGESTIONS

Based upon field ecological inputs and evaluation of the hydrobiology of the Lonar lake, few suggestion for conservation of the unique crater lake are given below:

1. Multi pronged efforts - administrative/scientific, on priority be initiated, to protect and conserve the unique meteor crater lake ecosystem and its environs, in its near 'pristine' state, through time targeted, measures ensuring.

- (i) Immediate diversion of small civic / organic waste water discharges, from all *points* and also to diffuse, *non-point* sources of civic pollutants.
 - (ii) Restrict free movement of unauthorized persons and tourists in the hollow crater basin by adequate policing of core area ensuring minimum intrusion through anthropogenic activities, there by containing accelerated/cultural eutrophication.
2. Initiate multidisciplinary ecological studies aimed at highlighting the limited biodiversity of crater lake and its ecosystem. In short, highlight crater lake as an *extreme aquatic habitat* with its own biological endowment of *extremophiles* microbial flora/fauna (*alkaliphilic-halophilic*), plankton (phyto-and zooplanton), littoral fauna, etc. Explore biotechnological potential in *bioremediation* of industrial wastes applications of *extremozymes* (*halo-/alklozyme*) for development of proteins with desired catalytic properties (Herbert, 1992).
 3. To create a Crater Lake Environmental Education Centre (EEC), on the lines of existing EEC in other Protected areas like, National Parks, Sanctuaries, Biosphere Reserves, *etc.*

SUMMARY

During the present studies conducted during 2000-2001 for a systematic evaluation of the eco-biological profile, on the Lonar lake revealed hyper alkaline (pH-9 to 10.5), highly saline (2.3-2.8% or 23-28‰) attributes and a *microcosm*, characterized by high aberrant ionic concentration of both cations-sodium, potassium, magnesium, calcium (Na>K>Mg>Ca), anions–predominantly chlorides, carbonates, sulphates (Cl>CO₃>SO₄) and alkalinity, *etc.* Nutrient enrichment, following indiscriminate anthropogene activities and consequent hyper eutrophication trends (allochthonous/authochthonous loading-domestic wastes carrying synthetic detergents and fertilizers in plantations in 3 km lake basins) and depaurate species diversity in aquatic life forms corroborate the inverse relationship between species diversity and salinity profile (Bayley, 1972).

Limited bloom forming phyto-and highly restricted zooplankton taxa-Ostrocods- 01 species and 02 species of genus Hydrachna and Arrenurus sp (watermites) could be observed (Table 4). Total absence of crustacean decapods and fish nekton may be attributed to pH shock and attendant mortality (pH10-11, alkaline death point) and high potassium content (range-8.16 to 25.00 Kmg/l) well above the average fresh water limits (10Kmg/l) exerting the toxic effects (Smith 2001). Surprisingly enough, open water (limnetic) patches in saline water spread area-77.69 hectares are inhabited by few species of water fowl, both resident and winged local visitors. It is also home to quite a few microbial extremophilies (alkaliphilic bacteria, Kanekar, Sarnaik and Kelker, 1999).

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Table 1. : Ecological profile of impact crater lake, Lonar, Buldana, Maharashtra, India. Salient Features.

1. Geographic Coordinates and Location : Latitude 19° and 20° North and Longitude 76° and 77° East Latitude, Taluk Lonar, Buldana Dist., Maharashtra State, ca. 165 kms. from Aurangabad, Maharashtra.
2. Altitude, Structure, Lithology and Morphometry : Circular, bowl shaped depression with amphitheatre of vertical cliffs, 1300 m dia meter: height of frame 20-30 m., depth 558 ft. circumference 6 k.ms., inner rim 3.5 k.ms, 30° angle, north of Khadakupurna river (S. Purna river). Water spread area - 77.69 ha. : swampy area 4 ha., algal mats 00.01 ha. : Located in trap region, Maharashtra, centreprel drainage on margin, radial outside the upper rim of hollow, indicative of subsidence of strata as the cause of origin of hollow. Near completely circular shape supports nonfluvatile erosion or alternately initial stage. Drainage patters well adopped to structure. Outside the lake drainage is consequent : within or inside, antidip, adopted to hollow caused by subsidence (Tamaskar and Deshmukh 1974).
3. Origin, age and Geology : Hyper velocity impact meteor crater in Basaltic rocks, only of its kind in the world, largest in size (1800 - 2000 m), indeed oldest - 52,000 years. Early school of thought ascribe origin to 'volcanic' action. Presence of shock metamorphosis, and rare <i>impactites</i> maskelynite, cone formation rock structure and near glass spherules indicate extra terrestrial origin. (Gopalakrishan, 2000).
4. Hydrology and lake type : Closed basin, endorheic, inland hyper alkaline, saline sink lake with no outflows and few inflows as subterranean streams : soda lake with pH> 10.5; carbonate-chloride type (Clarke, 1924), excessive chlorides and sodium (Na) and Potassium (K) salts, besides high BOD (3 days) and COD content.
5. Bio-geographical province and Principal Vegetation : Deccan plateau, dry deciduous forest around, dry bushy vegetation of the rim and slopes and moist deciduous trees in the basin with semi-evergreen components. Moist deciduous plantations along 2 perenial streams and salt-tolerant vegetation along the crater shore.
6. Land tenure/Land use : The lake and the surrounding area are under the conrtol of the state Revenue/Forest Departments, Government of Maharashtra, and Archaeological Survey of India. Firewood, fodder, allied agri-horticulture practices.
7. Conservation measures, Disturbances/Threats : Notified as sanctuary, Govt. of Maharashtra, June 2000 for its unique geological/natural wild life values. Comprehensive Conservation and Managing Action Plan (CMAP) in place, for implementation. Governmental efforts underway to procure UNESCO's World Heritage Site for crater lake. Sewage and garbage release, bathing and washing; indiscriminate chemical fertilizers use in the agri/horticulture practices, soil erosion and landslides and eutrophication, (nutrient loading/enrichment). Bioinvasion by exotic plant, <i>Prosopis juliflora</i> (Veedhu babhul) rampant.

8. Faunal diversity : Depaureate, characteristic alkaline saline lake biota. Phytoplankton- Blue greens Cyanophyceae) and greens (Chlorophyceae) ecological dominant, bloom forming-*Microcystis*, *Spirulina*, etc. and diatoms-*Cymbaella*, *Navicula spp.*, etc. Zooplankton : Rotifers (Brachionidae-*Brachionus* 01 spp.), Ostracods-1 spp., besides watermites (*Hydrachna* and *Arrenurus* 02 spp. and Arachnids - *Argyneta* 1 spp.) and neuston - Gerrids, etc, Belostomatid beetle as littoral fauna. Nekton : Fish/decapod crustaceance conspicuous by their absence. Bird nekton-water fowl habitat for few resident/local migratory birds. Few spp. of bats inhabit temple ruins around.

Table 2. : Showing range of values of different physicochemical parameters, during 2000-2001, major ions, inorganic plant nutrients-various forms of Phosphorous (P) and Nitrogen (N), other micronutrients, and pollution load in water samples from basin in crater lake, Lonar, Buldana

Physico-chemical parameters	Range of values-05 sampling sites	
	Minima	Maxima
<i>Temperature °C</i>		
Ambient atmospheric	24	37.7
Subsurface water	25	27
<i>Colour</i>		
Hazen unites	27	30
Pt. colour scale	120	200
Transparency Zsd,m	Not	feasible
Turbidity, NTU	51	167
Electrical Conductivity umhos/cm	11600	15100
Total volatile solids, mg/L at 55°C	320	430
pH	9	10.5
Dissolved Oxygen, DO mg/L	10.8	15.8
% saturation		
Total hardness, CaCo ₃ , mg/L	117	158
Chlorides, Cl, mg/L	2300	2800
<i>Major ions</i>		
Sodium, Na mg/L	2490	3840
Potassium, K mg/L	8.16	25
Calcium, Ca ⁺⁺ . Mg/L	2.04	4.8
Magnesium, Mg ⁺⁺ , mg/L	27.27	35.95
Silica, SiO ₂ , mg/L	3.48	3.58
Sulphate, SO ₄ , mg/L	106	117

Physico-chemical parameters	Range of values-05 sampling sites	
	Minima	Maxima
<i>Inorganic Nutrients</i>		
Phosphorus (P)		
Orthophosphates P-PO4, mg/L	0.25	0.56
Total Phosphorous, P-tot, mg/L	2.8	2.9
Inorganic Phosphorous, P, mg/L	0.5	0.75
Nitrogen (N)		
Nitrate Nitrogen, N-NO3, mg/L	13.7	19.4
Organic Nitrogen, N-org, mg/L	53.8	54.1
Total Kjeldahl Nitrogen, Kgl-N, mg/L	68.6	77
<i>Iron</i>		
Total Iron, Fe-tot, mg/L	0.67	13.95
Ferrous Iron, Fe++, mg/L	0.46	0.5
Ferric Iron, Fe+++, mg/L	0.17	13.4
Boron, B mg/L	Below	detectable limits)
<i>Others</i>		
Biochemical oxygen Demand BOD, mg/L (3days at 27 C)	50	56
Chemical Oxygen Demand, COD, mg/L	263	285

Table 3. : Summarizing chemical characteristics of 'brine' analysed by various authors as also values obtained from recent studies vis-a vis present study. All values, save present study, expressed as %.

Chemical Parameters (%)	Different studies				
	Christie 1910	Jhingran & Rao 1955	Nandy & Deo 1960	Badve, Kumaran & Rajashekhar 1993	Present study (Siddiqi 2000-01) mg/L
Carbonate, CO ₃	15.03	22.26	7.52	19.12-19.63	265.95-310.88
Bicarbonate, HCO ₃	2.16	2.06	11.65	22.26-24.34	546.23-632.66
Chloride, Cl	40.78	31.52	30.87	19.17-25.4	2300-2800
Sulphate, SO ₄	1.48	0.3	0.67	0.1-6.06	106-117
Sodium, Na ⁺	39.61	41.74	15.15	15.25-27.76	2490-3840
Potassium, K ⁺	0.11	1.58	0.25	0.06-0.08	8.16-25

Chemical Parameters (%)	Different studies				
	Christie 1910	Jhingran & Rao 1955	Nandy & Deo 1960	Badve, Kumaran & Rajashekhar 1993	Present study (Siddiqi 2000-01) mg/L
Calcium, Ca ⁺⁺	0.11	0.01	0.18	19.17-25.4	2.04-4.08
Magnesium, Mg ⁺⁺	0.11	0.01	0.14	1.27-5.78	3.48-3.58
R ₂ O ₃		0.09-0.13	1.46		
pH	-		-	9.3-9.7	10
*Alkalinity, CaCO ₃	19.12-19.63				444-519
Salinity, NaCL mg/L	15.25-27.96				2300-3900*
Silica, SO ₂				0.92-1.35	3.48- 3.58
Boron, B	Traces	Traces	0.13		Below Detectable limit

* Kanekar, Sarnaik and Kelkar 1999, report high total alkalinity (2605 CaCO₃ mg/L) and high salinity (2649 Na Cl mg/L)

Table 4. : Select group of microbial biota and euryhaline invertebrates observed/reported to inhabit high impact meteor crater lake, Buldana, a hyper alkaline, saline, soda lake.

Organisms/life forms	Source/Authors
Microbial Diversity	
Alkaliphilic & Halophilic bacteria <i>Arthro Bacter spp, Bacillus cereus, B.latero sporus, Citrobacter freundii, Micrococcus, agilis, Pseudomonos, Putida biovar. B, P. and pseudoalcaligenes.</i>	Kaneker, Sarnaik & Kelkar, 1999.
Thermophilic/Halophilic Bacteria <i>Streptomyces spp.</i>	Chaphalkar, Joshi and Dey 1994,
Bacteria: Cyanobacteria- <i>Oscillatoria aghardii, Spirulina platensis, S.fusiformies</i>	
Protoctista: Bacillariophyceae (Diatoms): Pennate. Pennularia sp., Cocconeis spp.; <i>Cymbella sp.. Navicula sp. and Aragilona sp.</i>	Badve, Kumaran & Rajsekhar, 1993.
Others <i>Fragilaria sp</i>	
Zooplankton	
Rotifers <i>Brachionus sp.</i>	
Ostracods <i>Cypris subglosa.</i>	
Hydrachna (Watermites)-	

<i>Hydrachna kloomi</i> (Red watermite) & <i>Arrenurus rouxi</i> (Green water) Arachnidae (Spider) <i>Argyroneota</i> sp. Diptera (Aquatic Diptera)- Culicidae genera/spp 02-03 nos. Gerridae - Belostomatidae - <i>Diplonychus</i> (= <i>Sphaerodema</i>) sp. (giant water beetle) Gastropods - <i>Lymnaea acuminata</i> , etc.	Present study, 2000 - 2001
Phytoplankton	
<i>Microcystis</i> spp. predominant, numerically abundant, followed by <i>Coconeis</i> spp. <i>Cymbella</i> , <i>Pinnularia</i> , <i>Ankistrodesmus</i> , <i>Chorella</i> , <i>Scenedesmus</i> , <i>Pediastrum</i> , <i>Cosmerium</i> , <i>Arthrospira</i> , <i>Dimorphococcus</i> , <i>Cylindrospermum</i> , <i>Eudorina</i> , <i>Euglena</i> , <i>Pondina</i> , <i>Navicula</i> spp, <i>Chaetoceros</i> , <i>Spirulina</i> , <i>Rivularia platonsis</i> , <i>Nostoc</i> sp., <i>Hyella caespitosa</i> , <i>Oscillatoria aghardi</i> , etc.	