RESEARCH ARTICLE

Changing biodiversity scenario in Lonar meteoritic crater, (MS), India, as revealed by the studies on insects (Order- Lepidoptera, Orthoptera and Odonata)

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ABSTRACT

The Indian sub-regions hosts about 1,504 species of butterflies of which peninsular India hosts 351, and the Western Ghats 334. Lonar Lake (19°59'N & 74°34'E) is situated about 155km from Parbhani town in Buldhana District of Maharashtra State. The Lonar crater has a circular outline with a diameter of 1,830 m and a depth. This is the only one meteorite crater made by the basaltic rock in India. In the present investigation, 20 Arthropod species were found out of which 13 species of butterflies were reported and they belonging to 4 families of order Lepidoptera, 5 species of order Orthoptera and 2 species of order Odonata. Compare to previous studies of order Lepidopterans present conditions was drastically declining Lepidopteron diversity in the Lonar Lake.

Keywords: biodiversity, Lepidoptera Orthoptera, Odonata, Lonar Crater.

INTRODUCTION

Biodiversity is the degree of variation of life forms within a given species, ecosystem, biome, or an entire planet. Biodiversity is a measure of the health of ecosystems. Biodiversity is in part a function of climate. In terrestrial habitats, tropical regions are typically rich whereas Polar Regions support fewer species. Rapid environmental changes typically cause mass extinctions. One estimate is that less than 1% of the species that have existed on Earth are extant (Raup, 1994). The period since the emergence of humans has displayed an ongoing biodiversity reduction and an accompanying loss of genetic diversity. The reduction caused primarily by human impacts, particularly habitat destruction. Conversely, biodiversity impacts on human health in a number of ways, both positively and negatively (Sala, 2009). In terrestrial ecosystem, insect fauna represent more than 70% and also play an important role in food chain for the natural balance. Insects are extremely important components of the bio-indicators of the world (Chakaravarthy *et al*., 1997

Jana *et al*., 2009, Rajagopal *et al*., 2011). Insects comprise more than half of earth's diversity of species. Healthy biological communities totally depend on insects as pollinators, seed dispersers, herbivores, predators and prey. Within the ecological communities, insects comprise a large proportion of the biomass and are conditions of energy through the system (Battist, 1988; May, 1992; Tiple, 2009). Butterflies are most beautiful and attractive than most other insects and have fascinated human imagination and creativity. They are valuable pollinators when they fly from plant to plant, gathering nectar and are the one of the important food chain components of the birds, reptiles, spiders and predatory insect. In the present investigation, a checklist of species of order Lepidoptera Orthopteran and Odonates of Lonar Lake has been prepared the lists (Table-1). But order Orthopteran and Odonates diversity has been firstly reported in this study.

MATERIALS AND METHODS

The insect fauna were observed in an around the crater by using transect method. Five lines transects were setup, approximately 500m long and 10m wide. The transect lines were walked at a constant space for approximately half an hour. In Transect were walked from 7.00 am to 11.00 am, when insect are most active. Insects were observed and identified by the guidelines of (Gunathilagaraj et al., 1998, Kunte, 2000). The spot observation was followed by photography binocular with high zoom power and rarely the fauna were collected from site for their identification and after the observation the insect were released in the environment. Similarly the dead insect and their body parts were such as wings, feathers, carapace; butterfly wings were also collected and considered in observation. Butterflies species were identified directly in the field visually with the help of field guide followed by photography and VDO recording.

Statistical analysis

Species diversity was calculated using the Shannon Index, which pools the number of species within a site with the relative abundance of each species (Shannon 1948; Magurran 1988, Odum 1997; Krebs 1989).

$$H' = - \Sigma \, pi \ln pi$$

Here, pi is the proportion of the ith species in the total sample. The number of species (species richness) in the community and their evenness in abundance (or equitability) are the two parameters that define H'.

B. Pielou's Evenness index (Equitability) or J': The species evenness is the relative abundance or proportion of individuals among the species. Evenness of species reveals how their relative abundance is distributed in a particular sample or site (Pielou 1969; Magurran 1988).

$$J' = H' / \ln S$$

Here, S is the number of species present in the site. The value of J' ranges from 0 to 1. The less variation was communities between the species, the higher value of J'.

RESULTS AND DISCUSSION

In present study, order Lepidoptera, Orthoptera and Odonata, 15 species of butterflies were reported out of which 2 species remains unidentified. 13 species identified belonging to 4 families of order Lepidoptera. The family Pieridae, represented by 6 species was the most dominated followed by *Danaidae* (4 species), *Nymphalidae* (2 species) and only 1 species of family *Papilionidae* (Table 1).

n order Odonata and Orthoptra, 3 species of Odonates were observed but 2 species is identified and 1 species is unidentified. These two identified species belonging to Anisoptera i.e. *Orthetrum pruinosum neglectum* and *Orthetrum sabina sabina* (Table 1) and 5 species of orthopterans were identified in 4 families, 1 species of Gryllidae, 1 species of Tettigoniidae, 1 speceis of Catantopidae and 2 species of Acrididae (Table 1). The observed and identifies Orthopteran such as, *Gryllus bimaculatus, Tettigonia viridissima, Patanga japonica, Locusta migratoria* and *Melanoplus bivittatus.* Previous studied on butterflies of Lonar Lake and reported that the 48 species of butterflies under five families. Nymphalidae and Pieridae were found dominant 19 and 15 species respectively, followed by Lycaenidae (9 species), Papilionidae (4 species) and one species from the family Hesperiidae. These were drastic changes and decline the biodiversity due to continuous habitat destruction, deforestation and agricultural spraying Palot and Soniya, (2003).

Table 1: Insect (Arthropod) Diversity of Lonar Lake (Total- F-9; G-17; S-17)

Sr. No.	Order	Family	Genus	Species
1	**Lepidoptera (F- 4; G- 11; S- 13)**	1)Papilionidae	*1)Papilo*	*polytes*
2		2)Pieridae	*2)Cepora*	*nerissa*
3			*3)Ixias*	*pyrene*
4			*4)calotis*	*etrida*
5			*5)Catopsilia*	*pomona*
6			*6)Terias*	*hecabe*
7				*laeta*
8		3)Nymphalidae	*7) Junonia*	*lemonias*
9			*8) Hypolimnas*	*bolina*
10		4)Danaidae	*9) Danaus*	*chrysippus*
11				*genutia*
12			*10) Tirumala*	*limniace*
13			*11) Euploea*	*core*
14	**Odonata (F- 1; G- 1; S- 2)**	1) Libellulidae	1) *Orthetrum*	1)*pruinosum neglectum*
15				2) *Sabina*
16	**Orthoptera (F- 4; G- 5; S- 5)**	1) Gryllidae	1) *Gryllus*	1) *bimaculatus*
17		2) Tettigoniidae	2) *Tettigonia*	2) *viridissima*
18		3) Catantopidae	3) *Patanga*	3) *japonica*
19		4) Acrididae	4) *Locusta*	4) *migratoria*
20			5) Melanoplus	5) bivittatus

(F-Family; G-genus; S-species)

Table 2: Seasonal Dynamics of Lepidoptera Population to their Species Diversity and Dominance

Family / Parameter	Pieridae	Nymphalidae	Danaidae	Papilionidae
Dominance_D	0.137	0.1207	0.122	0.1201
Shannon_H	2.212	2.286	2.264	2.273
Simpson_1-D	0.863	0.8793	0.878	0.8799
Evenness_e^H/S	0.761	0.8195	0.8018	0.8092
Equitability_ J	0.8901	0.9199	0.9111	0.9148

Table 3: Seasonal Dynamics of Orthoptera and Odaonata Population to their Species Diversity and Dominance

Family / Parameter	Gryllidae	Tettigoniidae	Catantopidae	Acrididae	Libellulidae
Dominance_D	0.1178	0.1166	0.1154	0.1172	0.1058
Shannon_H	2.25	2.272	2.281	2.263	2.343
Simpson_1-D	0.8822	0.8834	0.8846	0.8828	0.8942
Evenness_ e^H/S	0.7909	0.8079	0.8157	0.8009	0.868
Equitability_ J	0.9056	0.9141	0.918	0.9106	0.943

Abundance profile for Insect (Arthropods) observed in different season in Lonar Lake:

The abundance in population of butterflies has been significantly recorded during all the season or months in Lonar Lake.

Species Diversity and Evenness of different Families of Arthropods:

Species richness i.e. the total number of species encountered, diversity index, and evenness index did not varies among the families (Table 2 and Fig. 1). However, in the Lepidopterans families, Nymphalidae

have the higher values as compare to others (Table 3 and Fig. 2). In order Orthoptera and Odonata, *Catantopidae* and *Libellulidae* has higher values were obtained.

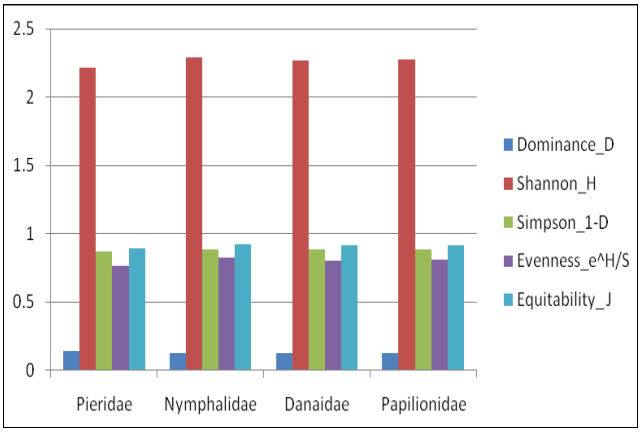

Fig. 1: Diversity and Dominance of Different Families of Order –Lepidoptera

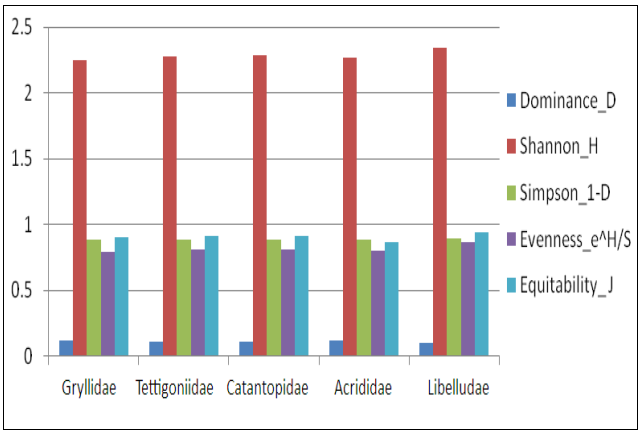

Fig. 2: Diversity and Dominance of Different Families of Order - Orthoptera and Odonata

The entire crater system is under the ecological stress due to disturbance of many ecological parameters in short the ecology of lake is under serious condition due to destruction of natural habitat and heavy deforestation.

REFERENCES

Tiple Ashish D and Khurad Arun M (2009) Butterfly species diversity, Habitats and seasonal distribution in and around Nagpur City, Central India. World Journal Zoology 4 (3): 153-162.

Tiple Ashish D (2011) Butterflies of Vidarbha region, Maharashtra State, central India. Journal of Threatened *Taxa* 3(1): 1469-1477

Battist A (1988) Phytophagous insects in the energy flow of an artificial stand of Pinus nigra Arnold in North Italy. Redia, 71(1): 139-160.

Chakaravarthy AKD (1997) Rajagopal and R. Jagannatha: Insects as bio indicators of conservation in the tropics. *Zoo's Print J*., 12, 21-25.

Gunathilagaraj K, Perumal TNA, Jayaram K and Kumar MG (1998) Some South Indian Butterflies. Nilgiri Wildlife and Environment Association, Tamil Nadu, India. 274pp.

Jana S, Pahari PR, Dutta TK and Bhattacharya T (2009) Diversity and community structure of aquatic insects in a pond in Midnapore town, West Bengal, India. *J. Environ. Biol.*, 30, 283-287.

Krebs C (1989) Ecological Methodology. HarperCollins, New York, 654pp.

Kunte K (2009) Occurrence of *Elymnias obnubila* Marshall and de Nicéville, 1883 (Lepidoptera: Nymphalidae: Satyrinae) in southern Mizoram: Range extension of the species and an addition to the Indian butterfly fauna. Journal of Threatened *Taxa* 1(11): 567-568.

Kunte K (2000) Butterflies of Peninsular India. Indian Academy of Sciences, Universities Press (India) Limited. 254.

Magurran AF (1988) Ecological Diversity and Its Measurements. University Press, Cambridge, 192pp.

May PG (1992) Flower selection and the dynamics of lipid reserves in two nectarivorous butterflies. Ecology, 73: 2181-2191.

Odum EP (1997) Ecology: A Bridge between Science and Society. Sinauer Associated Inc. Sunderland, Massachusetts, USA, 330pp

Palot Muhamed Jafer and Soniya VP (2003) A Preliminary Report on the Butterflies of Lonar Crater Lake, Buldhana District, Maharashtra. *Zoos' Print Journal*, 18 (11): 1267-1268

Pielou EC (1969) An Introduction to Mathematical Ecology. John Wiley, New York, 286pp.

Raup DM (1994) The role of extinction in evolution. Proceedings of the National Academy of Sciences 91 (15): 6758–6763.

Sala Osvaldo E, Meyerson Laura A and Parmesan Camille (2009) Biodiversity change and human health: from ecosystem services to spread of disease. Island Press. 3–5.

Shannon CE (1948) A mathematical theory of communication.Bell System Technical Journal 27: 379-423 & 623-656.

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