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A PRELIMINARY STUDY ON DIVERSITY OF WEEVILS (LIXINAE, CURCULIONIDAE) NEARBY KATEPURNA WILDLIFE SANCTUARY, MAHARASHTRA, INDIA

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Abstract:
Present study shows the first time report of diversity of true weevils belonging to subfamily Lixinae from the areas nearby Katepuran Wildlife Sanctuary, Maharashtra. The study period was from August 2019 to September 2020. A monthly record of observed species was maintained. Total 9 species were recorded under 4 genera of subfamily Lixinae belonging to family Curculionidae. Out of four genera recorded, genus *Larinus* (4 species) and genus *Hypolixus* (3 species) were found dominant among the subfamily Lixinae. Diversity indices such as Shannon index, Simpson index and richness were calculated. The seasonal observations indicate relative more number of true weevils in monsoon as compared to winter and summer.

Keywords: True weevils, diversity, Lixinae, seasonal changes.

Introduction

Lixinae is a true weevil subfamily which primarily include species that are root feeders, however some grow in flower buds or stems. Several species are employed to biologically manage invasive weeds. The beetles of this subfamily have clawed tarsal fused at the base, and labial palps that are telescoping and short. Their body is elongate with forwardly directed rostrum, each tibia bears a small hook (an uncus) on its distal end.

Several studies have be conducted to document the diversity of beetles of subfamily Lixinae in India by Kushwaha and sharma (1980), Pajni and Kohli (1990), Khairmode and Sathe (2013), Bharamal *et al.*, (2014) and Annapurneshwari and Deepika (2018). Forested areas are crucial because they sustain ecological processes and livelihoods (Goll *et al.*, 2014). Day by day natural forest area is minimizing due to anthropological activities and urbanization. Such reduction in habitat creates pressure on biological and also on artificial habitats like agricultural fields. Weevils are being used as indicators to assess the health status of habitats (Kritika and Jaimala, 2017).

Katepurna Wildlife Sanctuary (coordinate: 20º46’29’’N 77º13’48’’E) is a protected area to preserve several floral and faunal species. It is a home of a large number of invertebrate fauna including several beetle species inhabiting almost all the parts of the plants. Till now, there has been relatively little focus on Katepurna wildlife Sanctuary to interpret the diversity of weevils. The study of weevil diversity will be helpful in designing the management strategies of the area nearby Katepurna wildlife sanctuary. Therefore this study evaluates the diversity of weevils belonging to subfamily Lixinae nearby Katepurna wildlife sanctuary.

Materials and Methods

Two sites nearby Katepurna wildlife sanctuary [Site I (Kawthal) 20°18’48” N, 77°20’24” E, Site II (Shivani) 20°24’00” N, 77°22’39” E, and Site III (Kasola) 20°12’54” N, 77°17’37” E] were selected to observe and collect the specimens of the weevil species. The study period was from August 2019 to September 2020. The sites were visited in early morning hours during the study period. Monthly record of observed species was maintained. The data collected seasonally was analyzed statistically.

The calculation of Shannon Diversity Index is done by formula:

$$H = -\sum_{i=1}^{s} [(pi) x \ln(pi)]$$

in which, H is Shannon diversity index
pi is proportion of individuals of i^{th}species in a whole community
ln is natural logarithm
The calculation of Simpson's Diversity Index was done by formula:

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$$D = \sum_{i=1}^{s} \frac{ni(ni-1)}{N(N-1)}$$

here, D is simpson's diversity index
ni is number of individuals in i^{th} species
N is total number of individuals
Whereas, the calculation of species richness was done by formula as under -
Margalef Richness Index = (S - 1) / Log (n)
here, S is total number of Species
n is total number of Individuals in the Sample

Result and Discussion

In this study, 9 species belonging to 4 genera from subfamily Lixinae (Curculionidae) were identified from the sites nearby Katepurna wildlife Sanctuary (table no. 1). In this investigation, genus *Larinus* (4 species) is found to be dominant followed by genus *Hypolixus* (3 species) while genus *Xanthochelus* and genus *Lixus* are represented by single species as observed. The overall percent of individuals recorded was found highest in monsoon at both the sites nearby Katepurna wildlife sanctuary and least percent was found in summer season at both the study sites (table 2)

In study site – I nearby Katepurna wildlife sanctuary, the highest diversity of beetles belonging to subfamily Lixinae is recorded in winter season (H – 0.366), followed by monsoon season (H – 0.347) and least was observed in summer season (H – 0.299). The value of Simpson's index (D) in all sites was observed to be below 0.5 as shown in table no. 3. In the summer, the species diversity index was observed very less (D – 0.028), followed by winter (D – 0.111) and high in the monsoon (D – 0.250). The species richness is found highest in monsoon (S- 0.5) followed by winter (S- 0.33) and least in summer (S-0.16) as shown in table 3.

At study site – II nearby Katepurna wildlife sanctuary, the highest diversity of beetles belonging to subfamily Lixinae is recorded in winter season (H – 0.299), followed by monsoon season (H – 0.289) and least was observed in summer season (H – 0.270). Simpson's Index (D) was found to be very low as all the diversity indexes shown in table 3, were below 0.5. In the summer season the species diversity index is very less (D – 0.028), followed by winter season (D – 0.036) and high in the monsoon season (D – 0.444). The species richness is found highest in monsoon (S- 0.667) followed by winter (S- 0.167) and least in summer (S-0.154) as shown in table 3.

The diversity was seen to increase due to the increased appearance of beetle species during the monsoon (fig 1). The variation in weevil diversity seems to depend on the seasonal climatic conditions, it is more in monsoon which may be due to increased vegetation during rainy season. Similar observation are made with other weevils by Pesic (2004), Tiwar *et al.*, (2006), Khairmode *et al.*, (2019). However, Tara *et al.*, (2010) showed the presence of 9 species of weevils in Samba District of Jammu and Kashmir and reported *Hypolixus* as dominant genera.

Conclusion

In present study, 9 species from 4 genera belonging to subfamily Lixinae of family Curculionidae were identified from nearby sites of Katepurna wildlife Sanctuary in which the genus *Larinus* was found to be dominant. The present study shows the first time report of species of subfamily Lixinae from this area. The seasonal observations indicate relative more number of true weevils in monsoon as compared to winter and summer.

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Table 1: Checklist of Weevils observed during year 2019-2020 nearby Katepurna Wildlife Sanctuary.

Order- Coleoptera	
Suborder- Polyphaga	
Family- Curculionidae	
Sub family- Lixinae	
Sr. No.	**Name of Species**
1	*Hypolixus nubilosus* Boheman, 1836
2	*Hypolixus pica* Fabricius, 1798
3	*Hypolixus truncatulus* Fabricius, 1798
4	*Larinus latus* Herbst, 1784
5	*Larinus planus* Fabricius, 1792
6	*Larinus turbinatus* Gyllenhal, 1835
7	*Larinus vulpes* Olivier, 1807
8	*Xanthochelus faunus* Olivier, 1807
9	*Lixus sp.* Fabricius, 1801

Table 2: Seasonal mean of Weevils observed during year 2019-2020 nearby Katepurna Wildlife Sanctuary.

Sites	**Seasons**	**Individuals observed**	**Percent**
Site I	Monsoon	6	50%
	Winter	4	33%
	Summer	2	17%
Site II	Monsoon	4	57%
	Winter	2	29%
	Summer	1	14%

Table 3: Species diversity indices of Weevils observed during year 2019-2020 nearby Katepurna Wildlife Sanctuary.

Sampling Sites	**Indices**	**Monsoon**	**Winter**	**Summer**
Site I	Richness (S)	0.5	0.33	0.16
	Shanon-Weiner (H)	0.347	0.366	0.299
	Simpson (D)	0.250	0.111	0.028
Site II	Richness (S)	0.667	0.167	0.154
	Shanon-Weiner (H)	0.270	0.299	0.289
	Simpson (D)	0.444	0.036	0.028

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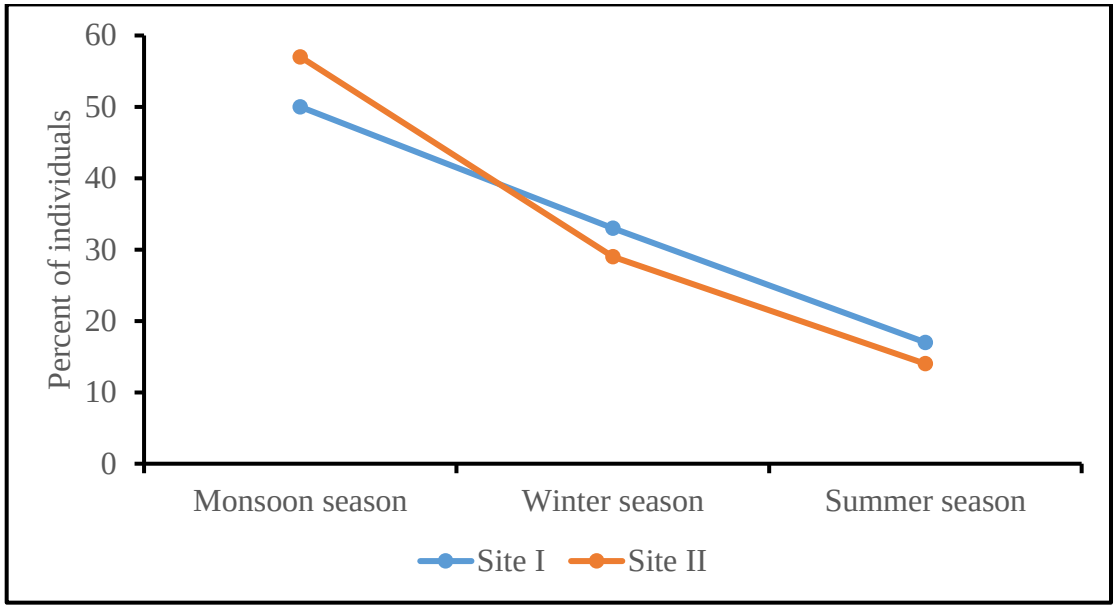

Figure 1: Seasonal variation in Weevil Species observed during year 2019-2020 nearby Katepurna Wildlife Sanctuary.