COMMON MOTHS OF BISRA RANGE, ROURKELA FOREST DIVISION, ODISHA, INDIA, AND THEIR ECOLOGICAL IMPORTANCE

ABSTRACT

Rourkela Forest Division ~~enjoys~~ presents a sub-tropical climatic condition with high humidity and rainfall after the onset of the monsoon. Lepidopterans are a group of insects that are potent pollinators and protectors of different terrestrial ecosystems. Among all the lepidopterans, moths are cosmopolitan and very important. Moths are mostly nocturnal pollinators and play a vital role in the pollination of different plant species and their seed production. Besides that, they play the important role of both prey and predator in a food chain. They are less known and have always been given less importance, unlike bees and butterflies, because very few studies have been done about moths and their importance in ecosystems. A field survey was done for the documentation of some common moths' diversity in Bisra Range, Rourkela Forest Division, Odisha, India, during 2022–2023. About 20 species of common moths were reported from the study area. This study depicts the ecological importance of moths, how they are inevitable members of the food chain in different types of terrestrial ecosystems, and their interactions with other plant and animal species in the division.*Macrobrochisgigas*and*Phocodermavelutina*larvae are abundant and major defoliators of *Shorearobusta* during the rainy season; *Lymantriamathura*is a major defoliator of *Mangiferaindica*, *Shorearobusta*, *Terminalia*, *Mitragyna*, and *Eugenia* spp.; *Xyleutesstrix* and *Xyleutes persona* are stem borers; and *Phocodermavelutina*shows a parasitic fungus.

Keywords:Moths, diversity, India, defoliators, borer, parasitic. ~~Pollinators; terrestrial; inevitable; documentation; ecosystem~~

INTRODUCTION

Among the invertebrates, the phylum Arthropoda is one of the most diversified and efficient phyla in every type of ecosystem, except the oceanic benthic zone (Abrol, 2019; Jamal, 2021). Pollinators are the soul of every ecosystem; they pollinate different plant species, and the majority of pollination occurs by bees and wasps (56%), followed by birds (12%), moths and butterflies (11%), flies (10%), wind (8%), and beetles (3% (Wychkyus, 2019). Adult

moths mainly feed on the nectar and juice of extra-ripe fruit (Sondhi and Sondhi 2016; Lees and Zilli 2019). Moths are nocturnal insects and are mainly responsible for pollinating night-blooming flowers (Singh et al. 2017). Moths are indicators of climate change, primary consumers, potent pollinators, mostly nocturnal, and crucial members of the nutrient cycling process (Kitching et al., 2000), so they are considered ecologically important insects.

Moths are nocturnal insects that belong to the order Lepidoptera. Moths can be easily identified by their activities, antennae structure, and wings. Unlike butterflies, moths have saw-edged antennae and drab-coloured scales on their odies. Moths are prey for different animals like bats, lizards, amphibians, and some insectivorous birds. There are approximately 160,000 species of moths found worldwide, among them about 12,000 species found in India (Chandra and Nema, 2007), with at least a few thousand undescribed species. Moths are divided into five families: Arctiidae, Noctuidae, Geometridae, Saturniidae, and Sphingidae. Mostly moths are infamous as dull-coloured insects and the 'poor cuisine' of butterflies. Contrary to the fact that some of the moth species have bright body colours with spectacular patterns on their wings, It is well known that invertebrates play the most important role in any type of ecosystem (Cardinal et al., 2006; Bashir, 2019; Shakeel, 2019). ~~Among the invertebrates, the phylum Arthropoda is one of the most diversified and efficient phyla in every type of ecosystem, except the oceanic benthic zone (Abrol, 2019; Jamal, 2021). Pollinators are the soul of every ecosystem; they pollinate different plant species, and the majority of pollination occurs by bees and wasps (56%), followed by birds (12%), moths and butterflies (11%), flies (10%), wind (8%), and beetles (3% (Wychkyus, 2019). Adult moths mainly feed on the nectar and juice of extra-ripe fruit (Sondhi and Sondhi 2016; Lees and Zilli 2019). Moths are nocturnal insects and are mainly responsible for pollinating night-blooming flowers (Singh et al. 2017). Moths are indicators of climate change, primary consumers, potent pollinators, mostly nocturnal, and crucial members of the nutrient cycling process (Kitching et al., 2000), so they are considered ecologically important insects.~~

STUDY AREA

Rourkela Forest Division is one of the three forest divisions in Sundargarh District. Other divisions are the Sundargarh Forest Division and the Bonai Forest Division (Pradhan et al., 2023).The division has Reserved Forests, Proposed Reserved Forests, Demarcated Protected Forests, Village Forests, Protected Forests, and DLC Forests. The total forest area was computed to be 1100.43 sq. km, which is about 36.73% of the geographical area of the

division. It is also known as the Steel City of Odisha," and it is situated in the northern district of Sundargarh, Odisha, India

METHODOLOGY

A field survey has been conducted in the monsoon months of June to July 2023, i.e., for 2 months. In the present study, preliminary data were collected during a field survey in Rourkela Forest Division, Odisha, India. A total of two surveys were done at 12 different sites, during both the day and night. Each site is approximately 2–3 km away from ~~each other~~ the next site. During the field survey, (state which kind of traps used how did you capture the specimens adult ones as well as catterpillars).~~a total of 87~~ Collected moths were collected and photographed (which kind of device did you use and their caracterics), then released into their wild habitat. Moth specimens were identified by the authors using their morphological characters and with the help of available literature.

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RESULTS AND DISCUSSION

The survey revealed a total of 20 common moth species, out of which 18 species are in adult moth form (Plate 1) and the remaining 02 are in caterpillar form (Plate 2), belonging to 17 genera and 10 different families from study areas (Table 1~~Figure 1~~). ~~Details on moths are listed in Table 1 and illustrated in Plate 1~~. Among the reported 20 common moth species, 5 are considered serious pests and ecologically important, and 1 moth species shows prey-predator interaction with a parasitic fungus. The common moth diversity of the study areas indirectly portrays the ecological and biodiversity status of the study areas. From the reported 20 species of common moths, 2 species belong to the family Cossidae, 7 species to Erebidae, 1 species to Eupterotidae, 3 species to Geometridae, 2 species to Sphingidae, and 1 species to Limacodidae, Lasiocampidae, Notodontidae, Saturnidae, and Uraniidae, respectively. The study areas are dominated by the family Erebidae, followed by Geometridae, Cossidae, and Sphingidae (Figure 1). *Macrobrochisgigas*and*Phocodermavelutina*larvae are abundant and major defoliators of *Shorearobusta* during the rainy season; *Lymantriamathura*is a major defoliator of *Mangiferaindica, Shorearobusta, Terminalia, Mitragyna,* and *Eugenia* spp.; *Xyleutesstrix* and *Xyleutes persona* are stem borers; and *Phocodermavelutina*shows a parasitic fungus. It was observed that *Phocodermavelutina*and *Macrobrochis gigas* are very common in the study areas, and their caterpillars are abundant during the monsoon season (more data about species numbers are necessary to lighten and enrich this reports as well as discussion in accordance to some precedent worksespicially moths species being

defoliatorsof different plants species) . The present study revealed that the study area is home to one of the ecologically important fungi, *Cordyceps spp*. Which is a parasitic fungus that grows on different wasps and caterpillars of *Phocodermavelutina.* The predator fungus growth is facilitated by the high humidity, rainfall, and diversified species composition of the study area (discussion must include references).

Table 1. Checklist of common moths recorded in the study areas

Family	Scientific name	Species descriptor
Cossidae	*Xyleutesstrix*	Guillou, 1841
	Xyleutes persona	Linnaeus, 1758
Erebidae	*Thyascoronata*	Fabricius,1775
	Lymantriasemicincta	Walker, 1855
	Lymantriamathura	Moore,1866
	Lymantria marginata	Walker,1855
	Eudocimamaterna	Linnaeus, 1767
	Macrobrochisgigas	Walker,1854
	Mocisundata	Fabricius, 1775
Eupterotidae	*Eupterotehibisci*	Fabricius, 1775
Geometridae	*Eumelealudovicta*	Guenee, 1858
	Hyperythralutea	Stoll, 1781
	Scopulaornata	Scopoli, 1763
Limacodidae	*Phocodermavelutina*	Koller, 1844
Sphingidae	*Ambulyxmoorei*	Moore,1858
	Theretrasilhetensis	Walker, 1856
Saturnidae	*Loepaktinka*	Westwood, 1848
Lasiocampidae	*Trabalavishnou*	Lefebvre, 1827
Notodontidae	*Phaleragrotei*	Moore, 1859
Uraniidae	*Acropterisstriataria*	Clerck, 1764

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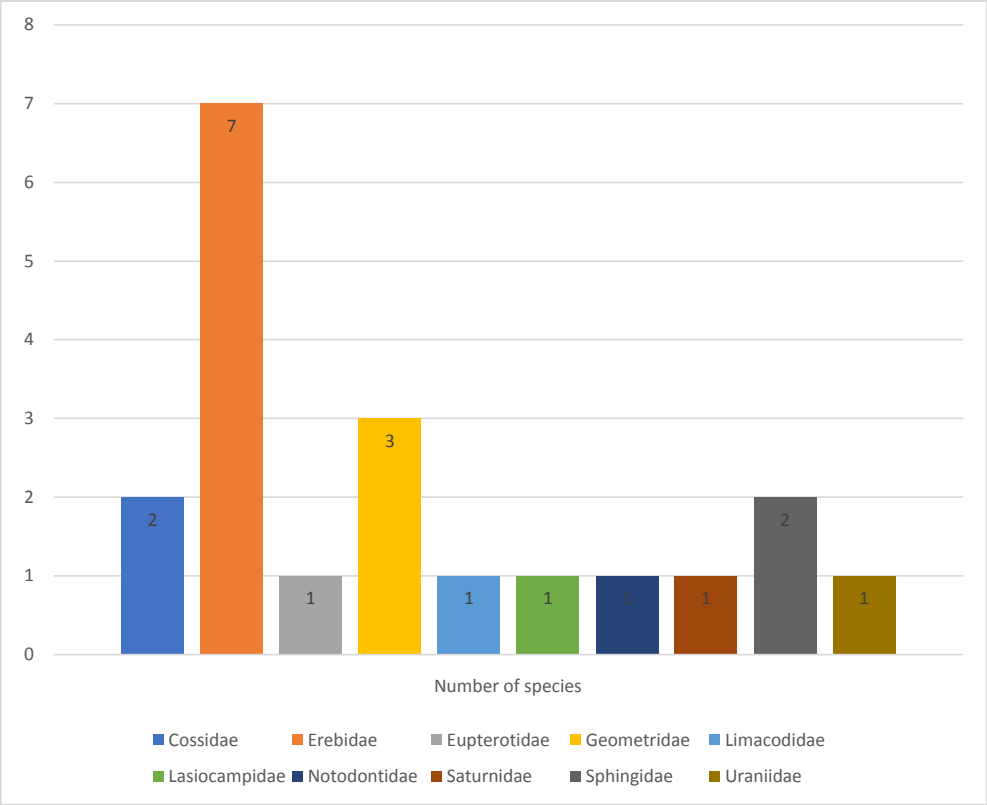

Figure 1: Moth species diversity in study areas

Plate 1: Some common moths in study areas, 1) *Loepaktinka* 2) *Lymantriasemicincta*3)*Thyascoronata*4)*Lymantriamarginata* 5)*Theretrasilhetensis* 6) *Ambulyxmoorei*7) *Phaleragrotei* 8)*Eudocimamaterna*

Other researchers also ~~been~~ studied ~~on~~ moth's diversity and reported their diversity on different parts of the country.In 2018, Jena et al. reported 30 different species of moths from Gupteswar proposed reserve forest of Eastern Ghats, Koraput, Odisha, India. In 2022Sanath et al. reported 31 moth species of 12 different families from Barsuan Range, Bonai Forest Division, Odisha, India.In 2019,Singh et al. reported 486 species of moths from different districts of Punjab.Alex et al (the year). also reported moths of 503 different species from Kavvai river basin of Kerala. In 2021 Pawar et al. reported 45 moth species from Panvel, Navi Mumbai, Maharashtra, India. In 2021, Singh et al. reported 17 moth species from Lalwan Community Reserve of Punjab.

ECOLOGICAL IMPORTANCE OF MOTHS

Moths are very important members of different terrestrial ecosystems. Most of these are nocturnal, some are diurnal and crepuscular, and they mostly pollinate night-blooming flowers. It is well known that moths play an important role in different types of food chains as herbivores, creating connections between primary producers and consumers at different trophic levels of the food chain, food web, and food pyramid. In the present study, it was observed that the larvae of *Phocodermavelutina*(Koller, 1844) were infested by *Cordyceps spp*. (a parasitic fungus). *Cordyceps* contains one of the polysaccharides, which is bioactive, exhibits a wide range of bioactivities, and is used as a medicinal herb (Jdrejko et al., 2021). The infestation and parasitic growth of *Cordyceps spp.* inside the body of *P. velutina*, which controls the brain and derives nutrients and then finally leads to larval death, is a unique parasitic and prey-predator relationship. It shows that besides linking primary producers with different consumers as an herbivore, moths are also linking parasitic organisms with other organisms (Plate 2).

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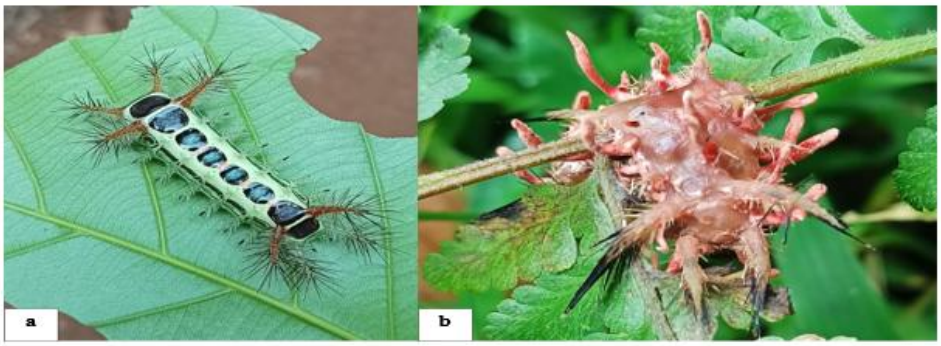

Plate 2: a. Caterpillar of *Phocodermavelutina*, b. Cordyceps infested caterpillar of *P. velutina.*

CONCLUSION

Rourkela Forest Division ~~enjoys~~ reveals biodiversity and different ecosystems, almost like Myurbhanj district in Odisha, India. The study areas are dominated by moths of the families Erebidae, Geometridae, Cossidae, and Sphingidae. During the monsoon season, a large number of caterpillars of *Phocodermavelutina* of the family Limacodidae and *Macrobrochisgigas* of the family Erebidae feed on their host plants like *Mangifera indica*, *Artocarpusheterophyllus*, and *Shorearobusta*. The study area ~~enjoys~~ offer dry deciduous and moist green forests of Sal and mixed-type forest ecosystems, along with their associated plant and animal species. The peculiarity of the study area is that its humid weather promotes the growth of *Cordyceps*sp., which is a parasitic fungus species. The present study highlights the diversified terrestrial ecosystems with some economically and ecologically important species and brings more attention to the conservation of the habitat of the Royal Bengal Tiger.

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