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Research Article

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New State Records of Three Plume T-Moths (Pterophoridae) at Paradip, Odisha, East India

Suruliyandi Vijayan
National Centre for Sustainable Coastal Management (NCSCM), Ministry of Environment, Forest and Climate Change, Anna Uni versity Campus, Chennai, Tamil Nadu, India
**Corresponding author e-mail: svvijay89@gmail.com*
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ABSTRACT
In the present study, *Cnaemidophorus rhododactyla*, Denis & Schiffermuller, 1775, *Emmelina monodactyla* Linnaeus, 1758 and *Platyptilia carduidactylus*, Riley, 1869 was recorded for the first time at Paradip, Odisha, India. These three species belong to plume moth categories and are global invasive pests of certain plant types. With identification based on photographs. In this note discuss the synonym, description, material examined, distribution, and remarks. Additionally, *C. rhododactyla*, *E. monodactyla* and *P. carduidactylus* is a new record for the Indian fauna.
Keywords: New records, Invasive species, Pterophoridae, Plume T-moth, Paradip, Odisha.

INTRODUCTION

Insects are very successful and adaptable to diverse settings, making them the most widespread and dominant animal group. Insects are ubiquitous and cover nearly 70% of the Earth's surface. According to Chapman (2009), there are approximately 965,431-1,015,897 described insect species worldwide. The order Lepidoptera is the second largest and most diverse group in the class Insecta. Mallet (2007), states that currently there are around 174,250 Lepidoptera species, with 156,300 nocturnal moths and the remaining being diurnal butterflies. India ranks as one of the world's 17th mega-diversity countries, with the richest and most diversified entomofauna. India is home to approximately 65,000-70,000 insect species, accounting for 7%-10% of the global entomofauna population. India's insect biodiversity is unusual, with about one-third of the known entomofauna being indigenous.

The economically significant species of plume moths, or Pterophoridae, include the artichoke plume moth, which is a nuisance on artichokes, and the grape plume moth, which is a pest on grapes (Silverson & Solis, 2014). The artichoke plume moth *Platyptilia carduidactyla* is a significant pest of the artichoke agroecosystem in California (Ryder et al., 1983). The artichoke plume moth's larvae consume every part of the plant. The Mediterranean region, which includes Europe and northern Africa, has a different artichoke environment than California. In New Zealand, where artichokes are relatively new, general pest issues are not too concerning. Snyder (1981), assembled a list of insects and other invertebrate species related to artichokes based on a recent assessment, taking into account their traits and ability to harm the artichoke crop. Stehr (1987) stated that plume moth larvae can feed on thistle stems, flower heads, or leaves, as well as other hosts from the Asteraceae family. According to Zwolfer (1988), oviposition occurs in mature flower heads, where larvae can feed on ripening achenes and receptacles. Plume moths are iteroparous, with two generations per year, and occur in several locations.

The Colombian plume moth, or *Cnaemidophorus* smithi, is described. The species is the first member of the Neotropical fauna to belong to the genus *Cnaemidophorus*. There is a Holarctic distribution for *Cnaemidophorus rhododactyla* Denis & Schiffermüller, 1775 (Barnes & Lindsey, 1921; Yano, 1963). In several European nations, it is referred to as a pest of *Rosa* (Aizpurua, 1998). The bud does not flower because the larva creates a hollow in it and kills at least 60% of it. There is only one larva per bud. While it feeds, the larva attaches the leaves to the infected bud by spinning a thin thread of silk. There are little excrement particles visible inside the cavity. At the larval feeding site, the fully developed larva pupates beneath a few silk strands. The adult then makes an appearance (Ozbek, 2008). While *C. rhododactyla* larvae were being raised over the summer of 2007, one tachinid species was raised as a larval parasitoid (Ozbek, 2008).

A member of the Pterophoridae (Plume moth) family, *Emmelina monodactyla* (Linnaeus, 1758) feeds mostly on leaves or borer stems and roots on a variety of host plants (Lange, 1950). Although the species is found practically everywhere globally, its origins are likely in Eurasia (Forbes, 1923). Purrington and Stinner (1988), reveal that the main food sources for *E. monodactyla* are the leaves, roots, and borer stems of several host plants,

especially *Ipomoea batatas.* Ghani et al. (1970-1975), specify that *E. monodactyla* virtually exclusively limited its feeding to the genera *Convolvulus* (*Convolvulus* sp.) and *Ipomea* (*I. batatas*), and it may be able to operate as a biological control agent for *Convolvulus* spp. As an adult, *Emmelina monodactyla* overwinters (Meyrick, 1928) and flies all year round. The hue of the species varies greatly, ranging from a light grey-white to a dark ferruginous brown. With a wingspan ranging from 18 to 27 mm, there is also a significant range in size (Gielis, 1990).

With 1318 species spanning 90 genera globally, the family Pterophoridae is represented in the Superfamily Pterophoroidea (Gielis 2003; Van Nieukerken et al., 2011). Some of the research related to the Pterohoridae family previously in India (Sidhu et al., 2010; Pooni et al., 2019; Pathania et al., 2021; Paunikar and Sharma, 2022). Therefore, these three newly recorded species of plume moths (Family: Pterohoridae) were discovered during the current study in Paradip, Odisha, East India. This study is a preliminary report to help future researchers of the Pterohoridae family.

MATERIAL AND METHODS

Description of the study area

Orissa formerly and now modified as Odisha; the official is an Indian state located in Eastern India. The current study site is located at 20° 17' 21.696" N and 86° 42' 19.0872" E in Paradip (Figure 1). The distance via Cuttack through Paradip for 105 km. In the Jagatsinghpur district of Odisha, India, Paradeep, also written Paradip (formerly spelled Paradweep, also spelled Paradwip), is a large industrial seaport city and municipality located 53 km (33 mi) from Jagatsinghpur city. Paradip, which is 0 feet (0 meters) above sea level, has a tropical wet and dry climate, often known as a savanna climate. The district experiences 28.75ºC (83.75ºF) annually, which is 2.78% hotter than the norm for India. Rainfall in Paradip averages 186.28 millimeters (7.33 inches) per year, with 141.26 wet days (38.7% of the total) occurring there.

Data collection

The present study was conducted in February 2024 at Paradip, Odisha. Data collection methods based on Vijayan and Anbalagan (2023). Identification using the available literature and already-published articles.

Cnaemidophorus rhododactyla, Denis & Schiffermuller, 1775 (Plate I, Figure 2)

Synonymy:

Alucita rhododactyla Denis & Schiffermuller, 1775

Platyptilia koreana Matsumura, 1931

Description:

A characteristic broad-winged plume with white markings on the dorsal side of the thoracic region that is brown, typically orange. Scaled, pale brown, mixed grey-white head appressed. Some have upright scales above the eye and at the collar. Palpae is 1.5 times the diameter of the eye, slender, slightly bent upward, and ringed in brown and white. Grey-brown antennae with short cilia are covered in grey-white scales. Middle and rear legs have two, while the forelegs have one scale brush encircling the bases of the spurs; the color is ochreous-white and brown with rings around the spurs; the hind legs have two equal-length pairs of lengthy spurs. Grey-brown abdomen except the first segment, which is ventrally grey-white, and the distal margins of segments two and three, which are grey-white at the dorsum. The dorsal side end of the abdomen is marked with two black spots.

Figure 1. The study map indicated the areas of examination.

Figure 2. Image of rose plume moth (*Cnaemidophorus rhododactyla*)

Figure 3. Image of T-moth or morning glory plume moth (*Emmelina monodactyla*)

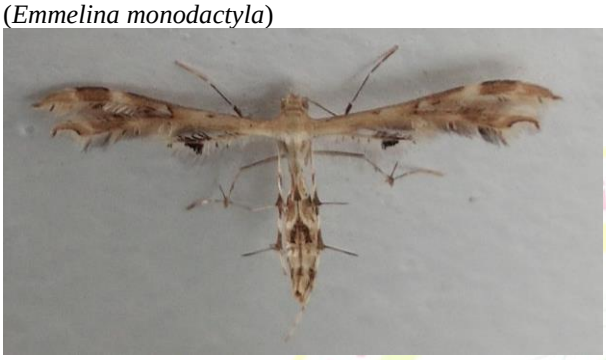

Figure 4. Image of Artichoke plume moth (*Platyptilia carduidactylus*)

Material Examined: One unknown adult, Paradip, Odisha, India, 11. ii.2024 coll. Dr. S. Vijayan

Distribution: East India (Present study), Greenland, North Africa, Northern Hemisphere and Southeast Asia

Remarks: One generation per year, the partially grown larvae overwinter inside the stem of the host plant and begin feeding again in the spring.

Emmelina monodactyla Linnaeus, 1758 (Plate II, Figure 3)

Synonymy:

Phalaena alucita monodactyla Linnaeus, 1758
Phalaena bidactyla Hochenwarth, 1785
Alucita pterodactyla Hubner, 1805
Pterophorus flaveodactylus, Amary, 1840
Pterophorus cineridactylus Fitch, 1855
Pterophorus naevosidactylus Fitch, 1855
Pterophorus impersonalis, Walker, 1864
Pterophorus pergracilidactylus Packard, 1873
Pterophorus barberi Dyar, 1903
Pterophorus pictipennis Grinnell, 1908
Pterophorus monodactylus cf. rufa Dufrane, 1960

Description: Having its wings folded together and positioned at a straight angle to its body, this prevalent plume species rests. The moth frequently rests with its wings tightly wrapped up, making it challenging to discern whether the wings are divided or cleft. Their colour and patterns can vary, and some other plume species may have superficial similarities. Verifying the identity requires measuring the spur length on the hind legs. The pair nearest the body should have the inner spur much longer than the outer spur. Brown streaks run along the midline of the pale buff dorsal longitudinal stripe on the abdomen.

Material Examined: One unknown adult, Paradip, Odisha, India, 10. ii.2024 coll. Dr. S. Vijayan

Distribution: Asia, East India (Present study), Europe, Japan, North Africa and North America

Remarks: A kind where the adult moth hibernates and there are 2 or 3 overlapping generations. Although they eat a wide range of plants, the larvae are especially fond of bindweed species. *Calluna vulgaris* and *Humulus lupulus* are two more common food plants.

Platyptilia carduidactylus, Riley, 1869 (Plate III, Figure 4)

Synonymy:

Pterophorus carduidactylus Riley, 1869
Platyptilia cardui Zeller, 1873
Platyptilia hesperis Grinnell, 1908

Description:

As an adult artichoke plume moth flies, its brown forewing has a darker costal border that extends to form a triangle at the top of the postmedial line; its hindwing is grey with a little black triangle on the anal margin; both sides of the subterminal line have white borders. The inner margin of the forewing is concave and expands drastically near the tip; the subterminal portion is usually colored crimson. The head is pointed; antennae are serrated with dull brown to brown. Abdomen: The dorsal portion is light brown to pale white and two arrow-shaped marks are presented. Tail portion five is segmented; the first three segments are larger than the last two; the first two segments are pale brown to white and the last three are pale white to medium brown.

Material Examined: One unknown adult, Paradip, Odisha, India, 11. ii.2024 coll. Dr. S. Vijayan

Distribution: East India (Present study), New Zealand, North America, North Mexico and the United States

Remarks: Plume moths are iteroparous, with two generations per year, and occur in several locations. Adults are nocturnal and emerge at night. However, they are also frequently observed on the flowers of herbaceous plants during the day.

OBSERVATIONS

The Pterophoroidea superfamily stands apart from other Lepidopteran insect families due to its tiny moths, long, slender legs, long abdomen, and narrowly clefted wings. The wings have a thin shape. In the forewing, there are 01, 02, and occasionally 3 clefts; in the hindwing, there are 02 clefted. The moths that belonged to the same superfamily are referred to as "plume-moths" in common parlance. When the wings are at rest, they are positioned so that the body is rectangular and has a T-shape. Family: Pterophoridae features include a smooth-scaled head, a lack of chaetosemata and ocelli, an unscaled proboscis, vestiges of a maxillary palpi, a slender labial palpus, cleft wings on the forewing, venous scales at the underside along with veins M3 and Cu2, and double cleft hindwings. The wings are smaller and arranged in a T-shape when they are at rest, with the wings being rectangular. Because these moths are so few,

taxonomical research is exceedingly challenging, and the same moth group presents quite significant challenges for field collections, pinning, stretching, labeling, and identification. Keeping all of the above in mind, the current study focuses on the Pterophorid moths in the area under inquiry.

CONCLUSION

The plume moth mostly consumes leaves, but it also buries the roots and stems of a range of host plants. It might pose a risk to an indigenous plant species. Furthermore, research on the seasonal occurrence of plume moths could be significant. Since plume moths only produce a single generation of *Cnaemidophorus rhododactyla* and two to three generations of *Emmelina monodactyla* and *Platyptilia carduidactylus* each year, they are special and limited in number. Therefore, more biological, molecular, and parasitic research is needed in this survey region.

CONFLICT OF INTEREST

The author here declares that there is no conflict of interest in the publication of this article.

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