

# First record of subfamily diapriniinae (diaprioidea: diapriniidae) from Odisha, with generic level distribution in rice ecosystems

P. V. Theertha, K. Rajmohana\* and Sunita Patra

Zoological Survey of India, (Sister Institute of University of Calcutta), 'M'-Block, New Alipore, Kolkata – 700053, West Bengal, India; Email: mohana.skumar@gmail.com

## Abstract

The present work investigates the distribution of diapriniids in the rice fields of Odisha. About 750 diapriniid specimens were collected across 10 rice fields falling under the 10 agroclimatic zones through various surveys conducted from 2018-2021. The study documented nine out of the 14 genera of the subfamily Diapriniinae found in India, viz. Aneuropria Kieffer, Basalys Westwood, Calogalesus Kieffer, Coptera Say, Entomacis Foerster, Monelata Foerster, Odontopria Kieffer, Spilomicrus Westwood, and Trichopria Ashmead. The distributional status of diapriniids across the agroclimatic zones is presented through GIS mapping. Comments on their abundance and morphological specializations are also mentioned. Diapriniids are documented for the first time in Odisha. The present findings indicate that they are abundant and widespread in the rice ecosystems of Odisha.

**Keywords:** Diapriniinae, Diptera, Odisha, Parasitoids, Rice Field

## Introduction

Rice is one of the important staple crops in Odisha, the fifth largest rice-producer state in India (Jambhulkar et al., 2020). The rice fields are dominated by arthropod communities, which comprise pests, predators, and parasitoids (Daniel et al., 2019). Among them, parasitic hymenopterans play an important role in the regulation of insects and other arthropods. The diapriniids are a family of parasitic wasps, a less studied group. The superfamily Diaprioidea is one of the most diverse groups of cosmopolitan microhymenopterans. They typically have a smooth, polished body and an average body size of 1.5 to 5.0 mm. The majority of the diapriniid species are black, brown, or yellow in colour; they are never metallic. They have reduced wing-venation. Their antennae, which are placed above the clypeus on a prominent transverse ledge, along with the upward-facing antennal sockets, set them apart from other parasitic hymenopterans (Notton and Mifsud, 2019). Diapriniids are pupal or larval-pupal endoparasitoids, mainly of dipterans either at the primary or secondary level; a few parasitize ant larvae or beetle's

pupae (Masner and García, 2002; Lak and Nel, 2009). By regulating the population of their host insect groups, they contribute to the food web dynamics, thereby maintaining ecosystem balance and stability. Thus, in the rice fields, they influence the population of several dipteran families like Ephydriidae, Ceratopogonidae, Syrphidae, and Tabanidae, which are of both ecological and economic significance (Rajmohana, 2006). Dipterans are vital components of the food webs and energy transfer in rice ecosystems (Adler and Courtney, 2019).

So far, 82 species under 14 genera of the subfamily Diapriniinae are known from India under the family Diapriniidae (Rajmohana and Bijoy, 2012). However, because of their tiny size, the group remains less studied. Hence, the level of diversity represented is often far lower than in the real scenario. Further, there is a dearth of research on the taxa in India. The present work aimed to study the presence and distribution of diapriniids in the rice fields of Odisha. The data generated will contribute to the baseline information regarding the diversity of diapriniids in rice ecosystems.

\* Author for correspondence

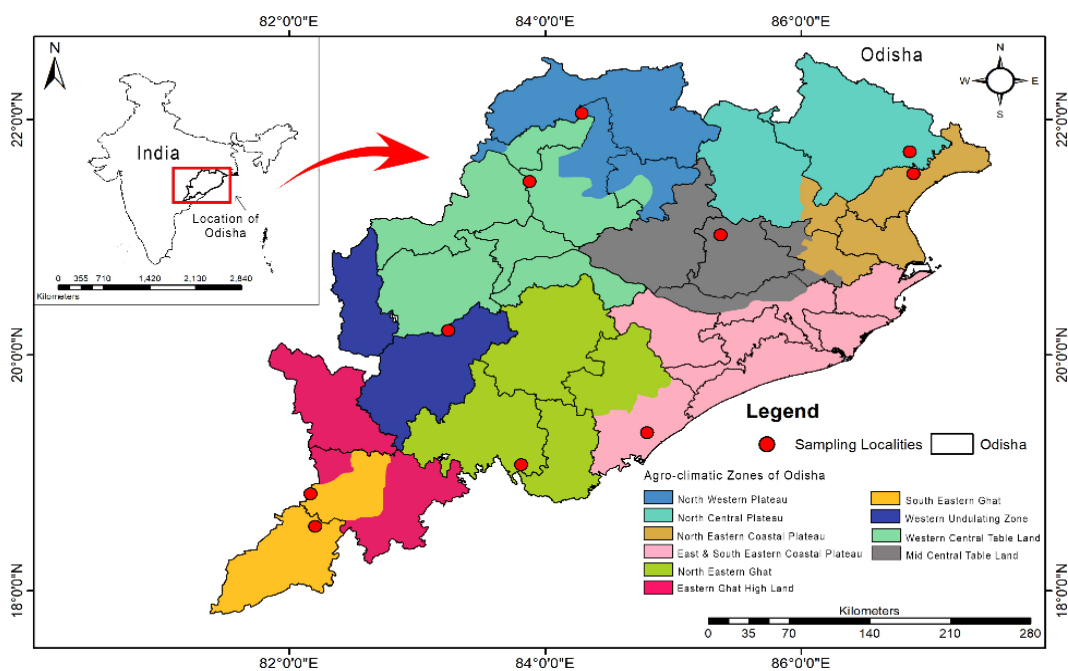
## Materials and Methods

The samples for the current study were collected using yellow pan traps kept at the ground level of rice ecosystems falling under 10 Agroclimatic Zones (ACZ) in Odisha, India, during 2018-2021 (Table 1). A total of 55 yellow plates were kept at ground level with a uniform spacing of 1.5m between the traps in each site, half-filled with water. A few drops of commercially available detergent were added to break the surface tension. The traps were set for 6-7 hrs, and the collected samples were preserved

in absolute alcohol. Specimens for morphological studies were sorted and then mounted on triangular cards. Studies were made using a Leica M205A stereo zoom microscope with a 1X objective. Images were taken using the integrated camera Leica DSC-500 and later processed using Leica Application Suite (LAS) software 3.1. The sampling localities shown in the map are prepared by using ArcGIS software version 10.5 (ArcMap, 2023). (Figure 1).

**Table 1.** Survey details

Sl. No.	Agroclimatic Zones (ACZ)	Area Surveyed	Date of Collection	Geo-coordinates
1	North Western Plateau	Bamara town, Sambalpur	20. ix.2021	22.054°N 84.287°E
2	North Central Plateau	Betnoti, Mayurbanj	25. xi.2021	21.727°N 86.847°E
3	North Eastern Coastal plain	Remuna, Balasore	24. xi.2021	21.539°N 86.878°E
4	East and South Eastern Coastal Plain	Nimakhandi, Ganjam	12. iv.2020	19.342°N 84.795°E
5	North Eastern Ghat	Gunupur, Rayagada	15. xii.2018	19.070°N 83.813°E
6	Eastern Ghat Highland	Dumajodi, Koraput	21. x.2021	18.976°N 82.276°E
7	South Eastern Ghat	Mathili Ag Campus, Malkanagiri	21. xi.2018	18.547°N 82.203°E
8	Western Undulating Zone	Kesinga-Tahasir, Kalahandi	26. x.2021	20.209°N 83.243°E
9	Western Central Table Land	Burla, Sambalpur	09. xi.2020	21.474°N 83.877°E
10	Mid Central Table Land	Kamakhyanagar, Dhenkanal	19. vi.2019	21.020°N 85.371°E



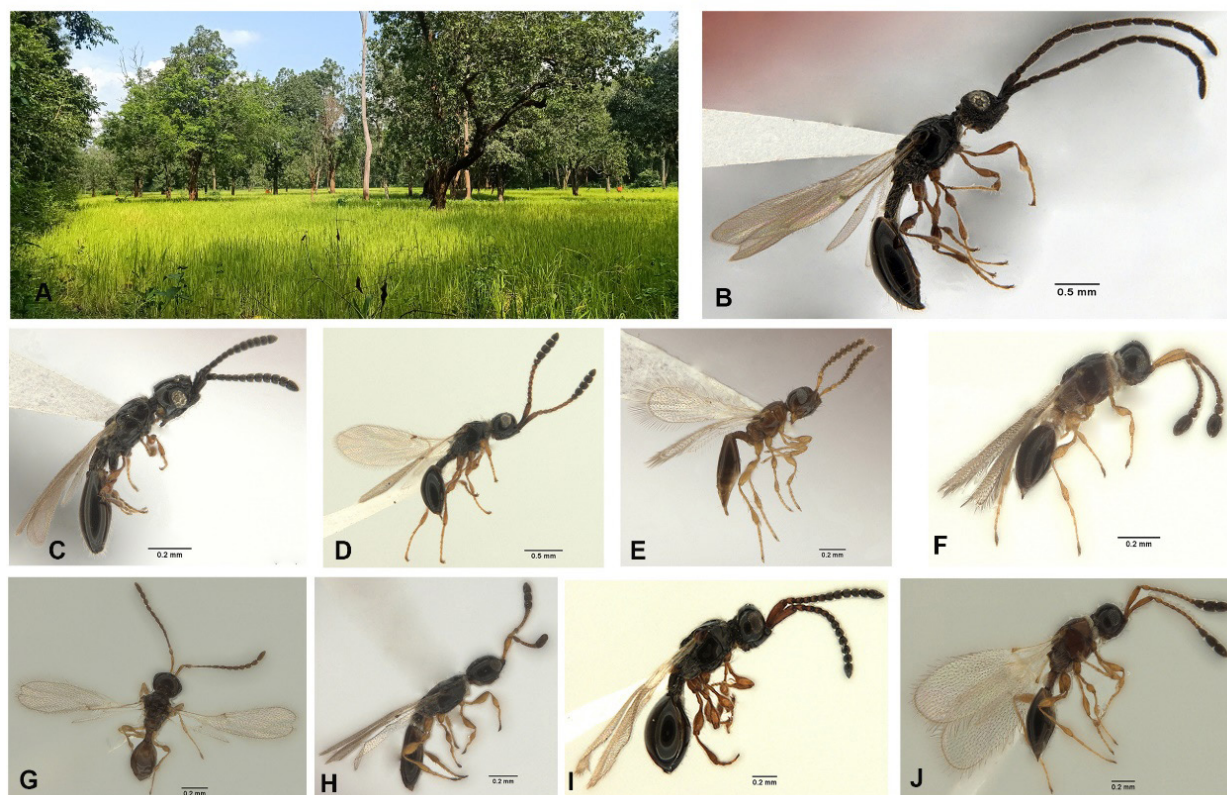
**Figure 1.** The distribution of subfamily Diapriinae across the rice fields of Odisha.

## Results and Discussions

In the present study, field surveys were conducted across the rice ecosystems of Odisha during 2018-2021 to assess the presence and distribution of diapiroids (Figure 2A). About 750 diapiroid specimens were collected across 10 rice fields falling under the 10 ACZ of the total rice fields surveyed (Figure 3). The study documented nine out of the 14 genera of the subfamily Diapriinae found in India, viz., *Odontopria* Kieffer, *Coptera* Say, *Spilomicrus* Westwood, *Calogalesus* Kieffer, *Monelata* Foerster, *Entomacis* Foerster, *Basalys* Westwood, *Aneuopria* Kieffer, and *Trichopria* Ashmead (Figure 2 B – J). Genus *Basalys* was found most diverse (53%), followed by the genus *Trichopria* (27%) (Figure 4), while the less abundant genera are *Spilomicrus*, *Odontopria*, *Aneuopria*, and *Calogalesus*.

Rice is a wetland crop since paddy fields remain flooded very often, especially in the nursery stages. The

distinctive wing morphology of diapiroid wasps, like the lengthy marginal fringes and body setae, can be explained as adaptations to inhabit aquatic and semi-aquatic habitats. The agroclimatic zone-wise distribution of the subfamily Diapriinae is given in Table 2. As per the distribution data of diapiroids in India (Rajmohana and Bijoy, 2013), diversity (63) is highest in Kerala, while very few species are reported so far from Tamil Nadu (18) and Himachal Pradesh (17). The states of Karnataka, Uttarakhand, West Bengal, Maharashtra, Uttar Pradesh, Madhya Pradesh, Jammu and Kashmir are the least explored, with fewer than 10 species. The remaining states in India remain taxonomically unexplored about diapiroids. Hence, extensive faunal surveys guarantee several new records and new species discoveries. Diapiroids are documented for the first time in Odisha through this work, and the present findings suggest that they are abundant and widespread in Odisha's rice ecosystems.



**Figure 2.** (A) Rice field of Odisha; (B) *Odontopria* Kieffer (C) *Coptera* Say (D) *Spilomicrus* Westwood (E) *Calogalesus* Kieffer (F) *Monelata* Foerster (G) *Entomacis* Foerster (H) *Basalys* Westwood (I) *Aneuopria* Kieffer (J) *Trichopria* Ashmead.

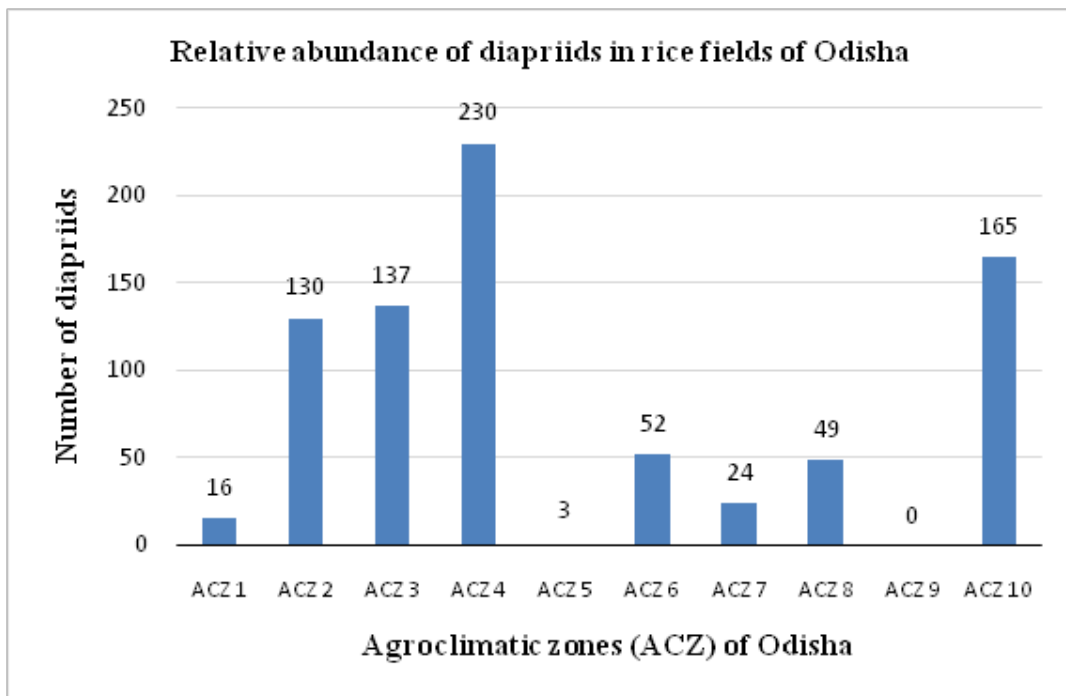


Figure 3. Relative abundance of diapiids in rice fields of Odisha.

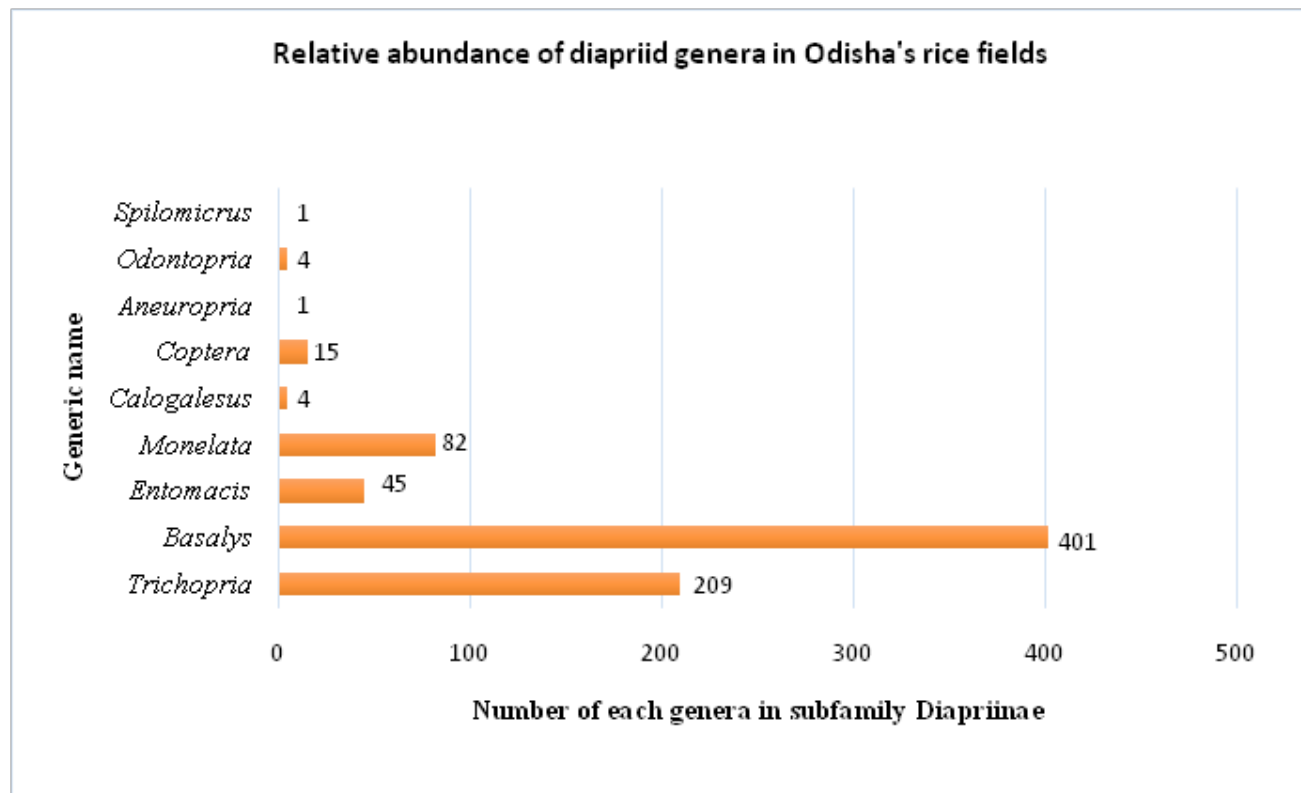


Figure 4. Relative abundance of genera in subfamily Diapiinae.

**Table 2.** The agroclimatic zone-wise distribution of the subfamily Diapriinae

Agroclimatic Zones	Generic Name	Number of Individuals
<b>North Western Plateau</b>	<i>Trichopria</i> Ashmead	10
	<i>Basalys</i> Westwood	3
	<i>Entomacis</i> Foerster	1
	<i>Monelata</i> Foerster	2
<b>North Central Plateau</b>	<i>Trichopria</i> Ashmead	12
	<i>Basalys</i> Westwood	9
	<i>Monelata</i> Foerster	72
	<i>Entomacis</i> Foerster	3
	<i>Calogalesus</i> Kieffer	1
<b>North Eastern Coastal plain</b>	<i>Trichopria</i> Ashmead	45
	<i>Monelata</i> Foerster	3
	<i>Basalys</i> Westwood	77
	<i>Entomacis</i> Foerster	7
	<i>Calogalesus</i> Kieffer	1
<b>East and South Eastern Coastal Plain</b>	<i>Coptera</i> Say	14
	<i>Aneuopria</i> Kieffer	1
	<i>Odontopria</i> Kieffer	3
	<i>Basalys</i> Westwood	174
	<i>Trichopria</i> Ashmead	35
	<i>Calogalesus</i> Kieffer	1
<b>North Eastern Ghat</b>	<i>Trichopria</i> Ashmead	3
<b>Eastern Ghat Highland</b>	<i>Trichopria</i> Ashmead	40
	<i>Entomacis</i> Foerster	2
	<i>Monelata</i> Foerster	3
	<i>Basalys</i> Westwood	7
<b>South Eastern Ghat</b>	<i>Basalys</i> Westwood	16
	<i>Trichopria</i> Ashmead	6
	<i>Coptera</i> Say	1
<b>Western Undulating Zone</b>	<i>Monelata</i> Foerster	2
	<i>Spilomicrus</i> Westwood	1
	<i>Basalys</i> Westwood	5
	<i>Trichopria</i> Ashmead	38
	<i>Calogalesus</i> Kieffer	1
	<i>Entomacis</i> Foerster	2
<b>Mid Central Table Land</b>	<i>Trichopria</i> Ashmead	20
	<i>Basalys</i> Westwood	110
	<i>Entomacis</i> Foerster	30
	<i>Odontopria</i> Kieffer	1

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