



EGYPTIAN ACADEMIC JOURNAL OF  
**BIOLOGICAL SCIENCES**  
ENTOMOLOGY

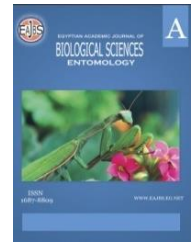
A



ISSN  
1687-8809

[WWW.EAJBS.EG.NET](http://WWW.EAJBS.EG.NET)

**Vol. 17 No. 3 (2024)**



**Rediscovery of *Paracopium lewisi* Distant, 1903 (Hemiptera: Heteroptera: Tingidae) from India after a Century from the Oriental Region with an Updated Checklist from The World**

**Sonam Jahan<sup>1</sup>, Sandeep Kushwaha<sup>2</sup>, Mohammad Salman Akhtar<sup>3#</sup>, P.C. Saha<sup>2</sup> and Preeti Khare<sup>1</sup>**

<sup>1</sup>Government Science College Jabalpur Madhya Pradesh, India.

<sup>2</sup>Zoological Survey of India, Central Zone Regional Center, Jabalpur, Madhya Pradesh  
Zoological Survey of India, Kolkata, India.

<sup>3</sup>Department of Basic Medical Sciences, Faculty of Applied Medical Sciences, Al-Baha University, Al-Baha, Saudi Arabia.

\*E-mail: [mdsalmanakhtar@yahoo.com](mailto:mdsalmanakhtar@yahoo.com)

**ARTICLE INFO**

**Article History**

Received:11/8/2024

Accepted:28/9/2024

Available:30/9/2024

**Keywords:**

*Paracopium lewisi*,  
dispersal,  
distribution,  
oriental region.

**ABSTRACT**

Family Tingidae is distributed from tropical to temperate zones. Because of the honeycomb-like surface on wings so-called lace bugs. The Genus *Paracopium* has some economic importance such as playing an important role in the gall formation and acting as a pest. *Paracopium lewisi* Distant, 1903 was reported only from Sri Lanka and Indonesia (Oriental region), in 1902. For the first time after 118 years, it has been reported from the North-Eastern region, of India. The new distribution record from Sri Lanka and Indonesia to Mizoram, India shows the long dispersal of the species. An updated checklist of the genus *Paracopium* Distant, 1902 from the world has been provided along with their distributions. The *Paracopium lewisi* Distant, 1903 belongs to the family Tingidae, commonly known as lace bugs, because of the lace-like pattern of their pronotum and hemelytra. Only two species of the genus *Paracopium* are well-known and reported in India.

**INTRODUCTION**

The family Tingidae (commonly known as lace bugs due to their lacelike body appearance) is currently divided into three subfamilies: Vianaidinae, Cantacaderinae, and Tinginae (Schuh and Weirauch., 2020). The family Tingidae is mostly found in tropical and temperate zones. They are small-sized bugs ranging between 2 to 8 mm., have a honeycomb-like surface on their wings called lace bugs, are phytophagous throughout their life, and have pest habits in some plants (NEAL & SCHAEFER (2000).

The internal classification of contemporary Tinginae has not been fully established (Schuh and Weirauch., 2020; Drake *et al.*, 1965; Guilbert *et al.*, 2014). However, four tribes are usually recognized, Tingini Laporte, 1832, Litadeini Drake and Ruhoff, 1965, Phatnomini Drake and Davis, 1960, and Ypsotingini, Drake and Ruhoff, 1965. The majority shows monophagous whereas some are oligophagous and polyphagous. The oriental region

shares only 11% of the total species of the world. Tingidae of the Indian region is very poorly defined however Chandra, (2000) described 3 species from Central India including *P. cingalense* (Walker) from Madhya Pradesh. More than 2500 species belonging to 300 genera of Tingidae are found worldwide. The *Paracopium lewisi* Distant, 1903 belongs to the family Tingidae, commonly known as lace bugs, because of the lace-like pattern of their pronotum and hemelytra. Only two species of the genus *Paracopium* are known from India GUIDOTI *et al.*, (2015), *Paracopium lewisi* Distant, 1903 was collected after 118 years from the Oriental region, earlier it was recorded from Sri Lanka and Sumatra in 1902. The genus *Paracopium* Distant, 1902 consists of 42 species reported worldwide GUILBERT, (2007) more frequently in the Afrotropical, Oriental, and Australian regions in which the Afrotropical region is dominating with 34 species DECKERT and SCHEIDING, (2006), and only two species are reported from India (Table 1). The Genus *Paracopium* also has some economic importance in it played a very important role in gall formation mainly in the Genus *Teucrium* and *Clerodendrum* family Lamiace MILLER and RAMAN, (2019). The oriental region comprises 5 species viz. *P. cingalense* (Walker), *P. comentis* Drake, *P. philippinensis* Drake, *P. lewisi* Distant, and *P. sauteri* Drake. The Reoccurrence of *P. lewisi* Distant after a century from the Oriental region mainly in India (DTR Mizoram) shows the long dispersal route from the nearby country of India.

**Table 1.** Updated Checklist of Genus *Paracopium* Distant, 1902 from the world (Source: GUILBERT, 2020, Hemiptera database/Tingidae).

S. No.	Taxa	Worldwide distribution
1.	<i>Paracopium philippinense</i> Drake, 1930	Philippines
2.	<i>Paracopium africanum</i> Drake, 1956	Madagascar South Tropical Africa Southern Africa
3.	<i>Paracopium albofasciatum</i> Hacker, 1927	Australia (Queensland)
4.	<i>Paracopium antennatum</i> (Schouteden, 1923)	Cameroon, Democratic Republic of the Congo, Republic of the Congo
5.	<i>Paracopium assimile</i> Horváth, 1929	Madagascar, Nigeria, Tanzania, Uganda
6.	<i>Paracopium australicum</i> (Stål, 1873)	Australia (New South Wales) Australia (Northern Territory) Australia (Queensland)
7.	<i>Paracopium bequaerti</i> (Schouteden, 1923)	Democratic Republic of the Congo Republic of the Congo
8.	<i>Paracopium burgeoni</i> (Schouteden, 1923)	Democratic Republic of the Congo Republic of the Congo
9.	<i>Paracopium caledonicum</i> Drake, 1956	France (New Caledonia)
10.	<i>Paracopium cingalense</i> (Walker, 1873)	India, Sri Lanka
11.	<i>Paracopium coloratum</i> Schouteden, 1955	Democratic Republic of the Congo Republic of the Congo
12.	<i>Paracopium comatum</i> Drake, 1953	India
13.	<i>Paracopium congruum</i> Drake, 1956	Congo, Republic of the Congo, Zambia Zimbabwe (ex Rhodesia)
14.	<i>Paracopium connexum</i> Linnavuori, 1977	Sudan
15.	<i>Paracopium convexocarinarum</i> Linnavuori, 1977	Sudan
16.	<i>Paracopium dauphinicum</i> Drake, 1956	Madagascar
17.	<i>Paracopium dollingi</i> Rodrigues, 1984	Uganda
18.	<i>Paracopium fenestrellatum</i> (Bergroth,	Ivory Coast, Madagascar, Northeast

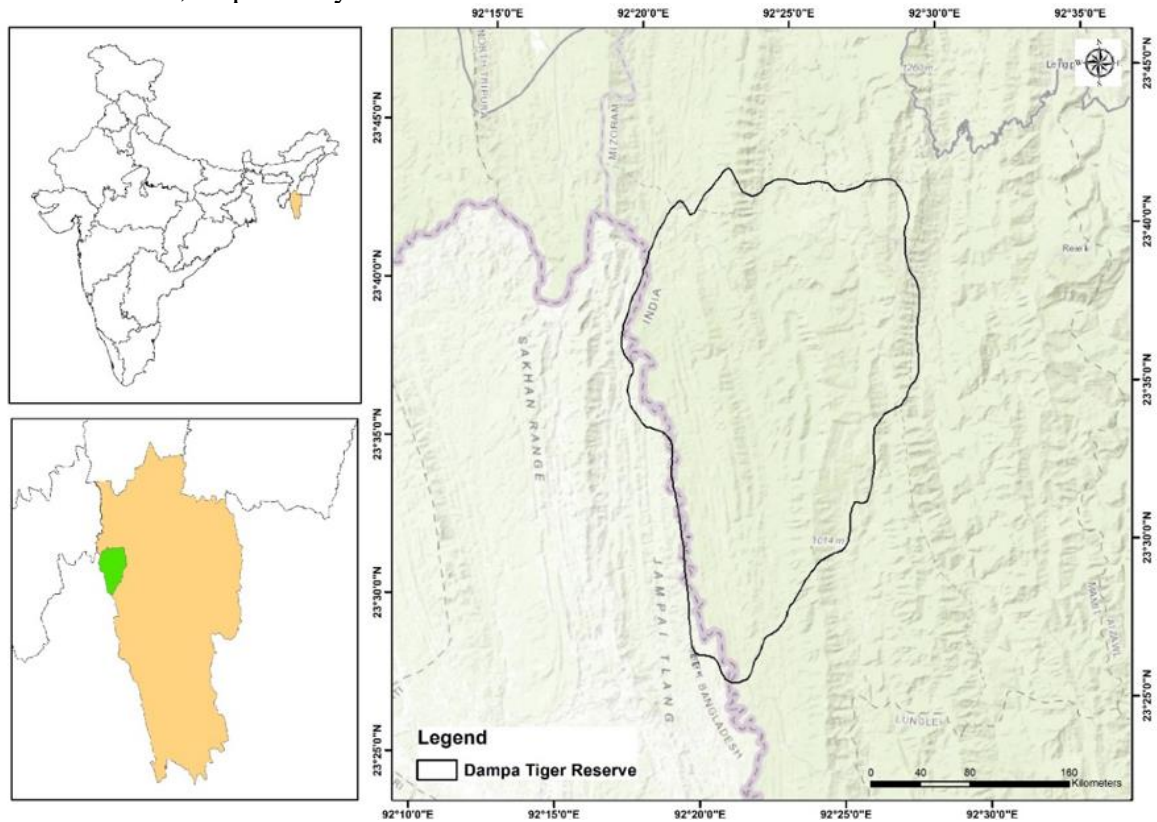
	1894)	Tropical Africa
19.	<i>Paracopium floricum</i> (Horváth, 1929)	Tanzania
20.	<i>Paracopium fraterculum</i> Schouteden, 1955	Democratic Republic of the Congo Republic of the Congo
21.	<i>Paracopium furvum</i> (Horváth, 1925)	Australia (Queensland)
22.	<i>Paracopium ghesquierei</i> (Schouteden, 1923)	Democratic Republic of the Congo Republic of the Congo
23.	<i>Paracopium gigantos</i> Drake, 1954	Madagascar
24.	<i>Paracopium glabricorne</i> (Montandon, 1892)	Democratic Republic of the Congo Madagascar, Mozambique, Republic of the Congo, Somalia, South Tropical Africa, Southern Africa, Zambia
25.	<i>Paracopium hamadryas</i> (Drake, 1925)	Democratic Republic of the Congo Ghana, Republic of the Congo Tanzania, Uganda
26.	<i>Paracopium hirsutum</i> Drake, 1953	Madagascar
27.	<i>Paracopium hirticorne</i> (Bergroth, 1912)	Ghana, Guinea, Ivory Coast
28.	<i>Paracopium insigne</i> Schouteden, 1955	Burundi, Democratic Republic of the Congo, Kenya, Republic of the Congo Rwanda
29.	<i>Paracopium insularis</i> Rodrigues, 1981	Madagascar, Seychelles
30.	<i>Paracopium kollari</i> (Fieber, 1844)	Mauritius
31.	<i>Paracopium lewisi</i> Distant, 1903	Sri Lanka, Indonesia, India*
32.	<i>Paracopium longulum</i> Drake, 1958	Madagascar
33.	<i>Paracopium longnaimai</i> Guilbert, 2007	Laos
34.	<i>Paracopium lupakense</i> (Schouteden, 1923)	Democratic Republic of the Congo Republic of the Congo
35.	<i>Paracopium majus</i> Rodrigues, 1992	Madagascar
36.	<i>Paracopium modestum</i> Schouteden, 1955	Democratic Republic of the Congo Republic of the Congo
37.	<i>Paracopium parvum</i> Drake, 1958	Madagascar
38.	<i>Paracopium proprium</i> Drake, 1958	Madagascar
39.	<i>Paracopium sauteri</i> Drake, 1951	China (Taiwan)
40.	<i>Paracopium scheidingae</i> Rodrigues, 1982	Tanzania
41.	<i>Paracopium stolidum</i> (Horváth, 1912)	Angola, Democratic Republic of the Congo, Madagascar, Republic of the Congo
42.	<i>Paracopium summervillei</i> (Hacker, 1927)	Australia (Queensland), Vanuatu

\*New addition

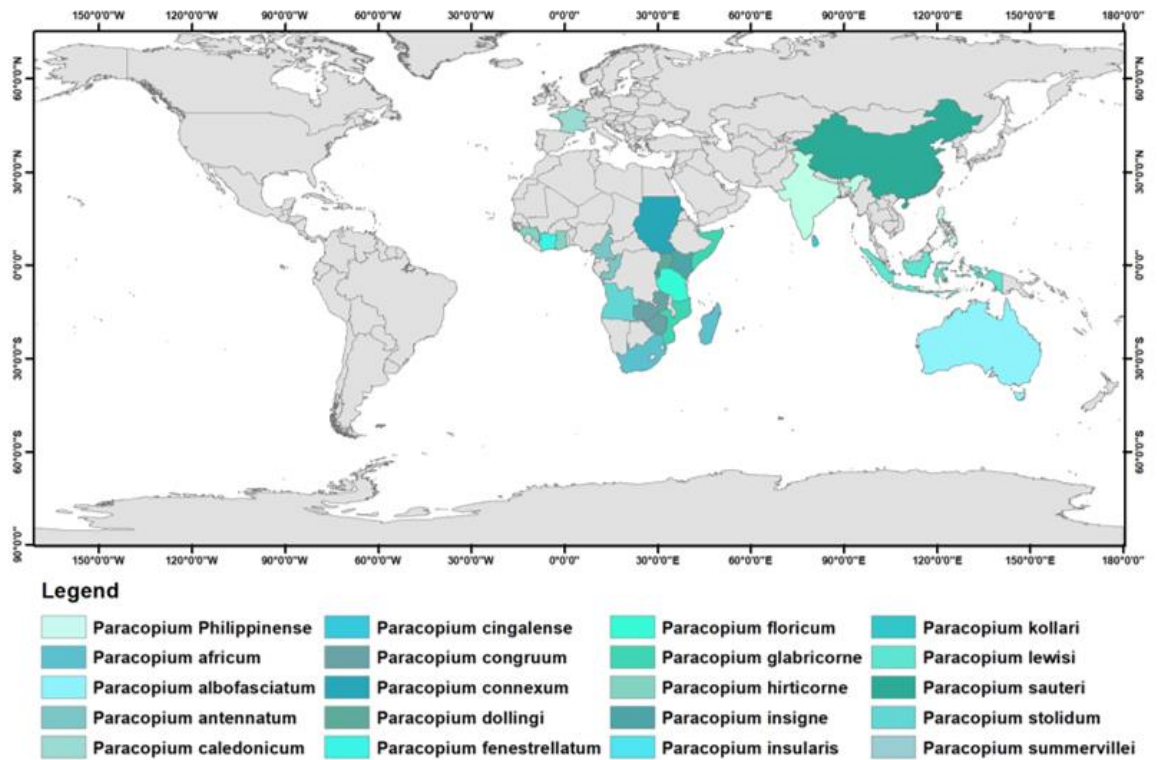
## MATERIALS AND METHODS

The Dampa Tiger Reserve (DTR) is about 127 Km (23.53° N - 23.68° N and 92.22° E - 92.45° E) away from the state capital, i.e., Aizawl (Fig. 1). The elevation of DTR ranges from 200m to 1200m above sea level and is spread over 988 Km<sup>2</sup> (500 Km<sup>2</sup> core zone and 488 Km<sup>2</sup> buffer zone). Tuichar and Chite Lui are the major rivers flowing through the Tiger Reserve besides other smaller streams that form a wetland around the Tiger Reserve Figure 1. The steep slopes are covered by orchids, rhododendrons, and majorly with bamboo plantations, specimen was collected from DTR and preserved in 70% alcohol and later card mounted for identification. The collected specimens were deposited in the National Zoological Collection of Zoological Survey of India, Hemiptera Section, Kolkata voucher

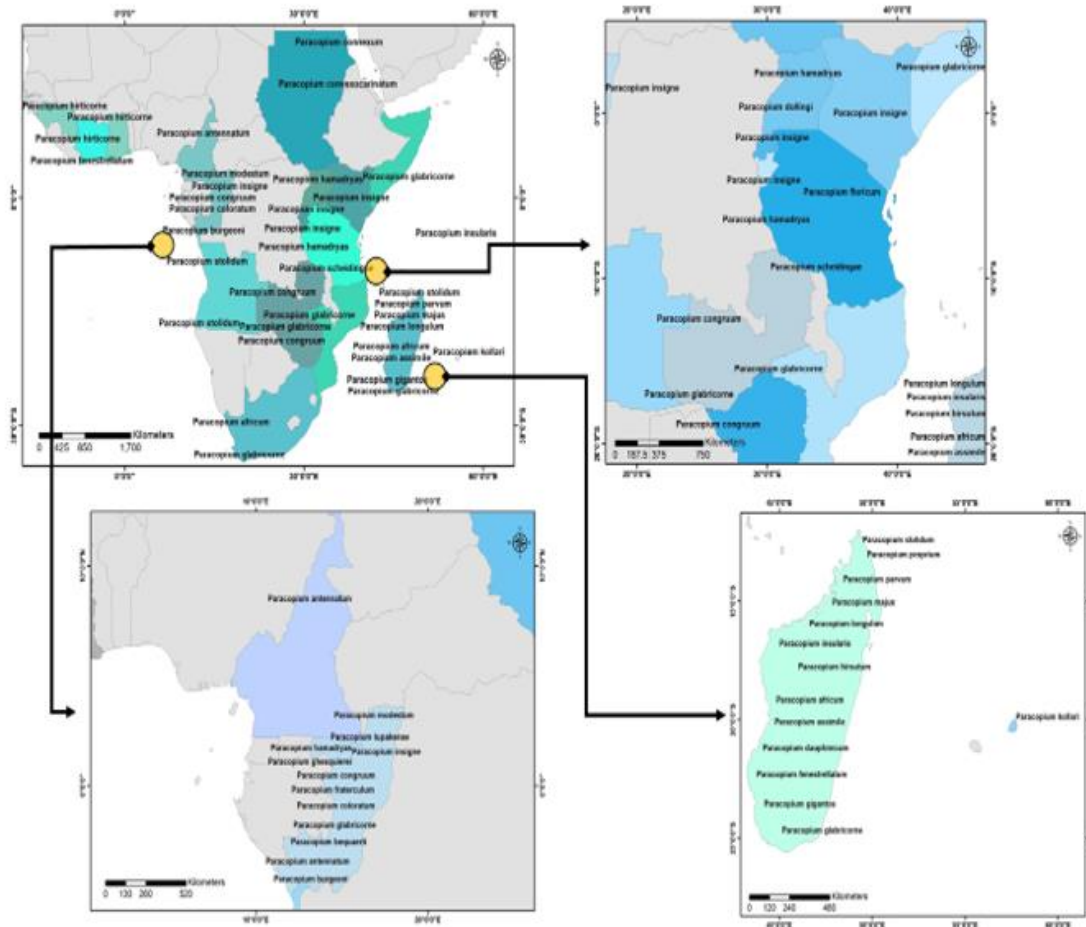
no. (H15-9810). Photographs and SEM studies were done with the aid of Leica M 205A and Zeiss EVO 18, respectively.



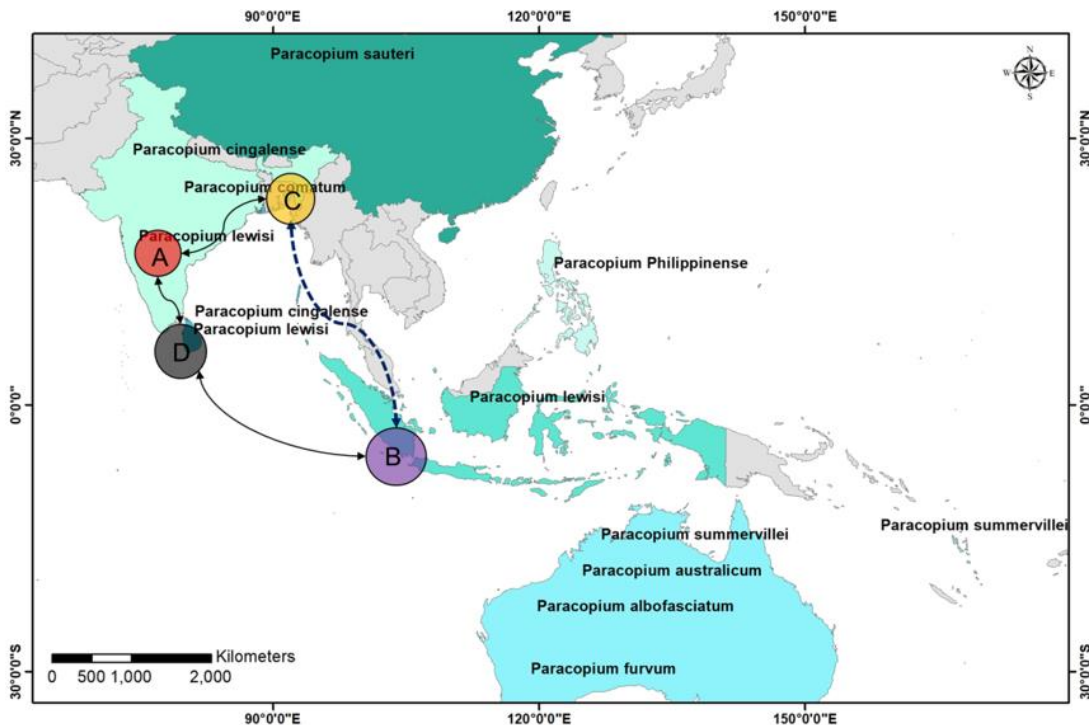
**Fig. 1:** Map showing study area Dampa Tiger Reserve, Mizoram.



**Fig. 2:** Global distribution of respective species under the genus *Paracopium*.



**Fig. 3:** Distribution of respective species under the genus *Paracopium* across the African continent.



**Fig. 4:** Distribution of *Paracopium lewisi* and possible dispersal routes in the south Asian regions.

**RESULTS****Taxonomic Account:**

Family Tingidae Laporte, 1833

Subfamily Tinginae Laporte, 1832

**Genus *Paracopium* Distant, 1902**

1902. *Paracopium*: Distant, *A.M.N.H.* (7) ix: 354.

**Diagnostic Characters of the Genus:**

Antennae robust, 2 mm long just  $\frac{1}{2}$  the entire body, having well-defined erect setae, 3<sup>rd</sup> joint of antennae thick; the width of 3<sup>rd</sup> and 4<sup>th</sup> joint of antennae are equal, the head having 5 variable spikes. Pronotum has keels, and the extreme border of hemelytra has rings.

Length: 4-5 mm.

**Type specimen:** *Paracopium cingalense* Walker, 1873 (Original combination).

**Distribution:** Angola, Australia (New South Wales), Australia (Northern Territory), Australia (Queensland), Burundi, Cameroon, China (Taiwan), Democratic Republic of the Congo, France (New Caledonia), Ghana, Guinea, India, Ivory Coast, Kenya, Madagascar, Mauritius, Mozambique, Nigeria, Northeast Tropical Africa, Philippines, Republic of the Congo, Rwanda, Seychelles, Somalia, South Tropical Africa, Southern Africa, Sri Lanka, Sudan, Sumatra, Tanzania, Uganda, Vanuatu, Zambia, and Zimbabwe.

***Paracopium lewisi* Distant, 1903:**

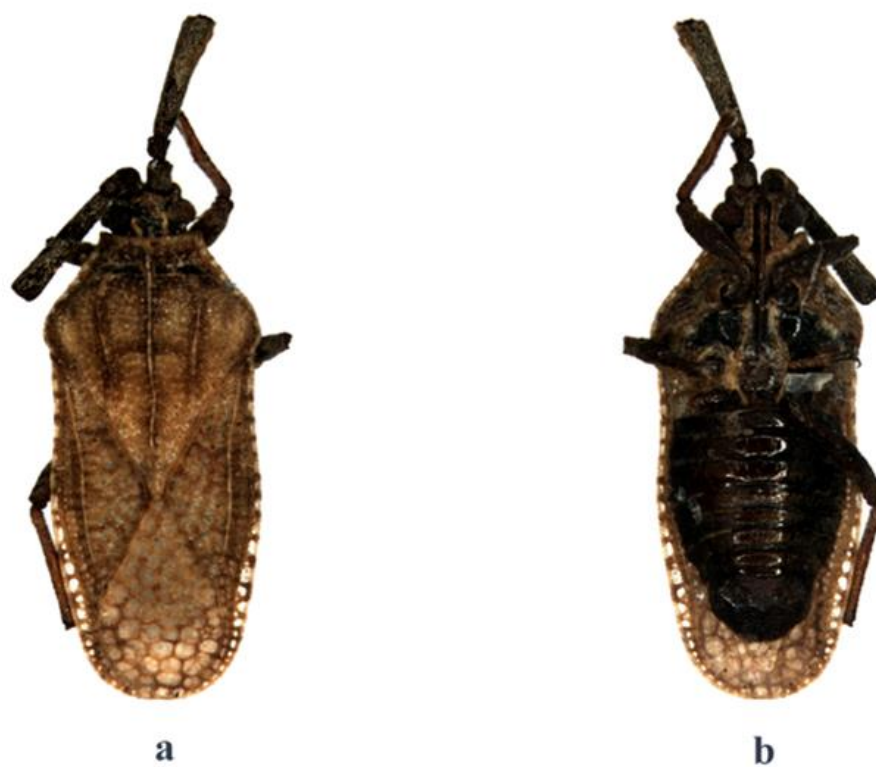
1903. *Paracopium lewisi*: Distant, *Ann. Soc. Ent. Belg.* xlvii:48.

**Material examines:** ♂, labeled: 'India, Mizoram/Mamit/DTR/Teirei Lui/28.xi.18, 1 gt. S. KUSHWAHA'.

**Description:** The body is brownish grey in color, long, about 2.54 X as long as wide, the head is wider than long, and the width of the head across compound eyes is about 1.75 X as long as the head length. Antennae are dark brown, stout, and robust, with eyes within the anterior margin of the pronotum, and lateral carination of the pronotum slightly curved outward (Fig 5 a & b). Rostrum was relatively short, reaching mid-coxae, tapering towards the apices. Abdomen minutely pilose (Fig 4a-2d). Pronotum longer than wide, about 1.28X as long as wide, deeply punctate, slightly gibbose, tricarinate, the median carinae not areolate, reduced to a ridge; collar raised. Hemelytra long, narrow, slightly narrower than pronotum, coastal area tri-serrate throughout the length, subcostal area wider than coastal area, triseriate, areolae round, smaller in a coastal area; discoidal area longer than half length of hemelytra, narrow, five areolae wide at the widest part.

**Distribution:** India: Mizoram (First time). Elsewhere: Indonesia and Sri Lanka.

**Comparative remark:** *Paracopium lewisi* is known to have a resemblance with *Paracopium cingalense* (Walker, 1873) and differs in antennal and colouration not having rings, having hairs, and longer than *Paracopium cingalense*.

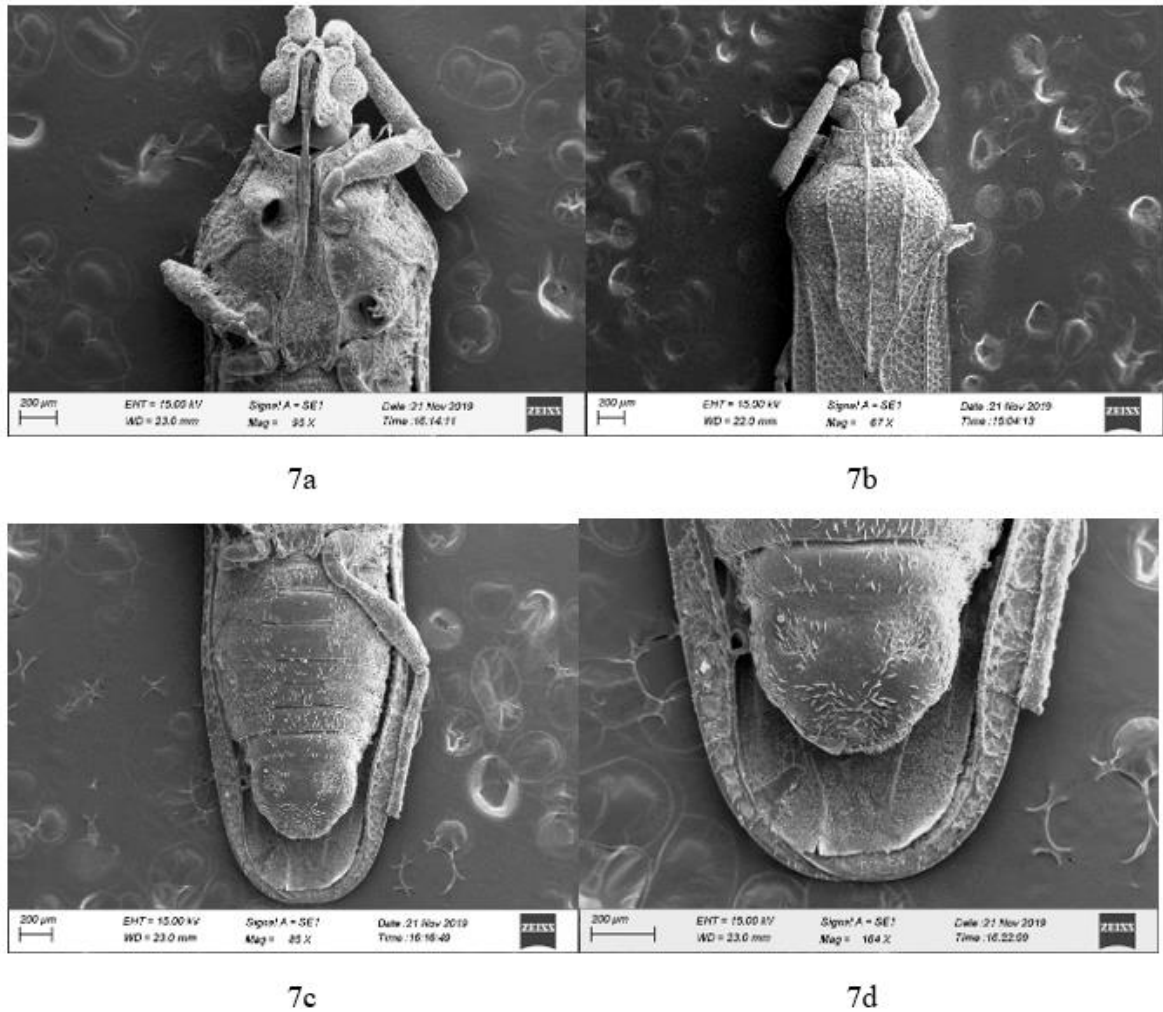


**Fig. 5:** *Paracopium lewisi*: a. dorsal view; b. ventral view.



**Fig. 6:** *Paracopium lewisi*: specimen deposited at National collection of ZSI, Hemiptera Section, Zoological Survey of India.





**Fig. 7.** SEM images of *Paracopium lewisi*

- i. Ventral view showing four-segmented rostrum with well-developed bacculae.
- ii. Dorsal view showing bulged pronotum with carination.
- iii. Ventral view showing abdomen.
- iv. Ventral view showing ♂ external genitalia.

## DISCUSSION

An updated Checklist of Genus *Paracopium* Distant, 1902 has been provided and reported one species of *Paracopium* earlier recorded from Mizoram first time from, India along with additional diagnostic characters.

The Species of these genera are mainly Holarctic in distribution (Schuh and Weirauch., 2020; Drake *et al.*, 1965; Froeschner., 2001; Golub and Golub., 2019) but some have been identified in the tropical regions of Africa and Asia (Drake *et al.*, 1965; Froeschner., 2001; Lis *et al.*, 2022; Lis *et al.*, 2013). Earlier this species was reported from Sri Lanka and Indonesia (Oriental region), in 1902 (Distant, 1903), and time after 118 years it has been reported from the Dampa Tiger Reserve Mizoram, India. This paper also attempts to provide possible dispersal routes for *Paracopium lewisi*, despite the vast distance dispersal of the genus *Paracopium* throughout the globe (Figs. 2 & 3), the species *Paracopium lewisi* was identified in the South Asian countries, from Indonesia, Sri Lanka, and India. However, the exact path of dispersal of *Paracopium lewisi* in different countries is beyond the scope of the present study. However, based on the limited data and literature support we have

identified three possible routes with four major nodes of dispersal for the species. Our hypothesis for the dispersal routes was based on the spatial connection between the terrestrial landscapes, a previous report of invasion routes of the country, and the human migration routes through motorways and waterways between the landmasses. The first route of dispersal counts on the dispersal from the Indian subcontinent (node A and C), where A and C represent the dispersal of the species within the country, the dispersal nodes i.e. A and C are vice versa, followed by the sequential dispersal to Sri Lanka (node A to D) and finally node D to B from the waterways (Figure 4). Alternatively, dispersal from Indian node C to B by the Asian highway network or the busy waterways may also be fissile. In the second route, dispersal counts from Indonesia (node B), followed by the sequential dispersal to node C by the Asian road and water network or to node D i.e. Sri Lanka, and final dispersal occurs in the Indian subcontinent from node A to node C (Fig. 4). The final theory counts the dispersal origin from the Sri Lankan origin i.e. through node D, followed by the dispersal to node A to C and alternatively to node B and finally to C and A (Fig. 4).

**Declarations:**

**Ethics Statement:** The study was conducted in compliance with all applicable ethical standards and regulations. The study went through an ethical review board. In this study, no human participants or animals were involved.

**Authors Contributions:** Sonam Jahan designed and performed the experiment and wrote the manuscript. Sandeep Kushwaha guided in the experimental work. Mohammad Salman Akhtar made corrections and modifications to the manuscript. P.C. Saha modified and reviewed the manuscript. Preeti Khare helps in experimental work and data collection. All authors contributed equally, and have read and approved the manuscript for publication.

**Conflict of Interest:** All the authors read the manuscript and declare that there is no conflict of interest in this manuscript.

**Availability of Data and Materials:** The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

**Funding:** The study was not funded by any funding agency.

**Acknowledgments** The authors express their sincere gratitude to the Director, of the Zoological Survey of India and the Officer in charge of ZSI, Jabalpur Madhya Pradesh for providing all sorts of necessary facilities. The authors are grateful to the Department of Forest, Environment and Climate Change, Government of Mizoram for research permission. We appreciate the logistical support offered by the field staff of Dampa Tiger Reserve. We greatly acknowledge the funding support by MoEF &CC through the NMHS scheme with project ID: NMHS/2017-18/MG44/28. Thanks, are also due to the Mountains of Central Asia Digital Dataset (MCADD) and Biodiversity Heritage Library (BHL) for availing the valuable literature.

## REFERENCES

- Chandra K. 2000: Records of the Lace-Bugs from Madhya Pradesh (Hemiptera: Tingidae). *Bionotes* **2** (3): 57.
- Deckert J. & Scheiding U. G. 2006: Lace bugs of Namibia (Heteroptera, Tingidae) zugleich Kataloge. *Neue Serie der OÖ. Landesmuseen*, **50**: 823–856.
- Distant W. L. 1903: *The fauna of British India including Ceylon and Burma, Rhynchota*, **2**(1):128–129. (Published by Taylor and Francis, London).
- Drake, C.J.; Ruhoff, F.A. Lacebugs of the World: A Catalog (Hemiptera: Tingidae). *Bulletin of the United States National Museum*. 1965, 243, 1–634.
- " Froeschner, R.C. 2001, Lace Bug Genera of the World, II: Subfamily Tinginae: Tribes Litadeini and Ypsotingini (Heteroptera; Tingidae). *Smithson.*

- Contributions to Zoology*, 611, 1–28.
- Golub, V.B.; Golub, N.V. 2019, On the status of the genera complex *Acalypta*, Dictyonota, *Kalama* and *Derephysia* (Heteroptera: Tingidae: Tinginae) having common morphological and karyological features. *Zoosystematica Rossica*, 28, 228–237.
- Guidoti M., Montemayor S. I. & Guilbert E. 2015: Lace bugs (Tingidae). In: R. Panizzi and J. Grazia, eds., True bugs (Heteroptera) of the Neotropics. Dordrecht: Springer, *Entomology in Focus*, 2: 395–422.
- Guilbert E. 2007: Tingidae (Hemiptera: Heteroptera) from Laos: new species and new records. *Zootaxa*, 1442: 1–18.
- Guilbert E. 2020: Hemiptera-databases in MNHN-Paris. [www.hemiptera-databases.org/tingidae/](http://www.hemiptera-databases.org/tingidae/) (Accessed on 18.04.2020).
- Guilbert, E.; Damgaard, J.; D’Haese, C.A. Phylogeny of the lacebugs (Insecta: Heteroptera: Tingidae) using morphological and molecular data. *Systematic Entomology*, 2014, 39, 431–441.
- Lis, B.; Parveen, S.; Ramamurthy, V.V. 2013, Redescription of the Oriental lace-bug *Recaredux rex* Distant, 1909 (Hemiptera: Tingidae: Tinginae), and its new tribal assignment, with a key to Ypsotingini. *Zootaxa*, 3702, 597–600.
- Lis, B.; Zielińska, A.; Lis, J.A. 2022, The King’s Lace Bug *Recaredux rex* Distant, 1909 (Hemiptera: Heteroptera: Tingidae): Systematic Position, First Palearctic and Afrotropical Records, and Ecological Niche Modelling. *Insects*, 13, 558.
- Miller D. G. & Raman A. 2019: Host–Plant Relations of Gall-Inducing Insects. *Annals of the Entomological Society of America*, 112(1): 1–19.
- Neal J. W. Jr. & Schaefer C. W. 2000: Lace Bugs (Tingidae). In: Schaefer C.W. & A.R. Panizzi (Eds), Heteroptera of economic importance. CRC Press, Boca Raton, London, New York, Washington, D.C.: 85–137.
- Schuh, R.T.; Weirauch, C.H. True Bugs of the World (Hemiptera: Heteroptera): Classification and Natural History, 2nd ed.; Monograph Series; Siri Scientific Press: Rochdale, UK, 2020; Volume 8, 767p.