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New Combination of Genus *Ancylophyes* Diakonoff, 1988 and Three New Records of Moths of Subfamily Olethreutinae (Lepidoptera: Tortricidae) from India

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ABSTRACT

Three species of tortricid moths of the subfamily Olethreutinae, viz., *Acanthoclita acrocroca* Diakonoff, 1982, *Age onychistica* Diakonoff, 1982 and *Bactra coronata* Diakonoff, 1950, were recorded for the first time from India. The species, *Acroclita cheradota* Meyrick, 1912 is transferred from *Acroclita* Lederer, 1859 to *Ancylophyes* Diakonoff, 1988 as *Ancylophyes cheradota* (Meyrick, 1912) comb. nov. A key to all species of the genus *Ancylophyes* Diakonoff, 1988 is provided. Images of adults and genitalia and distribution maps are provided for each of the four studied species.

Keywords: Microlepidoptera, Enarmoniini, Grapholitini, Olethreutini, Odisha.

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INTRODUCTION

The family Tortricidae Latreille, 1803, commonly referred to as leaf roller moths, constitutes the sole family within the superfamily Tortricoidea Latreille, 1803. This family comprises more than 11,365 species across 1151 genera, with a global distribution (Gilligan, Baixeras, & Brown, 2018). The family is classified into three subfamilies (Chlidanotinae Meyrick, 1906; Olethreutinae Walsingham, 1895 and Tortricinae Latreille, 1803), among which Olethreutinae exhibits the greatest diversity in India (Pathania, Das, Brown, & Chandra, 2020). The family also includes several species that are economically important pests of agriculture (Kar, Majhi, Chakraborti, & Mishra, 2023; Harun-Or-Rashid, Sarkar, Dutt, Saha, & Howlader, 2023). In the present study, as part of the taxonomic revision of Tortricidae of India (Naik, Shashank, Rajgopal, & Meshram, 2021; Naik, Shashank, & Garg, 2022; Naik & Shashank, 2022; Reddy & Shashank, 2022; Reddy & Shashank, 2023; Poon, Reddy, Naik, Anooj, & Shashank, 2024; Naik, Sahoo, Reddy, Poon, & Shashank, 2024; Naik & Shashank, 2024a; 2024b; 2024c), three species are newly recorded from India and a new combination is proposed for an earlier misplaced species.

MATERIALS AND METHODS

The examined materials were collected from three different locations in Odisha, India: 1. Tigiria, Cuttack District; 2. College of Agriculture, Bhawanipatna; and 3. Badrama Wildlife Sanctuary, Sambalpur (Fig. 1). Moths were collected from a vertical white screen using a mercury vapour light (160 W) or LepiLED (Brehm, 2017) during evening and night hours. The voucher specimens are deposited at the National Pusa Collection, Division of Entomology, Indian Agricultural Research Institute (ICAR), New Delhi, India (INPC) (http://grbio.org/cool/nwky-2b63). Genitalia were dissected after boiling the abdomen in 10% KOH for 3-5 minutes (or until the abdomen was clear of scales and gut contents) cleaned, and mounted on a glass slide using Euparal as mounting medium. The images of adult moths, labial palpi, male and female genitalia structures were captured at different magnifications using Leica DFC425C digital camera mounted on a Leica M205FA stereo zoom automontage microscope. The terminology of Horak (2006) was followed for descriptions of male and female genitalia. The distribution maps were prepared by using the software, QGIS version 3.24.3-Tisler. The following abbreviations are used in the text:

INPC: Indian Agricultural Research Institute- National Pusa Collection, New Delhi, India

WLS: Wildlife Sanctuary

MVL: Mercury Vapour Lamp

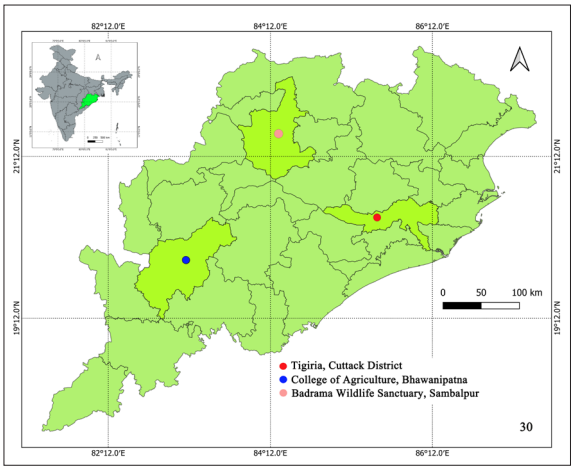

Figure 1. Sites of collection in Odisha, India.

RESULTS

Family Tortricidae Latreille, 1803

Subfamily Olethreutinae Walsingham, 1895

Tribe Grapholitini Guenée, 1845

Genus *Acanthoclita* Diakonoff, 1982

Type species: *Eucosma balanoptycha* Meyrick, 1910

Acanthoclita acrocroca Diakonoff, 1982 (Fig. 2)

Remarks: New record for India.

Material Examined: 1♂, India: Odisha, Tigiria, 20°26'47"N, 85°30'59"E, 66mASL, 27.x.2021, MVL, Kishore C. Sahoo (gen. slide no. L00053009); 1♂, same data as previous, 16.ix.2022 (gen. slide no. L00053011); 1♂, India: Odisha, Tigiria, 20°26'37"N, 85°31'01"E, 48m ASL, 19.x.2022, MVL, Kishore C. Sahoo (gen. slide no. L00053010)- coll. INPC.

Diagnosis: The species can be easily distinguished from related species of the genus based on the characters of the male genitalia. Tegumen narrowed dorsally to form a short protruding uncus. Valva long, about 1.5x broader at basal than apex, with a median waist-like constriction. Sacculus with a bunch of thorn-like spines ventro-apically, before the median constriction of valva. Valva with semioval apical margin covered with hair-like spines and distinct row of long, sclerotized spines ventro-medially. Phallus broad basally, slightly narrowed apically with a median spatulate process and two lateral, small dactylate process; vesica with cluster of cornuti. Forewing and hindwing greyish-brown. Fore wing with narrow, whitish and dark brown strigulae arising from both costa and dorsum.

Distribution (Fig. 4a): India (Odisha- present study); Sri Lanka (Diakonoff, 1982).

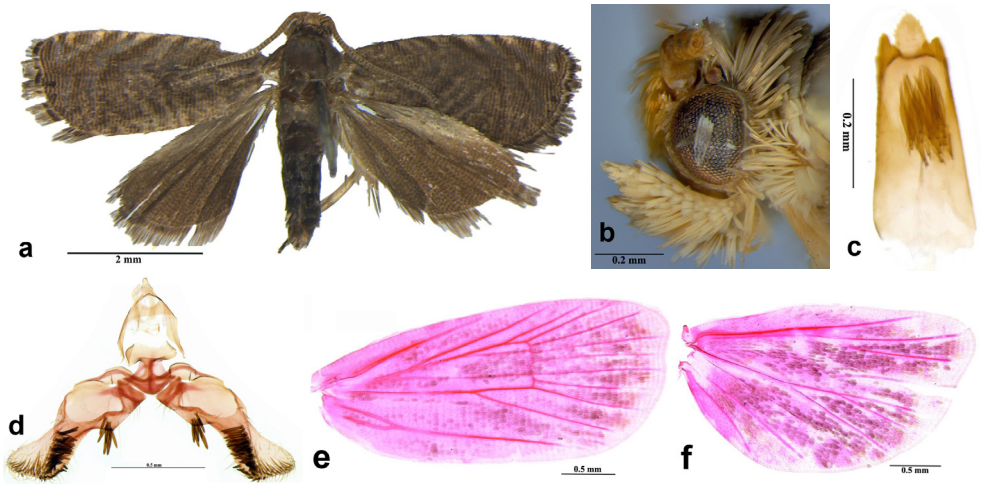

Figure 2. *Acanthoclita acrocroca* Diakonoff, 1982: a) Habitus, b) Labial palpus, c) Phallus, d) Male genitalia, e) Fore wing venation, f) Hind wing venation.

Genus *Age* Diakonoff, 1982

Type species: *Age onychistica* Diakonoff, 1982

Age onychistica Diakonoff, 1982 (Fig. 3)

Remarks: New record of the genus and species from India.

Material Examined: 3♂, 2♀, India: Odisha, Bhawanipatna, 19°55'05"N, 83°09'36"E, 249mASL, 28.ix.2022, MVL, Kishore C. Sahoo (gen. slide. No. L00053015); 2♂, 1♀, India: Odisha, Bhawanipatna, 19°55'10"N, 83°09'26"E, 245mASL, 27.ix.2023, MVL, Kishore C. Sahoo (female gen. slide. No. L00053016, male gen. slide. No. L00053014); 2♂, 3♀, same data as previous, 30.ix.2023 (female gen. slide. No. L00053018, L00053020; male gen. slide. No. L00053019); 1♂, India: Odisha, Tigiria, 20°26'47"N, 85°30'59"E, 66 mASL, 20.iv.2022, LepiLED, Kishore C. Sahoo; 1♀, same data as previous, 21.iv.2022- coll. INPC.

Diagnosis: This is the only species in the genus, and it can be easily diagnosed by male and female genitalia characters. **Male Genitalia:** Tegumen broad with prominent laterally produced shoulder. Uncus distinct, conical. Valva broad, dilated, fleshy with crescent-shaped apical margin covered with dense row of bristles, Sacculus with a deep excision at about mid-length of valva. Phallus distinctly curved, with a bulbous base. **Female genitalia:** Ostium on top of a funnel-shaped colliculum; Ductus bursae simple. Corpus bursae rounded, with a ring-like sclerite, encircling base of ductus bursae; ductus bullae arising from ring-like sclerite. Signa paired, with two slender horns. Forewing with brick red ground color distally, with creamy white and greyish costal strigulae. Termen somewhat oblique, sinuate, apex obtusely pointed. Hindwing greyish brown, dorsum with dense scales.

Distribution (Fig. 4b): India (Odisha- present study); Sri Lanka (Diakonoff, 1982); United Arab Emirates (Kuznetzov, 1997); Oman (Razowski, 1995); Kenya (Agassiz & Aarvik, 2014).

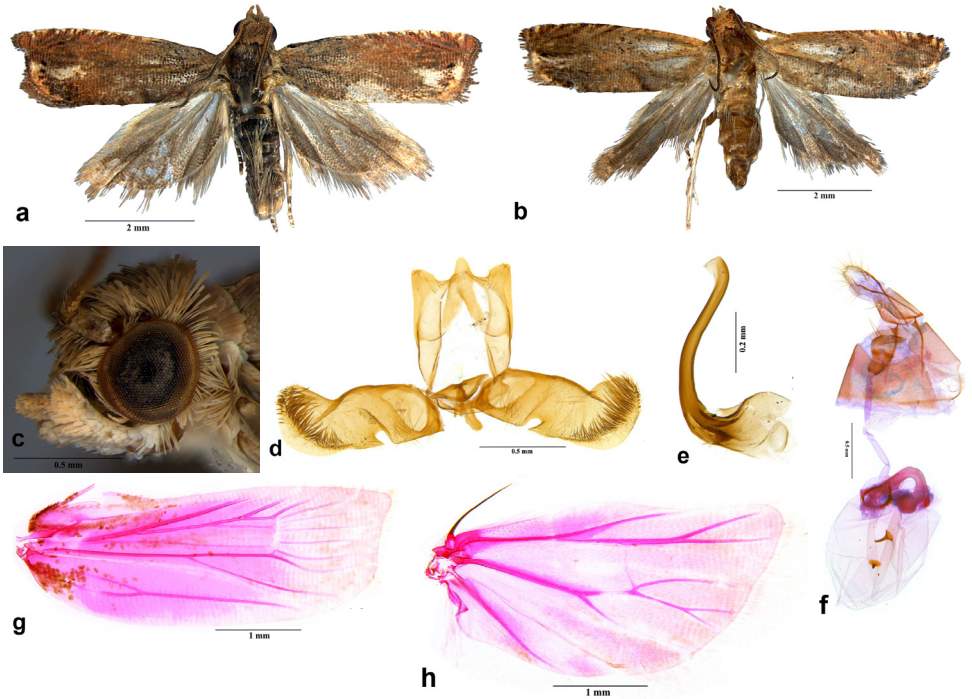

Figure 3. *Age onychistica* Diakonoff, 1982: a) Habitus (Male), b) Habitus (female), c) Labial palpus, d) Male genitalia, e) Phallus, f) Female genitalia, g) Fore wing venation, h) Hind wing venation.

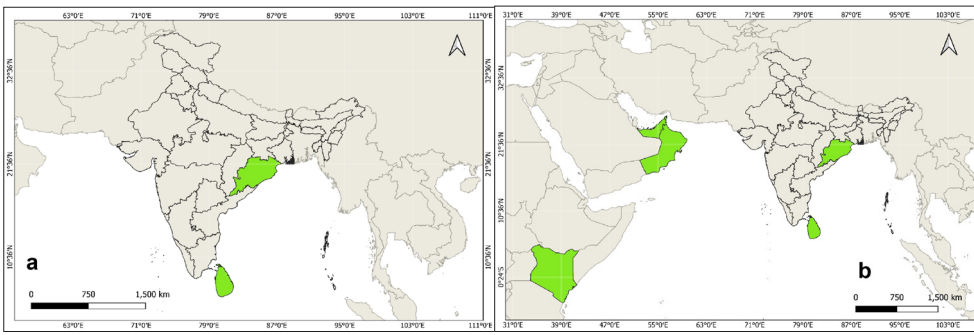

Figure 4. Distribution maps: a). *Acanthoclita acrocroca* Diakonoff, 1982, b). *Age onychistica* Diakonoff, 1982

Tribe Olethreutini Walsingham, 1895

Genus *Bactra* Stephens, 1834

Type species: *Tortrix plagana* Haworth, 1811

Bactra coronata Diakonoff, 1950 (Fig. 5)

Remarks: New record from India.

Material Examined: 1♂, India: Odisha, Tigiria, 20°26'47"N, 85°30'59"E, 66mASL, 04.xi.2021, MVL, Kishore C. Sahoo (gen. slide no. L00053101); 1♂, same data as previous, 09.xi.2021 (gen. slide no. L00053102); 1♂, India: Odisha, Tigiria, 20°26'37"N, 85°31'01"E, 48mASL, 19.x.2021, MVL, Kishore C. Sahoo (gen. slide no. L00053103); 1♂, same data as previous, 28.x.2021 (gen. slide no. L00053104); 1♂, same data as previous (gen. slide no. L00053105)- coll. INPC

Diagnosis: The species is similar to *Bactra copidotis* Meyrick, 1909 and *Bactra tornastis* Meyrick, 1909. However, it can be distinguished by the following characters of the male genitalia: uncus ovate with row of dense, short, stout spines at apex, arranged like a crown. Sacculus distinctly bulbous with rows of stout bristles ventrobasally, cucullus with semicircular apical margin covered with small hair-like setae. A crescent-shaped lobe almost medially on cucullus, with dense row of spines on inner margin. Anellus distinct. Phallus broad medially, narrowing towards apex, without cornuti. Forewing with creamy white ground color, intermixed with brown striae; costal strigulae evident; apex slightly produced; distinct patch at 1/3 basal length. Hind wing creamy white.

Distribution (Fig. 6): India (Odisha- Present study); Thailand; Philippine Island.; Indonesia (Kangean Island; Java, Borneo, Sunda Island); Timor; Sri Lanka (Pinkaew, 2006; Diakonoff, 1973).

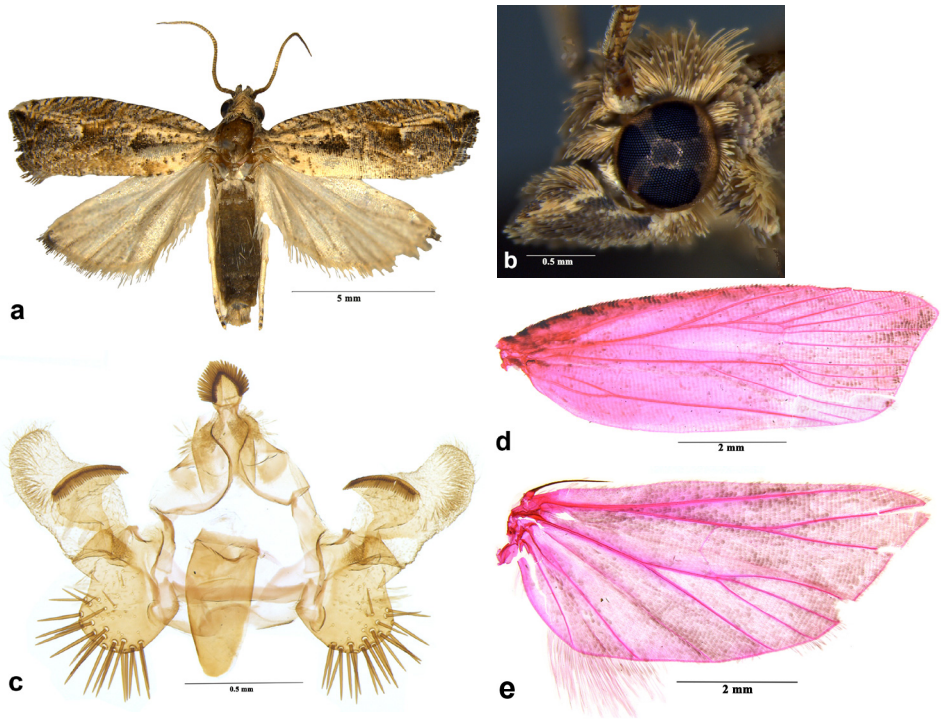

Figure 5. *Bactra coronata* Diakonoff, 1950: a) Habitus, b) Labial palpus, c) Male genitalia, d) Fore wing venation, e) Hind wing venation.

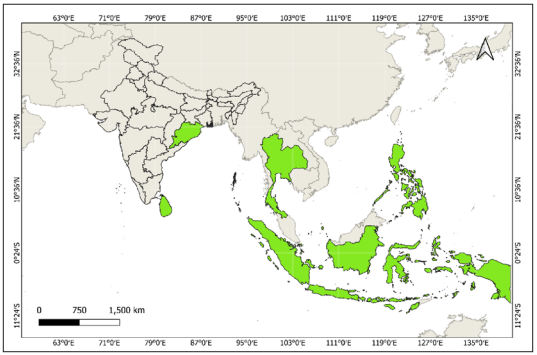

Figure 6. Distribution map of *Bactra coronata* Diakonoff, 1950.

Tribe Enarmoniini Diakonoff, 1953

Genus *Ancylophyes* Diakonoff, 1988

Type species: *Ancylis (Ancyloides) stenampyx* Diakonoff, 1982

Ancylophyes Diakonoff, 1988, *Entomol. Ber.* (Amst.) 48: 195 (replacement name for *Ancyloides* Diakonoff, 1982).

Ancyloides Diakonoff, 1982, *Zool. Verh.* (Leiden) 193: 63 (established as subgenus of *Ancylis*; a junior homonym of *Ancyloides* Kuznetzov, 1964, *Entomol. Obozr.* 43: 882, Lepidoptera, Tortricidae).

Diakonoffiella Kuznetzov, 1997*, Entomol. Obozr.* 76: 195 (unnecessary replacement name for *Ancyloides* Diakonoff, 1982).

Ancylophyes cheradota (Meyrick, 1912) comb. nov. (Fig. 8)

Acroclita cheradota Meyrick, 1912; *J. Bombay nat. Hist. Soc.* 21: 856.

Material Examined: 2♂, India: Odisha: Bhawanipatna, 19°55'10"N, 83°09'26"E, 245mASL, 27.ix.2022, MVL, Kishore C. Sahoo (gen. slide no. L00053004, wing venation slide no. L00053006); 1♂, 1♀, same data as previous, 30.ix.2022 (gen. slide no. L00053007); 1♂, India: Odisha: Bhawanipatna, 19°55'05"N, 83°09'36"E, 249mASL, 28.ix.2022, MVL, Kishore C. Sahoo; 1♀, 3♂, India: Odisha: Badrama Wildlife Sanctuary, 21°28'48"N, 84°18'04"E, 327mASL, 02.iii.2022, MVL, Kishore C. Sahoo (gen. slide no. L00053000, L00053001, L00053003)-coll. INPC

Diagnosis: *Ancylophyes cheradota* (Meyrick, 1912) is similar to *A. stenampyx* and *A. monochroa* based on the male genitalia. However, it can be distinguished from these two species in having the cucullus confluent with the sacculus, without a prominent constriction or neck before the cucullus. In contrast, both *A. stenampyx* and *A. monochroa* have a distinct neck region in the valva separating the oval to round cucullus. The other species, *Ancylophyes praestabilis,* can be separated from rest other species by having a very narrow valva and cucullus with a distinctly large ventral lobe. The female genitalia of *Ancylophyes cheradota* (Meyrick, 1912) are similar to *A. monochroa*. However, the anterior signum is larger in *Ancylophyes cheradota* (Meyrick, 1912) than in *A. monochroa.*

Remarks: Based on the relatedness of characters on male and female genitalia of the type species and other related species of genus *Ancylophyes* Diakonoff, 1988, as described and illustrated by Diakonoff (1982), Hoorak (2006) and Razowski and Wojtusiak (2012), this species which was originally placed under the genus *Acroclita* Lerderer, 1859 is transferred to genus *Ancylophyes* Diakonoff, 1988. The female genitalia is illustrated for the first time.

Redescription

Head (Figs. 8a-c)**.** Ocellus and chaetosemata moderate. Frons white to creamy white. Vertex roughly scaled, creamy white suffused with pale brown. Labial palpi long (more than twice the diameter of eye), porrect, basal segment slender, second segment slightly expanded with creamy white loose scales throughout, terminal segment long (about 0.75X of second segment), slender, with appressed scales, slightly concealed by few creamy white to pale brown scales from distal end of second segment. Antenna more than half the forewing length, scape concolourous with vertex, flagellum creamy white suffused with brown scales forming rings, no cilia.

Thorax. Posterior crest absent; pronotum reddish-brown; tegula creamy white. Wingspan, male: 8.76-10.86 mm (n=6); female: 10.57-11.22 mm (n=2). Forewing narrow, subrectangular, with falcate apex; costal fold absent, termen strongly sinuated; upperside with general ground colour greyish white, with dark brown to black markings, dusted with pale brownish yellow scales; basal half with large semi-circular yellowish brown to black patch touching the dorsum; uneven patch of reddish yellow ochreous scales extending from middle to apex of costal margin; small to moderate costal strigulae extending from base to apex of costal margin; fringes greyish brown. Hindwing greyish brown, costal margin with strong sinuation, termen oblique, dark brown fringes extending from costal to anal margin, more profuse towards the anal margin; wing pattern almost similar in male and female. *Legs.* without any modification; tibia creamy white, tarsi dark brown with ring of creamy white scales distally in each segment.

Wing venation (Figs. 8f-g). Forewing: chorda absent; M-stem well developed, obliquely bent at mid-length of cell, very closely approximated with the hind margin of cell distally; R4 short, R5 slightly curved towards apex; M2 straight; M1, M3 and CuA1 distally bent towards M2; M3 and CuA1 distinctly separated, curved; CuA2 arises from 2/3rd of cell, parallel to oblique part of M-stem; CuP very short, only at margin. Hindwing: Rs closely approximated to M1 basally; M3 and CuA1 bifurcated distally with common long stem; M3 distally parallel to M2; M2 basally curved towards common stem of M3 and CuA1; CuA2 arises from 2/3rd of cell length; 1A+2A with indistinct basal loop; 3A visible.

Abdomen. Dark brown to black with some greyish white scales basally. *Male genitalia* (Figs. 8h-i)**:** Tegumen moderately sclerotized, dilated towards base (region of attachment with valva), slightly constricted at about 2/3rd from base, with two lateral triangular shoulders distally (a); uncus region typically modified to an onion shaped bulbous structure, tip of uncus slightly bilobed by a small median invagination; socii crescent-shaped, sparsely hairy; sclerotized bands, broad basally narrowing down apically, arising above tegumen, jointly projecting as long anal tube, extending distally

beyond uncus (b); valva narrow, elongate, dilated distally, ventral margin with sinuation at 1/3rd from base (c), dorsal margin with a small raised patch of spines at the base (d); costal process small, finger-like, extending towards tegumen; cucullus sub-ovate with a nose shaped tip at the lower margin (e), densely covered with hairs; sacculus with few smaller spines at base (f); thumb-like lateral process, broad medially, V-shaped apically, with patch of hair-like spines on sclerotized inner margin (g) (Fig.8h); caulis a sclerotized, narrow band; anellus cup-shaped; vinculum short, triangular, sclerotized; phallus (Fig. 8g) simple, broad basally, gradually narrowed towards apex; cornuti absent. *Female genitalia* (Fig. 8j)**:** 8th sternite with small lateral sparse hairs distally (a); anal papillae spinulose, crescent-shaped, relatively narrow; apophyses long, moderately sclerotized; sterigma simple, sclerotized, funnel-shaped tubular structure (b); ostium distally on S7; no trace of lamella antevaginalis and lamella postvaginalis; ductus bursae short, narrow, membranous; corpus bursae teardrop-shaped, membranous with inconspicuous granular patch near the neck; signum paired, distinct, sub-triangular, positioned medially on corpus bursae (c) (Fig. 8j).

Distribution (Fig. 7): India (Bihar, Odisha-present study); Sri Lanka; Thailand; Vietnam (Pinkaew, 2006; Koçak & Kemal, 2012; Nedoshivina, 2013; Pathania et al., 2020).

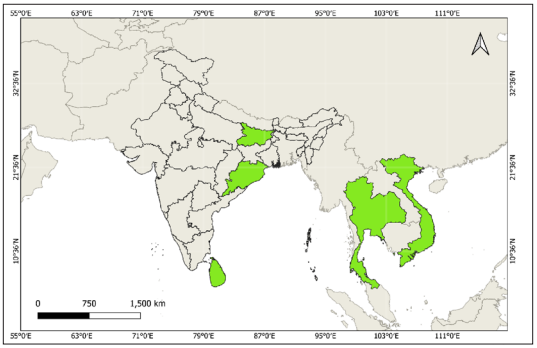

Figure 7. Distribution map of *Ancylophyes cheradota* (Meyrick, 1912).

Key to species of *Ancylophyes* Diakonoff, 1988 (based on male genitalia)

1. Cucullus not distinctly separated from basal part of valva by a constriction ……..…… *Ancylophyes cheradota* (Meyrick, 1912)

1a. Cucullus distinctly separated from the valve by a constriction……2

2. Cucullus with large ventral lobe…… *A. praestabilis* Razowski & Wojtusiak, 2012

2a. Cucullus round to oval, without a distinct ventral lobe……3

3. Uncus blunt or nipple-shaped, cucullus round…… *A. monochroa* Diakonoff, 1984

3a. Uncus produced to a sharp point, cucullus longer than wide..... ..... *A. stenampyx* Diakonoff, 1982

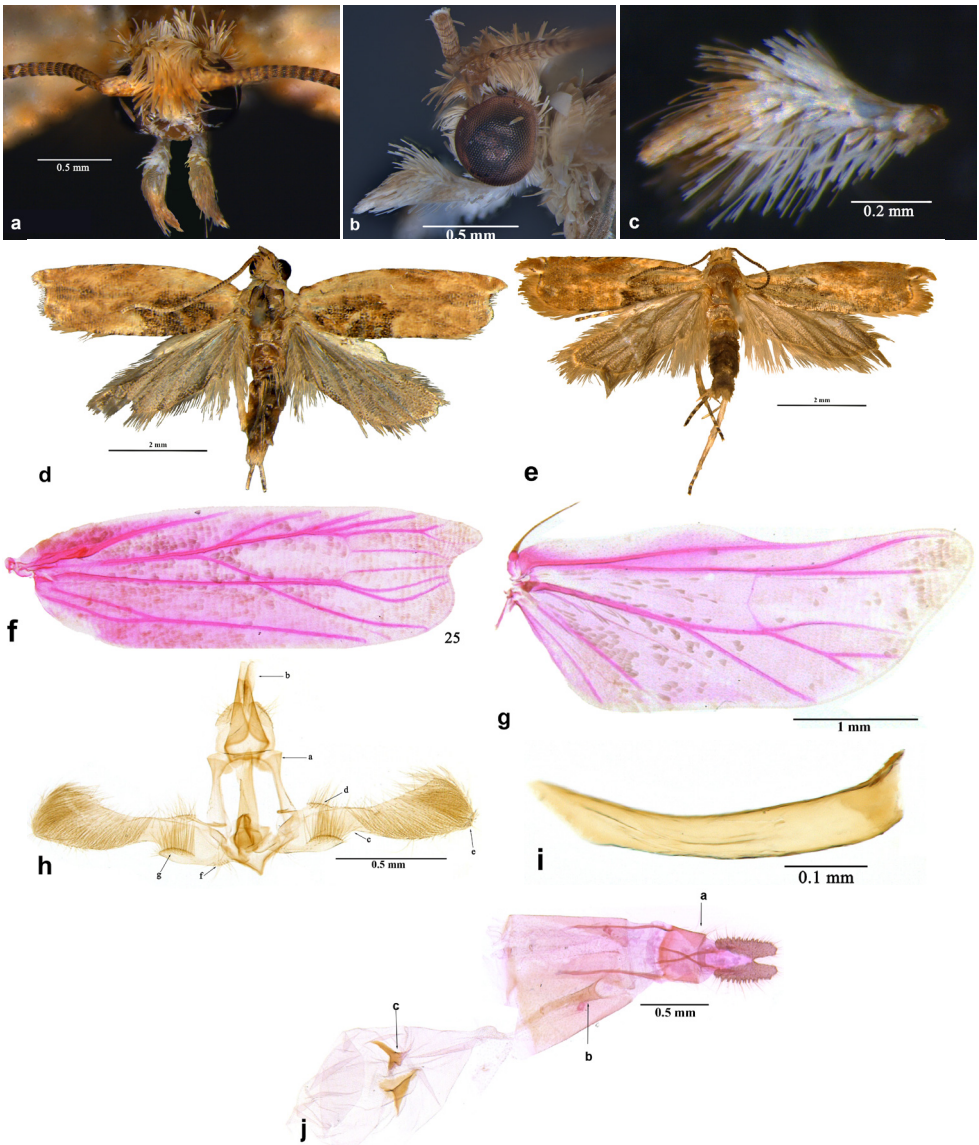

Figure 8. *Ancylophyes cheradota* (Meyrick, 1912), comb. nov.: a) Frons, b) Head, lateral view, c) Labial palpus, d) Male habitus, e) Female habitus, f) Fore wing venation, g) Hind wing venation, h) Male genitalia, i) Phallus, j) Female genitalia.

DISCUSSION

Acanthoclita Diakonoff, 1982 and *Age* Diakonoff, 1982 belong to the tribe Grapholitini. With the recent addition of a new species from India (*Acanthoclita bengaluruensis*

Reddy and Shashank, 2022), there are 14 species of the genus *Acanthoclita* Diakonoff, 1982 worldwide and four species in India. *Acanthoclita acrocroca* Diakonoff, 1982 (type locality: Sri Lanka, Ratnapura District, Uggalkaltota) is added to the Indian fauna in the current study. Genus *Age* Diakonoff, 1982 is monotypic. *Age arabica* Kuznetzov, 1997 and *Cydia omana* Razowski, 1995 which were described from United Arab Emirates and Oman, respectively, were later synonymized with *Age onychistica* Diakonoff, 1982 (Groenen & Aarvik, 2008). The genus and the species, *Age onychistica* Diakonoff, 1982 is recorded for the first time from India.

Bactra Stephens, 1834 belongs to tribe Olethreutini. There are about 107 species of this genus known worldwide (Gilligan et al., 2018) and 11 species from India (Pathania et al., 2020). In the present study, *Bactra coronata* Diakonoff, 1950 (Type Locality: Indonesia) is recorded for the first time from India increasing the number of Indian species to 12.

Ancylophyes, a member under the tribe Enarmoniini of the subfamily Olethreutinae, was established by Diakonoff (1988) as a replacement for the subgeneric name, *Ancyloides* Diakonoff, 1982. It was subsequently placed in the genus *Ancylis* Hübner having *Ancylis* (*Ancyloides*) *stenampyx* Diakonoff, 1982 as the type species known from Sri Lanka. Later, Horak (2006) elevated the subgenus to generic status and provided illustrations of *Ancylophyes monochroa,* earlier reported from Sumba by Diakonoff (1984) as *Ancylis* (*Anchylopera*). Razowski & Wojtusiak (2012) described *Ancylophyes praestabilis* from Anambra State, Nigeria. The genus is characterized by the typical onion-shaped structure above the tegumen and the long anal tube projecting far beyond the apex of the tegumen (Horak, 2006).

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ETHICAL STATEMENT

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Conflict of Interest: On behalf of all authors, the corresponding author states that there is no conflict of interest in this paper.

Ethical approval: N/A

Informed consent: N/A

Author contribution: All authors contributed to the study conception and design. The specimens were collected by Kishore Chandra Sahoo and Sandeepta Kumar Nayak. Examination of materials, identification and characterization was done by Kishore Chandra Sahoo and Pathour Rajendra Shashank. First draft of the manuscript was written by Kishore Chandra Sahoo, and all authors participated in improving and finalizing the manuscript. All authors read and approved the final manuscript.

Data Availability Statement: N/A

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