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ORIBATID MITES (ACARI, ORIBATIDA) FROM DIPTEROCARP AND
POLYDOMINANT FORESTS OF THE DONG NAI CULTURE AND NATURE RESERVE
(SOUTHERN VIETNAM), WITH DESCRIPTION OF A NEW SPECIES OF *LYROPPA*
(OPPIIDAE)

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ABSTRACT — An annotated checklist of oribatid mite taxa from dipterocarp and polydominant forests of the Dong Nai Culture and Nature Reserve (Southern Vietnam) is presented. It includes 59 species, 46 genera and 29 families. The species *Cycloppia restata*, *Tegeozetes tunicatus* and the genera *Cycloppia*, *Tegeozetes* are first records for Vietnam. *Truncopes moderatus variabilis* is recorded for the first time in the Oriental region. *Lyroppia dongnaiensis* n. sp. (Oppiidae) is described from soil of dipterocarp forests. The morphology of gnathosoma and legs are presented in detail for the first time for this genus. An identification key to all known species of *Lyroppia* is given.

KEYWORDS — oribatid mites; checklist; Vietnam; new record; new species; *Lyroppia*; key

INTRODUCTION

This work is a part of our continuing study on oribatid mites of Southern Vietnam (see Ermilov and Anichkin 2010, 2011, 2012; also other author's papers), and includes the data about oribatid mites of dipterocarp and polydominant forests from Dong Nai Culture and Nature Reserve. The goal of this paper is to present an annotated checklist of oribatid mites from these forests with additional taxa, which we recorded from Vietnam and the Oriental region for the first time.

One unknown species, belonging to the genus *Lyroppia* Balogh, 1961 (Oppiidae), was found and

described herewith. The morphology of gnathosoma and legs are presented in detail for the first time for *Lyroppia*.

Previously, one identified species of *Lyroppia* has been found from Vietnam (see Ermilov *et al.* 2012). We compared our present material with that of previously found one, and clarified that they are different species. Hence, the new species is the second member of *Lyroppia* recorded from Vietnam.

Lyroppia is a small oribatid mite genus proposed by Balogh (1961) with *Lyroppia scutigera* Balogh, 1961 as type species. Currently, this genus comprises five species, which are distributed in pantropic areas: *Lyroppia anareolata* Balogh and

Mahunka, 1981 (see Balogh and Mahunka 1981) from Brazil and Paraguay; *Lyroppia delicata* Lu and Wu, 1995 (see Lu and Wu 1995) from China; *Lyroppia neotropica* Balogh and Mahunka, 1974 (see Balogh and Mahunka 1974) from the Neotropical region; *Lyroppia scutigera* Balogh, 1961 (see Balogh 1961) from the Ethiopian and Neotropical regions; *Lyroppia similis* Balogh and Mahunka, 1977 (see Balogh and Mahunka 1977) from Bolivia. The main generic characters of *Lyroppia* are proposed by Balogh (1961) and also are summarized later (Balogh 1983; Subías and Balogh 1989; Balogh and Balogh 1992).

In addition, we provide an identification key to all species of *Lyroppia*.

MATERIAL AND METHODS

Our studies were conducted during the period of July in Dong Nai Culture and Nature Reserve (Dong Nai Province, Southern Vietnam). Two sites of monsoon tropical forest were sampled for oribatid mites:

— Dipterocarp forest (11°18' N, 107°04' E). The primary tropical forest with four layers. The forest trees consisted mainly of Dipterocarpaceae and Irvingaceae. The site relief is plane. The fresh litter (L horizon) consisted mainly of leaves of *Dipterocarpus diery* Pierre (about 10 cm thick). The F (decomposing litter) and H (well decomposed litter) horizons were absent. The soil is ferralitic. Material was collected from soil (Dip-1) and litter (Dip-2).

— Polydominant forest (11°22' N, 107°03' E). The secondary tropical forest with three layers. The forest trees consisted mainly of Moracea. The fresh litter consisted of leaves and branches (about 2-3 cm thick). The FH horizons were absent. The soil is ferralitic. Material was collected from soil (Pol-1) and litter (Pol-2).

Soil samples were collected by taking 10 soil-cores (diameter: 7.8 cm; depth: 10 cm). Samples were left in the metal cores to minimize disturbance during transport from the field to the laboratory. Soil oribatid mites were extracted into 75 % ethanol using Berlese's funnels with electric lamps (40 W) for five days.

Litter was collected by taking 16 samples using a stainless frame (50 x 50 cm) and passed through a sifter (mesh size 2 x 2 cm). The fine fraction was placed in a Winkler extractor with a collection bottle containing 100 ml 75 % ethanol. The extractions were conducted at room temperature over 10 days.

The holotype and paratypes were mounted in lactic acid on temporary cavity slides for measurement and illustration. All body measurements are presented in micrometers. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate to avoid discrepancies caused by different degrees of notogastral distortion. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. General terminology used in this paper follows that of Grandjean (summarized by Norton and Behan-Pelletier 2009), Balogh and Subías (1989).

Checklist of identified oribatid mite taxa

Hypochthoniidae

– *Eohypochthonius crassisetiger* Aoki, 1959. Locality: Pol-2

Epilohmanniidae

– *Epilohmannia pallida pacifica* Aoki, 1965. Locality: Dip-1

Lohmanniidae

– *Javacarus kuehnelti* Balogh, 1961. Locality: Dip-1, Pol-1

– *Meristacarus sundensis* Hammer, 1979. Locality: Dip-1, Dip-2, Pol-1, Pol-2

– *Papillacarus hirsutus* (Aoki, 1961). Locality: Dip-1, Pol-1

Trhypochthoniidae

– *Arhegozetes longisetosus* Aoki, 1965. Locality: Dip-1, Dip-2, Pol-2

Malaconothridae

– *Malaconothrus dorsofoveolatus* Hammer, 1979. Locality: Dip-1, Pol-2

Nanhermanniidae

– *Cosmohermannia robusta* (Aoki, 1994). Locality: Dip-1, Dip-2, Pol-1

Hermannidae

– *Phyllhermannia gladiata* Aoki, 1965. Locality: Dip-1, Dip-2, Pol-1, Pol-2

Zetorchestidae

- *Zetorchestes saltator* Oudemans, 1915. Locality: Dip-2, Pol-2

Astegistidae

- *Furcoppia cattienica* Ermilov and Anichkin, 2012. Locality: Dip-1, Pol-1

Basilobelbidae

- *Basilobelba parmata* Okayama, 1980. Locality: Dip-1

Eremulidae

- *Eremulus avenifer* Berlese, 1913. Locality: Dip-1

Eremobelbidae

- *Eremobelba breviseta* Balogh, 1968. Locality: Dip-1, Pol-1, Pol-2

Arceremaeidae

- *Tecteremaeus hauseri* Mahunka, 1982. Locality: Dip-1

Oppiidae

- *Arcoppia arcualis* (Berlese, 1913). Locality: Dip-1, Pol-1
- *Arcoppia hammerae* Rodríguez and Subías, 1984. Locality: Dip-1
- *Cycloppia restata* (Aoki, 1963). The genus and species are recorded for the first time from Vietnam. Locality: Pol-1, Pol-2
- *Lyroppia dongnaiensis* n. sp. Locality: Dip-1
- *Multioppia tamdao* Mahunka, 1988. Locality: Dip-1, Pol-1
- *Neoamerioppia vietnamica* (Mahunka, 1988). Locality: Dip-1, Dip-2, Pol-2
- *Oppiella nova* (Oudemans, 1902). Locality: Dip-1, Pol-2
- *Pulchroppia elegans* Hammer, 1979. Locality: Pol-1
- *Pulchroppia roynortoni* Ermilov and Anichkin, 2011. Locality: Pol-1
- *Taiwanoppia hungarorum* (Mahunka, 1988). Locality: Dip-2

Granuloppiidae

- *Gigantoppia zryanini* Ermilov and Anichkin, 2011. Locality: Pol-1, Pol-2

Suctobelbidae

- *Suctobelbella semiplumosa* (Balogh and Mahunka, 1967). Locality: Dip-1

- *Suctobelbella variosetosa* (Hammer, 1961). Locality: Dip-1, Dip-2

Tetracondylidae

- *Dolicheremaeus aokii* Balogh and Mahunka, 1967. Locality: Dip-1

Otocephidae

- *Otocephus duplicornutus* Aoki, 1965. Locality: Dip-1, Dip-2, Pol-1

Tectocephidae

- *Tectocephus velatus* (Michael, 1880). Locality: Dip-1, Dip-2, Pol-1
- *Tegezotes tunicatus* Berlese, 1913. The genus and species are recorded for the first time from Vietnam. Locality: Dip-2

Microtegeidae

- *Microtegeus borhidii* Balogh and Mahunka, 1974. Locality: Pol-1, Pol-2
- *Microtegeus reticulatus* Aoki, 1965. Locality: Dip-2, Pol-2

Idiozetidae

- *Idiozetes javensis* Hammer, 1979. Locality: Dip-2, Pol-2

Microzetidae

- *Berlesezetes ornatissimus* (Berlese, 1913). Locality: Dip-1

Mycobatidae

- *Lamellobates molecula* (Berlese, 1916). Locality: Dip-1, Dip-2, Pol-2
- *Paralamellobates misella* (Berlese, 1910). Locality: Dip-2

Mochlozetidae

- *Unguizetes cattienensis* Ermilov and Anichkin, 2011. Locality: Dip-2
- *Unguizetes sphaerula* (Berlese, 1905). Locality: Pol-1, Pol-2

Schelorbitidae

- *Schelorbitates fimbriatus* Thor, 1930. Locality: Dip-1, Pol-1, Pol-2
- *Schelorbitates kraepelini* (Berlese, 1908). Locality: Dip-1
- *Schelorbitates praeincisus* (Berlese, 1910). Locality: Dip-2, Pol-2

Oripodidae

- *Truncopes moderatus variabilis* Aoki and Yamamoto,

2007. The species is recorded for the first time from Vietnam and the Oriental region. Locality: Pol-2

Haplozetidae

- *Peloribates kaszabi* Mahunka, 1988. Locality: Dip-1
- *Peloribates rangiroaensis* Hammer, 1972. Locality: Dip-1, Dip-2, Pol-2
- *Protoribates heterodactylus* Ermilov and Anichkin, 2011. Locality: Dip-1, Pol-1
- *Protoribates maximus* (Mahunka, 1988). Locality: Pol-1
- *Protoribates paracapucinus* (Mahunka, 1988). Locality: Dip-1
- *Trachyoribates ovulum* Berlese, 1908. Locality: Dip-1, Dip-2, Pol-1, Pol-2

Parakalummidae

- *Neoribates jacoti* (Balogh and Mahunka, 1967). Locality: Dip-2, Pol-1, Pol-2
- *Neoribates spindleformis* Ermilov and Anichkin, 2012. Locality: Dip-1, Dip-2

Galumnidae

- *Galumna* (*Cosmogalumna*) *dongnaiensis* Ermilov and Anichkin (in press). Locality: Dip-1, Dip-2, Pol-1, Pol-2
- *Globogalumna biporosa* Ermilov and Anichkin, 2012. Locality: Locality: Pol-1
- *Neogalumna seniczaki* Ermilov and Anichkin, 2010. Locality: Dip-1
- *Pergalumna indistincta* Ermilov and Anichkin, 2011. Locality: Dip-1, Pol-1
- *Pergalumna margaritata* Mahunka, 1989. Locality: Dip-1, Dip-2, Pol-1, Pol-2
- *Pergalumna pseudosejugalis* Ermilov and Anichkin, 2012. Locality: Dip-1, Dip-2, Pol-1, Pol-2
- *Trichogalumna nipponica* (Aoki, 1966). Locality: Pol-2

Thus from dipterocarp and polydominant forests from Dong Nai Culture and Nature Reserve we have registered 59 species from 46 genera and 29 families. Three species (*Cycloppia restata*, *Tegeozetes tunicatus*, *Truncopes moderatus variabilis*) and two genera (*Cycloppia* Balogh, 1983, *Tegeozetes* Berlese, 1913) are first records from Vietnam; *T. moderatus variabilis* is recorded for the first time from the Oriental region. We have registered 48 species from 39 genera and 26 families in dipterocarp forest, and 40 species from 34 genera and 22 families in polydom-

inant forest. Oribatid fauna of these two forests is similar nearly in half of total: 29 species have been found in both forest sites.

DESCRIPTION OF NEW SPECIES

Lyroppia dongnaiensis n. sp. (Figures 1-3)

Diagnosis — Body size 192 – 205 x 90 – 94. Rostral setae inserted laterally on prodorsum. Lamellar, interlamellar and exobothridial setae minute. Sensilli with long stalk and oblong, dilated, smooth head. Notogastral cristae ending between the insertions of notogastral setae *la* and *lm*. Lenticulus present, circular. Distance between notogastral setae *c* and *la* twice the length of distance between notogastral setae *la* and *lm*. Aggenital setae inserted laterally to genital plates. Lyrifissures *iad* shorter than half length of anal plates.

Measurements — Body length 192 (holotype), 205 (two paratypes); notogaster width 90 (holotype), 94 (two paratypes).

Integument — Body color light brown. Body surface smooth; leg trochanter and femora III and IV with stria.

Prodorsum — (Figures 1A, C-E). Rostrum rounded in dorsal view. Costulae near half length of prodorsum, slightly converging. Translamella absent. Rostral setae (*ro*, 8-10) setiform, smooth, inserted laterally. Lamellar (*le*) and interlamellar (*in*) setae short (4), setiform, thin, smooth. Sensilli (*ss*, 49-53) with long stalk and oblong, dilated head. Sensillar head slightly pointed or rounded distally, smooth or with several indistinct barbs on dorsal side.

Notogaster — (Figure 1A). Anterior margin medially convex, with two divergent, sclerotized apophyses running to basal part of prodorsum. Notogastral cristae long, ended between the insertions of notogastral setae *la* and *lm*. Lenticulus (*len*) present, circular (diameter 28 – 32). Notogastral setae short (4 – 6), thin, smooth. Centrodorsal setae (*c*, *la*, *lm*, *lp*, *h*₁, *h*₂) inserted in one row. Distance between notogastral setae *c* and *la* twice length of distance between notogastral setae *la* and *lm*. Setae

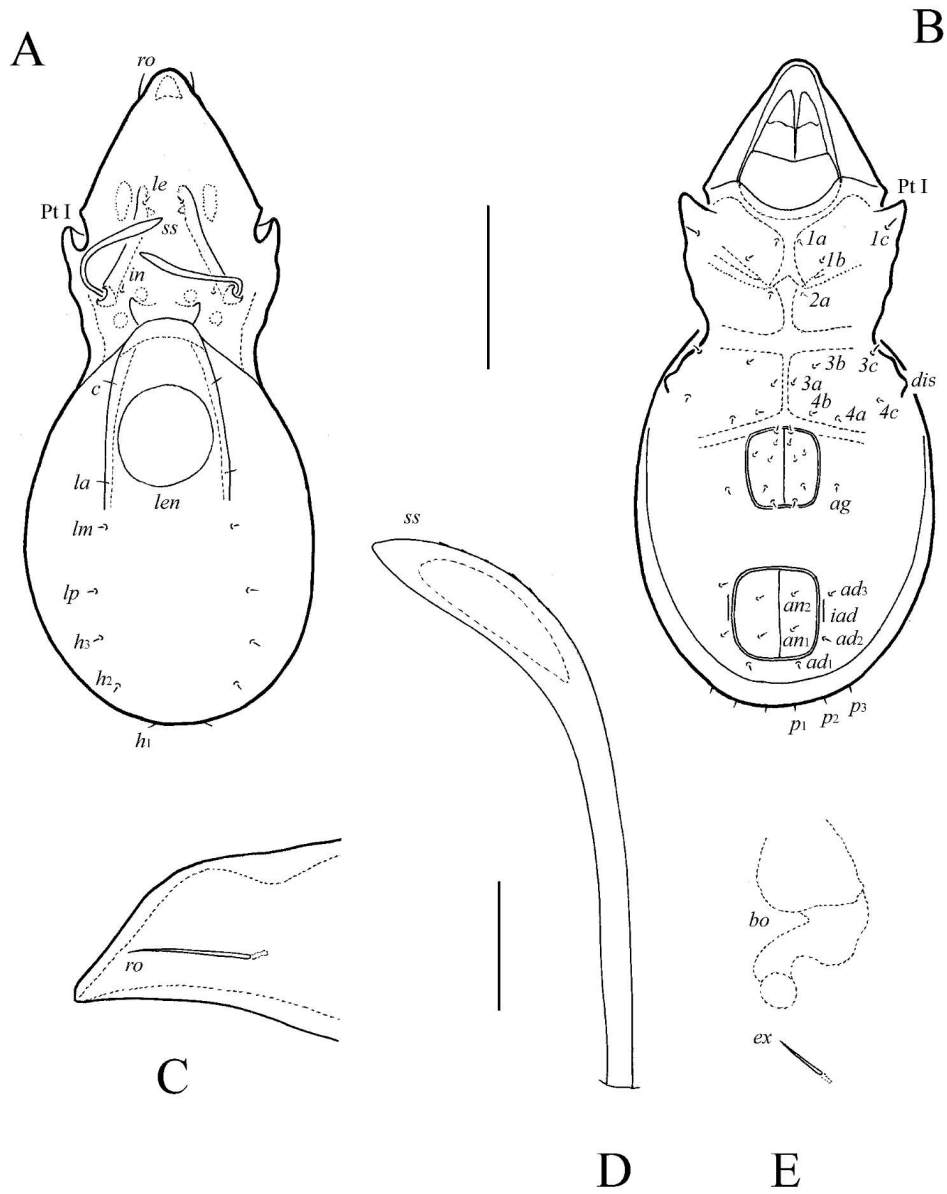


FIGURE 1: *Lyroppia dongnaiensis* n. sp.: A – dorsal view; B – ventral view, legs, palps and subcapitular setae not shown; C – lateral view of rostrum and rostral seta; D – sensillus; E – exobothridial seta and medio-posterior part of bothridium (bo). Scale bar (A+B) 50 μ m, scale bar (C+D+E) 10 μ m.

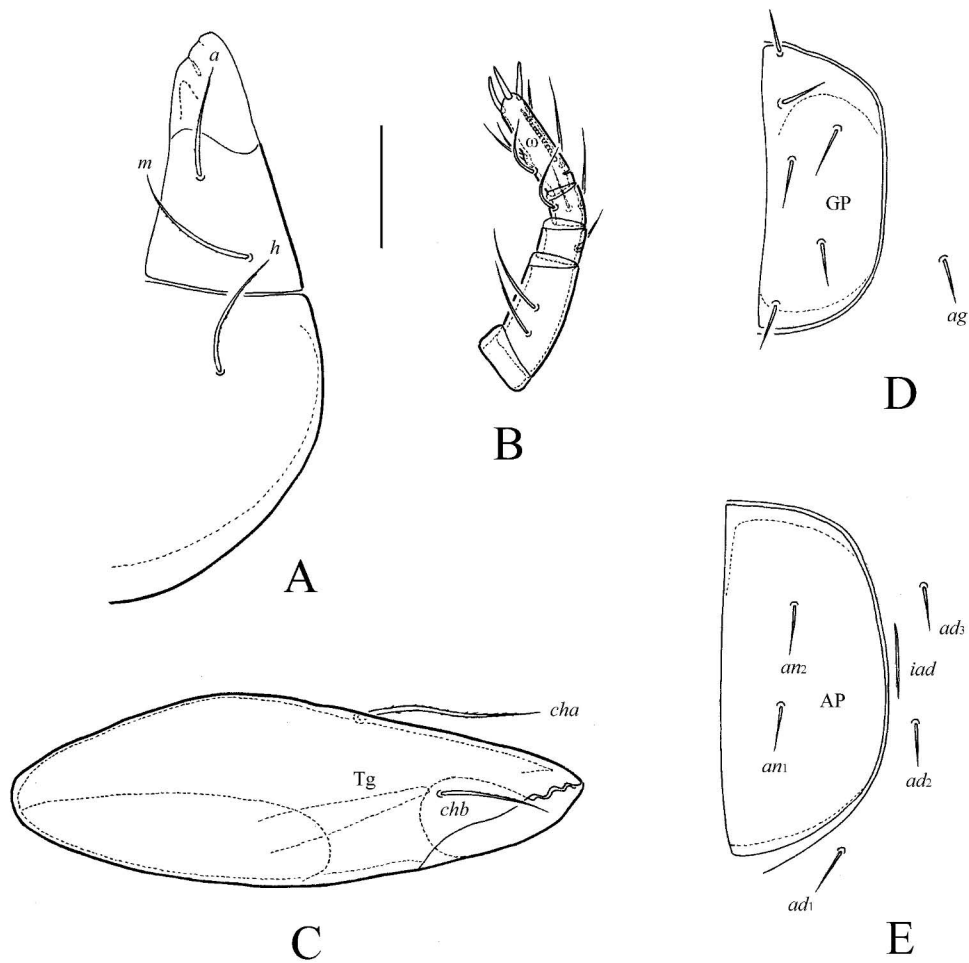


FIGURE 2: *Lyroppia dongnaiensis* n. sp.: A – subcapitulum, left half; B – palp; C – chelicera; D – genital plate, left, and aggenital seta; E – anal plate, left, and adanal setae. Scale bar 10 μ m.

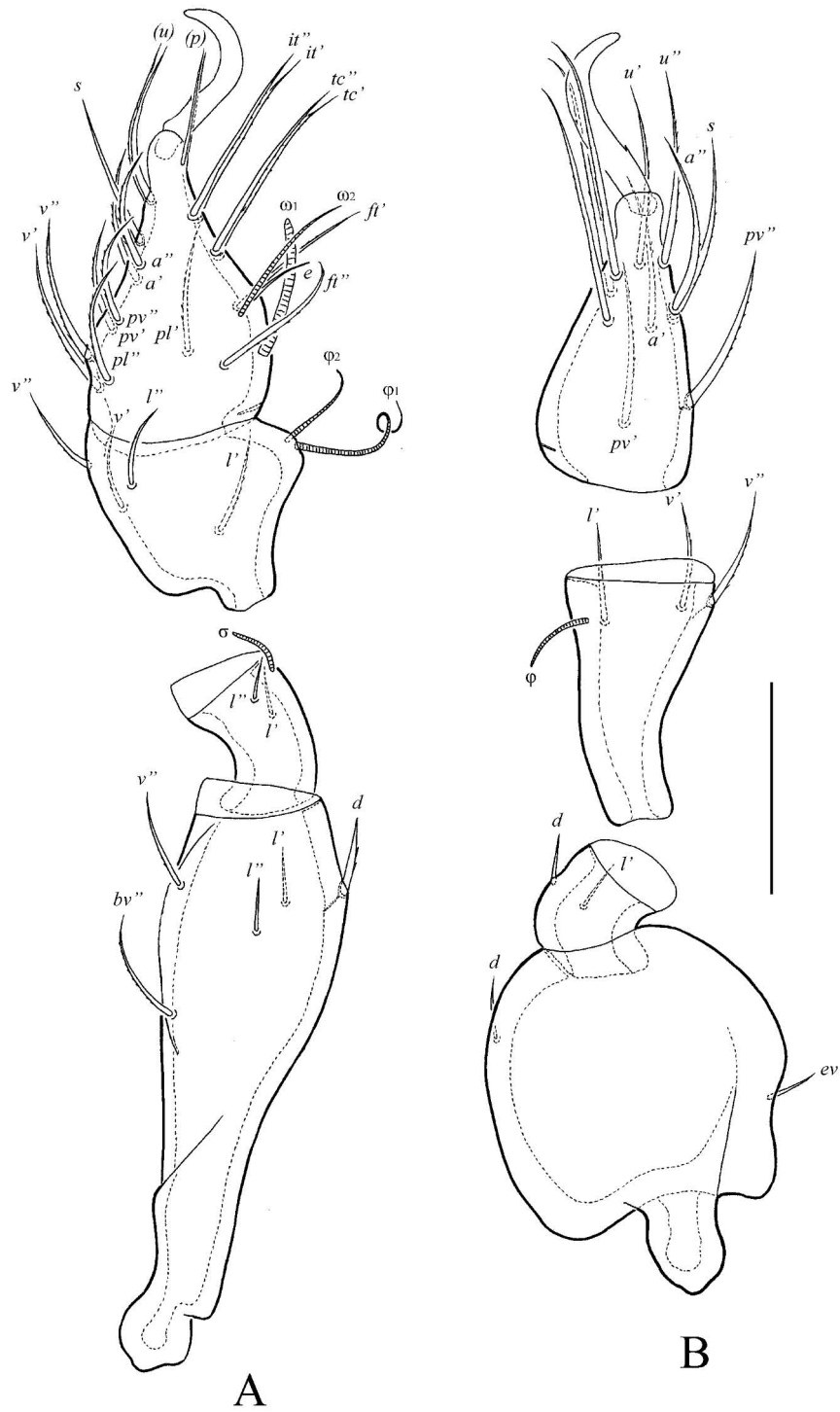


FIGURE 3: *Lyroppia dongnaiensis* n. sp.: A – leg I, without trochanter, left, antiaxial view; B – leg IV, without trochanter, right, paraxial view. Scale bar 20 μ m.

TABLE 1: Leg setation and solenidia of *Lyroppia dongnaiensis* n. sp.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	<i>v'</i>	<i>d, (l), bv'', v''</i>	<i>(l), σ</i>	<i>(l), (v), φ₁, φ₂</i>	<i>(ft), (tc), (it), (p), (u), (a), s, (pv), (v), (pl), e, ω₁, ω₂</i>
II	<i>v'</i>	<i>d, (l), bv'', v''</i>	<i>(l), σ</i>	<i>(l), (v), φ</i>	<i>(ft), (tc), (it), (u), (a), s, (pv), ω₁, ω₂</i>
III	<i>l', v'</i>	<i>d, l', ev'</i>	<i>l', σ</i>	<i>l', (v), φ</i>	<i>(ft), (tc), (it), (u), (a), s, (pv)</i>
IV	<i>v'</i>	<i>d, ev'</i>	<i>d, l'</i>	<i>l', (v), φ</i>	<i>ft'', (tc), (u), (a), s, (pv)</i>

Roman letters refer to normal setae (e to famulus), Greek letters to solenidia. Single prime (') marks setae on anterior and double prime (") setae on posterior side of the given leg segment. Parentheses refer to a pair of setae.

*h*₃, *p*₁₋₃ inserted in postero-marginal position. Lyrifissures *ia, im, ip* and opisthonotal gland openings not evident.

Lateral part of body — (Figures 1A, E). Pedotecta I (Pt I) convex. Exobothridial setae (*ex*, 4) setiform, thin, smooth. Lyrifissures *ih, ips* not evident. Discidia (*dis*) rounded distally.

Gnathosoma — (Figures 2A-C). Subcapitulum longer than wide (45 – 49 x 32 – 36). Subcapitular setae setiform, slightly barbed; *h* and *m* (12 – 16) little longer than *a* (10 – 12). Adoral setae absent. Palps (28) with setation 0-2-1-3-8(+1ω). Solenidion not attached with eupathidium, pressed to the palptarsus surface. Chelicerae (49) with two barbed setae; *cha* (16 – 18) longer, than *chb* (10). Trägårdh's organ (Tg) distinct.

Epimeral region — (Figure 1B). Epimeral border IV transverse, straight. Epimeral setal formula: 3-1-3-3. Epimeral setae short (*1c*, 8; others, 4 – 6), setiform, thin, smooth.

Anogenital region — (Figures 1B, 2D,E). Six pairs of genital, one pair of aggenital (*ag*), two pairs of anal (*an*₁, *an*₂) and three pairs of adanal (*ad*₁₋₃) setae short, similar in length (4), setiform, thin, smooth. Aggenital setae inserted laterally to genital plates. Lyrifissures *iad* paraanal, shorter than half length of anal plates.

Legs — (Figures 3A, B). Tarsi with one claw, having a poorly visible barb on ventral side. Femora and trochanters III, IV with ventral ridge. Homology of setae and solenidia indicated in Table 1. Famulus setiform. Solenidia weakly thickened, blunted.

Material examined — Holotype (male) and two paratypes (male and female) from Dip-1.

Type deposition — The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; one paratype is in the collection of the Siberian Zoological Museum, Novosibirsk, Russia; one paratype is in the personal collection of the first author.

Etymology — The new species is named after Dong Nai Culture and Nature Reserve (Southern Vietnam), where the material was collected.

Remarks — *Lyroppia dongnaiensis* n. sp. can be distinguished from all known species of the genus *Lyroppia* by the key which is presented below.

Key to known species of the genus *Lyroppia*

1. Lenticulus absent from medio-anterior part of notogaster 2
 — Lenticulus present in medio-anterior part of notogaster 3
2. Notogastral cristae reaching the insertions of notogastral setae *la*; lyrifissures *iad* long, near half length of anal plates.....
*Lyroppia anareolata* Balogh and Mahunka, 1981
 — Notogastral cristae reaching the insertions of notogastral setae *lm*; lyrifissures *iad* short, considerable shorter than half length of anal plates.....
*Lyroppia delicata* Lu and Wang, 1995
3. Rostral setae inserted dorsally, close to each other; aggenital setae inserted between genital

and anal plates.....
*Lyroppia neotropica* Balogh and Mahunka, 1974
 — Rostral setae inserted laterally or dorso-laterally,
 not close to each other; aggenital setae inserted laterally to genital plates..... 4

4. Lenticulus of round triangular; adanal setae *ad*₃ inserted laterally to lyrifissures *iad*.....
 *Lyroppia scutigera* Balogh, 1961
 — Lenticulus of circular; adanal setae *ad*₃ inserted anterio-laterally to lyrifissures *iad* 5

5. Notogastral cristae ended between the insertions of setae *la* and *lm*; distance between setae *c* and *la* twice length of that between setae *la* and *lm*.....
 *Lyroppia dongnaiensis* n. sp.
 — Notogastral cristae ended between the insertions of setae *lp* and *h*₃; distance between setae *c* and *la* equal to that between setae *la* and *lm*.....
*Lyroppia similis* Balogh and Mahunka, 1977

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