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A new species of *Notogalumna* (Acari, Oribatida, Galumnidae) from the Oriental region with a key to known species

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ABSTRACT — A new galumnid mite species, *Notogalumna lagunaensis* **n. sp.**, is described from the Philippines and Vietnam. It is morphologically most similar to *N. africana* Mahunka, 1988, but differs from the latter by the smaller body size and location of lamellar setae between lamellar lines. *Notogalumna* is recorded from the Philippines for the first time. A new diagnosis and an identification key to the known species of this genus are provided.

KEYWORDS — oribatid mites; Galumnidae; new species; *Notogalumna*; generic diagnosis; key; Philippines; Vietnam

INTRODUCTION

Notogalumna is an oribatid mite genus of the family Galumnidae (Acari, Oribatida) that was proposed by Sellnick (1959) with *Notogalumna praetiosa* Sellnick, 1959 as type species. At present, seven species of this genus are known (Subías 2004, updated 2015; see also Ermilov *et al.* 2014), which are distributed in the Australian, Ethiopian, Nearctic and Oriental regions (Warburton 1912; Jacot 1929; Sellnick 1959; Balogh 1960; Mahunka 1988; Balakrishnan 1989; Ramani and Haq 1990; Haq and Sumangala 2003). An unidentified species of the genus was also recorded in the Neotropical region (de Moraes *et al.* 2011).

During taxonomic study of oribatid collections from the Museum of Natural History (University of the Philippines Los Baños) and the Joint Russian-Vietnamese Biological expedition (October 2013 – April 2014) in forest zones of southern Vietnam, a new species of the genus *Notogalumna* was discovered. The main goal of our paper is to describe and illustrate it. Additionally, we provide an identification key for all known species of this genus, and propose a new generic diagnosis.

MATERIALS AND METHODS

We examined five specimens (holotype: female; four paratypes: two females and two males) with data as follows: Philippines, Luzon Island, Laguna Province, San Pablo City, in coconut leaves infested with coconut scale insect, *Aspidiotus rigidus* Reyne, 31 March 2014 (M.V. Navasero and M.M. Navasero). In addition, two paratype specimens (one female and one male) collected from: Vietnam, Dong Nai Province, Dong Nai Biosphere Reserve, in mosses and ferns on stones near Dong Nai river, 31 September 2013 (A.E. Anichkin and S.G. Ermilov).

Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. All body measurements are presented in micrometers. Formulas for leg setation are given in parentheses according to the sequence trochanter-femur-genu-tibia-tarsus (famulus included). Formulas for leg solenidia are given in square brackets according to the sequence genu-tibia-tarsus. General terminology used in this paper follows that of F. Grandjean (summarized by Norton and Behan-Pelletier 2009). Drawings were made with a drawing tube using a Carl Zeiss transmission light microscope "Axioskop-2 Plus".

SYSTEMATICS

Genus *Notogalumna* Sellnick, 1959

Type species: *Notogalumna praetiosa* Sellnick, 1959

Diagnosis — Galumnidae with body hexagonal, truncated posteriorly; lamellar and sublamellar lines present, thin, curving backwards in mediodistal parts; bothridial setae setiform or clavate; lamellar setae inserted between lamellar and sublamellar lines or between lamellar lines; notogaster with 10 pairs of alveoli, each pteromorph with one alveolus; notogaster with three to four pairs of porose areas, *A1* usually large, boomerang-shaped; adanal lyrifissures located near anal aperture, in paraanal position; three pairs of adanal and two pairs of anal setae or alveoli present (except three pairs of anal alveoli in *N. praetiosa*); leg tarsi with three claws; sexual dimorphism absent.

Notogalumna lagunaensis n. sp. (Figures 1-5)

Diagnosis — Body size: 531 – 581 × 365 – 415. Body covered by microgranular cerotegument. Notogaster and anogenital region foveolate. Rostral, lamellar and interlamellar setae long, barbed. Lamellar setae inserted between lamellar lines. Bothridial setae setiform, smooth. Anterior notogastral margin not developed. Notogaster with three pairs of porose areas, *A1* very large, boomerang-shaped. Genital and aggenital setae of medium size, anal and adanal setae minute. Adanal setae ad_3 inserted near anal aperture. Postanal porose area represented by one pair.

Description — *Measurements*. Body length: 564 (holotype: female), 531 – 581 (six paratypes: three females and three males); body width: 398 (holotype), 365 – 415 (six paratypes).

Integument — Body color brown, covered by cerotegumental microgranules (less than 1, but well visible under high magnification in dissected specimens). Notogaster and anogenital region with small, round foveolae (up to 4). Ventral side with two transverse striate bands (*sb*) located laterally between genital and anal plates, and one arcuate striate band located posteriorly to anal plates, extending into the ano-adanal region.

Prodorsum — Rostrum broadly rounded. Lamellar (*L*) and sublamellar (*S*) lines thin, distinct, parallel. Rostral (*ro*, 73 – 82), lamellar (*le*, 82 – 90) and interlamellar (*in*, 73 – 82) setae setiform, barbed. Rostral and lamellar setae directed forwards, interlamellar setae directed medially. Lamellar setae inserted between lamellar lines. Bothridial setae (*ss*, 90 – 102) setiform, with short attenuate tips, smooth. Exobothridial setae and their alveoli absent. Porose areas *Ad* elongate oval, transversally oriented (16 – 24 × 6 – 8).

Notogaster — Anterior margin not developed. Dorsophragmata (*D*) long, elongated longitudinally. Ten pairs of alveoli of notogastral setae well visible. Three pairs of porose areas with slightly distinct margins, varied in sizes: *Aa* elongate oval (28 – 49 × 16 – 20), transversally oriented; *A1* very large, boomerang-like; *A3* oval (28 – 36 × 16 – 24). Porose areas *Aa* located between setal alveoli *la* and *lm*, nearer to the latter; *A3* located in corners of the truncated part of notogaster. Median pore absent. All lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) distinct; *im* located anteriorly or antero-laterally to *A1*. Opisthonotal gland openings (*gla*) located laterally to setal alveoli h_3.

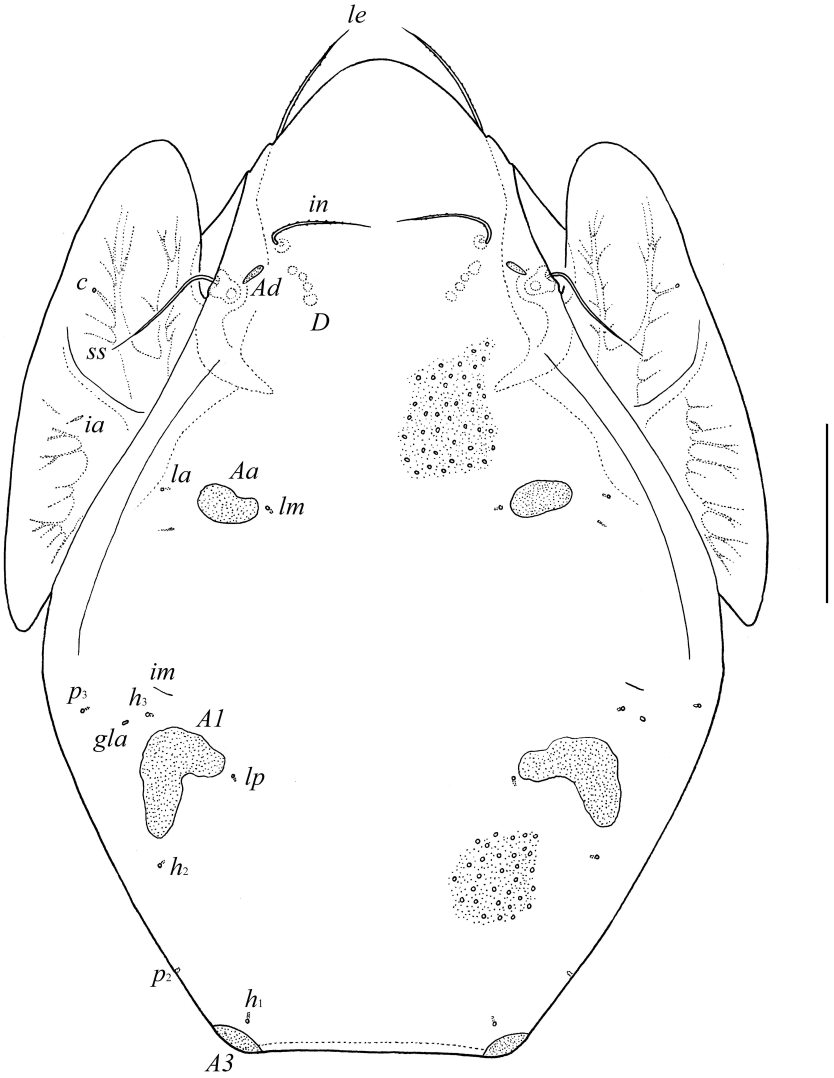

FIGURE 1: *Notogalumna lagunaensis* **n. sp.**: dorsal view. Scale bar 100 μm.

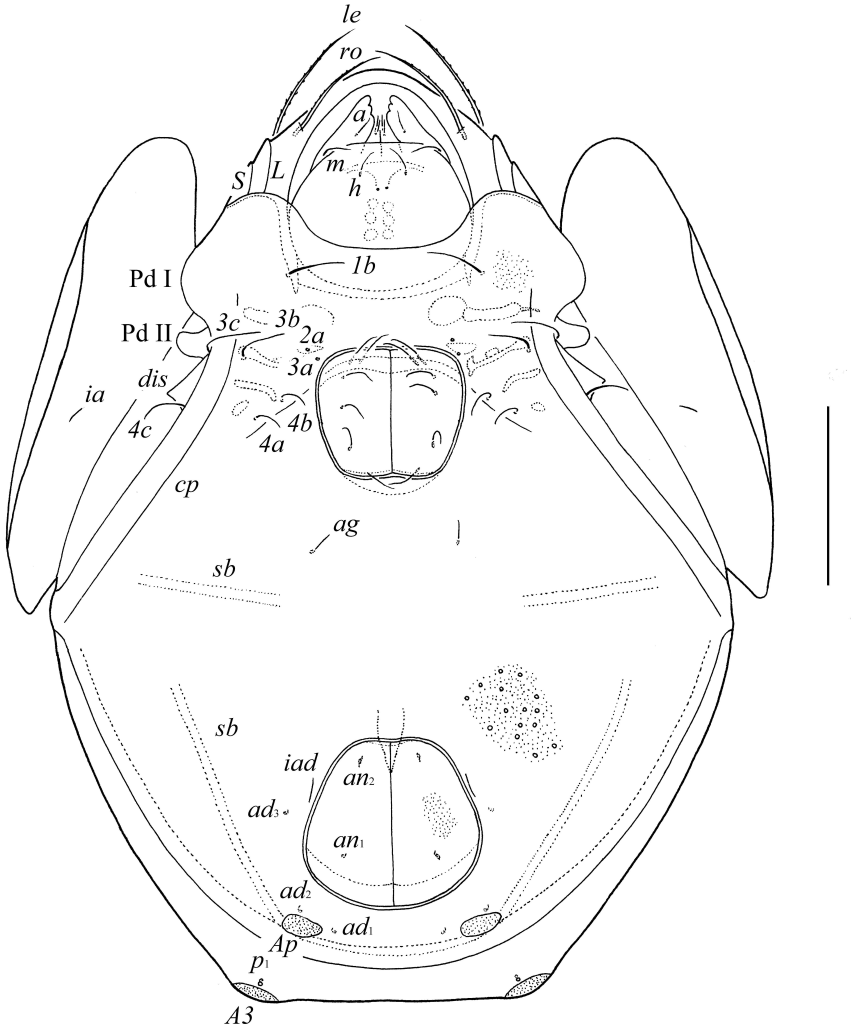

FIGURE 2: *Notogalumna lagunaensis* **n. sp.**: ventral view (legs not illustrated). Scale bar 100 μm.

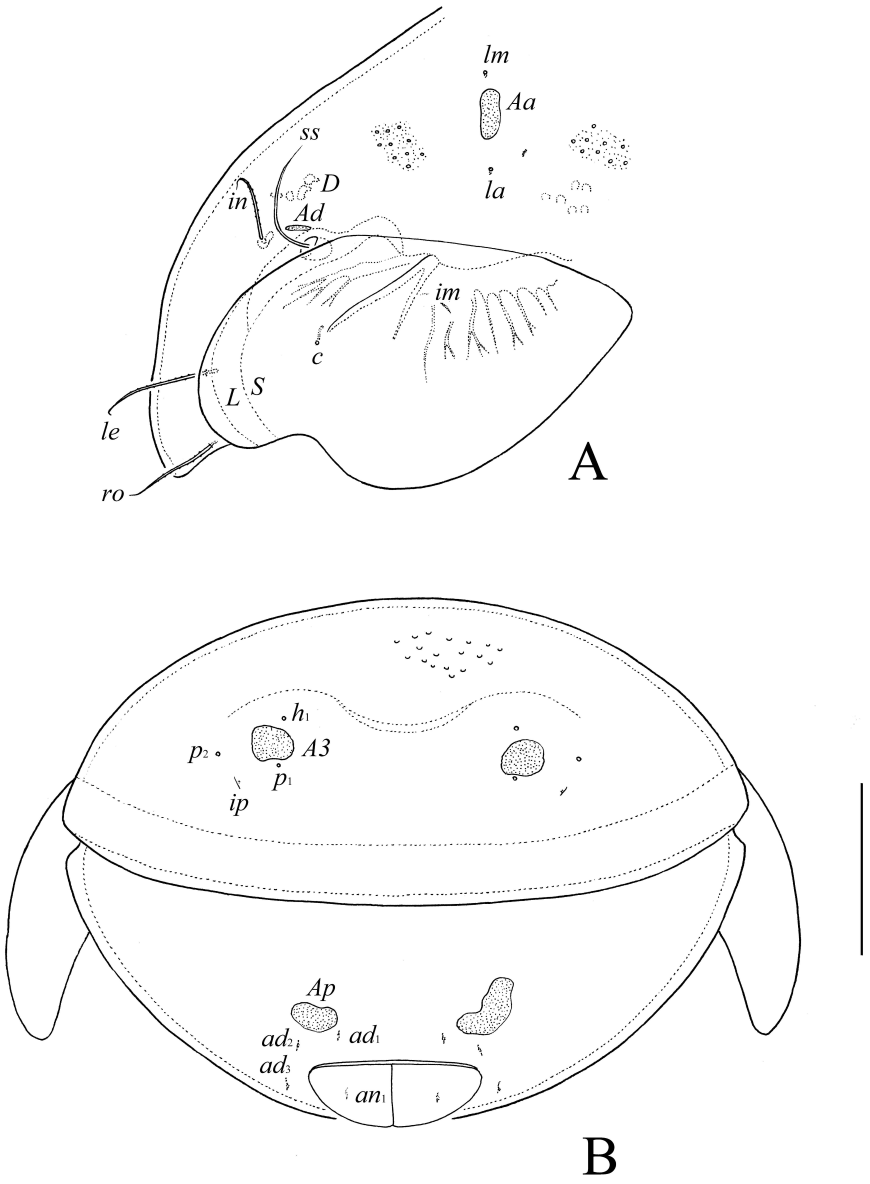

FIGURE 3: *Notogalumna lagunaensis* **n. sp.**: A – lateral view of prodorsum and anterior part of notogaster (gnathosoma not illustrated); B – posterior view. Scale bar 100 μm.

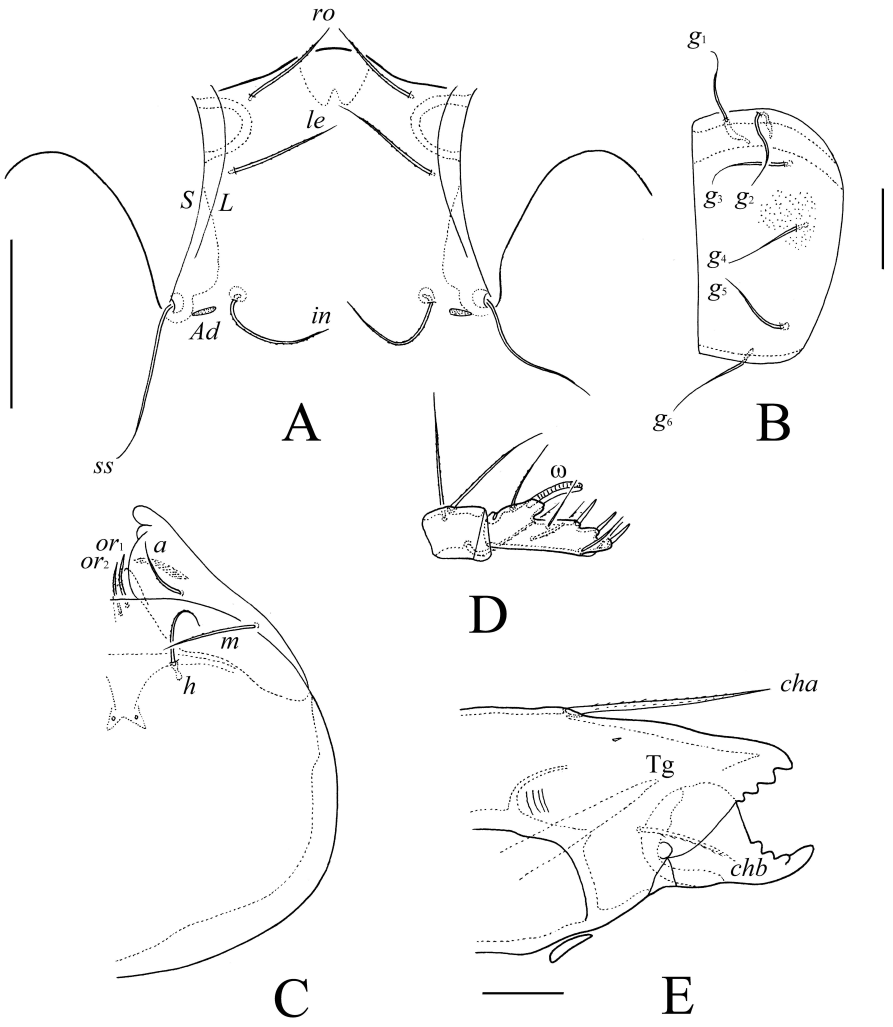

FIGURE 4: *Notogalumna lagunaensis* **n. sp.**: A – frontal view of prodorsum; B – genital plate, left; C – subcapitulum, left half, ventral view; D – tibia and tarsus of palp; E – medio-anterior part of chelicera, paraxial view. Scale bar (A) 100 μm, scale bar (B-E) 20 μm.

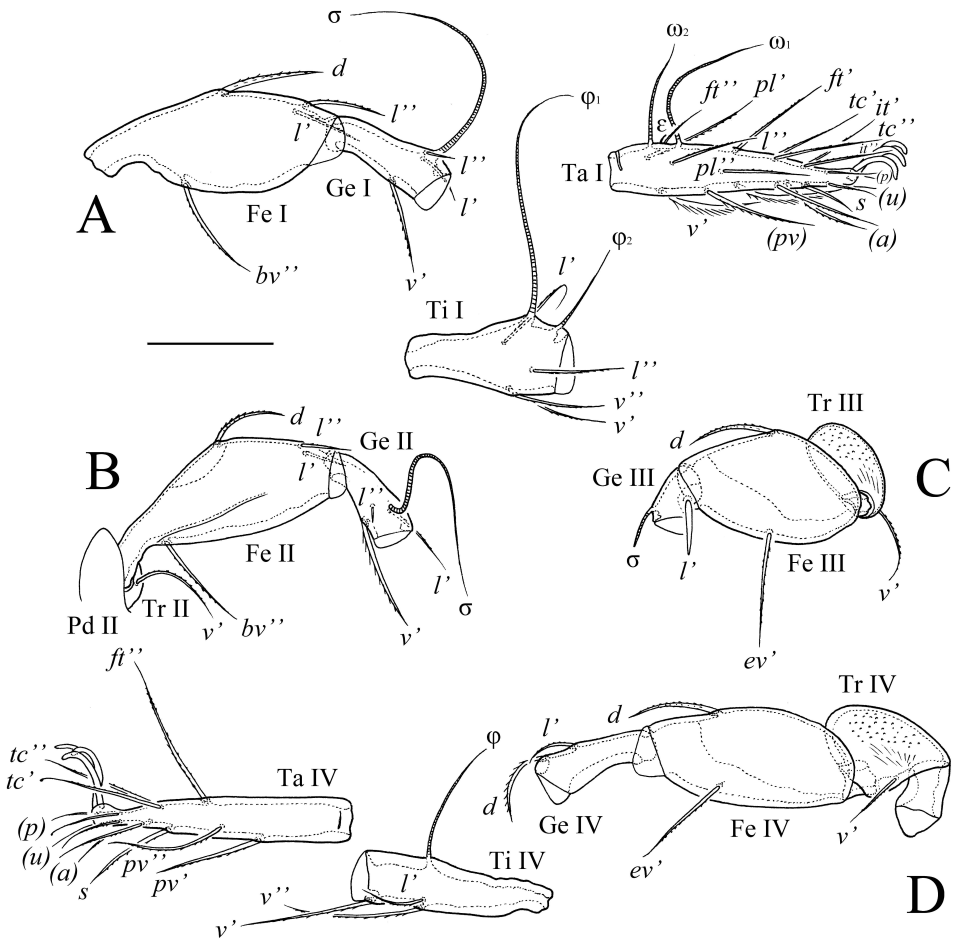

FIGURE 5: *Notogalumna lagunaensis* **n. sp.**: A – leg I, right, antiaxial view; B – trochanter, femur and genu of leg II, right, antiaxial view; C – trochanter, femur and genu of leg III, right, antiaxial view; D – leg IV, right, antiaxial view. Scale bar 50 μm.

TABLE 1: Leg setation and solenidia of *Notogalumna lagunaensis* **n. sp.**

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	*v'*	*d, (l), bv''*	*(l), v',* σ	*(l), (v),* φ_1, φ_2	*(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'',* ε, ω_1, ω_2
II	*v'*	*d, (l), bv''*	*(l), v',* σ	*(l), (v),* φ	*(ft), (tc), (it), (p), (u), (a), s, (pv),* ω_1, ω_2
III	*v'*	*d, ev'*	*l',* σ	*l', (v),* φ	*(ft), (tc), (it), (p), (u), (a), s, (pv)*
IV	*v'*	*d, ev'*	*d, l'*	*l', (v),* φ	*ft'', (tc), (p), (u), (a), s, (pv)*

Roman letters refer to normal setae, Greek letters to solenidia (except ε = famulus). 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.

Gnathosoma — Subcapitulum longer than wide (114 – 131 × 102 – 114). Subcapitular setae setiform, slightly barbed; *a* (24 – 28) shorter than *h* (32 – 36) and *m* (36 – 41). Two pairs of adoral setae (or_1, or_2, 12 – 16) setiform, densely barbed. Palps (90) with setation 0-2-1-3-9(+ω). Solenidion attached to eupathidium, both located on dorsal tubercle. Chelicerae (151 – 159) with two simple, barbed setae; *cha* (53 – 57) longer than *chb* (24 – 28). Trägårdh's organ (Tg) long, tapered.

Epimeral and lateral podosomal regions — Anterior tectum of epimere I smooth. Apodemes 1, 2, sejugal and 3 well visible. Eight pairs of setae observed; setal formula: 1-1-3-3. Setae *1b*, *3b*, *3c*, *4c* (36 – 41) and *4a*, *4b* (24 – 32) thin, slightly barbed; *2a* and *3a* minute (2) or represented by alveoli. Pedotecta I (Pd I) broadly rounded, pedotecta II (Pd II) rectangular, rounded distally in ventral view; both scale-like in lateral view. Discidia (*dis*) sharply triangular. Circumpedal carinae (*cp*) distinct, long, directed to pedotecta I.

Anogenital region — Six pairs of genital (g_1 – g_6) and one pair of aggenital (*ag*) setae similar in length (20 – 24), thin, indistinctly barbed. Two pairs of anal (an_1, an_2) and three pairs of adanal (ad_1 – ad_3) setae minute (2). Two setae on anterior edge of each genital plate. Adanal setae ad_3 inserted near to anal aperture, postero-laterally to adanal lyrifissures (*iad*). Postanal porose area (*Ap*) represented by one pair, which are oval (28 – 45 × 10 – 24), sometimes with protruding posterior triangle.

Legs — Claws similar in size, indistinctly barbed on dorsal sides. Formulas of leg setation and solenidia: I (1-4-3-4-20) [1-2-2], II (1-4-3-4-15) [1-1-2], III (1-2-1-3-15) [1-1-0], IV (1-2-2-3-12) [0-1-0]; homology of setae and solenidia indicated in Table 1. Solenidion φ of tibiae IV inserted dorsally at about 2/3 length of segment.

Type deposition — The holotype is deposited in the collection of the Senckenberg Institution Frankfurt, Germany; four paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia; two paratypes are deposited in the Museum of Natural History, University of the Philippines Los Baños, College, Laguna, Philippines.

Etymology — The specific name "*lagunaensis*" refers to the Philippine Province origin, Laguna.

Comparison — *Notogalumna lagunaensis* n. sp. is morphologically most similar to *N. africana* Mahunka, 1988, but differs from the latter by the smaller body size (531 – 581 × 365 – 415 versus 605 – 633 × 440 – 467) and position of lamellar setae (between lamellar setae versus between lamellar and sublamellar setae). All known species of the genus

Notogalumna can be distinguished by the key presented below.

Key to known species of *Notogalumna*[1]

1. Bothridial setae clavate; notogastral porose areas *A1* of medium size, rounded 2
— Bothridial setae setiform; notogastral porose areas *A1* very large, boomerang-like 3

2. Interlamellar setae flagelliform; anterior notogastral margin developed; body size: 512 × 363 ..... *N. hexagona* (Balogh, 1960). Distribution: Angola.
— Interlamellar setae represented by alveoli; anterior notogastral margin not developed; body size: 660 × 560 ..... *N. floridae* (Jacot, 1929)[2]. Distribution: U.S.A.

3. Insertions of adanal setae ad_3 in preanal position; three pairs of anal setae; body size: 720 × 490 ..... *N. praetiosa* Sellnick, 1959. Distribution: Polynesia, India and Borneo.
— Insertions of adanal setae ad_3 in paraanal position; two pairs of anal setae 4

4. Alveoli of notogastral setae *c* located posterior to medial transverse groove on pteromorphs; insertions of adanal setae ad_3 distanced from anal plates 5
— Alveoli of notogastral setae *c* located anterior to medial transverse groove on pteromorphs; insertions of adanal setae ad_3 near to anal plates 6

5. Bothridial setae long, reaching the medial transverse groove on pteromorphs; anterior edges of genital plates with two setae; body size: 459 – 548 × 332 – 446 ..... *N. nortoni* Ramani and Haq, 1990. Distribution: India.
— Bothridial setae of medium size, not reaching the medial transverse groove on pteromorphs; anterior edges of genital plates with three setae; body size: 600 – 680 × 400 – 480 ..... *N. foveolata* Balakrishnan, 1989. Distribution: India and Vietnam.

6. Lamellar setae inserted between lamellar and sublamellar lines; body size: 605 – 633 × 440 – 467 ..... *N. africana* Mahunka, 1988. Distribution: Tanzania.
— Lamellar setae inserted between lamellar lines; body size: 531 – 581 × 365 – 415 ..... *N. lagunaensis* **n. sp.** Distribution: Philippines and Vietnam.

[1] *Notogamumna truncata* (Warburton, 1912) from the Seychelles was very poorly described by Warburton (1912), therefore we did not include this species in the key

[2] See also Jacot (1935)

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