SUPPLEMENTARY DESCRIPTION OF *PERGALUMNA HAWAIIENSIS HAWAIIENSIS* (JACOT, 1934) (ACARI, ORIBATIDA, GALUMNIDAE) WITH ADDENDUM TO THE CHECKLIST OF ORIBATID MITES OF VIETNAM

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ABSTRACT: The oribatid mite, *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934) (Oribatida, Galumnidae), is recorded for the first time in Vietnam. It is redescribed and illustrated in detail on the basis of Vietnamese specimens collected from the large decomposing logs in polydominant forest of Cat Tien National Park. The main morphological traits for this species are summarized. An addendum of new taxa, including twenty two species, six genera and two families, to the checklist of oribatid mites of Vietnam is presented.

KEY WORDS: oribatid mite, *Pergalumna hawaiiensis*, systematics, morphology, supplementary description, fauna, record, list of taxa, Vietnam.

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INTRODUCTION

The oribatid mite *Pergalumna hawaiiensis* (Jacot, 1934) (Acari, Oribatida, Galumnidae) was described as *Galumna hawaiiensis* from Hawaii (see Jacot 1934a). At present, this species is recorded also in Tahiti (Sellnick 1959) and Sumatra (Ermilov *et al.* 2015b). Jacot (1934b) described the subspecies, *Pergalumna hawaiiensis marquesana* (Jacot, 1934) (as representative of *Galumna*) from the Marquesas Islands.

During taxonomic identification of oribatid mites from Southern Vietnam, we found *P. hawaiiensis hawaiiensis*. It is recorded for the first time in the Vietnamese fauna.

The original description (Jacot 1934a) is brief (lacking information about some morphological structures and their measures, leg setation and solenidia, morphology of gnathosoma) and not illustrated completely. The main goals of the paper are to present a supplementary description of *P. hawaiiensis hawaiiensis* on the basis of specimens from Vietnam, and to summarize the main morphological traits, which will help with identification of this species in the future.

This work is part of our continuing study of oribatid mites (Acari, Oribatida) of Vietnam (e.g. Ermilov 2015, 2016, 2017; Minor and Ermilov 2015; Minor *et al.* 2017). In addition, an addendum of new taxa to the checklist of oribatid mites of Vietnam (Ermilov 2015) is presented.

MATERIAL AND METHODS

Material. Six specimens (two females and four males) of *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934): Southern Vietnam, Dong Nai Province, Cat Tien National Park, 11° 26' 48" N, 107° 26' 26" E, 145 m a.s.l., polydominant forest, sample from the large decomposing logs, 12.XI.2015 (collected by A. V. Tiunov).

All specimens are stored in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Methods. Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. 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 behind pteromorphs 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. Morphological terminology used in this paper follows that of F. Grandjean: see Travé & Vachon (1975) for references, Norton (1977) for leg setal nomenclature, and Norton & Behan–Pelletier (2009) for overview. Drawings were made with a camera lucida using a Leica transmission light microscope "Leica DM 2500".

SYSTEMATICS

Pergalumna hawaiiensis hawaiiensis (Jacot, 1934)

Figs. 1–12

Description. *Measurement*s. Body length: 547–615 (six specimens: two females and four males); notogaster width: 415–448 (six specimens). No difference between females and males.

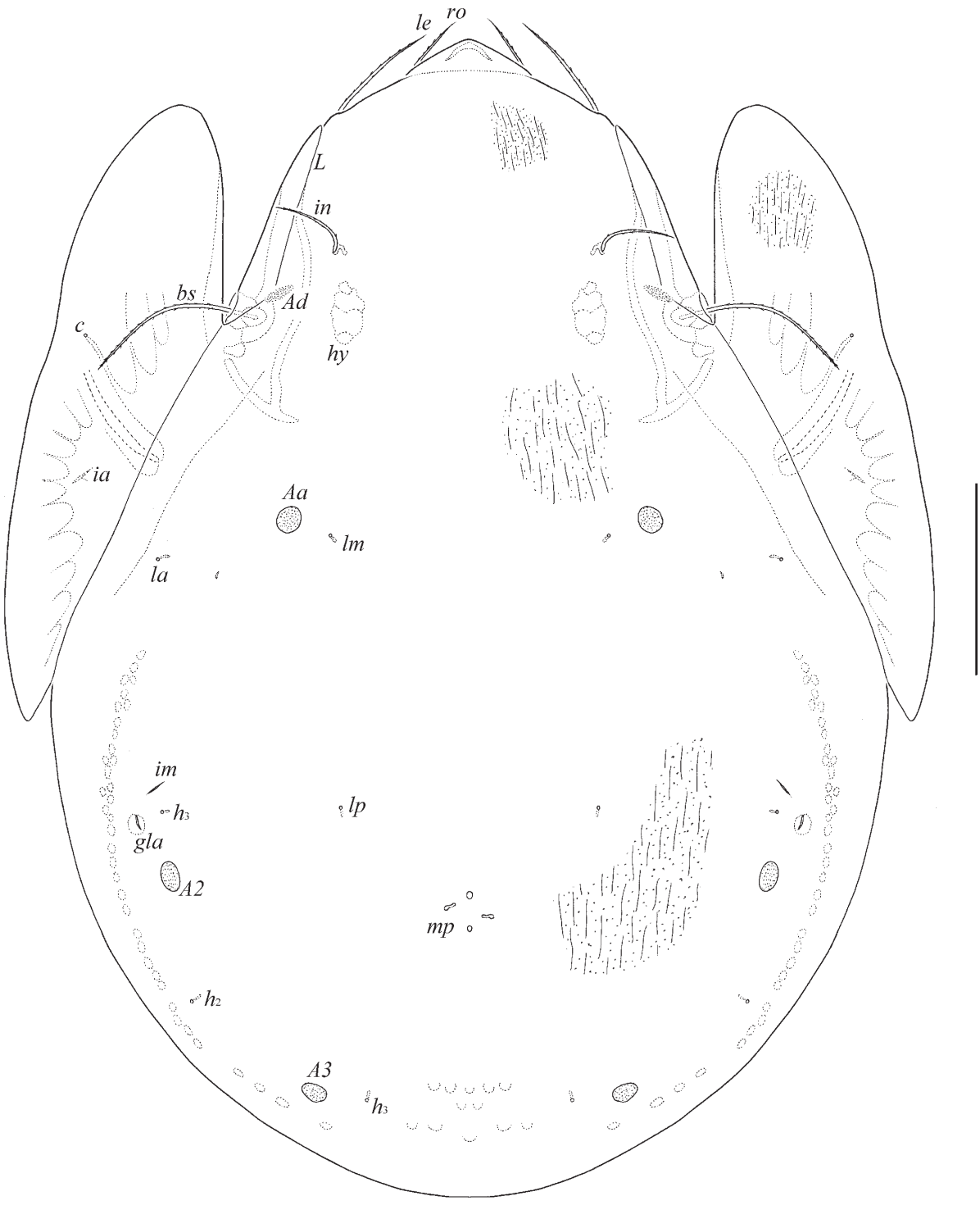


Fig. 1. *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934), adult: dorsal view. Scale bar 100 μm.

Integument (Figs. 1–5). Body color brown. Body surface (including pteromorphs, subcapitular mentum, genital and anal plates) densely microgranulate (visible under high magnification, × 1,000), granules rounded with diameter less than 1. Surface of prodorsum, notogaster, pteromorphs and lateral parts of epimeres I slightly and longitudinally striate.

Prodorsum (Figs. 1, 3). Rostrum broadly rounded. Lobe with projects, creating M-shaped inner excavation and inner rostral tooth (*irt*). Rostrophragma (*rp*) relatively thick. Lamellar (*L*) and sublamellar (*S*) lines thickened, parallel, curving backwards. Lateral structures *N* and ridges *E* well-developed, ridges *T* slightly visible, *N* and basal parts of lines *S* connected. Rostral (*ro*, 53–

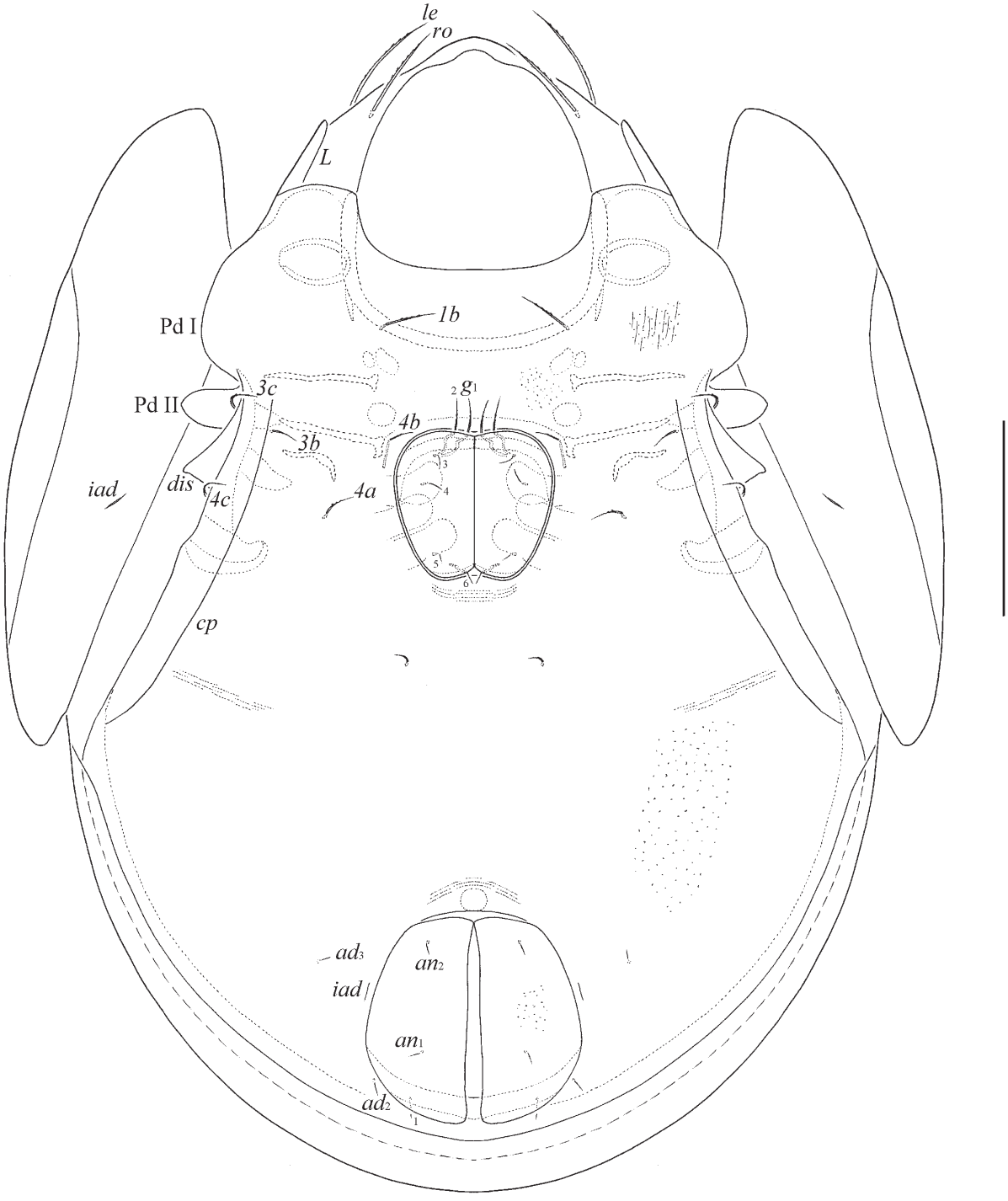
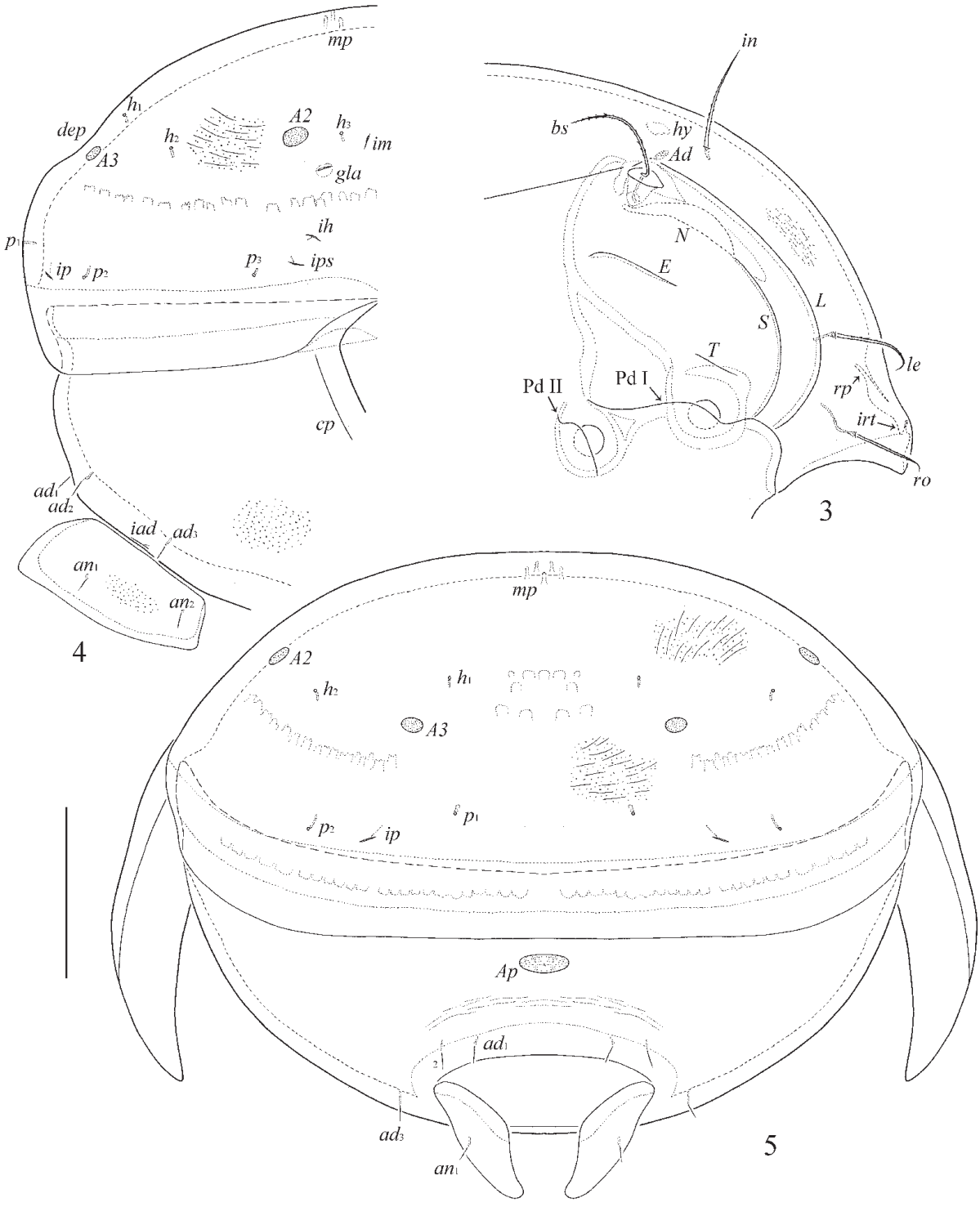


Fig. 2. *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934), adult: ventral view (gnathosoma and legs not illustrated). Scale bar 100 μm.

61), lamellar (*le*, 65–73), interlamellar (*in*, 61–69) and bothridial (*bs*, 82–90) setae setiform, similar in thickness, barbed. Exobothridial setae and porose areas *Al* absent. Sejugal porose areas (*Ad*, 14–16×6) narrowly elongate oval, transversely oriented, posterolateral to *in*. Dorsophragmatic apophyses (*hy*) represented by group of low, roughened thickenings collectively elongated longitudinally, with variable number of components.

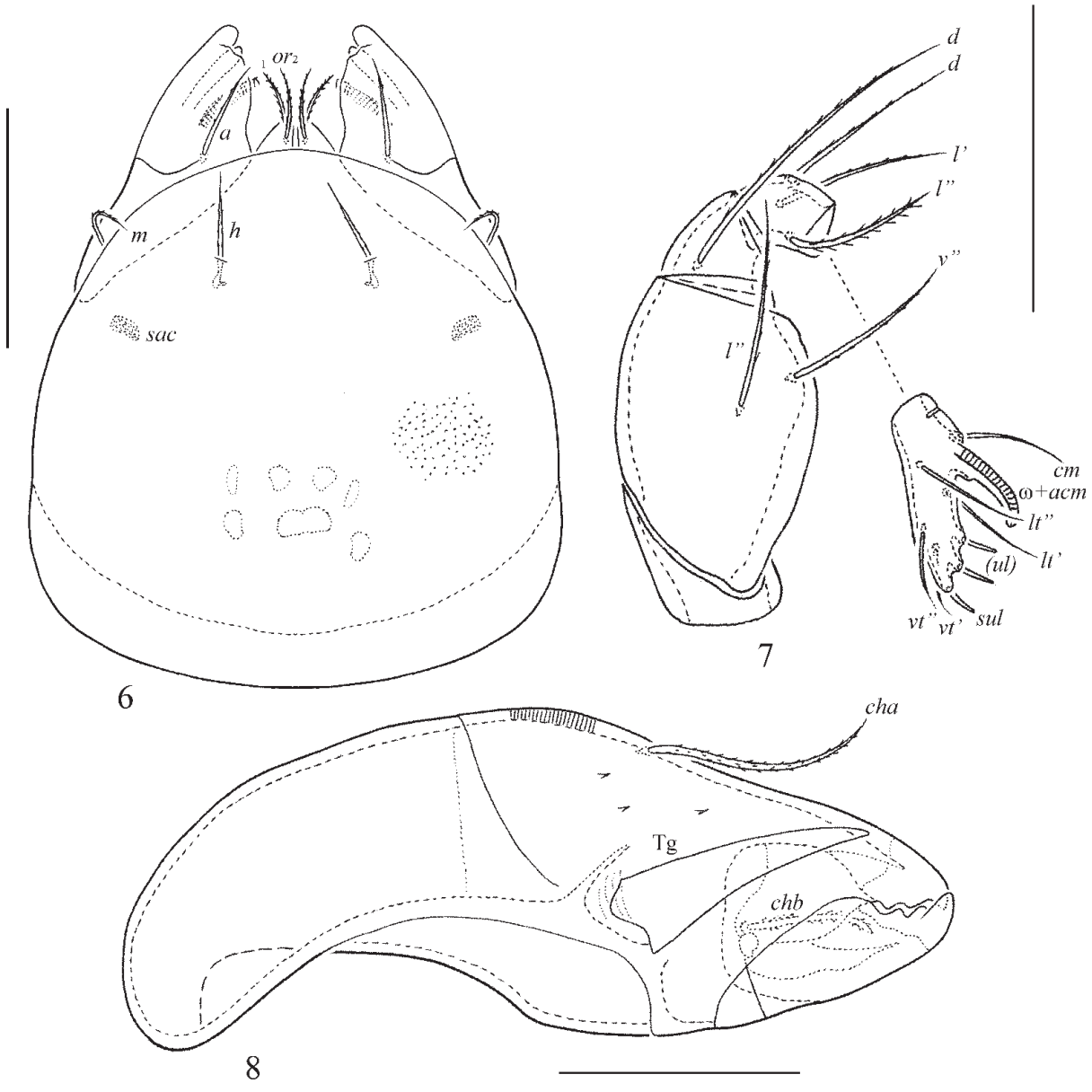
Notogaster (Figs. 1, 4, 5). Dorsosejugal suture absent medially, leaving notogaster and prodorsum partially fused. Posterior part with transverse depression (*dep*; well visible only in lateral view). With 10 pairs of setal alveoli and three pairs (*A1* absent) of rounded porose areas, *A2* (14–16) slight-



Figs. 3–5. *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934), adult: 3—anterior part of body, lateral view (pteromorph and legs I, II not illustrated); 4—posterior part of body, lateral view; 5—posterior view. Scale bar 100 μm.

ly larger than *Aa* (12–14) and *A3* (10–14), *Aa* located nearly to setal alveoli *lm* and distanced from *la*. Median pore (*mp*) present in females and males, represented by four or five parts, located between *A2*. All lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) distinct, *im* located anterior to *A2* and distanced from them, *ip* between setal alveoli p_1 and p_2, *A3*, *ih* and *ips* close to each other, anterior to p_3. Opisthonotal gland opening (*gla*) anterolateral to *A2*.

Gnathosoma (Figs. 6–8). Morphology of subcapitulum, palps and chelicerae typical for *Pergalumna* (e.g. Ermilov *et al.* 2010, 2015a;

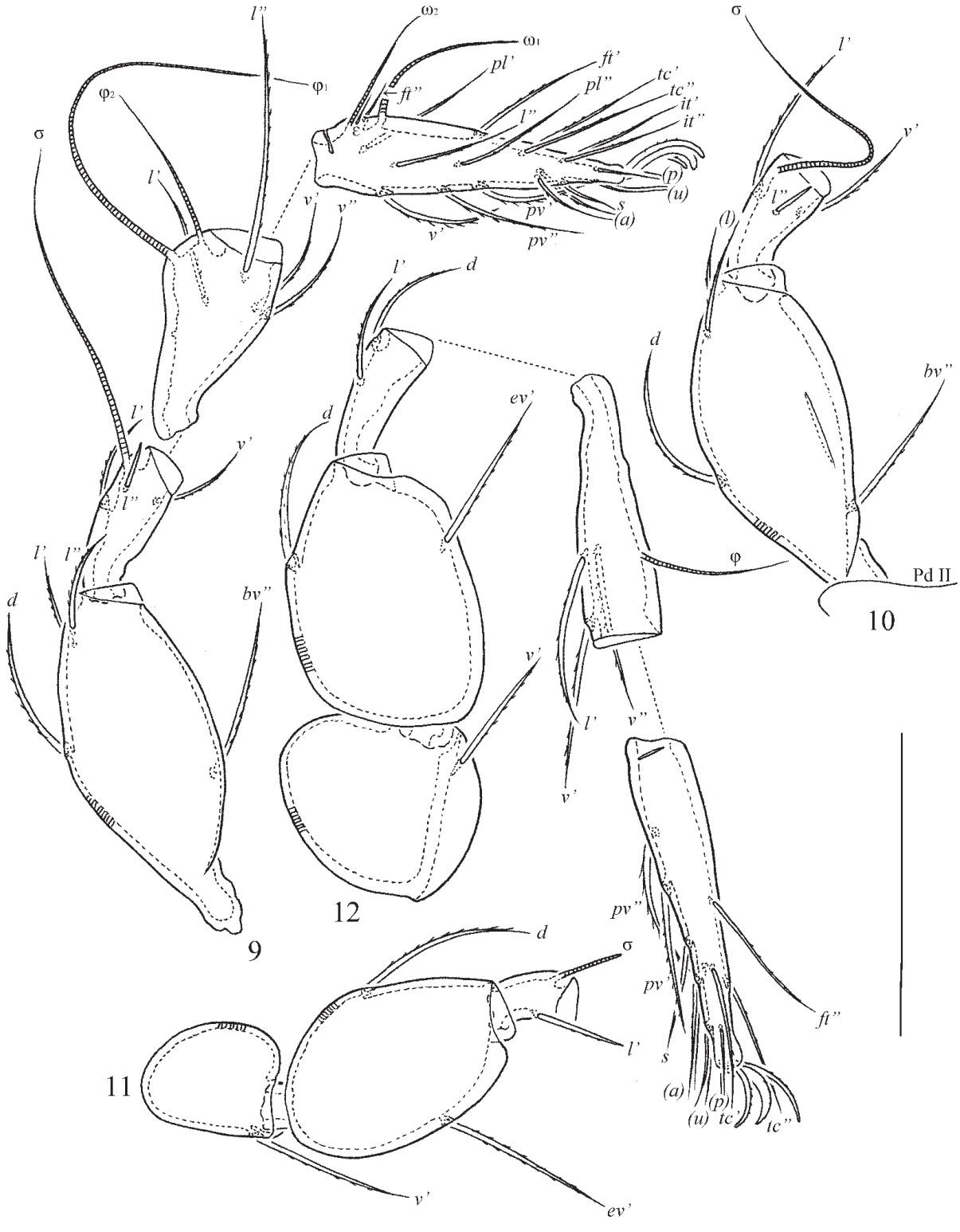


Figs. 6–8. *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934), adult: 6—subcapitulum, ventral view; 7—palp, right, antiaxial view; 8—chelicera, left, paraxial view. Scale bars 50 μm.

Ermilov and Starý 2017e). Subcapitulum size: 143–147 × 118–131. Three pairs of subcapitular setae setiform, *h* (20–24) and *m* (16–20) barbed, *a* (24–28) slightly barbed, *m* thinnest. Two pairs of adoral setae (or_1, or_2, 16–20) setiform, densely barbed. Length of palps: 90–102. Axillary saccules (*sac*) distinct, slightly elongated. Postpalpal setae (6) spiniform. Length of chelicerae: 176–184. Dorsoparaxial sides with several conical teeth. Two cheliceral setae setiform, barbed, *cha* (49) longer than *chb* (28). Trägårdh's organ (Tg, 57–61) long, elongate triangular.

Epimeral and lateral podosomal regions (Figs. 2, 4). Anterior tectum of epimere I smooth. Pedotecta I (Pd I) and II (Pd II) rounded distally in ventral view. Discidia (*dis*) triangular. Circumpedal carinae (*cp*) thin, long, directed to apodemes II, but slightly not reaching them. Epimeral setal formula: 1–0–2–3. Epimeral setae thin, slightly barbed, *1b* longest (32–36) and thickest, *3c* (26–28) longer than *3b*, *4a, 4b* and *4c* (18–24).

Anogenital region (Figs. 2, 4, 5). Six pairs of genital (g_1, g_2, 24–26; g_3–g_6, 8–10), one pair of aggenital (*ag*, 10–12), two pairs of anal (an_1, an_2, 8–12) and three pairs of adanal (ad_1–ad_3, 10–12) setae setiform, slightly barbed, g_1, g_2 longest and thickest. Anterior edges of genital plates with two setae. Aggenital setae inserted closer to genital



Figs 9–12. *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934), adult: 9—leg I, without trochanter, right, antiaxial view; 10—femur and genu of leg II, right, antiaxial view; 11—trochanter, femur and genu of leg III, left, antiaxial view; 12—leg IV, left, antiaxial view. Scale bar 100 μm.

aperture than anal aperture. Adanal lyrifissures (*iad*) located close and parallel to anal plates. Adanal setae ad_1 and ad_2 postanal, ad_3 paraanal and lateral to *iad*. Distance ad_1–ad_2 distinctly shorter than ad_2–ad_3. Unpaired postanal porose area (*Ap*) elongate oval (28–32 × 12–16). Ovipositor is typical for Galumnidae (Ermilov 2010), elongated (290 × 86), three blades (102) shorter than length of distal sec-

tion (beyond middle fold; 188). Setae of blades smooth, $\psi_1 \approx \tau_1$ (57) setiform, longer than thorn-like $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (24) and coronal setae (*k*, 12).

Legs (Figs. 9–12). Morphology of legs typical for *Pergalumna* (e.g. Ermilov *et al*. 2010, 2015a; Ermilov and Starý 2017e). Median claw distinctly thicker than laterals, all barbed on dorsal sides. Porose areas on all femora and on trochanters III, IV slightly visible. 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]; homologies of setae and solenidia indicated in Table 1. Solenidia of tibiae IV inserted in anterior part of the segments. Famuli on tarsi I inserted between setae *ft"* and solenidia ω_2.

Remarks. 1. Based on the supplementary description of *P. hawaiiensis hawaiiensis* and known literature data (Jacot 1934a), we propose the following diagnostic morphological traits for this species: body size 460–615 × 415–448; body surface den-sely microgranulate, surface of prodorsum, notogaster and pteromorphs slightly striate; rostrum rounded; lamellar and sublamellar lines parallel; rostral, lamellar, interlamellar and bothridial setae well-developed, barbed; sejugal porose areas oval; dorsosejugal suture absent medially; posterior part of notogaster with transverse depression; three pairs of rounded porose areas (*A1* absent), *Aa* located nearly to setal alveoli *lm*; median pore represented by several parts in females and males; lyrifissures *im* located anterior to *A2*, *ip* between setal alveoli p_1 and p_2, *ih* and *ips* close to each other; subcapitular setae of medium size, *h* and *m* barbed, *a* slightly barbed, *m* thinnest; circumpedal carinae long, directed to apodemes II, but not reaching them; epimeral setal formula 1–0–2–3, epimeral setae thin, slightly barbed, *1b* longest and thickest; anogenital setae thin, slightly barbed, g_1 and g_2 longest and thickest; aggenital setae inserted closer to genital aperture than anal aperture; distance ad_1–ad_2 distinctly shorter than ad_2–ad_3; postanal porose area elongate oval; solenidia of tibiae IV inserted in anterior part of the segments; famuli on tarsi I inserted between setae *ft"* and solenidia ω_2.

2. The specimens of *P. hawaiiensis hawaiiensis* from Vietnam and Sumatra (from personal collection of Sergey G. Ermilov) are morphologically identical. The specimens from Vietnam are similar in general appearance to those from Hawaii according to the original description (Jacot 1934a). However, some differences are presented:

a) Jacot (1934a) did not describe or illustrate the body surface except prodorsum. The specimens from Vietnam have dense microgranular surface on all surface and slight (often poorly visible) striate ornamentation on notogaster and pteromorphs.

b) Jacot (1934a) stated that rostral, lamellar, interlamellar, and bothridial setae are nearly smooth. These setae are well barbed in the specimens from Vietnam.

Hence, these data should be considered in any future identification of *P. hawaiiensis hawaiiensis*.

ADDENDUM TO THE CHECKLIST OF ORIBATID MITES OF VIETNAM

According to the Ermilov's list (2015) of oribatid mite taxa of Vietnam, it includes 535 species/subspecies from 222 genera and 81 families. In the course of taxonomic identification of materials during 2016 and first half of 2017 several new species and new records were observed.

22 species:

Fijibates problematicus Ermilov, 2016 [see Ermilov 2016];

Eremella induta Berlese, 1913 [see Ermilov 2016];

Eremaeozetes lineatus Mahunka, 1985 [see Ermilov 2016];

Pseudocarabodes xenus Mahunka, 1991 [see Ermilov 2016];

Yoshiobodes nakatamarii (Aoki, 1973) [see Ermilov 2016];

Zetorchella sottoetgarciai (Corpuz-Raros, 1979) [see Ermilov 2016];

Punctoribates insignis Berlese, 1910 [see Ermilov 2016];

Trhypochthoniellus longisetus (Berlese, 1904) [see Ermilov 2016];

Tyrphonothrus albulus (Hammer, 1972) [see Ermilov 2016];

Nodocepheus dentatus Hammer, 1958 [see Ermilov 2016];

Liebstadia pannonica (Willmann, 1951) [see Ermilov 2016];

Lohmannia pseudoturcmenica Ermilov, 2017 [see Ermilov 2017];

Scheloribates daoensis Ermilov and Starý, 2017 [see Ermilov and Starý 2017a];

Liacarus vietnamensis Ermilov and Starý, 2017 [see Ermilov and Starý 2017b];

Xenillus tamdaoensis Ermilov and Starý, 2017 [see Ermilov and Starý 2017b];

Galumna dkrivolutskyi Ermilov and Starý, 2017 [see Ermilov and Starý 2017c];

Protoribates chistyakovi Ermilov and Starý, 2017 [see Ermilov and Starý 2017d];

Protoribates shaldybinae Ermilov and Starý, 2017 [see Ermilov and Starý 2017d];

Protoribates shvanderovi Ermilov and Starý, 2017 [see Ermilov and Starý 2017d];

Pergalumna kunsti Ermilov and Starý, 2017 [see Ermilov and Starý 2017e];

Pergalumna storkani Ermilov and Starý, 2017 [see Ermilov and Starý 2017e];

Pergalumna hawaiiensis hawaiiensis (Jacot, 1934) [see the data of this paper].

6 genera:

Trhypochthoniellus Willmann, 1928 [see Ermilov 2016];

Eremaeozetes Berlese, 1913 [see Ermilov 2016];

Pseudocarabodes Mahunka, 1991 [see Ermilov 2016];

Nodocepheus Hammer, 1958 [see Ermilov 2016];

Liacarus Michael, 1898 [see Ermilov and Starý 2017b];

Xenillus Robineau-Desvoidy, 1839 [see Ermilov and Starý 2017b].

2 families:

Nodocepheidae [see Ermilov 2016];

Liacaridae [see Ermilov and Starý 2017b].

Hence, including the above listed data, the oribatid mite fauna of Vietnam includes now 557 species and subspecies from 228 genera and 83 families.

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Table 1.
Leg setation and solenidia of adult *Pergalumna hawaiiensis hawaiiensis* (Jacot, 1934)

Leg	Tr	Fe	Ge	Ti	Ta
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)*

Note: Roman letters refer to normal setae, Greek letters refer to solenidia (except ε = famulus). Single prime (*'*) marks setae on the anterior and double prime (*"*) setae on the posterior side of a given leg segment. Parentheses refer to a pair of setae. Tr—trochanter, Fe—femur, Ge—genu, Ti—Tibia, Ta—tarsus.