

ORIGINAL ARTICLE

A NEW SPECIES OF *Saemundssonina* AND NEW RECORDS OF *Quadriceps* SPECIES (PHTHIRAPTERA: ISCHNOCERA: PHILOPTERIDAE) FOUND ON SOME PHILIPPINE CHARADRIIFORM BIRDS

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ABSTRACT

Chewing lice collected at different periods from some Philippine charadriiform birds namely, *Rostratula benghalensis benghalensis* (Rostratulidae), *Lymnocyrtus minimus*, *Actitis hypoleucos* and *Tringa totanus eurhinus* (Scolopacidae) were processed for microscopic examination (cleaned in 10% KOH solution, dehydrated in increasing grades of ethyl alcohol, cleared in oil of cloves, mounted in Canada balsam) and carefully examined for species identification. These revealed a new species of *Saemundssonina* herein described, illustrated and named as *S. philippina* from *R. b. benghalensis*. Two previously known species of *Quadriceps*, *Q. quadrisetaceus* and *Q. birostris* from *R. b. benghalensis*, *L. minimus*, *A. hypoleucos* and *T. totanus eurhinus*, respectively are redescribed and illustrated based on the present Philippine materials. Additional features of these species not given in previous literature description are provided. *Saemundssonina philippina* is characterized and differentiated from closely related species of the genus. The genus *Saemundssonina* is recorded for the first time in *Rostratula b. benghalensis*, a new host record for the genus. *Quadriceps quadrisetaceus* and *Q. birostris* are reported for the first time in the Philippines. The occurrence of the former species on *L. minimus* and *A. hypoleucos*, and the latter on *Tringa totanus eurhinus* constitute new host records for these species.

Key words: charadriiform birds, chewing lice, *Quadriceps* spp., *Saemundssonina philippina*

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INTRODUCTION

Birds are known to be infested with parasitic lice which have been the cause of many injurious effects to the host (Johnson and Clayton, 2003). Many avian groups including those belonging to the order Charadriiformes have been shown to be infested with their own particular species of lice (Price *et al.*, 2003a). Members of the avian order Charadriiformes include shorebirds and relatives. They inhabit shorelines and inland waterways and form an important natural component of this ecosystem. Worldwide, this order contains 17

families (Myers *et al.*, 2017) and nine of which are represented in the Philippine avian fauna (Kennedy *et al.*, 2000).

Little is known about the species of chewing lice that infest Philippine birds of the order Charadriiformes. As far as the author is aware, there are only four previously published works that recorded Philippine materials of lice, the latest of which appeared in 1974. These papers are as follows: de Elera (1895), Emerson and Ward (1958), Hopkins and Timmermann (1954), and Price (1974). That of Emerson and Ward (1958) contained some materials that have not been identified to species level. None of the succeeding published works on chewing lice of

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Philippine wild birds have dealt with members of the order Charadriiformes but rather of other avian orders namely, the Apodiformes (Price and Clayton, 1997); Coraciiformes (Price and Emerson, 1977); Columbiformes (Eduardo, 2013); Gruiformes (Eduardo, 2012, 2014); Passeriformes (Price, 1977; Price and Hellenthal, 1998; Hellenthal and Price, 2003; Price *et al.*, 2006; Eduardo and Villa, 2011); Procellariiformes (Palma, 2011) and Strigiformes (Desamero and Eduardo, 2011). This is partly due to the very few opportunities presented in examining charadriiform birds for their lice.

Examination of recent collections of chewing lice from two avian families, Scolopacidae and Rostratulidae, of the order Charadriiformes revealed a species new to science belonging to the genus *Saemundssonina* and two previously known species belonging to the genus *Quadriceps* but hitherto not reported in the Philippines hence, this paper.

MATERIALS AND METHODS

Three bird species of the family Scolopacidae namely, *Lymnocyptes minimus* (Jack snipe), *Actitis hypoleucos* (common sandpiper) and *Tringa totanus eurhinus* (common redshank) and a species of the family Rostratulidae, *Rostratula benghalensis benghalensis* (greater painted-snipe) were the bird hosts of the lice herein examined. Lice were collected from bird host whenever opportunity arose at irregular intervals between the periods March 2014 to September 2016. Many of the bird host were kept at the Laguna Wildlife Rescue Center and PAWB. Other host were bought from farmers that captured birds and were later released to the wild after examination for the presence of lice. Additional specimens submitted to the author for study thru the kindness of Dr. Carmelito Gaddi and Dr. Loida Valensuela also form part of this study.

Visual inspection was used to determine the presence of lice. Lice were visible along the feathers. Lice were collected either by using a fine thumb forceps or by cutting a part of the infested feather(s). The collected lice were preserved in 70% ethyl alcohol, and then

brought to laboratory for further processing. For species identification, lice were processed as follows: cleaning in 10% KOH, washing in distilled water, gradually dehydrating in increasing grades of ethyl alcohol, clearing in oil of cloves and mounting on glass slide in Canada balsam.

Measurements were made with the aid of a calibrated eyepiece micrometer. Photomicrographs were taken using a Nikon biological microscope Eclipse E2000 with digital sight capture attachment DS-Fil (Nikon Corporation, 916, Ohi 3-chome, Shinagawa-ku, Tokyo 140-8505, Japan). Drawings were made with the aid of an Olympus drawing apparatus attached to an Olympus CX31 research microscope (Olympus Optical Co. Ltd, 2-43-2, Hatagaya, Shibuya-ku, Tokyo, Japan). Voucher and type specimens were deposited in the Parasite Collection and Reference Center of the College of Veterinary Medicine, University of the Philippines Los Baños. Lice terminology follows that of Price *et al.* (2003a) and bird host nomenclature after that of Kennedy *et al.* (2000).

Permission was given by the authorities of the Wildlife Rescue Center, Biodiversity Management Bureau, Department of Environment and Natural Resources to examine and collect lice from the birds.

RESULTS

A new species of *Saemundssonina* and two previously known species of *Quadriceps* both of the family Philopteridae, suborder Ischnocera were identified in the present study. *Saemundssonina philippina* was recovered from the wing feathers while *Quadriceps quadrisetaceus* and *Q. birostris* were found on the body feathers of their respective hosts. In general, the birds were lightly infested and appeared to be apparently healthy.

The new species of *Saemundssonina* and two previously known species of *Quadriceps* are described and illustrated below based on the present Philippine materials.

Saemundssonina Timmermann, 1936
Saemundssonina philippina new species
 (Figs. 1-14)

Male (n=10): Body (Fig. 1) heavily sclerotized and pigmented, 1.845-1.873 mm long and 0.749-0.878 mm in its greatest width at level of abdominal segment IV. Head 0.698-0.701 mm long and 0.616-0.650 mm in greatest width at level of the temples. Temple angle latero-medial marginal setae = 3 + 3. Cephalic index (breadth:length): 0.88-0.92. Clypeal signature (head plate) as shown in Fig. 3; 0.358-0.361 mm in length and 0.175-0.188 mm in its widest width, with anterior margin slightly convex or nearly flattened and darkly pigmented long postero-medial process.

Prothorax roughly quadrangular, wider than long, 0.165-0.172 mm in length and 0.352-0.362 mm in width, lateral margins much darker. Pterothorax pentagonal with convex posterior border, 0.195-0.200 mm in length and 0.485-0.496 mm at its widest width, broader medially than anteriorly and posteriorly, lateral margin much darker. Pteronotal submarginal setae = 8 + 9 (Fig. 5). Thoracic sternal plate with 1 + 1 setae as shown in Fig. 7. Abdomen ovate 0.798-0.812 mm long and 0.750 mm at its greatest width attained at level of segment IV. Tergites: undivided medially in II, divided in III, partly divided in IV (Fig. 9), undivided in V-VII, IX, divided in VIII; tergite setae medial to spiracle: 2 + 2 on II, 4 + 4 on III, VII, 5 + 5 on V, VI, 0 + 0 on VIII, 1 + 1 on IX; Sternites undivided and pigmented; sternite setae: 1 + 1 on II-VI, VIII, 2 + 2 on VII. Pleurites heavily pigmented and elongate except for VIII and VIII which are shorter and curved. Post spiracular setae: 1 + 1 on II-VIII. Genitalia complex as shown in Fig. 11, total length 0.601-0.607 mm; basal plate 0.350-0.354 mm long, broader anteriorly (proximal part) than posteriorly (distal part), anterior borders join medially forming an arch anteriorly, transverse crossbar at distal part absent; parameres 0.250 mm long, lightly shorter than basal plate, broad, nearly parallel in two third of its course then reducing in thickness towards posteriorly then curve inwards and meeting close to its other medially; mesosomal structure broad and forming an arc anteriorly, then gradually narrows inwards its course posteriorly and each lateral part slightly curve outwards at its extreme tip at level of the two thirds length of the parameres, phallus part long and slender with extending well beyond the endomeres. Posterior end and

setae as shown in Fig. 13.

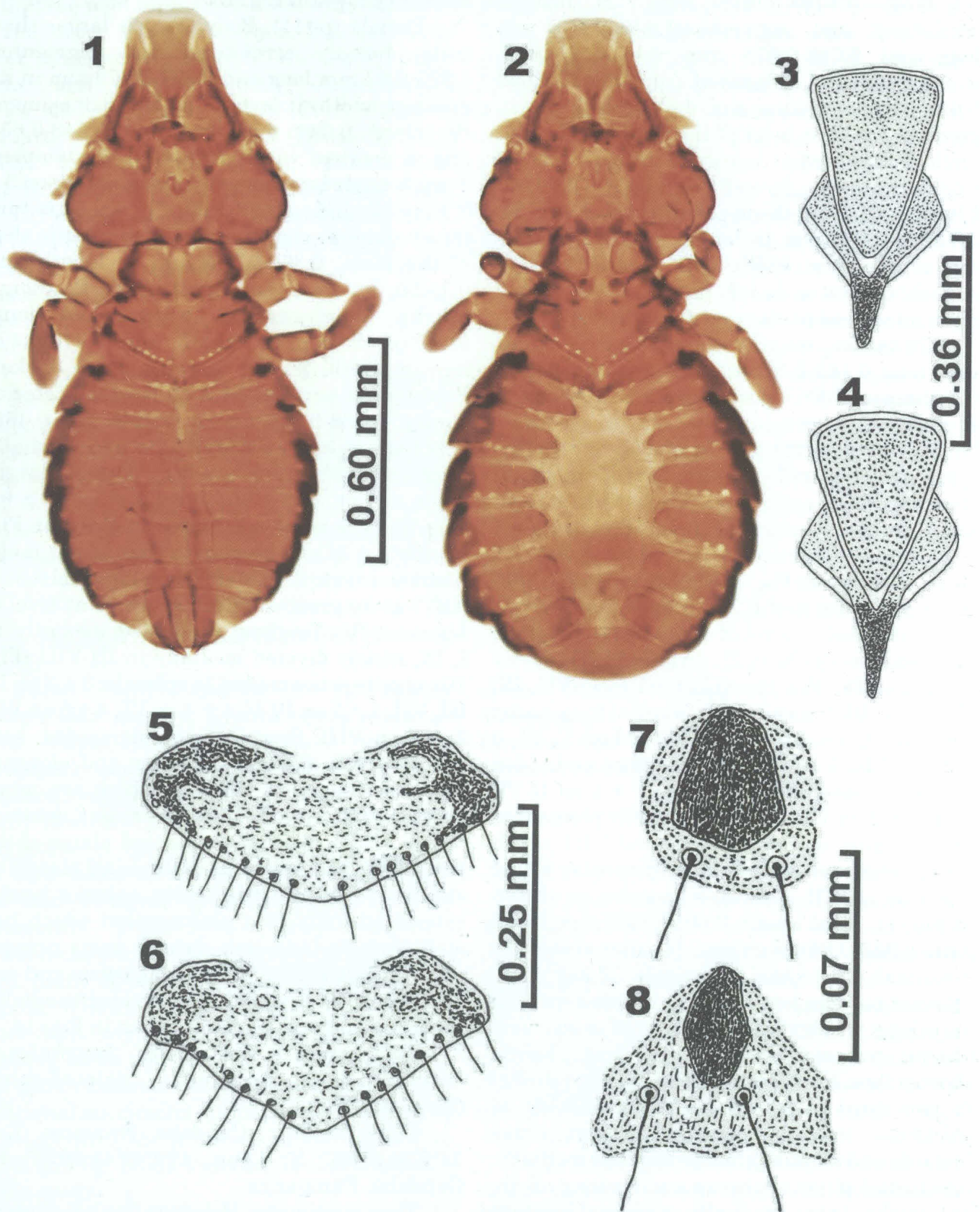
Female (n=11): Body (Fig. 2) larger than male, heavily sclerotized and pigmented 1.925-2.03 mm long and 0.871-0.878 mm in its greatest width at level of abdominal segment IV. Head 0.641 mm long and 0.648-0.654 mm in greatest width at level of the temples. Temple angle latero-medial marginal setae: 3 + 3. Cephalic index: 0.97-1.03. Clypeal signature (head plate) as shown in Fig. 4, similar to that of the male, 0.350-0.356 mm in length and 0.192-0.198 mm in its widest width. Prothorax roughly quadrangular, wider than long, 0.139-0.145 mm in length and 0.470-0.473 mm in width, lateral margins much darker. Pterothorax pentagonal with convex posterior border, 0.238-0.246 mm in length and 0.469-0.473 mm at its widest width, broader medially than anteriorly and posteriorly, lateral margin much darker. Pteronotal marginal setae: 8 + 8 (Fig. 6). Thoracic sternal plate as shown in Fig. 8 with 1 + 1 seta similar to that of the male. Abdomen ovate 0.995-0.997 mm long and 0.870-0.877 at its greatest width attained at level of segment IV. Tergites: undivided medially in I, IX, widely divided medially in III-VIII (Fig. 10); tergite setae medial to spiracle: 3 + 3 on II-III, VII, 5 + 5 on IV-V, 4 + 4 on VI, 4 + 5 on VII, 2 + 2 on VIII. Sternites non-pigmented, seta not observed. Pleurites slender and elongate except for segment VII-VIII which are much shorter and curved. Post spiracular setae: 0 + 0 on I-VIII. Ventral pigmented plates of the last abdominal segments (subgenital plates) as shown in Fig. 12, with convex anterior border extend laterally to a prolongation which has at its base a long seta, lateral parts proceed posteriorly with medial prolongations and end posteriorly to a round end divided medially. Posterior end and setae as shown in Fig. 14.

Type host: *Rostratula benghalensis benghalensis* (greater painted-snipe) (Rostratulidae)

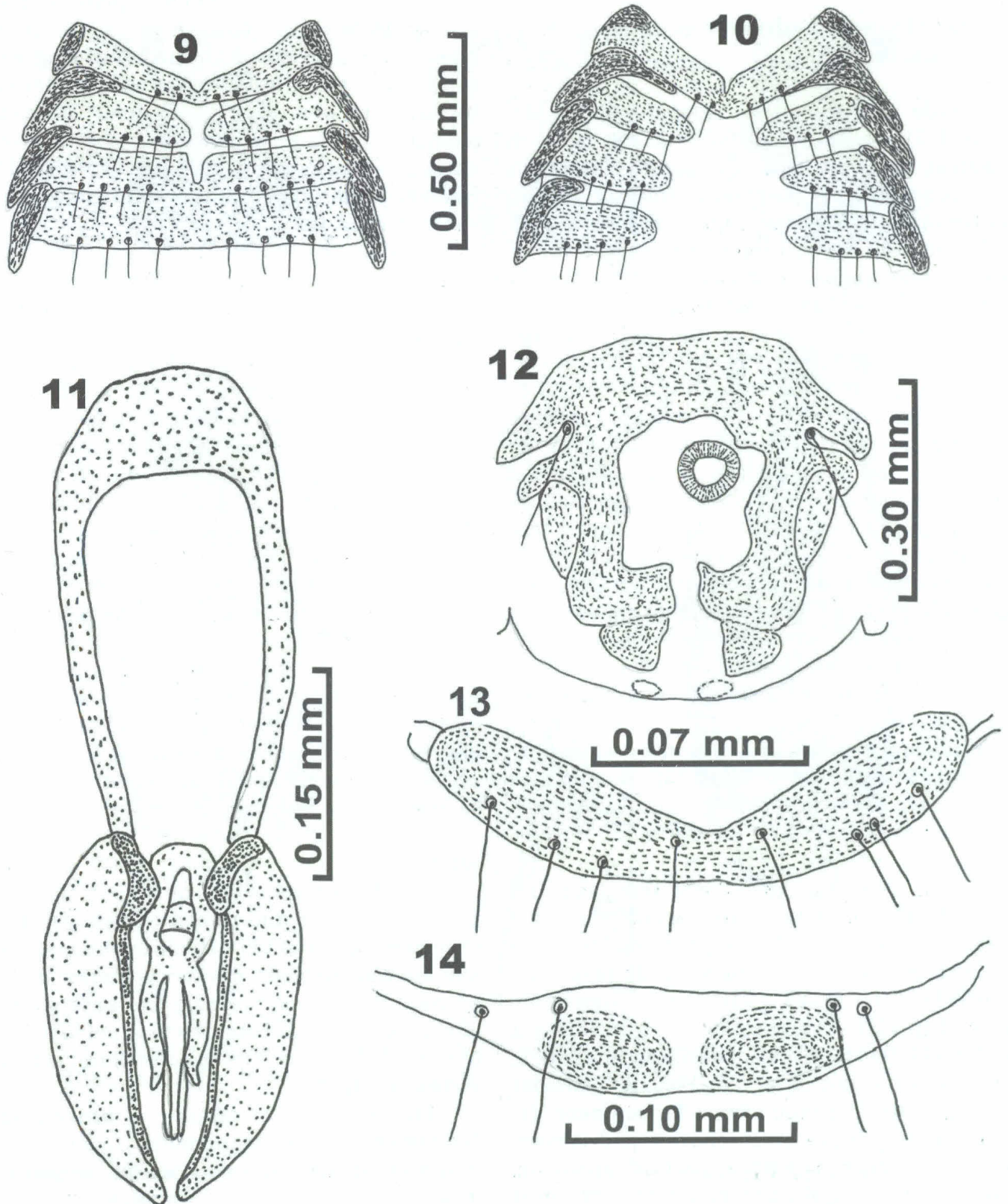
Type locality: Candaba Swamps (Lat. 15°5'35.9988" N; Long. 120°49'41.9916" E), Candaba, Pampanga.

Type specimens: Holotype (male), allotype (female) and paratypes deposited in the Parasite Collection and Reference Center, CVM. UPLB

Etymology: Species epithet after the country of origin.



Figs. 1-8. *Saemundssonina philippina* n.sp.: 1. Male, whole, dorsal view; 2. Female, whole, dorsal view; 3. Male clypeal signature; 4. Female clypeal signature; 5. Male pteronotum and marginal setae; 6. Female pteronotum and marginal setae; 7. Male sternal plate and setae; 8. Female sternal plate and setae.



Figs. 9-14. *Saemundssonina philippina* n.sp.: 9. Male tergites, pleurites and setae; 10. Female tergites, pleurites and setae; 11. Male genitalia; 12. Female genital plates; 13. Male posterior end and setae; 14. Female posterior end and setae.

Quadriceps Clay and Meinertzhagen, 1939*Quadriceps quadrisetaceus* (Piaget, 1880)
(Figs. 15-23)

Male (n=10): Body elongate (Fig. 15), 1.710-1.715 mm long. 0.519-0.524 mm in greatest width at level of abdominal segment IV. Head roughly narrower anteriorly than posteriorly 0.464-0.469 mm long and 0.352-0.356 mm at its greatest width at level of the temple angles; anterior margin slightly concave, temple angle latero-marginal setae: 3 + 3. Cephalic index: 0.72-0.74. Clypeal signature as shown in Fig. 16, roughly shield-shaped, 0.121-0.126 mm long and 0.104-0.110 mm at its greatest width, anterior margin concave, lateral sides nearly parallel along its 2/3 length and narrow towards medially in the rest of its course to extended to a long median process; contains two structures, a flower bud like structure with roughened anterior border and smooth lateral and posterior borders, and a faintly outlined rectangularly-shaped plate in its anteriorly part which is flattened in its anterior border, and slightly concave posterior border. Prothorax roughly quadrangular, 0.113-0.119 by 0.225-0.231 mm, lateral margins much darker. Pterothorax pentagonal, 0.225-0.231 mm by 0.333-0.338 mm, wider than long, broader medially than anteriorly and posteriorly, lateral margin much darker. Pteronotal marginal setae: 8 + 8 (Fig. 19). Abdomen elongate, 0.878-0.883 mm long and 0.527-0.531 mm at its greatest width at level of abdominal segment IV. Tergites incompletely divided medially in segments I-III (Fig. 20), undivided in IV-VI, VIII and completely divided in VIII; tergite setae: 1 + 1 on II, 2 + 2 on III-VII, 0 + 0 on VIII. Sternites undivided, sternite setae not observed. Pleurites slender and elongate in shape except for segment VII and VIII which are much shorter and curved, strongly darker, posterior part of preceding plate overlapping the anterior part of the next plate. Postspiracular setae: 1 + 1 on II, 2 + 2 on III-IV, 3 + 3 on V-VII, 0 + 0 on VIII. Genitalia complex as in Fig. 21, total length 0.380-0.387 mm; basal plate 0.228-0.236 mm long and 0.112-0.118 in its greatest width, lateral parts of which join anteriorly but not completely in its posterior border, transverse crossbar at

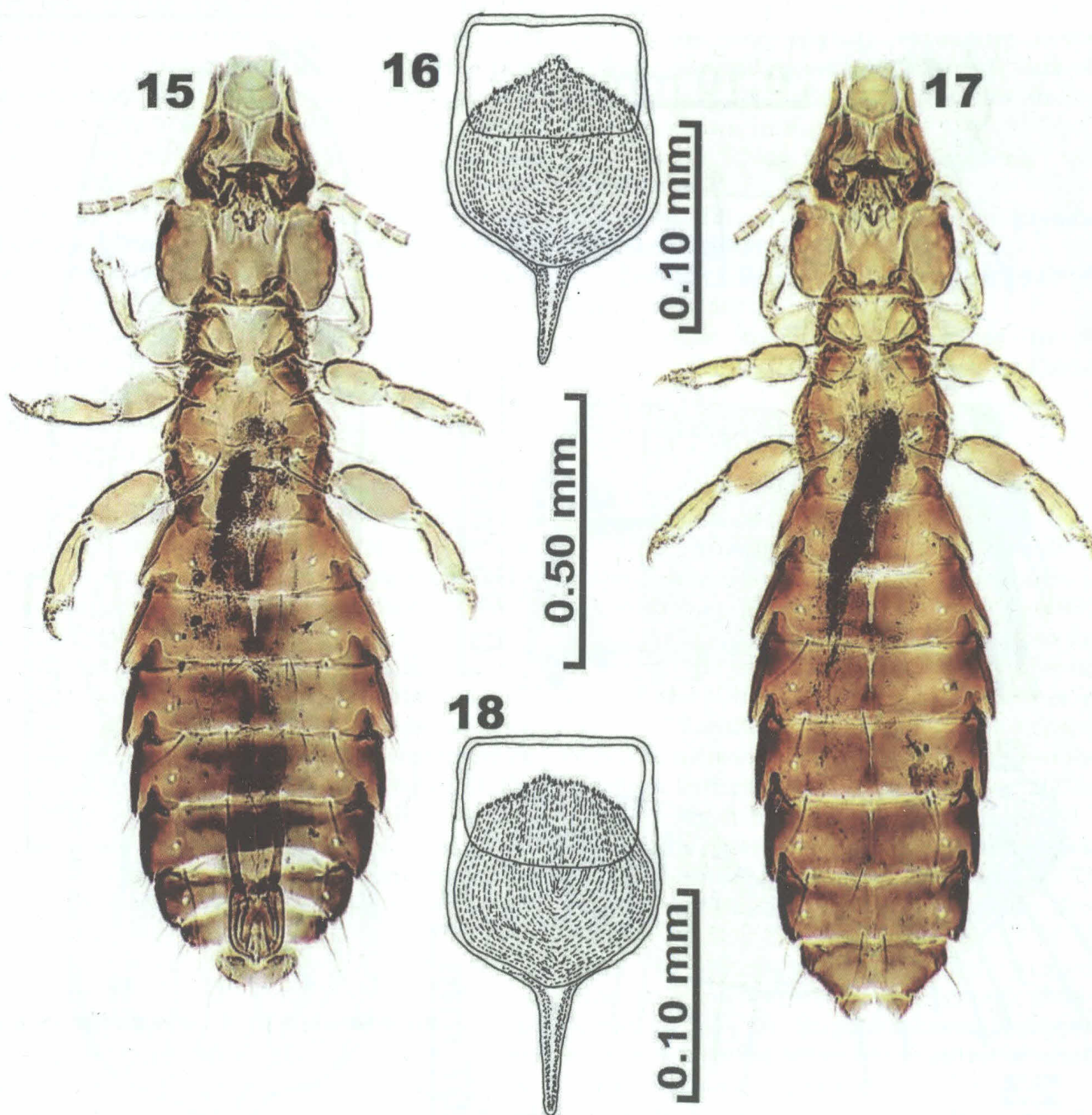
distal part absent; parameres 0.150-0.155 mm long, slightly shorter than basal plate, slender, nearly parallel in two third of its course posteriorly then curve inwards meeting close to its other medially, then directed posteriorly in its extreme tip; mesosomal structure elongate, marked by short spines and extend as a process medially; phallic parts slightly broader posteriorly. Posterior end and setae as shown in Fig. 22.

Female (n=10): Body elongate (Fig. 17), longer than male, 1.971-1.978 mm long. 0.518-0.525 mm in greatest width at level of abdominal segment IV. Head roughly narrower anteriorly than posteriorly 0.507-0.516 mm long and 0.357-0.364 mm at its greatest width at the level of the temple angles; anterior margin slightly concave; temple angle latero-marginal setae: 3 + 3. Cephalic index: 0.73-0.75. Clypeal signature as shown in Fig. 18, similar to that of the male, 0.129-0.133 mm long and 0.108-0.113 mm at its greatest width. Prothorax roughly quadrangular 0.135 by 0.292 mm, lateral margins much darker. Pterothorax pentagonal 0.292 by 0.382 mm, wider than long broader medially than anteriorly and posteriorly, lateral margin much darker; Pteronotal marginal setae = 8 + 8 as in the male. Abdomen elongate, 1.170-1.175 mm long and 0.519-0.524 mm at its greatest width at level of abdominal segment IV. Tergites incompletely divided medially in II-VI, undivided in VIII-VIII; tergite setae same as in the male. Sternites undivided; sternite setae same as in the male. Pleurites slender and elongate in shape except in segment VII and VIII which are much shorter and curved, strongly darker, posterior part of preceding plate overlapping the anterior part of the next plate. Postspiracular setae similar to that of the male. Posterior end and setae as shown in Fig. 23.

Hosts: *Rostratula benghalensis benghalensis* (Rostratulidae), *Lymnocyptes minimus* (Jack snipe), *Actitis hypoleucos* (common sandpiper) (Scolopacidae)

Locality: Candaba Swamp (lat. 15°5'35.9988" N, long. 120°49'41.9916" E), Pampanga; Ilocos Norte (lat. 18.1647° N, long. 120.7116° E).

Voucher specimens: Deposited in the Parasite Collection and Reference Center, CVM. UPLB

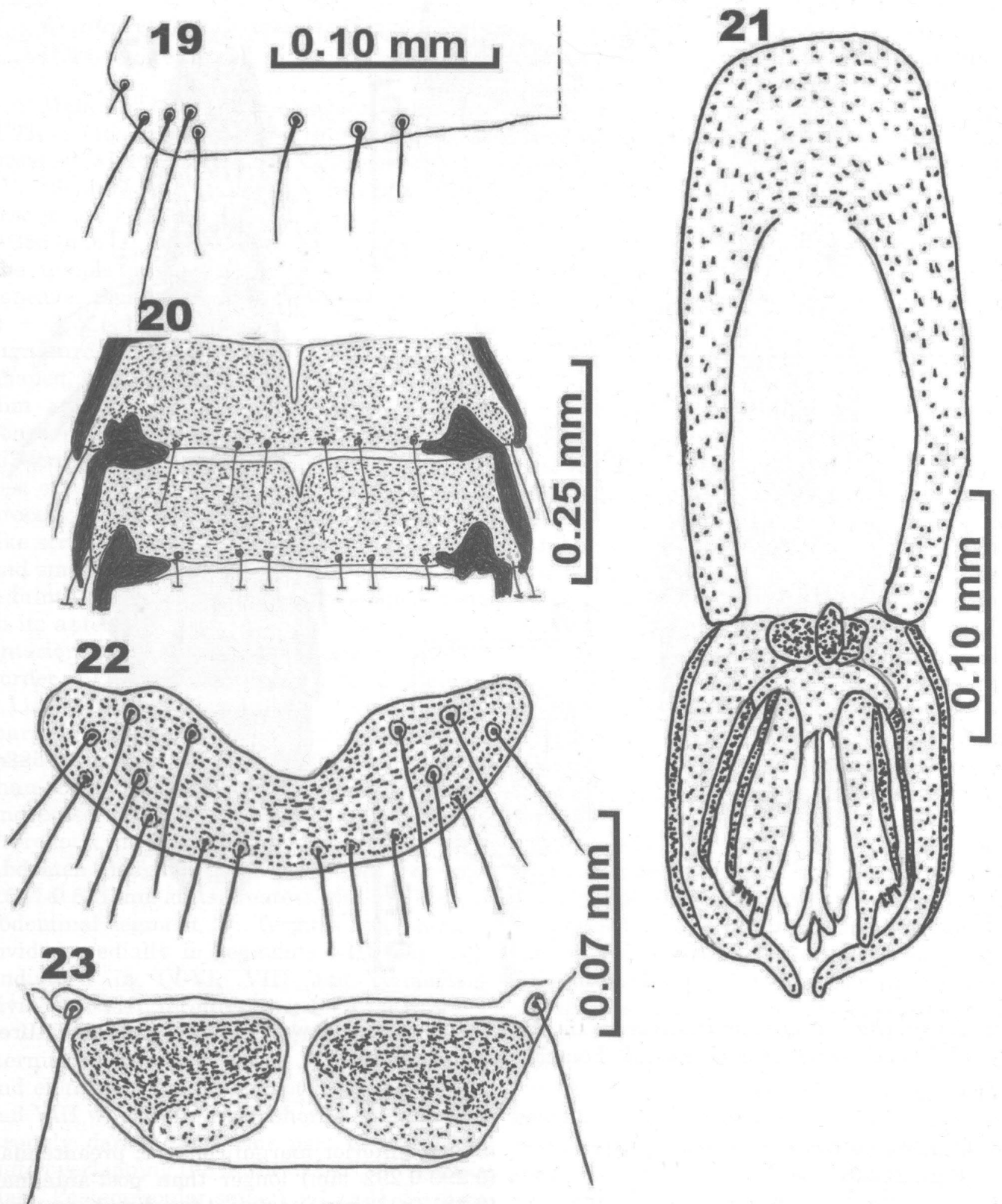


Figs. 15-18. *Quadraceps quadrisetaceus*: 15. Male, whole, dorsal view; 16. Male clypeal signature; 17. Female, whole, dorsal view; 18. Female clypeal signature.

Quadraceps birostris (Giebel, 1874)
(Figs. 24-30)

Male (n=5): Body elongate (Fig. 24), 2.195-2.200 mm long and 0.471-0.478 mm in greatest width at level of abdominal segment V. Head roughly elongate narrower anteriorly than posteriorly 0.622-0.627 mm long and 0.437 mm at its greatest width at level of the temple

angles; anterior margin concave; preantennal (0.290-0.292 mm) longer than post-antennal (0.231-0.238 mm) part, last two distal antennal segments characteristically darkly pigmented than the rest of the segments. Temple angle marginal setae: 4 + 4. Cephalic index: 0.69-0.71. Clypeal signature as shown in Fig. 25, shield-shaped, nearly twice longer than wide, 0.161-0.167 by 0.017-0.020 mm, anterior margin



Figs. 19-23. *Quadriceps quadrisetaceus*: 19. Male pteronotal (left half) marginal setae; 20. Male tergites, pleurites and setae; 21. Male genitalia; 22. Male posterior end and setae; 23. Female posterior end and setae.

concave, lateral sides nearly parallel along is 2/3 length and narrow towards medially in the rest of its course posteriorly terminating into a rounded medial end; marked in its anterior part with by a roughly butterfly wing-shaped pigmented area which is concave both anteriorly and posteriorly but deeply concave in the latter with asymmetrical lateral prolongations. Prothorax roughly quadrangular, 0.110-0.116 by 0.250-0.255 mm, lateral margins much darker. Pterothorax pentagonal, 0.333-0.338 by 0.344-0.349 mm, broader medially than anteriorly and posteriorly, lateral margin much darker; pteronotal marginal setae: 4 + 4 (Fig. 26). Abdomen elongate, 1.163-1.168 mm long and 0.473-0.477 mm at its greatest width at level of segment V. Tergites II and III marked medially by a small U-shaped darkly pigmented area near their posterior border, the rest of the area transparent and non-pigmented, III partly divided medially in its anterior border and pigmented, IV-VI pigmented (Fig. 27); tergite setae: 2 + 2 on II, 3 + 3 on III-V, 1 + 1 on VI, 0 + 0 on VII-VIII. Sternites marked with darker median areas (Fig. 28) (trapezoidal on segments II and III and nearly rectangular on segments IV-VI); sternite setae: 2 + 2 on II, IV-VI, 3 + 3 on III, 0 + 0 on VII-VIII. Pleurites slender and elongate in shape except for segment VII and VIII which are much shorter and curved, strongly darker, posterior part of preceding plate overlapping the anterior part of the next plate. Post spiracular setae: 0 + 0 on II, 1 + 1 on III, 2 + 2 on IV-V, 3 + 3 on VI, 4 + 4 on VII, 2 + 2 on VIII. Genitalia complex as shown in Fig. 29, total length 0.344-0.349 mm; basal plate 0.203-0.208 mm long and 0.148-0.153 mm wide, broader anteriorly (proximal part) than posteriorly (distal part) forming an arch anteriorly and with well-developed broad transverse bar connecting the lateral parts near their distal ends; parameres 0.139-0.143 mm long, shorter than basal plate, slender, nearly parallel in two third of its course posteriorly then curve inwards meeting close to its other medially, then directed posteriorly in its extreme tip; mesosomal structure broad anteriorly, bordered by a transversely elongate plate, then gradually narrows inwards its course posteriorly and each lateral part curve outwards at its extreme tip in a hook-like process at level of the two thirds length of

the parameres; phallic part medially located in between and slightly extending beyond endomeres, and bound by a small sclerotic band short of the distal end. Posterior end and setae as shown in Fig. 30.

Female: No female specimens were collected.

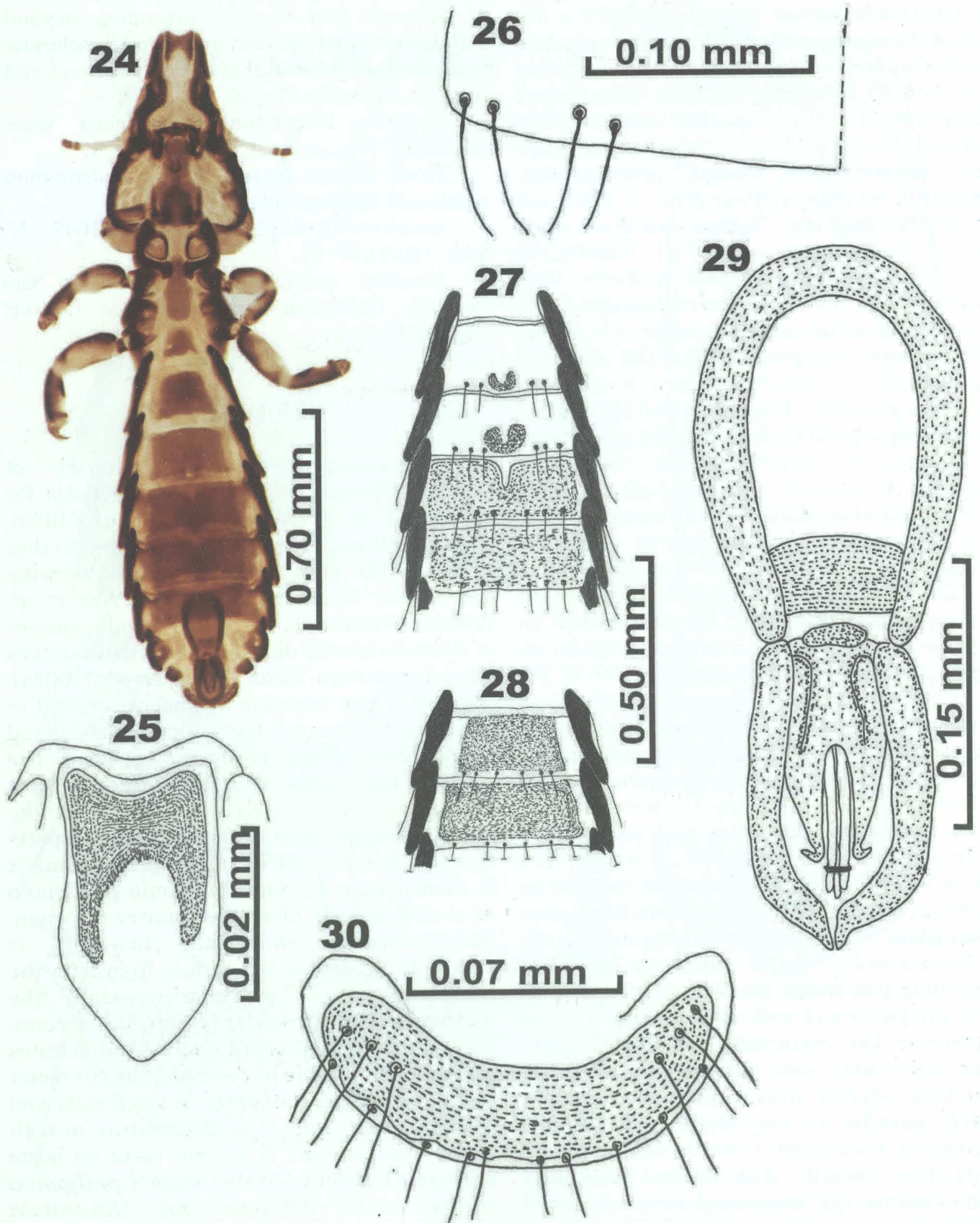
Host: *Tringa totanus eurhinus* (common redshank) (Scolopacidae).

Locality: Ilocos Norte (lat. 18.1647° N, long. 120.7116° E).

Voucher specimens: Deposited in the Parasite Collection and Reference Center, CVM. UPLB.

DISCUSSION

The present Philippine materials of *Saemundssonina* conform to the diagnosis for the genus as given by Timmermann (1935), Clay (1949) and Price *et al.* (2003b) and to that genus in the keys to the genera of chewing lice of the Charadriiformes by Price *et al.* (2003a). Worldwide, there are 49 valid species of *Saemundssonina* distributed to eight families of charadriiform birds (Price *et al.*, 2003a). None of which however has been recorded in the family Rostratulidae while 15 were found on members of the family Scolopacidae. The present specimens of *Saemundssonina* from *Rostratula benghalensis benghalensis* of the family Rostratulidae differ in many respects from all known species of the genus, thus it is named here as *Saemundssonina philippina* as a new species after the country of origin. *Saemundssonina philippina*, however, is closest to *S. sterna* but differs from it in the characters of the genitalia especially the mesosomal structure, the presence or absence and extent of medial division of the tergites and number of setae in the male, the character of the ventral genital plates in the female and the character of the clypeal signature in both sexes. Furthermore, *S. sterna* occur on hosts belonging to family Laridae while *S. philippina* occurs on a different host (*Rostratula benghalensis benghalensis*) belonging to a different family (Rostratulidae). There are only two species of *Saemundssonina* previously recorded in the Philippines and these are: *Saemundssonina sterna* from "esternidos" but



Figs. 24-30. *Quadriceps birostris*, male: 24. Whole, ventral view; 25. Clypeal signature; 26. Pteronotal (left half) marginal setae; 27. Tergites, pleurites and setae; 28. Sternites, pleurites and setae; 29. Genitalia; 30. Posterior end and setae.

species of host and specific locality of host in the Philippines was not given (de Elera, 1893) and *S. scolopacisphaeopodis* from *Numenius phaeophaeus variegatus* from Tagum, Davao (Emerson & Ward, 1958). Both were not described nor illustrated based on the Philippine materials. *Saemundssonina philippina* differs further from *S. scolopacisphaeopodis* in the features of the male genitalia and female ventral plates. Moreover, the bird host of *S. scolopacisphaeopodis* belongs to a different bird family (Scolopacidae). *Saemundssonina philippina* apart from being a species new to science, the genus *Saemundssonina* is recorded for the first time from *Rostratula benghalensis benghalensis* or the family Rostratulidae for that matter, constituting a new host record for the louse genus.

Two species of *Quadriceps* namely, *Q. ravus* and *Q. strepsilaris* and an undetermined species of *Quadriceps* were previously reported in the Philippines (Emerson and Ward, 1958; Hopkins and Timmermann, 1954), none however were described and illustrated based on the Philippine materials. The present specimens of *Q. quadrisetaceus* and *Q. birostris* agree with the illustration of the male genitalia and illustration for the former species by Timmermann (1955) and the description and illustration of the latter species by Kellogg and Kuwana (1902) and Ferris (1932) (as *Nirmus gloriosus* and *Degeeriella gloriosus*, respectively, which are now junior synonyms of *Q. birostris*) and Timmermann (1952). The present re-description of the two *Quadriceps* species include additional information not given in previous descriptions. These include features of the clypeal signature, tergites, sternites and their setae more details for the male genitalia. *Q. quadrisetaceus* and *Q. birostris* are reported for the first time in the Philippines. Furthermore, the occurrence of the former species on *L. minimus* and *A. hypoleucos* and the latter on *T. totanus eurhinus* are new host records for these lice species.

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