DESCRIPTIONS AND RE-DESCRIPTIONS OF FIVE SPECIES OF *NEOSCHOENGASTIA* (ACARINA, TROMBICULIDAE) FROM THE ORIENTAL-AUSTRALIAN REGION [1]

BY

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Abstract

Two new species, *Neoschoengastia longipes* and *N. solitus*, collected from birds in Thailand, are described for the first time. *N. thomasi* Radford, *N. entomyza* Womersley and *N. struthidia* Womersley are re-described.

In 1963, I received a collection of trombiculid mites for determination from the Chief of the Entomology Department, SEATO Medical Research Laboratory, Bangkok. Among the collection were two species of *Neoschoengastia* obtained from several species of birds. The two species are described herein as new after having compared them with the type material of related species. Opportunity is taken to provide more descriptive information for *Neoschoengastia thomasi* (Radford, 1946) *N. entomyza* Womersley, 1952 and *N. struthidia* Womersley, 1952.

One of the new species, *N. longipes*, is close to *N. thomasi* and *N. entomyza* and together form a related group. The differences among the three species are tabulated under the section on diagnosis of *N. longipes* n. sp. While I concur with WOMERSLEY's views that *N. thomasi* and *N. entomyza* are identical in several specific characters and that they might prove to be conspecific, I am retaining them as separate species. Until the extent of variation is known by examining a large series of each species, it would be pointless to create a new synonymy. The other new species, *N. solitus* is close to *N. struthidia*. The differences are discussed under diagnosis of *N. solitus*.

I am most grateful to the late Dr. H. WOMERSLEY for sending me the paratypes of *N. entomyza* and *N. struthidia* and to Dr. G. O. EVANS of the British Museum

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(Natural History), London, for providing me with excellent facilities to study the type of *N. thomasi* and other trombiculid mites when I visited his department in 1964. My thanks are extended to Major J. E. SCANLON, former chief of the SEATO Medical Research Laboratory, Bangkok for sending me the chigger material and to his successor, Dr. D. J. GOULD for permission to describe the new species.

The holotypes of the two new species will be deposited in the U.S. National Museum, Washington, D.C. and paratypes in the British Museum (N.H.), London ; Hooper Foundation, University of California, San Francisco ; Institute for Medical Research, Kuala Lumpur ; Bishop Museum, Honolulu ; SEATO Medical Research Laboratory, Bangkok ; Dr. R. Traub, Bethesda, Maryland ; Institute of Acarology, Wooster, Ohio ; Zoological Survey of India, Calcutta ; and the Xouth Australian Museum, Adelaide.

Neoschoengastia longipes n. sp.

(figs 1-8)

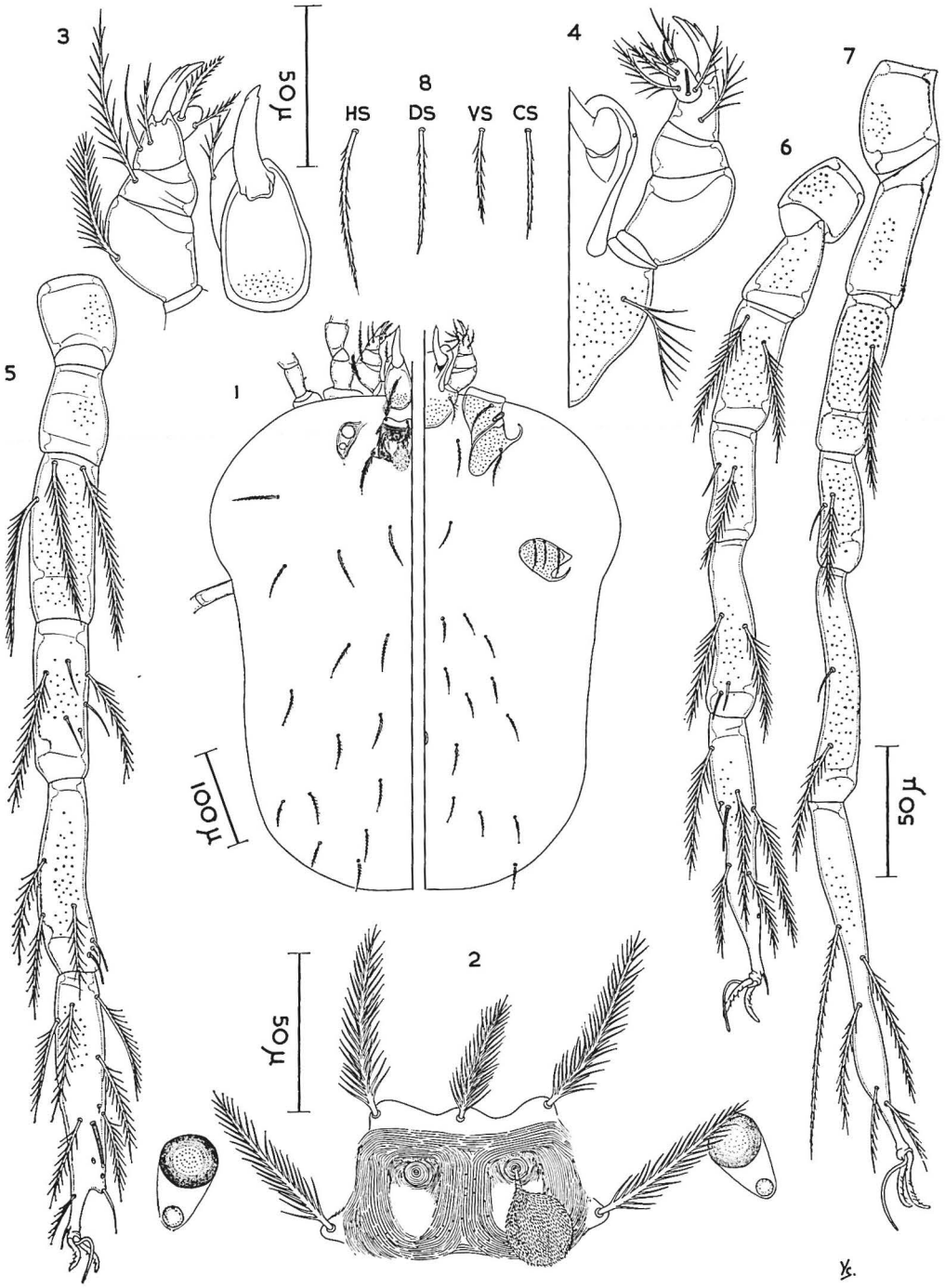
Diagnosis of larva. Palpal formula B/B/BNB + 7BS ; claw 3-pronged ; galeal seta barbed. Scutum roughly quadrate with cuticular striations overlapping scutum in parallel and concentric formations, as figured ; sensilla globose and densely covered with minute barbs. DS 30 in number, arranged 2,6,6,4,6,4,2. Legs 7-7-7 segmented, segments very long ; Ip 1140-1230 μ. Tarsus III up to 140 × 14 μ or length/height ratio 10.0. Coxa III with 3 setae. Parasubterminala on leg I absent ; subterminala based on a hump-like protuberance.

The new species is close to *Neoschoengastia entomyza* Womersley, 1952 and *N. thomasi* (Radford 1946). The differences are tabulated below :

	longipes	*entomyza*	*thomasi*
Palpal formula	B/B/BNB + 7BS	B/B/BNB + 7BS	B/B/BBB + 7BS
Dorsal setae	2,6,6,4,6,4,2	2,8,6,4,4,2	2,6,6,6,2(4)2(0)
AM, AL and PL measurements in μ	35, 68, 57	31, 36, 46	36, 56, 54
Scutal punctae	posterior region	anterior region	ant. & post. region
Placement of AL setae	marginal	submarginal	submarginal
Ratio of length/ height, tarsi I-III	5.3, 6.0, 10.0	3.3, 3.5, 6.0	3.4, 3.9, 6.3

Description of larva. — Color in life orange ; idiosome of engorged larva large, 970 × 640 μ, brodaly elongate with slight medial contriction. Eyes 2 + 2, round, strongly sclerotized ; anterior eye approximately 3 × diameter of posterior eye.

Gnathosome. Cheliceral base elongate, minutely punctate, blade 32 μ long with a sharp dorsal and a ventral tooth. Palpal formula B/B/BNB + 7BS, seta on femur and genu long and bipectinate, dorsotibial seta slender with fewer barbs, ventro-



FIGS. 1-8. — *Neoschoengastia longipes* n. sp., larva.

1. Dorsal and ventral aspects of idiosome ; 2. Scutum ; 3 and 4. Dorsal and ventral aspects of gnathosome ; 5, 6 and 7. Legs I, II and III ; 8. Humeral, dorsal, ventral and caudal setae.

tibial seta slender with long, tapering barbs ; and dorsolateral seta on tibia slender and nude ; on tarsus dorsal seta stout and brush-like, a pectinate dorsolateral seta, 5 pectinate ventral setae and a subapical, nude seta. Claw 3-pronged, axial prong 24 μ and 2 unequal accessory prongs. Galeal seta barbed. Gnathosomal coxa with few sparsely distributed punctae and a pair of long barbed setae.

Scutum somewhat quadrate in shape ; anterior margin markedly sinuate, lateral margins slightly arcuate and posterior margin completely submerged by cuticular striations ; pattern of striations on scutum as figured. AL and PL setae strongly bipectinate, AM seta more so. AL setae almost 2 × as long as AM seta, PL slightly shorter than AL setae. AL setae inserted on anterolateral corners, not submarginal. SB small, wide apart and inserted nearer AL than PL setae ; sensillae globose and densely covered with minute setules (sensillae dark brown in alcohol specimens. Punctae few and sparingly distributed in posterior region and in between sensillary bases.

Standard data, in micra, of *N. longipes*.

	AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	Sens.
Holotype	51	80	32	21	24	34	31	69	59	36 × 19
Mean of 11.....	53	86	31	23	26	33	35	68	57	34 × 19

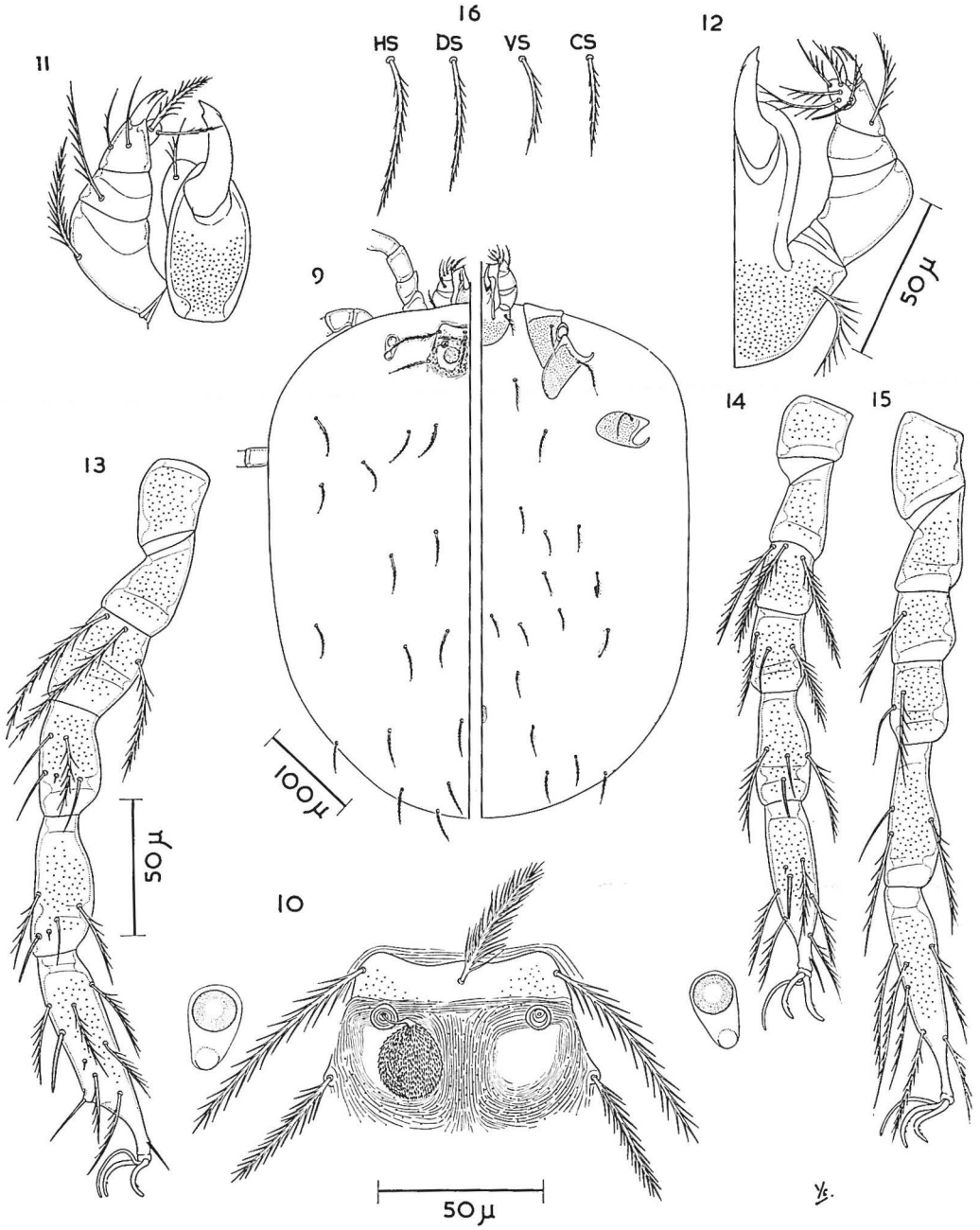
Body setae : HS 49 μ ; DS 44-46 μ ; VS 30-34 μ ; CS 40 μ long. HS and DS 30 in number, regularly arranged 2,6,6,4,6.4,2. Ventral setae 12-14 in number plus 8-10 caudal setae.

Legs : 7-7-7 segmented, segments long and slender, Ip 1140-1230 μ. Coxae and other segments sparsely but distinctly punctate. Coxa III with 3 setae. Empodia of legs slender and sickle-shaped. Claws of normal contour, with rows of very short, fine setules on their inner margins. Ordinary setae vary in length and texture ; those on telofemur I longest (up to 70 μ) and bipectinate. Measurements, type and number of sensory and barbed setae as follows :

Leg I : 410-460 μ long. Tarsus plus pretarsus 90-102 × 18-19 μ. Tarsala slender and blunt, 16 μ long ; a short microtarsala proximal to base of tarsala ; a nude subterminala based on a hump-like protuberance of tarsus (8 μ high), nude parasubterminala lacking ; one pretarsala and 17 barbed setae. 2 tibialae, a microtibiala grouped together on extreme distal portion of segment, and 7 barbed setae. 3 genualae, a microgenuala and 4 barbed setae. Telofemur with 5, basifemur with 1, trochanter with 1, and coxa with 1 barbed setae respectively.

Leg II : 357-370 μ long. Tarsus plus pretarsus 88-102 × 17 μ ; a tarsala more slender and rounded at tip than tarsala I, 18 μ long, a microtarsala closely proximal to tarsala, a pretarsala and 13 barbed setae. 2 tibialae close together and inserted at extreme distal portion of segment, plus 6 barbed setae. One genuala and 4 barbed setae. Remaining segments with 4, 2, 1, 1 barbed setae.

Leg III : 380-400 μ long. Tarsus plus pretarsus 140 × 14 μ, with distal half of segment attenuated, height of tarsus at narrowest point only 9 μ. Nude masti-



FIGS. 9-16. — *Neoschoengastia solitus* n. sp., larva.

9. Dorsal and ventral aspects of idiosome ; 10. Scutum ; 11 and 12. Dorsal and ventral aspects of gnathosome ; 13, 14 and 15. Legs I, II and III ; 16. Humeral, dorsal, ventral and caudal setae.

tarsala lacking, replaced by a long (80 μ) outstanding barbed seta, nude and tapering distally ; and 13 other barbed setae. One tibiala and 6 barbed setae. One genuala and 3 barbed setae. Remaining segments with 3, 2, 1 barbed setae. Coxa with 3 barbed setae inserted along its anterior margin (4 on right coxa of holotype).

Type material : Holotype, larva, V181(5), ex bird, *Saxicola ferrea*, Nan, Ban Pha Hang, Thailand, 13-XII-1961. Coll. J. E. SCANLON and K. THONGLONGYA. 18 paratypes from same locality as holotype, as follows : 3 same data as holotype ; one ex *Copsychus malabaricus*, 30-XI-1961 ; 4 ex *C. malabaricus*, 5-XII-1961 ; 2 ex *C. malabaricus*, 11-XII-1961 ; 2 ex *C. malabaricus*, 16-XII-1961 ; 2 ex *C. saularis*, 13-XII-1961 ; one ex *Hemipus picatus*, 1-XII-1961 ; one ex *Luscinia cyane*, 11-XII-1961 ; 2 ex *Monticola solitaria*, 12-XII-1961.

Additional material examined : 106 specimens from Thailand, Nan, Ban Pha Hang, as follows : 5 ex 2 *Anthus hodgsoni*, 11 & 13-XII-1961 ; 37 ex 5 *Copsychus malabaricus*, Nov. & Dec., 1961 ; 8 ex *C. saularis*, 13-XII-1961 ; 4 ex *Coracias benghalensis*, 6-XII-1961 ; one ex *Centropus sinensis*, 12-XII-1961 ; 2 ex *Glaucidium cuculoides*, 16-XII-1961 ; one ex *Hypothymis azurea*, 10-XII-1961 ; 3 ex *Hemipus picatus*, 1-XII-1961 ; 2 ex *Luscinia cyane*, 11-XII-1961 ; 2 ex *Monticola solitaria*, 12-XII-1961 ; 3 ex 3 *Muscicapa hainana*, 4 & 13-XII-1961 ; 3 ex *Phylloscopus fuscatus*, 6-XII-1961 ; 5 ex *Pomatorhinus hypoleucos*, 4-XII-1961 ; 11 ex 2 *Saxicola ferrea*, 13-XII-1961 ; 3 ex *Copsychus malabaricus*, Nan, Ban Sa Liek, 24-XI-1961. All collections by J. E. SCANLON and K. THONGLONGYA for SEATO Medical Research Laboratory, Bangkok, Thailand.

Neoschoengastia thomasi (Radford)
(fig. 17)

= *Paraschongastia thomasi*, Radford, 1946.

Redescription of larva (based on type specimen) : Unfed larva 210 μ × 200 μ, globular. Eyes 2 + 2, round, placed on ocular shield, anterior eye bigger and lens-like. *Gnathosome :* Cheliceral blade 34 μ, slender, with a blunt dorso-apical tooth and a pointed inner tooth. Palpal formula B/B/BbB + 7BS, lateral and ventral setae least developed compared to other palpal setae ; lateral seta fine, with 2 barbs. Claw three-pronged, accessory prongs subequal, slender and reach only half the length of axial prong. Palpal coxa distinctly punctate. *Scutum* : subquadrate, with numerous minute punctae in the anterior region and fewer along posterior margin. Anterior lateral margin strongly sinuate, and form lateral shoulders. Parallel striations anterior of SB join up to form a solid semicircular ridge. AL setae placed below anterior lateral shoulders, not marginal ; PL setae placed at postero-lateral corners. PL and AL setae subequal in length (AL 56 μ, PL 54 μ), strongly developed, bearing long barbs from base to tip. AM seta shortest (36 μ) very strongly developed with numerous long barbs, barbs at base being longer than those at the tip. Sensillae globose, and densely covered with minute setules.

Standard data of type, in micra, of *N. thomasi* :

AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	Sens	
48	71	28	21	25	33	36	56	54	28	(21 × 22)

Body setae : Dorsal setae 24 (HS 56 μ, DS 46 μ) arranged 2,6,6,6,2 (4),2(0). On ventral aspect 2 pairs of sternal setae, 12 ventral setae (26 μ) plus 12 caudal setae. *Legs :* Sensory and feathered setae as described for *longipes*. Punctae of coxa I to III are few and scattered. Measurements of tarsi I to III as follows : 85 μ × 25 μ (ratio 3.4), 78 μ × 20 μ (ratio 3.9), 108 μ × 17 μ (ratio 6.3 μ). Hump-like protuberance on tarsus I similar to *longipes*. Claw armed with even rows of minute setae.

Neoschoengastia entomyza Womersley, 1952
(fig. 18)

Redescription of larva (based on a paratype) : Fed larva 560 μ × 390 μ, broadly elongate. Eyes 2 + 2, round, anterior eye 2 × diameter of posterior eye. *Gnathosome :* (cheliceral blade broken), galeal seta slender with 5 barbs. Palpal formula B/B/BNB + 7BS, setae on femur, genu and dorsal tibia strong and heavily barbed, seta on genu being the longest (54 μ), lateral seta nude. Claw slender (22 μ), 3-pronged, an axial prong, and 2 subequal prongs which reach two-thirds the length of axial prong. Palpal coxa distinctly, but sparsely punctate. *Scutum* as figured, trapezoidal, anterior lateral margin strongly sinuate forming anterior lateral shoulders, posterior margin overlapped by cuticular striations, lateral margins slightly curved inward. Punctae few, distinct and confined to anterior region of scutum. PL>AL>AM. AL setae inserted distinctly below antrolateral corners, not marginal.

Standard data of paratype, in micra, of *N. entomyza*.

AW	PW	SB	ASB	PSB	A-P	AM	AL	PL	Sens	
46	75	29	23	26	34	31	36	46	30	(20 × 25)

Body setae : Dorsal setae (HS 31 μ, DS 29 μ) arranged 2,8,6,4,4,2. In the first row four medial setae are arranged close to each other in almost straight line. Two setae on either flank are lower and placed wide apart. Two pairs of sternal setae, 12 ventral setae (17 μ) plus 8 caudal setae.

Legs : 7-7-7 segmented. Sensory and feathered setae of legs I, II and III as described for *longipes*. Measurements of tarsus I 85 μ × 26 μ = ratio 3.3, tarsus II 81 μ × 23 μ = ratio 3.5, tarsus III 110 μ × 19 μ = ratio 6.0. A medial constriction on tarsus III present. Claws of leg I, II and III armed with minute hairs on inner side. On tarsus I hump-like protuberance not very significant. Parasubterminala absent.

Material examined : One paratype labelled "*Neoschongastia entomyza* n. sp. ex. Lousy Jack ; loc : Buckleton C.Q., 18-XI-1948. Det. H. WOMERSLEY."

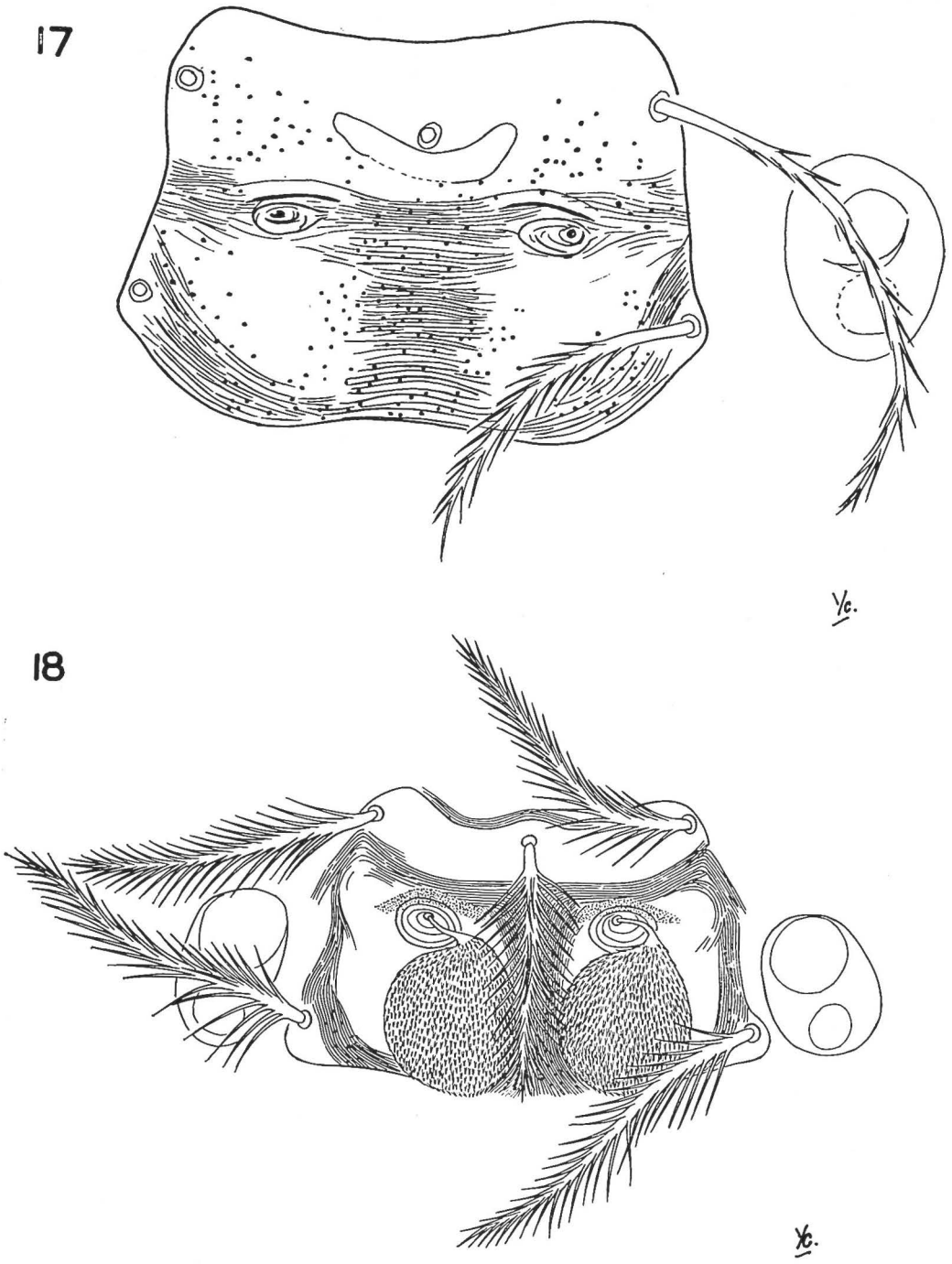


FIG. 17. — *Neoschoengastia thomasi* (Radford), scutum of larva.
FIG. 18. — *N. entomyza* Womersley, scutum of larva.

Neoschoengastia solitus n. sp.

(figs 9-16)

Diagnosis of larva : Palpal formula B/B/NbB + 7B ; claw 3-pronged ; galeal seta barbed. Scutum roughly subquadrate ; cuticular striae run in concentric circles around SB and from right to left in parallel lines anterior of SB, but extending less than halfway between SB and anterior margin of scutum. Sensillae globose. DS 32-34, arranged 2,8,6,4(6),6,4,2. Legs 7-7-7 segmented ; Ip 830-875 μ ; tarsus + pretarsus III 74-78 × 17-18 μ. Coxa III with one seta ; parasubterminala absent. An outstanding basally barbed seta instead of nude mastitarsala present on tarsus III.

Near *N. struthidia* Womersley, 1952, the new species is separated (1) in having dissimilar pattern of scutal striation ; (b) galeal seta barbed instead of nude ; (c) dorsotibial seta nude instead of barbed ; (d) absence of subterminal on palpal tarsus ; (e) difference in dimensions of scutum and scutal setae ; (f) difference in dimensions of leg tarsi I-III.

Description of larva : Colour in life light orange. Idiosome of engorged larva large, 990 × 500 μ, broadly elongate with slight medial constriction. Unfed larva globose, 230 × 210 μ. Eyes 2 + 2, on ocular plate, anterior eye big, round and oculate ; posterior eye small, and less oculate.

Gnathosome : Cheliceral blade 35 μ long, with a prominent subapical tooth on ventral aspect and 2 subapical teeth of unequal size on dorsal aspect. Palpal formula B/B/NbB + 7B ; seta on femur, genu and ventral aspect of tibia strongly barbed, dorsolateral seta of tibia slender with 1-2 barbs ; on palpal tarsus, one brush-like dorsal seta, a strongly barbed dorsolateral seta and 5 barbed, ventral setae. Claw 3-pronged, axial prong 15 μ long ; one of the accessory prongs equal to axial prong in length, the other half the length of axial prong. Galeal seta slender and weakly barbed. Gnathosomal coxa densely punctae with minute pittings and with a pair of pectinate setae.

Scutum subquadrate with very prominent anterolateral shoulders. Cuticular striae extend only slightly anterior of SB, so that remaining anterior region devoid of striae ; anterior striae run from right to left in parallel lines, and in concentric circles round SB ; posterior margin of scutum submerged. Punctae of unequal size, sparsely distributed, absent round AM seta and posterior medial margin. Sensillary bases small and wide apart, closer to ALs than to PLs. AL and PL setae strongly barbed, AM seta more so. AL setae inserted submarginally.

Standard data, in micra, of *N. solitus*.

	AW	PW	SB	ASB	PSB	SD	AP	AM	AL	PL	Sens.	
Holotype	59	80	46	20	32	52	33	44	76	47	32	(20 × 20)
Mean of 7	59	82	46	23	34	57	33	46	75	50	33	(21 × 20)

Body setae : HS 44 μ ; DS 40 μ ; VS 25 μ ; CS 32 μ long. Humeral and dorsal setae strongly ciliated, 32-34 in number arranged 2,8,6,4(6),6,4,2 ; posterior setae irregularly arranged. Ventral setae pectinate, 16 in number plus 6 caudal setae. Sternal setae 2 + 2 ; anterior pair longer than posterior pair.

Legs : 7-7-7 segmented ; Ip 830-875 μ. Coxae I-III densely punctate, remaining leg segments with fewer punctae. Coxa III with a single seta. Terminal claws with 1 or 2 very fine spicules on their inner distal portion. Empodia only slightly thinner than claws. Barbed setae on trochanter longest (60 μ) and more pectinate. Measurements, type and number of sensory and barbed setae as follows :

Leg I : 285-302 μ long. Tarsus plus pretarsus 75-78 × 21-23 μ. Tarsala blunt, 23 μ long ; a short microtarsala distal to base of tarsala, a nude subterminala (parasubterminala lacking), a pretarsala and 18-20 barbed setae. 2 tibialae and microtibiala on distal portion of tibia plus 8 barbed setae. 3 genuala, a microgenuala and 4 barbed setae. Remaining segments with 5,1,1 barbed setae.

Leg II : 243-258 μ long. Tarsus + pretarsus 60-62 × 17-20 μ. Tarsala blunt and as thick as tarsala I, but only 16 μ long ; a microtarsala proximal to tarsala, a pretarsala and 16-17 barbed setae. 2 tibialae in tandem and 6 barbed setae. One genuala and 3 barbed setae. Remaining segments with 4,2,1,1 barbed setae.

Leg III : 302-315 μ. long Tarsus + pretarsus 74-78 × 17-18 μ. A long basally barbed seta (58 μ) present in place of nude mastitarsala ; 14 ordinary setae. One tibia and 6 barbed setae. One genuala and 3 barbed setae. On basifemur 3 barbed setae one of which is 60 μ long and distally nude. Remaining segments with 2,1,1 barbed setae. Coxa with a single seta inserted on anterior margin.

Type material : Holotype, V120-3-d, ex bird, *Pomatorhinus hypoleucos*, Nan, Ban Pha Hang, Thailand, 4-XII-1961. Coll. J. E. SCANLON and K. THONGLONGYA. 7 paratypes with same data as holotype.

Additional material : Data for 7 damaged specimens from Nan, Ban Pha Hang, Thailand as follows : 3 ex *Saxicola ferrea*, 13-XII-1961 ; 2 ex *Pomatorhinus hypoleucos*, 4-XII-1961 ; and 2 ex *Copsychus malabaricus*, 16-XII-1961. Coll. J. E. SCANLON and K. THONGLONGYA.

Neoschoengastia struthidia Womersley, 1952.

Redescription of larva (based on a single paratype) : Partially engorged larva 460 μ × 410 μ, broadly oval, without medial constriction. Eyes 2 + 2, anterior eye big and oculate.

Gnathosome : Cheliceral blade 45 μ long ; dorso-apical tooth blunt. Palpal formula B/B/bBB + 7BS ; setae on femur and genu strongly barbed, seta on genu being the longest (59 μ) ; dorsotibial seta fine with 2 or 3 barbs, dorsolateral and ventral setae with several fine barbs ; on palpal tarsus 1 stout brush-like dorsal

seta, 1 plumose lateral seta, 5 barbed setae and 1 nude subapical subterminala on ventral aspect. Claw 3-pronged, axial prong 25 μ long and 2 unequal accessory prongs both shorter than axial prong. Galeal seta nude. Punctae on palpal coxa deep, fairly big and sparsely distributed.

Scutum : Cuticular striations few and not forming concentric circles, but striations run in parallel lines from right to left, posterior striations form a semicircle and are separated from anterior striations. Posterior margin of scutum discernable and biconcave. Punctae of two sizes, unevenly distributed, the region of AM above lines of ALs and sensillary pits below SB devoid of punctate. Standard data, in micra, of single paratype examined : AW 72, PW 85, SB 42, ASB 32, PSB 32, A-P 34, AM 57, AL 85, PL 51, Sens 32 with head 24 × 24.

Body setae : Dorsal setae (HS 58, DS 44) arranged 2,8,6,6,4,2(4),2 in transverse rows. Two pairs of sternal setae (ant. pair 52 μ), 14 ventral setae (31 μ) plus 10 caudal setae.

Legs : 7-segmented. Sensory and feathered setae as follows : *Leg I :* 3 genualae, one microgenuala, 2 tibialae, one microtibiala, one stout tarsala (18 μ), one microtarsala placed in front of tarsala, a subterminala, parasubterminala lacking, one pretarsala. Feathered setae : Coxa : 1, Trochanter : 1, basifemur : 1, telofemur : 4, genu : 4, tibia : 7, tarsus : 20-22. *Leg II :* one genuala ; two tibialae in tandom ; one short, slender tarsala (14 μ) ; one microtarsala placed behind tarsala ; one pretarsala. Feathered setae ; 1,1,2,4,3,6,16-17. *Leg III :* one genuala, one tibiala. Feathered setae : 1,1,2,3,3,6,13-14. Measurements of tarsi I, II, and III as follows : 100 μ × 28 μ, 85 μ × 28 μ, 110 μ × 25 μ.

Material examined : one paratype labelled as follows : " Paratype — *Neoschongastia struthidia* n. sp. on Lousy Jack, Loc : Logan Downs, Clermont Q., 28.11.44., D. A. Gill, Det. H. Womersley. "

REFERENCES

Radford (C. D.), 1946. — New species of larval mites (Acarina : Trombiculidae) from Manipur, India. Proc. Zool. Soc. London. **116** : 247-65.

Womersley (H.), 1952. — The scrub-typhus and scrub-itch mites of the Asiatic-Pacific region. Rec. S. Aust. Mus. **10** : 1-435, 118 pls.