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DESCRIPTIONS OF FIVE NEW TEINOCOPTES (Acarina: Sarcoptiformes) WITH A KEY TO THE KNOWN SPECIES[1]

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Abstract: Five new species of *Teinocoptes* (Acarina: Sarcoptiformes) from West New Guinea and the Solomon Islands are described and illustrated. A key to the females of the known species is provided. Additional host and locality records are given for *Teinocoptes asiaticus* Fain & Domrow, 1961 and *Teinocoptes domrowi* Fain, 1960. The known range of the genus is extended to West New Guinea, the Solomon Islands, and the Philippine Islands.

Recent collections made by Bishop Museum teams in various parts of the Pacific have yielded a wide variety of interesting ectoparasitic arthropods. We take this opportunity to describe five new species of teinocoptid mites taken from bats of the family Pteropodidae, and also to add new host and locality records for two species described previously. Insofar as known, teinocoptid mites are restricted to pterodid bats as hosts and have been recorded previously from Africa, Malaya, and Australia. The material included in the present study extends the range of one of the Malayan species, *Teinocoptes asiaticus* Fain & Domrow, 1961, to the Philippine Islands and the distribution of the Australian species, *Teinocoptes domrowi* Fain, 1960, to West New Guinea. The species described as new in this paper were collected in West New Guinea and the Solomon Islands.

We wish to express our sincere appreciation to Dr. Hobart M. Van Deusen of the American Museum of Natural History for his generous assistance in providing rapid and accurate host identifications. Also, thanks are due Dr. J. L. Gressitt whose prominent leadership of the Bishop Museum Entomology Program has made this study possible.

KEY TO THE FEMALE TEINOCOPTES

1. Dorsal surface completely striated 2
   Dorsal surface partially scaled 4
2 (1). Perianal and ventrolateral setae short and trifed ..... **domrowi**
   Perianal and ventrolateral setae never trifed although perianal setae may suggest a bipartite condition 3
3 (2). Body about as long as wide; 1 pair of ventrolateral setae ..... **auricularis**
   Body about 2× as long as wide; 2 pairs of ventrolateral setae ..... **eidoloni**

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4 (1). Dorsal scaly area covers entire dorsal surface of posterior opisthosoma...**asiaticus**
Posterior portion of dorsal opisthosoma traversed by smooth striations; dorsal scaly area never extending posteriorly to anal region.....5
5 (4). With 3 pairs of short setae surrounding anus and 1 pair of similar setae on dorsum 60–100 μ anterior to anus ..... **aingworthi**
With 4 pairs of setae in immediate anal area 6
6 (5). Three pairs of dorsal anal setae and 1 pair of ventral anal setae.....**wilsoni**
Anal setal arrangement differing from above 7
7 (6). Anal setae situated in 2 longitudinal rows on either side of posterior opisthosoma ..... **katherinae**
Anal setal arrangement differing from above..... 8
8 (7). Dorsal scaly areas widely separated along midline; triangular scales with heavily sclerotized tips and separate bases ..... **strandtmanni**
Dorsal scaly areas from either side joined along midline; scales not triangular nor heavily sclerotized 9
9 (8). Perianal setae long and thin..... 10
Perianal setae stout and lanceolate..... 11
10 (9). Dorsal scaly areas from either side united medially by only a few scales; larva without dorsal scales ..... **malayi**
Dorsal scaly areas from either side well joined medially; larva with dorsal scales... ..... **epomophori**
11 (9). Distance from anterior to posterior margin of dorsal scaly area measured midway between midline and lateral idiosomal margin greater than 45 μ..... ..... **vandeuseni**
This distance much less than 45 μ.....12
12 (11). Body shape conical; bursa relatively short (70–105 μ); larva with 38–47 dorsal scales..... **astridae**
Body shape elliptical; bursa quite long (195–240 μ); larva with 22–30 dorsal scales..... **rousetti**

Teinocoptes asiaticus Fain & Domrow, 1961

This species was originally described from specimens collected on *Cynopterus brachyotis* taken at Rantau Panjang, Selangor, Malaya (Fain & Domrow, 1961) and subsequently recorded from *Macroglossus* sp. captured in the Fort Betis forest, Ulu Kelantan, Malaya (Fain & Nadchatram, 1962). Bishop Museum's collection contains additional material collected in the Philippine Islands on the type host, *Cynopterus brachyotis*, by M. Thompson as follows:

20 specimens; Macagua, Brooks Point, Palawan I.; BBM-1047, 1050, 1052, 1065, 1069, 1072 and 2000; 3–5. IV. 1962. 9 specimens; Minagas Point, Dalawan Bay, Balabac I.; BBM-2906; 1. V. 1962. 12 specimens; Tarabanan, Conception, 73 km N, Puerto Princesa; BBM-2442; 17. V. 1962. 14 specimens; 6 km NE San Nicholas, Busuanga I.; BBM-2479–80; 21. V. 1962.

Teinocoptes domrowi Fain, 1960.

This species was originally described from specimens collected on *Pteropus conspicil-*

latus taken near Inisfail, North Queensland, Australia (Fain, 1960). Bishop Museum's collection contains additional material collected in NW New Guinea by L. & S. Quate from the following hosts and localities:

6 specimens; Archbold Lake, 760 m; BM–NG 453; 1. XII. 1961; ex *Syconycteris* sp.
12 specimens; Vogelkop, Kebar; BM–NG 809; 20. I. 1962; ex *Syconycteris crassa papuana.*
20 specimens; Vogelkop, Kebar; BM–NG 851; 25. I. 1962; ex *Syconycteris* sp.

Teinocoptes aingworthi Mitchell & Fain, n. sp. Fig. 1.

Diagnosis: This species is well differentiated from related species by the presence of 3 pairs of very small setae in the immediate anal area and 1 pair of dorsal anal setae displaced anteriorly 60–100 μ. Also, the presence of a small laterodorsal scaly area and a poorly sclerotized retrovulvular area are diagnostic.

Female: Body elongate, parallel-sided, with flattened anterior portion bearing legs, mouthparts and genital aperture. Posterior portion of opisthosoma gently rounded and encircling anal opening. Length of idiosoma 630 μ in holotype, 550–825 in 12 paratypes and averaging 669 μ. Body widtn 342 μ at level of coxae III in holotype, 340–383 in 10 paratypes and averaging 357 μ. Holotype contains 9 unembryonated eggs and 2 larvae. *Dorsum*: Four pairs of very small, short spines situated in anterior 1/4 of idiosoma and disposed in 2 transverse rows. Extending posteriorly from posterolateral spine is a small scaly area which continues for a short distance and then blends in with smooth striations which traverse remainder of dorsum. Scaly area does not join along midline. One pair of dorsal anal setae situated along edge of non-striated cuticle surrounding anus. Second pair of dorsal anal setae displaced 60–100 μ anteriorly and situated ca. equidistant from midline and lateral idiosomal margin. Both dorsal and ventral anal setae very short, measuring 3–6 μ in length. Bursa copulatrix follows a sinuous course looping upon itself once or twice en route to a vesicular pouch located ca. 80 μ from an external papilla situated on dorsal side of anus. *Venter*: Two pairs of very small, short spines located ventrally at same level as posterior row of dorsal spines. Two pairs of large ventrolateral setae located just anterior to posterior 1/2 of idiosoma average 75 μ in length in holotype. Anterior and lateral to anterolateral seta is a small patch of scales situated in 6–9 rows and bearing 1–6 scales per row with median rows having greatest number of scales. A small depression leads forward from this scaly area to base of coxa III where depression expands and terminates. Retrovulvular area lightly sclerotized and lacking striations although it may be wrinkled. Leg IV vestigial and represented by a short spine.

Nymph: Two nymphs measure 402 μ long by 175 μ wide and 327 μ long by 190 μ wide respectively. This stage is morphologically similar to adult ♀ except for smaller size and absence of sexual characters.

Larva: Length of 2 free larvae is 131 and 150 μ with widths of 98 and 114 μ respectively. Larva similar to *T malayi* Fain & Nadchatram, 1962 in lacking dorsal scales.

Male: Unknown.

Holotype ♀ (BISHOP 3420), Archbold Lake, Central Mts., 760 m, NW New Guinea; 26. XI–3. XII. 1961; ex Tube-nosed fruit bat, *Nyctimene* sp. (Pteropodidae); collectors L. & S. Quate. Twelve paratype ♀♀, 2 nymphs and 5 larvae, same data as holotype. This mite is named in honor of Professor Helen Aingworth, Dept. of Biology, Northeastern State

College, Tahlequah, Oklahoma. Paratype ♀♀, nymphs and larvae in Bishop Museum and authors' collections.

Teinocoptes wilsoni Mitchell & Fain, n. sp. Fig. 2.

Diagnosis: This species differs from related species by having 1 pair of ventral anal setae displaced dorsally and consequently having 3 pairs of setae surrounding the anus dorsally with only 1 pair of anal setae ventrally. No sclerotized retrovulvular area nor verrucous area around coxae III. Distinguished from African species by having dorsal scaly area more developed in length.

Female: Body elongate, parallel-sided, with flattened anterior portion bearing legs, mouthparts and genital aperture. Opisthosoma tapering posteriorly and terminating in a truncate portion which, in dorsoventral mounts, gives a bilobed appearance due to slight invagination of anal orifice. Specimens examined tended to be somewhat laterally compressed and consequently many were mounted laterally rather than dorsoventrally. Length of idiosoma 843 μ in holotype, 497–1514 in 10 paratypes and averaging 1072 μ. Body width 292 μ at level of coxae III in holotype, 307–334 in 3 paratypes and averaging 321 μ. Dorsoventral distance at level of coxae III for those specimens mounted laterally measures 206–344 μ in 7 paratypes and averages 298 μ. Six paratypes contain 25–45 unembryonated eggs. One paratype contains 13 larvae in addition to approximately 30 unembryonated eggs. *Dorsum*: Four pairs of very small, short spines situated in anterior 1/4 of idiosoma and disposed in 2 transverse rows. Scaly area extending posteriorly on either side from region of posterolateral spines. Scaly areas from each side in close proximity along midline but do not join. Three pairs of anal setae ca. 20 μ ln length situated dorsolaterally with respect to anal orifice. Anteriormost pair located medially to other 2 pairs, whereas posterior pair is lateral to other 2 pairs. Bursa copulatrix loops upon itself once or twice en route to a vesicular pouch located 90–150 μ from an external papilla situated on dorsal side of anus. External papilla averages 22 μ in length and ranges from 20–25 μ in 9 paratypes. Two shallow furrows are located one on either side of coxa II and extend posteriorly for a short distance. These are best observed on laterally mounted specimens. *Venter*: Two pairs of very small, short spines located ventrally at about same level as posterior row of dorsal spines. Medial pair located somewhat anteriorly to lateral pair. Length of 2 pairs of large ventrolateral setae averages 56 μ in 7 paratypes and ranges from 40–70 μ. Only 1 pair of anal setae on venter. Ventral anal setae measuring ca. 7 μ in length, being approximately 1/3 as long as dorsal anal setae. Retrovulvular area nonsclerotized and traversed by smooth striations. Small furrow extending posteriorly from coxa III to area near anterior ventrolateral seta. Posterior portion of furrow contains 10–20 rows of small scales with 1–3 scales per row. Leg IV vestigial, represented by a small spine located anteriorly and medially to coxa III.

Larva: Three larvae within ♀ brood chamber average 97 μ in length and 74 μ in width. Dorsum of larva bearing 30–40 small triangular scales.

Nymph and Male: Unknown.

Holotype ♀ (BISHOP 3421), Nabire, ca. 5 m S Geelvink Bay, NW New Guinea; BBM–NG 21718; 8. IX. 1962; ex Spinal-winged fruit bat, *Dobsonia moluccensis magna* (Pteropodidae); collector N. Wilson. Ten paratype ♀♀ and 13 larvae, same data as holotype. This mite is named in honor of Dr. Nixon Wilson, Acarologist, Bishop Museum. Paratype

♀♀ and larvae in Bishop Museum and authors' collections.

Teinocoptes strandtmanni Mitchell & Fain, n. sp. Fig. 3.

Diagnosis: Well differentiated from related species by unequal size of ventrolateral setae; shape of dorsal scales which are apparently true scales well separated from each other; large size of posterior end of vesicular pouch with its "W" shaped appearance at point of union with bursa copulatrix; and presence of a lightly sclerotized retrovulvular area.

Female: Body sub-conical, with flattened anterior portion bearing legs, mouthparts and genital aperture. Opisthosoma tapering posteriorly and terminating in small, truncate anal area. Length of idiosoma 548 μ in holotype, 527–602 in 7 paratypes and averaging 567 μ. Idiosomal width measured at widest point (slightly posterior to level of coxae III) 258 μ in holotype, 254–290 in 6 paratypes and averaging 277 μ. Holotype contains 11 unembryonated eggs and 2 larvae. Seven unembryonated eggs average 111 μ in length and 65 μ in width with ranges of 80–128 and 42–75 μ respectively. *Dorsum*: Four pairs of very small, short spines situated in 2 transverse rows along anterior portion of dorsum. Surrounding posterolateral spine and extending posteriorly is a scaly area consisting of small triangular scales with well sclerotized tips and separate bases. This scaly area extends laterally and ventrally to outer margin of ventral surface, terminating in area between ventrolateral setae. Scaly areas on each side of dorsum separated medially by distances ranging from 83–105 μ in 5 specimens. Length of 2 pairs of dorsal anal setae ca. 10 μ. All anal setae inflated, and some suggest a bipartite condition at their tips. Convoluted bursa copulatrix connects to a vesicular pouch located 35–60 μ from an external papilla situated on dorsal side of anus. Papilla measures 10–15 μ in 7 paratypes. Spherical vesicular pouch has thin membranous walls except for stalk which has thickened walls. Stalk invaginates to admit bursa copulatrix thus presenting a "W" shaped appearance. *Venter*: Retrovulvular area lightly sclerotized. Leg IV vestigial and represented by a short spine located medially to coxa III. Lateral to legs III is a pair of setae approximately 2× as long as spine representing leg IV. Slightly anterior and medial to coxae III is another pair of setae which is about equal in length to spine representing leg IV. Shallow furrow extends posteriorly from coxa III to an area just lateral to anterior ventrolateral seta. Posterior portion of furrow may have a few rows of small scales with 1–3 scales per row. Remainder of venter traversed by coarse striations, i. e. striae are 3–4 μ apart. Two pairs of flattened, blade-like ventrolateral setae have dark inner cores. Anterior pair roughly 2× as long as posterior pair. Fifteen anterior ventrolateral setae averaged 41 μ in length and ranged from 38–48 μ. Eight posterior ventrolateral setae averaged 20 μ in length and ranged from 17–22 μ. Two pairs of ventral anal setae similar to dorsal anal setae in size and shape.

Larva: Five larvae in ovo averaged 93 μ in length and 68 μ in width with ranges of 86–100 and 64–72 μ respectively. Only 2 larvae were in position satisfactory for observing their dorsal surfaces. These 2 specimens bore 19 and 21 small triangular scales on their dorsal surface.

Nymph and Male: Unknown.

Holotype ♀ (BISHOP 3422), Nabire, ca. 5 m S Geelvink Bay, NW New Guinea; BBM–NG 21718; 8. IX. 1962; ex Spinal-winged fruit bat, *Dobsonia moluccensis magna* (Pteropo-

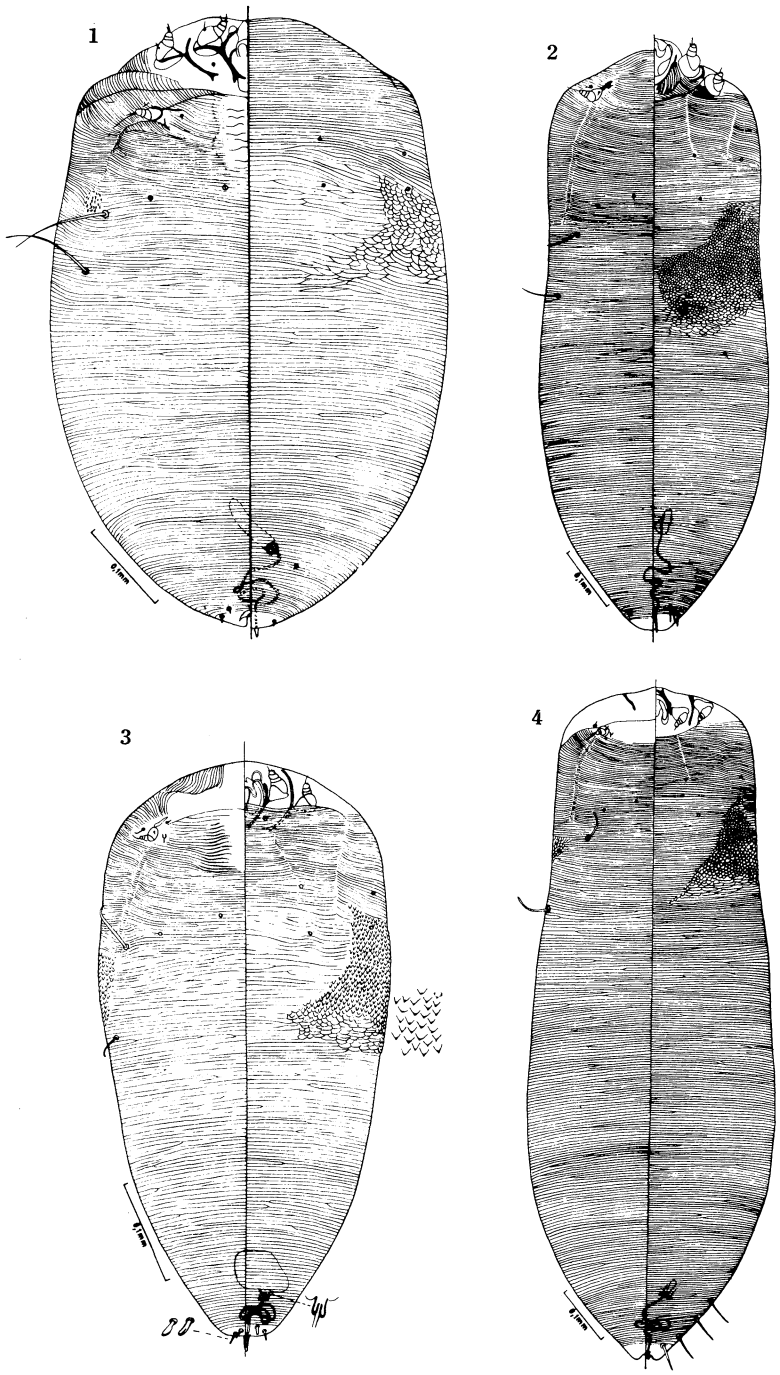
didae); collector N. Wilson. It is interesting to note that *T. wilsoni* and *T. strandtmanni* are described from material collected not only from the same species of host, but also from the same individual host! Seven paratype ♀♀ and 9 larvae in ovo, same data as holotype. This mite is named in honor of Dr. R. W. Strandtmann visiting Acarologist at Bishop Museum. Paratype ♀♀ and larvae in Bishop Museum and authors' collections.

Teinocoptes katherinae Mitchell & Fain, n. sp. Fig. 4.

Diagnosis: This species is well differentiated from related species by the unique arrangement of anal setae which are situated along each side in 2 longitudinal planes. Also, poorly developed dorsal scaly area which does not join along midline and lack of sclerotized retrovulvular area are diagnostic.

Female: Body elongate, cylindrical, with flattened anterior portion bearing legs, mouthparts and genital aperture. Opisthosoma tapering posteriorly and encircling anal opening. Length of idiosoma 1083 μ in holotype, 904–984 in 5 paratypes and averaging 944 μ. Although holotype exceeds length of longest paratype by 99 μ it is nonetheless most representative specimen of series. Body width 317 μ at level of coxae III in holotype, 285–317 in 5 paratypes and averaging 301 μ. Holotype ♀ contains 9 well developed larvae plus several unembryonated eggs. A single paratype ♀ contains 9 well developed larvae and 38 unembryonated eggs. Five unembryonated eggs average 68 μ in width and 126 μ in length with ranges of 60–74 and 120–136 μ respectively. *Dorsum*: Four pairs of very small, short spines situated in anterior 1/5 of idiosoma and disposed in 2 transverse rows. Surrounding posterolatetal spine and extending posteriorly is a small scaly area which continues for a short distance and then blends in with smooth striations traversing remainder of dorsum. Scaly area does not join along midline. For convenience, 4 pairs of anal setae are referred to as anal setae I, II, III, and IV, beginning with posteriormost pair and numbering anteriorly. Anal setae II and III situated somewhat laterally to anal setae I and IV so that anal setae lie in 2 longitudinal planes parallel to each other, i. e. anal setae I and IV in one plane and anal setae II and III in other. All anal setae similar in length and measuring ca. 45 μ. Distance between anal setae I and IV averages 108 μ for 5 specimens and ranges from 101–115 μ. Distance between anal setae II and III averages 43 μ for 5 specimens and ranges from 40–46 μ. Bursa copulatrix follows a sinuous course looping upon itself once or twice en route to a vesicular pouch situated 100–200 μ from an external papilla located on dorsal side of anus. *Venter*: Two pairs of very small, short spines just posterior to propodosomal region. Median pair of spines slightly anterior to lateral pair. Two pairs of long, whip-like, ventrolateral setae located just anterior to posterior 2/3 of idiosoma. Tips of these setae are frequently broken off, cf. holotype, specimen illustrated and majority of specimens examined. One unbroken seta measures 70 μ in length, whereas 9 setae with broken tips average only 50 μ. Shallow furrow extends posteriorly from coxa III to area anterior and lateral to anterior ventrolateral seta. Posterior portion of furrow gives some indication of being squamous. Retrovulvular area non-sclerotized and traversed by light striations. Leg IV vestigial and represented by a small spine located medially to leg III.

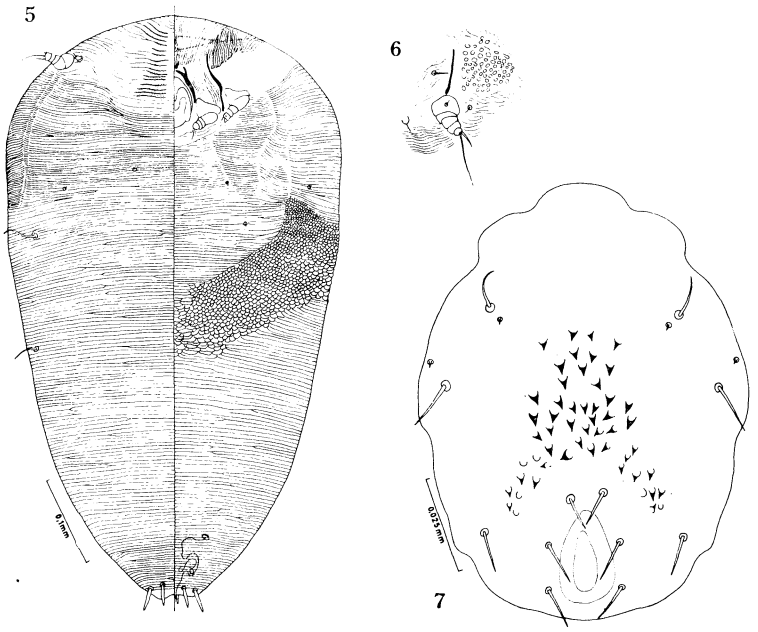
Larva: Five larvae average 103 μ in length and 78 μ in width with ranges of 100–106 and 67–85 μ respectively. Dorsal surface bears several small triangular spines numbering 32–48 per individual in 5 specimens.



Figs. 1–4. 1, *Teinocoptes aingworthi* n. sp. ♀ ; 2, *Teinocoptes wilsoni* n. sp. ♀ ; 3, *Teinocoptes strandtmanni* n. sp. ♀ ; 4, *Teinocoptes katherinae* n. sp. ♀ (figs. 1–4 with dorsum on right, venter on left).

Nymph and Male: Unknown.

Holotype ♀ (BISHOP 3423), Sia Cave, Buka I., (Bougainville), Solomon Is.; TMP 1501–02 & 1561–77; 8. XII. 1959; ex Spinal-winged fruit bat, *Dobsonia inermis* (Pteropodidae); collector T. Maa. Six paratype ♀♀ and 31 larvae in ovo, same data as holotype. This mite is named in honor of the senior author's young daughter, Katherine Ann Mitchell. Paratype ♀♀ and larvae in Bishop Museum and authors' collections.



Figs. 5–7. 5, *Teinocoptes vandeuseni* n. sp. ♀ (dorsum on right, venter on left); 6, *T. vandeuseni* n. sp., ventral view of left side showing verrucous area antero-lateral to leg III of ♀; 7, *T. vandeuseni* n. sp., dorsal scaly area of larva in ovo.

Teinocoptes vandeuseni Mitchell & Fain, n. sp. Figs. 5–7.

Diagnosis: This species is closely related to *T. rousetti* Fain, 1959, but can be differentiated on the basis of the following characters: Less than 690 μ in length; greater development of dorsal scaly area; presence of a weakly sclerotized retrovulvular area; and dorsal spines of larva are more numerous.

Female: Body sub-conical, with flattened anterior portion bearing legs, mouthparts and genital aperture. Opisthosoma tapering posteriorly and terminating in a small truncate anal area. Length of idiosoma 661 μ in holotype, 483–690 in 6 gravid paratype ♀♀ and averaging 633 μ. Body width 365 μ at widest point in holotype, 317–385 in 6 paratypes and averaging 360 μ. Holotype contains 11 unembryonated eggs and 6 larvae. Six paratypes contain 0–7 larvae and 1–18 eggs. Six eggs average 130 μ in length by 85 μ in width with ranges of 122–139 and 80–92 respectively. *Dorsum*: Four pairs of very small, short spines situated posterior to propodosomal region and disposed in 2 transverse rows. Scaly area

originates medially and anteriorly to posterolateral spine and extends posteriorly and medially to midline where scaly areas from each side join. Shape of scaly area roughly that of an expanded "V" with narrow portion representing point of juncture along midline which may be interrupted partially by striated cuticle. Distance from anterior margin of scaly area to posterior margin of scaly area, for measurements made at right angles to arms of "V" midway between midline and lateral idiosomal margin, is 64 μ in holotype, 45–65 in paratypes and averages 55 μ. Remainder of dorsum traversed by smooth striations. Two pairs of strong, lanceolate, dorsal anal setae average 24 μ in length and range from 17–35 μ. Anal setae prolonged into long, finely tapering tips in young ♀♀, but generally broken off in older specimens. Bursa copulatrix loops upon itself one or more times and connects to a vesicular pouch located ca. 70 μ from an external papilla which protrudes from dorsal anal area. Papilla very broad at base as in *T. rousetti* and measures 5–6 μ in width at this point. *Venter*: Two pairs of very small, short spines located ventrally near level of posterior row of dorsal spines. Two pairs of ventrolateral setae averaging 32 μ and ranging from 22–39 μ, although most setae measured had finely tapering tips broken off. Leg IV vestigial and represented by a short spine situated medially to coxa III. Extending posteriorly from coxa III is a shallow furrow which terminates just lateral to anterior ventrolateral seta. Posterior portion of furrow occupied by a dozen or so rows of small spines with 1–5 spines per row. Verrucous area in front of leg III as in *T. rousetti* (fig. 6). Retrovulvular area lightly sclerotized. Two pairs of ventral anal setae similar to dorsal anal setae as described above.

Nymph: Similar to adult ♀ except for lack of sexual characters and poorly developed dorsal scaly area. Four nymphs average 234 μ in length and 160 μ in width with ranges of 194–247 and 151–179 μ respectively.

Larva (fig. 7): One free larva measures 138 μ in length and 112 μ in width. Six larva in ovo average 106 μ in length and 76 μ in width with ranges of 101–112 and 73–81 μ respectively. Number of small, triangular dorsal scales average 48 for 8 larvae and range from 43–53 per individual. Dorsal scaly area extends posteriorly on either side of anterior pair of anal setae. This is in contrast to *T. rousetti*l arvae in which there are fewer dorsal scales, and areas lateral to anteriormost pair of anal setae are completely devoid of scales.

Male: Unknown.

Holotype ♀ (BISHOP 3424), Sumberbaba (Soemberbaba), Japen I., NW New Guinea, ca. 25 m; BBM-NG 22057–58; 29. X. 1962; ex *Rousettus stresemanni* (Pteropodidae); collector Nixon Wilson. Six paratype ♀♀, 4 nymphs, 1 free larva and several larvae in ovo, same data as holotype. This mite is named in honor of Dr. Hobart M. Van Deusen, Assistant Curator, Archbold Collections, American Museum of Natural History, New York. Paratype ♀♀, nymphs and larvae in Bishop Museum and authors' collections.

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