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DESCRIPTION OF MALE, NYMPH AND LARVA AND REDESCRIPTION OF FEMALE OF IXODES COLLOCALIAE SCHULZE[1]

By Nixon Wilson

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Abstract: The ♀ of *Ixodes collocaliae* Schulze, 1937, previously known from 2 specimens, is redescribed and the ♂, nymph and larva are described for the first time. Several new host and locality records are given.

Schulze, in 1937, described *Ixodes collocaliae* on the basis of 2 engorged ♀♀ collected from *Collocalia spodiopygia reichenowi* in New Britain.[2] The original description and drawings were rather brief and appeared in an ornithological journal not readily available to acarologists. There have been no records of this unusual species since the original description.

Thus it was with a great deal of interest that I discovered all stages of this tick among a large collection of New Guinea material gathered in recent years by staff members of Bishop Museum. Additional specimens were located in the collection of the Rocky Mountain Laboratory, Hamilton, Montana and are included in the following presentation of data.

In the following descriptions total length is taken from tips of palpi to posterior body margin, and width at widest part of body. Length of capitulum is measured from tips of palpi to posterior margin of base width at widest point. Sensilla and most setae were visible only on slide mounted specimens.

Acknowledgment is extended to Mr. G. M. Kohls for the loan of material under his care and for comparing some of the present specimens with the cotypes in the Rocky Mountain Laboratory collection.

Ixodes collocaliae Schulze, 1937

Diagnosis: Large, with extremely long spider-like legs, which are especially apparent in the adults. The ♀ has a long, curved external spur on coxa IV unlike any other species of *Ixodes*. The ♂ has 10 ventral plates, several of which have irregular margins, no spurs

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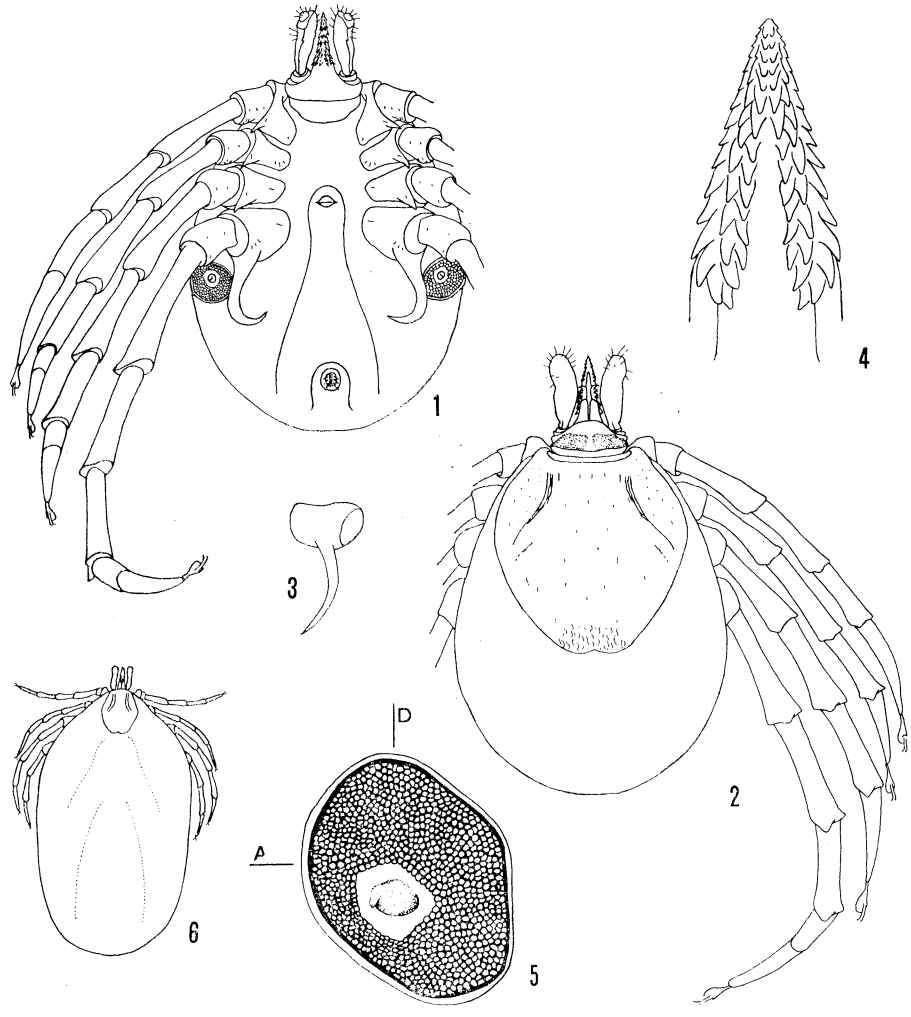
2. Peters (1940) lists *Collocalia spodiopygia reichenowi* as occurring only in the Solomon Is. and *C. spodiopygia eichhorni* as occurring in the Bismark Archipelago. If this is the case then the type host for *Ixodes collocaliae* should be the latter subspecies.

on coxae or trochanters and a large dorsal plate, which has an irregular margin postero-laterally. The nymph has external spurs on coxae I–IV and ventral spurs on trochanters I–II. The large, stout, triangular spur on coxa IV originates from the center and projects ventro-posteriorly rather than posteriorly as in other ixodids. The larva has 1 pair of sensilla auriformia, 3–5 pairs of sensilla hastiformia and 3–4 pairs of small setae on the scutum. Spur pattern on legs I–III similar to that of nymph.

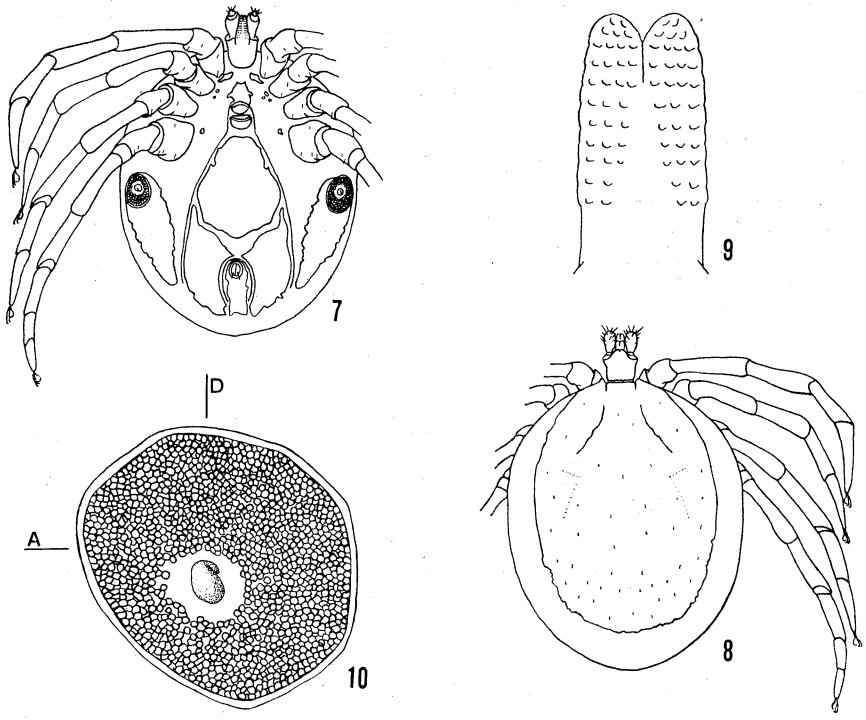
Redescription: ♀ (figs. 1–6). All measurements except length and width the mean of 3 specimens. Body: a single unengorged specimen is oval, widest posteriorly, 5.88 mm long, 3.64 mm wide, surface granulated, with moderate number of setae. Two fully engorged specimens are oblong, 12.78 mm long, 7.54 mm wide. Legs, scutum and capitulum dark brown. Legs extremely long and thin, giving spider-like appearance to unengorged specimens. Capitulum: Length 1.20 mm, width 0.89 mm, dorsum of basis broad, rectangular, dorsal ridge and postero-lateral margins drawn out into flange giving appearance of transverse crease bisecting porose areas, crease becoming groove laterally, porose areas large, faint, superficial, cornua absent; ventrally basis smooth, shining, creased, slightly constricted laterally; lateral profile line mildly concave, converging posteriorly, posterior margin slightly convex, auriculae present as mild lateral saliences, transverse sutural line visible. Palps long, narrow, outer margin nearly straight, inner margin convex, inner surface slightly concave, length of segments 2–3, 0.87 mm, suture line between them indistinct, greatest width 0.28 mm, about anterior end of segment 2, setae few in number, more numerous on anterior 1/2 of segment 3. Hypostome: 0.79 mm long, attenuated, pointed at apex, broad at base, dentition 3/3, each file has 12–14 teeth, file 1 extends almost to base, files 2 & 3 slightly shorter and subequal in length, lateral denticles largest, inner denticles smallest. One specimen has 2 superflous denticles next to right file 3 opposite denticles 4–5. Scutum: longer than broad, length 2.82 mm, width 2.31 mm, widest just in front of middle, lateral margins convex, converging, posteriorly, rounded behind, posterior margin with or without slight notch, scapulae short, broadly rounded, cervical grooves moderate, first parallel, then divergent, fading out before reaching lateral margins, deepest anteriorly, lateral carinae not evident, punctations few, small, shallow, setae few, short, fine, both more numerous antero-laterally, posterior area of scutum may be faintly rugose. Legs: elongate with a few short setae, dorsal distal ends of femur, genu and tibia with 2 triangular-shaped protuberances as figured, coxae I–III with a large stout external spur, coxa IV with a long, 1.19 mm, hook-like external spur, coxa I with broadly rounded anterior spur which fits in groove on side of basis. Trochanters I–II with very small ventral salience; tarsus tapering gradually terminally, length of tarsus I, 1.38 mm, II, 1.00 mm, III, 1.11 mm and IV, 1.19 mm, pulvilli 2/3 as long as claws. Minute spur adjacent to base of large external spur on right coxa IV of unengorged specimen. Spiracular plate: elliptical, broader than long, length 0.51 mm, width 0.63 mm, outer surface slightly elevated, goblets numerous, small, evenly distributed; macula antero-ventral to center, depressed. Genital aperture: opposite posterior edge of coxa III. Genital groove: in unengorged specimen, rounded in front of genital aperture, concave laterally opposite coxa IV, divergent postero-laterally, terminates short of posterior margin about on line with posterior edge of anus. In engorged specimens extends from genital aperture to about posterior margin, sides diverge slightly posteriorly. Anal groove: horseshoe-shaped, terminating short of posterior margin, complete anteriorly; anus located in anterior region of area outlined by anal groove, 3 pairs of anal setae.

Description: ♂ (figs. 7–10). Measurements the mean of 6 specimens. Body: shape



Figs. 1-6. *Ixodes collocaliae* Schulze, ♀. 1, ventral view; 2, dorsal view; 3, coxae IV (after Schulze, 1937); 4, hypostome; 5, spiracular plate; 6, engorged ♀.

similar to unengorged ♀ but smaller, color as in ♀, length 4.29 mm, width 2.91 mm, widest at about middle, rounded posteriorly, marginal body fold narrowest antero-laterally, widest posteriorly. Capitulum: length 0.75 mm, width 0.46 mm, dorsum of basis rectangular, longer than broad, posterior margin straight, cornua absent, surface convex, impunctate; ventrally basis smooth, shining, crazed, shape same as in dorsal view, posterior margin straight, auriculae absent, 2 or more transverse creases visible giving slight tumescent appearance. Palps short, broad, rounded apically, inner surface flat, segment 2 slightly constricted at base, length of segments 2-3, 0.41 mm, suture line between them indistinct, greatest width, 0.18 mm, about anterior end of segment 2, setae longer and more numerous on antero-lateral margins of segment 3. Hypostome: 0.31 mm long, slightly shorter than palps, apex



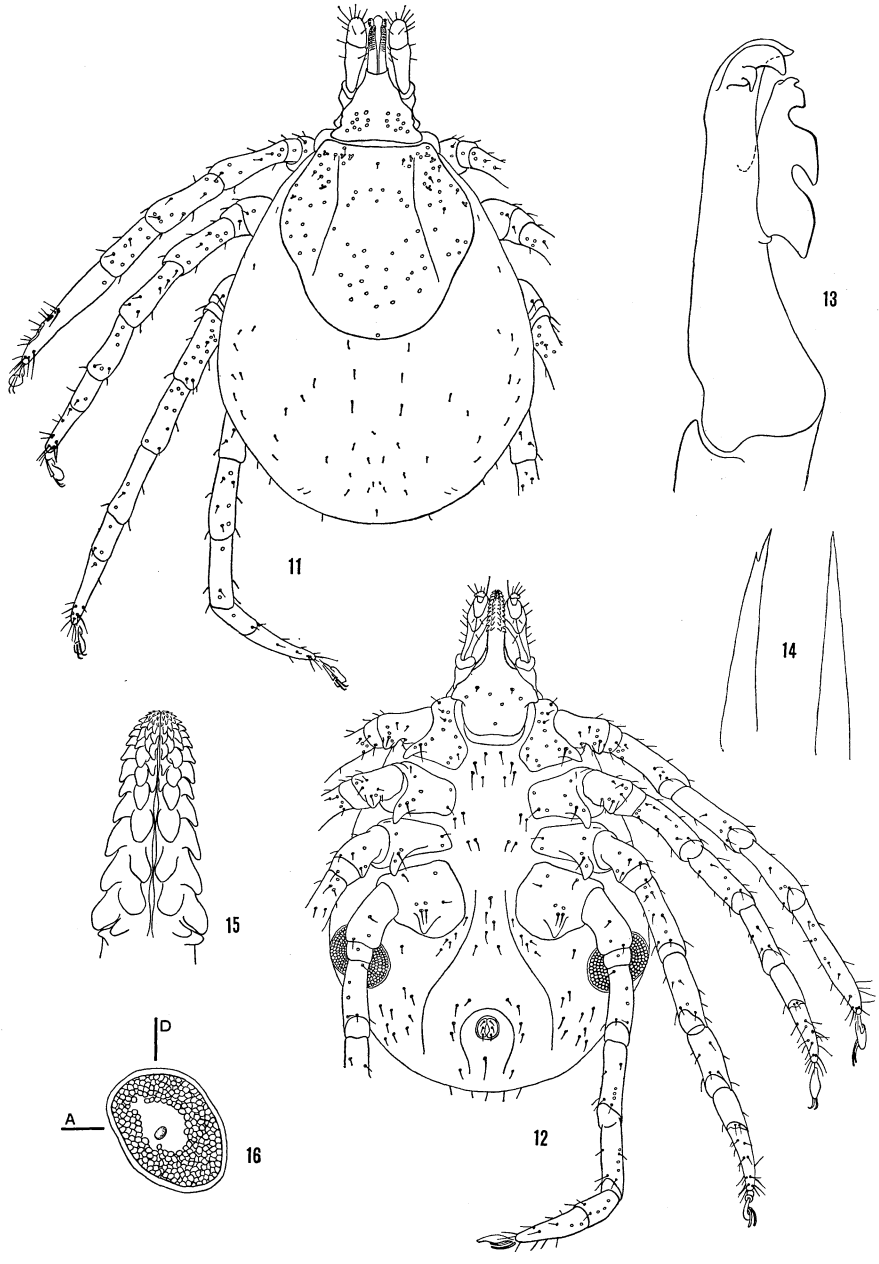
Figs. 7–10. *Ixodes collocaliae* Schulze, ♂. 7, ventral view; 8, dorsal view; 9, hypostome; 10, spiracular plate.

rounded, notched in center, several rows of tooth-like transverse crenulations. Scutum: longer than broad, length 3.09 mm, width 2.14 mm, lateral and especially posterior margin irregular in outline, scapulae short, blunt, cervical grooves faint, short, first parallel then divergent, fading out before reaching lateral margins, confined to anterior 1/3 of scutum, a small, shallow, L-shaped concavity lies back of each cervical groove delineating pseudoscutum, lateral carinae lacking, surface smooth, impunctate, setae few, minute, scattered. Ventral plates: median plate pentagonal, longer than wide, greatest width near posterolateral margin, posterior margin may be irregular, anal plate long, narrow, anterior margin rounded, slightly constricted postero-laterally, posterior margin irregular, adanal plates long, curved around anal plate but not joining in front of it, posterior margin irregular, epimeral plates with very irregular margins, enclosing spiracular plates and extending diagonally to near base of adanal plates, postgenital plate 2× as wide as long, halfmoon-shaped, truncate on ends, pregenital plate irregular in shape, approximately hexagonal or pentagonal, as wide as genital aperture, jugular plates adjacent to coxae I, shape variable, may be long and narrow or short and broad. Some specimens have several small irregularly shaped plates adjacent to coxae II and/or IV. A few scattered short setae and numerous fine punctations on all plates. Non-sclerotized areas between plates with numerous small sclerotized plaques, some with short setae, plaques extend dorsally to lateral body fold. Legs: similar to ♀ except correspondingly shorter and lacking spurs on coxae and triangular-shaped protuberances on femur, genu and tibia. Coxae I–III with a faint serrate ridge extending trans-

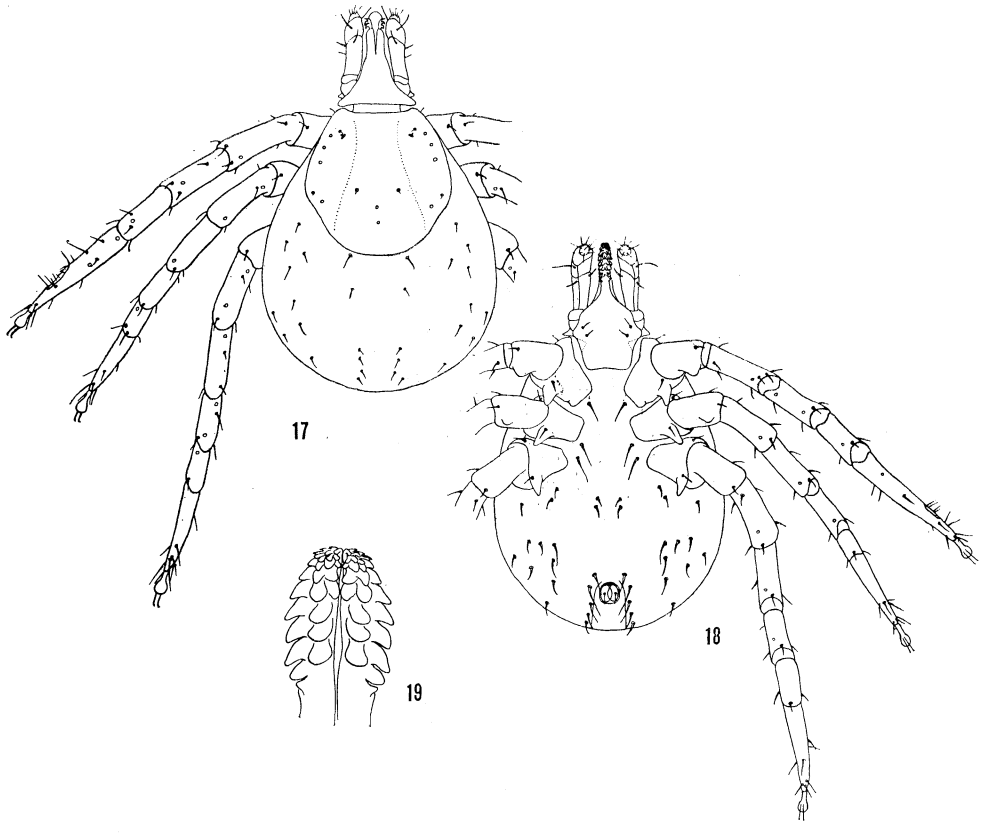
versely along posterior distal edge, faintest on coxa I, strongest on coxa III, coxa IV with several faint serrate ridges. Length of tarsus I, 1.15 mm, I, 0.82 mm, III, 0.91 mm and IV, 0.99 mm. Spiracular plate: as in ♀ except slightly smaller, length 0.47 mm, width 0.53 mm. Genital aperture: opposite coxa III. Genital groove: as in unengorged ♀, delineated by lateral margins of postgenital, median and adanal plates, dissects posterior margin of pregenital plate. Anal groove: as in ♀; anus as in ♀.

Nymph (figs. 11–16). Measurements the mean of 10 unengorged to slightly engorged specimens. Body: general appearance similar to ♀. Color of legs, scutum and capitulum pale brown. Length 2.07 mm, width 1.24 mm. Four engorged specimens 4.34 mm long, 3.08 mm wide. Capitulum: length 0.48 mm, width 0.36 mm, dorsum of basis triangular, posterior margin slightly concave, cornua absent, 2 clumps of about 9 sensilla hastiformia located in region occupied by porose areas in ♀; ventrally posterior margin slightly concave, constricted at middle, auriculae distinct, lateral, triangular extensions, visible in dorsal view as points projecting beyond lateral margins of basis, 1 pair of small posthypostomal setae present in antero-lateral area, palps as in ♀, length of segments 2–3, 0.27 mm, width 0.08 mm, sensilla not discernible. Hypostome: 0.24 mm long, projects slightly beyond palps, rounded apically, with very slight median notch, dentition 4/4, file 1 extends to base with 15 teeth, file 2 extends almost to base with 14 teeth, file 3 extends 1/3 length with 8 teeth, file 4 extends 1/16 length with 3 teeth. Scutum: slightly longer than broad, length 0.84 mm, width 0.77 mm, rounded behind, slightly concave postero-laterally, scapulae short, rounded, cervical grooves shallow, first parallel, then divergent, terminating before reaching postero-lateral margins; surface smooth, impunctate, 5 pairs sensilla auriformia and about 66 sensilla hastiformia scattered in antero-lateral, antero-median and postero-median areas, about 1/2 external to cervical grooves, 10 minute setae scattered in antero-lateral and antero-median areas. Legs: coxae I–III with external spurs as in ♀ except correspondingly smaller and more blunt at tip, coxa IV expanded ventrally, a stout triangular spur originating from center, pointing ventroposteriorly and extending to posterior edge of coxa in ventral view; trochanters I–II with ventral spurs, 2 dorsal protuberances lacking on distal ends of femur, genu and tibia; coxae I–III and trochanters I–II with single long seta at base of spur, coxa IV with 2–4 long setae at base of spur, several shorter setae and sensilla on all coxae, sensilla becoming less numerous posteriorly. Other segments with scattered small setae and sensilla, some setae barbed. Length of tarsus I, 0.63 mm, II, 0.45 mm, III, 0.48 mm and IV, 0.52 mm. Spiracular plate: elliptical, slightly broader than long, length 0.20 mm, width 0.23 mm, goblets numerous, small, evenly distributed, macula antero-ventral to center. Anal groove: as in ♀, flanked by 4–5 pairs of short setae; anus as ♀, 1 or 2 postanal setae.

Larva (figs. 17–19). All measurements except length and width the mean of 9 specimens. Chaetotaxy based on 3 specimens. Body: engorged and unengorged specimens oval, wider just behind middle, 7 unengorged specimens 1.03 mm long, 0.67 mm wide, 2 engorged specimens 2.04 mm long, 1.39 mm wide. Dorsally, 24–30 setae, ventrally, 36–42 setae, considerable variation in number and location, only sternals with 3 pairs and anals with 1 pair constant; legs, scutum and capitulum light brown. Capitulum: length 0.25 mm, width 0.21 mm, dorsum of basis triangular, posterior margin slightly concave, postero-lateral corners bluntly rounded suggestive of mild cornua, sensilla lacking; ventrally basis weakly constricted at middle, auriculae as lateral triangular extensions visible in dorsal view, 2 pairs of small posthypostomal setae present in antero-lateral area, palps similar to nymph, length of segments 2–3, 0.16 mm, width 0.05 mm, sensilla not discernible, some setae barbed. Hypos-



Figs. 11–16. *Ixodes collocaliae* Schulze, nymph. 11, dorsal view; 12, ventral view; 13, chelicera; 14, leg setae; 15, hypostome; 16, spiracular plate.



Figs. 17–19. *Ixodes collocaliae* Schulze, larva. 17, dorsal view; 18, ventral view; 19, hypostome.

tome: 0.15 mm long, projects slightly beyond palps, rounded apically with very slight median notch, dentition 4/4, file 1 extends about 3/4 of way to base with 12 teeth, file 2 extends about 2/3 of way to base with 9 teeth, file 3 extends about 1/5 of way to base with 6 teeth, file 4 very short with 4 teeth. Scutum: slightly longer than broad, length 0.44 mm, width 0.41 mm, rounded behind, slightly concave postero-laterally, scapulae short, rounded, cervical grooves as in nymph, 1 pair sensilla auriformia, 2–4 pairs sensilla hastiformia and 2–3 pairs small setae located lateral to cervical grooves, 1–2 sensilla hastiformia and 1 pair of small setae located in posteromedian area. Legs: similar to nymph except coxa I with faint internal spur suggested by salient corner, trochanters I–II with mild ventral spurs, coxa I with 2–3 setae, coxae II–III with 2 setae, no sensilla on coxae, other segments with scattered sensilla and setae, some setae barbed. Length of tarsus I, 0.35 mm, II, 0.30 mm and III, 0.34 mm. Anal groove: extending to posterior margin of body in unengorged specimens, incomplete anteriorly, slightly divergent posteriorly, flanked by 4–5 pairs of setae, the 2nd pair of which is longer (0.08 mm) than any other body setae; anus as in ♀ and nymph.

SPECIMENS EXAMINED: All NE New Guinea. 1♂, 10 NN, Gatop, Finschhafen Subdistr.,

900 m, *Collocalia vanikorensis* and nests (RML 37287), X. 1960, B. McMillan; 1♂, 1♀, Edie Creek, 14 km SW Wau, 2000 m, from 2 nests of *Collocalia esculenta* with young (adults no. 49–50), 6. X. 1961, J. H. Sedlacek; 1♀, Edie Creek, 14 km SW of Wau, 2000 m, hanging on ceiling of cave among *Collocalia esculenta* nests, 6. X. 1961, Sedlacek; 1 N, Gatop, Finschhafen Subdistr., 900 m, *Collocalia vanikorensis* nest (RML 37678), 9.X.1961, B. McMillan; 1 N, Edie Creek, 14 km SW Wau, 1900 m, 4–10. X. 1961, Sedlacek; 1♂, 23 NN, 9 LL, Edie Creek, 14 km SW of Wau, 2100 m, in nest of *Collocalia vanikorensis* (S-213), 10. II. 1962, H. Clissold; 1 N, 1 L, Edie Creek, 14 km SW of Wau, 2100 m, *Collocalia vanikorensis* (S-214), 10. II. 1962, G. Monteith; 3♂♂, 1♀, 1N, Edie Creek, 14 km SW of Wau, 2000 m, 14. II. 1962, Sedlacek; 1♂ Otibanda Creek, 2100 m, in abandoned mine tunnel (BBM-NG 28930), 14. VIII. 1963, H. Clissold; 3 ♂♂, Edie Creek, 14 km SW of Wau, 200 m, in abandoned mine tunnel (BBM-NG 28947), 15. VIII. 1963, Clissold; 3 ♂♂, Edie Creek, 14 km SW of Wau, 2000 m, in old *Collocalia* nest (BBM-NG 28949), 16. VIII. 1963, Clissold.

Ten ♂♂, 3 ♀♀, 26 nymphs and 10 larvae are in Bishop Museum. Three ♂♂ and 11 nymphs are in the Rocky Mountain Laboratory.

The 3♀♀ compare favorably with Schulze's cotypes with the exception of the spur on coxa IV. This spur is hook-like (fig. 1) in the New Guinea specimens and sickle-like (fig. 3) in the New Britain specimens. At present this difference is considered to be within the limits of variation for the species based on what we know of this in other species of ticks.

I. collocaliae has several morphological and biological characters in common with *Ixodes vespertilionis* Koch, a widespread bat infesting species. Both are restricted to caves and cave inhabiting vertebrates, have long spider-like legs and a long, pointed hypostome with similar dentition in the ♀♀. These characters are probably the result of similar habits rather than indicative of a close relationship between the two species. On the basis of larval chaetotaxy, as outlined by Clifford and Anastos (1960), *I. collocaliae* falls in the group of unclassified species as to subgenus, distinguished by the large number of dorsal and ventral setae which exhibit widespread variation in their number and location. It is interesting that within this unclassified group, *I. collocaliae* has its closest relationship with *Ixodes kohlsi* Arthur, a penguin infesting species from S. Australia.

All records of *I. collocaliae* are in association with the genus *Collocalia* and apparently the species is restricted to this group of birds. The cave swiftlets are very common and widespread throughout the S. Pacific and SE Asia and it would not be surprising if *I. collocaliae* were eventually found at other localities within this range. The 3 species of hosts from which it has been reported are the most widespread of the genus (Mayr 1945).

Most of the specimens were collected from *Collocalia* nests in abandoned mine tunnels or from the ceilings of these tunnels or caves. Four nymphs were attached to birds in the following locations: 2 at base of claw; 1 at base of claw; 1 to body skin. Schulze (1937) reported his specimens firmly attached to the ventral body surface of the host. Many adults, nymphs and larvae in various stages of engorgement were collected in October and February. Only ♂♂ were collected in August, all of which were in an old *Collocalia* nest or crawling over the surface of an abandoned mine tunnel. This limited data would suggest feeding takes place during the southern hemisphere summer.

One nymph (S-213) displayed an abnormality in that right leg II was represented as a small rudimentary appendage displaced lateral to its normal position and projecting at a right angle to the ventral surface. It originated from a slightly raised circular area and

had a total length of 0.25 mm. Right coxa I and III were larger than their counterparts on the opposite side and almost filled the space left by the absence of coxa II.

LITERATURE CITED

Clifford, C. M. & G. Anastos. 1960. The use of chaetotaxy in the identification of larval ticks (Acarina: Ixodidae). J. Parasit. **46** (5): 567–78.

Mayr, E. 1945. Birds of the southwest Pacific. The MacMillan Co., New York, xix+315 pp.

Peters, J. L. 1940. Check-list of birds of the world. Vol. 4. Harvard Univ. Press, Cambridge, xii+227 pp.

Schulze, P. 1937. Die erste Zecke von einer Salangane, *Ixodes collocaliae* n. sp. von Neupommern. Ornitholog. Monatsber. **45** (3): 77–80.

Pacific Insects 6 (2): 308–311 **August 31, 1964**

MILICHIIDAE AND CHLOROPIDAE (Diptera) FROM THE BATU CAVES, MALAYA

By Curtis W. Sabrosky[1]

Abstract: Several species of flies, 2 of them new, are recorded from Batu Caves.

This paper reports on two families of acalyptrate Diptera collected in the Batu Caves, near Kuala Lumpur, Malaya, by H. E. McClure, B. L. Lim and associates, and referred to me for study by Bishop Museum, Honolulu.

In 1929, F. W. Edwards published a short paper on the Diptera of the Batu Caves (J. Fed. Malay States Mus. **14**: 376–77) and recorded four species of acalyptrate Diptera from the caves. Two of these, *Chiromyia* (sic) *dubia* Lamb (Chyromyidae) and *Agromyza* (?) sp. (Agromyzidae) are outside the scope of this paper, although the latter, "a very small black species" and "in poor condition," might have been one of the Milichiidae recorded below. The *Phyllomyza* sp. (Milichiidae) of Edwards' list is probably *P. cavernae* Meijere. The record of *Tricimba cavernae* (Meijere)(Chloropidae) is a misidentification. Edwards' specimen is indeed a *Tricimba*, as kindly verified for me by H. Oldroyd of the British Museum (Nat. Hist.), but Meijere's *Oscinella cavernae*, of which I have seen the type in Amsterdam, is not. The Batu species is herein described as new. Edwards may have been

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