

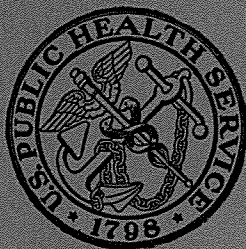
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**TICKS (IXODOIDEA)  
OF THE PHILIPPINES**

ACAROLOGY LABORATORY  
THE OHIO STATE UNIVERSITY



**FEDERAL SECURITY AGENCY**

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**National Institutes of Health Bulletin No. 192**

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# **TICKS (IXODOIDEA) OF THE PHILIPPINES**

**GLEN M. KOHLS  
United States Public Health Service**

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**From the National Institutes of Health  
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## TICKS (IXODOIDEA) OF THE PHILIPPINES

Few species of ticks are known from the Philippines. Of the 13 species that have been reported, 5 must be eliminated because of synonymy, or error in identification or labeling. This leaves only 8 species which with certainty can be credited to the Islands, namely: *Haemaphysalis centropi* Kohls, *Boophilus microplus* (Canestrini), *Rhipicephalus sanguineus* (Latr.), *Indocentor compactus tricuspis* Schulze, *Amblyomma cyprium aeratipes* Schulze, *Amblyomma helvolum* Koch, *Aponomma ecinctum* Neumann, and *Aponomma fimbriatum* (Koch). The single records of *Amblyomma americanum* (Linn.) and *Amblyomma dissimile* Koch, as reported by Robinson (1926) and Neumann (1899), respectively, and the report of the presence of *Dermacentor variabilis* (Say) by Banks (1919) are regarded as highly questionable. All are New World species and their reported occurrence in the Philippines requires confirmation.

The present report, which is based on the Philippine Zoological Expedition collection of the Chicago Natural History Museum and the few Philippine collections from miscellaneous sources in the Rocky Mountain Laboratory, brings to 21 the number of known species. Thirteen of these, including seven new species here described, have not been previously reported from the Islands. It is perhaps unnecessary to add that further collecting, especially in areas not reached by the Expedition, would probably extend the present list considerably.

The holotype, allotype, and half of the paratypes of the new species plus about half of the non-type materials are in the Chicago Natural History Museum. The remainder of the material with the exception of paratypes distributed to other institutions is deposited in the Rocky Mountain Laboratory. To facilitate future reference to materials studied, Rocky Mountain Laboratory accession numbers have been assigned to the various individual lots. These numbers accompany the specimens and are cited below with the collection data. Measurements are in millimeters.

The illustrations were prepared under the writer's supervision by Alma Dinehart Smith, Illustrator, Rocky Mountain Laboratory.

*Argas pusillus* sp. nov. (Figure 1)

*Holotype*.—Male, from Brooke's Point, Palawan Island, April 25, 1947 (M. Celestino) 24520. Host: An undetermined species of bat. In the Chicago Natural History Museum.

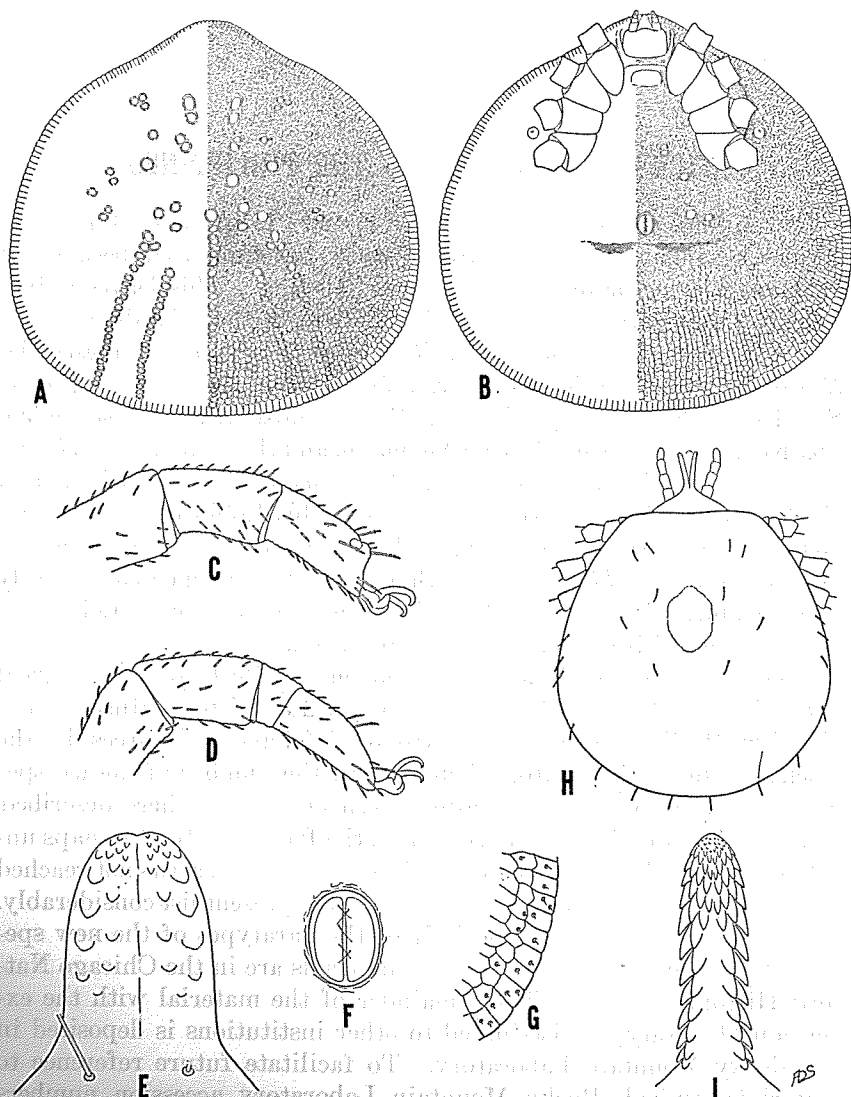


FIGURE 1.—*Argas pusillus* sp. nov. A. Male dorsum. B. Male venter. C. Male metatarsus and tarsus, leg I. D. Male metatarsus and tarsus, leg IV. E. Male hypostome. F. Male anus. G. Portion of dorsal, posterolateral surface and margin, male. H. Larva, dorsum. I. Larva hypostome.

*Paratypes*.—Thirty-six larvae, data as for the holotype. From *Scotophilus temminckii* Horsfield: 22 larvae, Davao Province, Mindanao, January 4, 1947 (F. Werner and A. Castro) 24459; 7 larvae, Parang, Cotabato Province, Mindanao, December 12, 1947 (F. Werner and G. Alcasid) 24460; 132 larvae, Cuyo Island, Cuyo Group, Palawan Province, May 28, 1947 (A. Castro) 24516. From *Pipistrellus imbr-*

*catus* Horsfield: 6 larvae, Puerto Princesa, Palawan Island, April 1, 1947 (F. Werner) 24472. Paratype larvae are deposited in the Chicago Natural History Museum and the Rocky Mountain Laboratory.

*Description*.—Male. The single adult specimen at hand measures 2.53 in length by 2.67 in width. The body is subcircular, broadly rounded posteriorly, the anterior margin bluntly pointed. The discs are inconspicuous and arranged as shown in the figures. The surface of the margin is composed of irregular quadrangles each with one or two very short hairs which arise from circular pits. Surface of the integument with numerous fine, sinuous wrinkles; a radially arranged pattern of small units or "cells" is evident posteriorly, both dorsally and ventrally.

The capitulum is situated just under the slightly protuberant anterior margin. Width of basis capituli about 0.30. Postpalpal hairs, hood, and cheeks absent. Hypostome broad, mildly notched apically; length from bases of posthypostomal hairs to apex, 0.131. The larger denticles are arranged 2/2 with about 4 in each file, the denticles in the lateral files larger than those in the median files. Corona with only a few small denticles.

The elliptical anus is situated slightly posterior to the middle of the body; length, 0.15, width, 0.12. The two valves are furnished with three pairs of short fine hairs. Behind the anus and at a distance of about half its length there is a peculiar paired organ consisting of two deep clefts situated on each side of the median postanal depressions, each cleft lying in an area of modified integument.

Legs short and stout, surface irregular and with scattered, short, minutely barbed hairs. Tarsi without subapical dorsal protuberances. Length of tarsus I, 0.27; metatarsus, 0.27. Length of tarsus IV, 0.35; metatarsus, 0.28. The coxae are contiguous. The supracoxal folds extend from the base of the capitulum to the posterior ends of coxae IV; the coxal folds begin at the ends of coxae II and join the supracoxal folds behind coxae IV.

The genital opening is situated between coxae I.

Female and nymphs unknown.

*Larva*.—All specimens at hand are partially engorged; one that is only slightly engorged measures about 0.41 in length (capitulum excluded) and 0.33 in width. Outline of the body, oval, but with the anterior margin truncate; sometimes abruptly narrowed anteriorly. Integument with fine transverse striae except on the dorsal plate, and with 24 minutely barbed dorsal hairs arranged as shown in the figure. Anus distant from the posterior margin and with a pair of hairs as figured. Most of the capitulum is visible dorsally. Hypostome pointed, sides nearly parallel, dentition 5/5 apically except for the

corona, followed by  $4/4$  and  $3/3$ , then finally  $2/2$  to the base. Length about 0.114.

*Remarks.*—The peculiar paired organ posterior to the anus in the adult relates this new species to *Argas testudo* (Rossi), 1790 (= *vespertilionis* Latr. 1802, vide Oudemans, 1929) and to *Argas boueti* Roubaud and Colas-Belcour, 1933, both of which infest bats. *A. testudo* is still imperfectly known. The name *vespertilionis* has been applied to ticks from Europe, Asia, Africa, and Australia, and it is reasonable to suspect that two or more species have been confused. However, from descriptions that have been given by various authors, it is apparent that *pusillus* differs in several respects including the very much smaller size of the adult, the contiguous coxae, the distance of the paired organ from the anus, and the absence of a hood. The latter character will separate it from *A. boueti* (known only from French Sudan), as will its small size, and its much shorter and stouter legs.

The larva of *pusillus* differs from that of *testudo* in having the anterior margin of the body truncate. In this respect it agrees with the larva of *A. pipistrellae* Audouin, 1832, the adult of which apparently has not been described. Schulze (1930) recorded larvae of *pipistrellae* from Sweden and stated that in the Oudemans collection there are larvae off *Vesperugo abramus* from Java. Available descriptions of *pipistrellae* are inadequate and do not permit clear-cut differentiation between this species and *pusillus*, but it hardly appears likely that the same species occurs in areas so widely separated. *Argas steini* Schulze, 1935, described from Timor from the flying fox, is also known only in the larval stage. Although the anterior margin is truncate, the body is much more elongate than in *pusillus*.

***Ornithodoros batuensis* Hirst**

1929. *Ornithodoros batuensis* Hirst. J. Federated Malay States Museums, 14: 365.

This species was described from Batu Caves (Dark Cave) Selangor, Federated Malay States, and up to the present no further collections have been reported. The Philippine series agrees in all particulars with Hirst's brief description.

From *Rousettus amplexicaudatus* Geoffroy: 1 female, Sitio Tegato, Davao Province, Mindanao, October 22, 1946 (H. Hoogstraal) 24455. "In bat collecting bag": 1 female, Luangbay Cave, Sitio Tegato, Davao Province, Mindanao, October 22, 1946 (H. Hoogstraal) 24571. "Walls of cave": 9 males, 7 females, 2 nymphs, locality, date, and collector as above, 24572. "On stone in cave": 1 female, Tawang Cave, Samal Island, Davao Province, December 1946 (M. Celestino) 24685.

*Ixodes granulatus* Supino

1897. *Ixodes granulatus* Supino. Atti Soc. Veneto-Trent. di Sci. Nat.  
3 (2) : 232.

This species is found in the Far East from eastern India to Java, but the present records appear to be the first from the Philippines. A total of 12 females was present in 8 collections from *Rattus* sp., Mount Data, Mountain Province, Luzon, May 28, 1947, elevation about 7,000 feet (D. Heyneman) 24441-24448.

*Ixodes mindanensis* sp. nov. (Figure 2.)

*Holotype*.—Female, from east slope of Mt. McKinley at an elevation of about 6400 feet, Davao Province, Mindanao, September 1, 1946 (H. Hoogstraal) 24795. Host: *Turdus poliocephalus*. In the Chicago Natural History Museum.

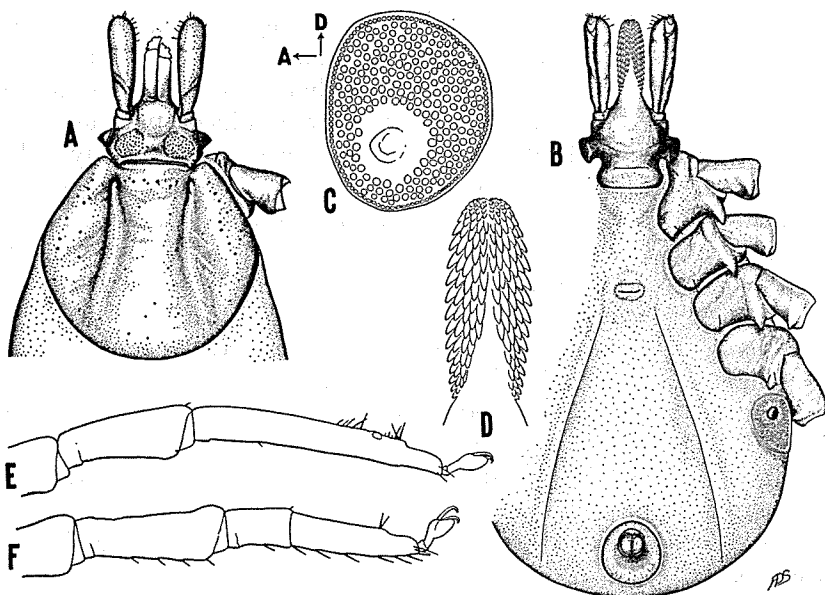


FIGURE 2.—*Ixodes mindanensis* sp. nov. Female. A. Capitulum and scutum, dorsum. B. Capitulum, coxae and body, venter. C. Spiracular plate (A=anterior; D=dorsal). D. Hypostome. E. Metatarsus and tarsus, leg I. F. Metatarsus and tarsus, leg IV.

*Description*.—Female. Color of capitulum and lateral areas of the scutum blackish; legs, median area of scutum, and postscutal area yellow brown.

Capitulum: Length, tips of palpi to tips of cornua, 0.88; width of basis capituli, 0.58; widest at the rounded, salient posterolateral angles. Cornua short and pointed, distance between the tips about 0.34. Posterior margin of basis between the cornua nearly straight. Porose areas large, slightly depressed, and separated by a distance of less

than the diameter of one. Palpi stout, broad, and rounded apically, surface smooth. Palpal articles 2 and 3 fused, leaving no visible suture; combined length 0.56. Ventrally the basis is sharply constricted behind the large flattened auriculae which project laterally beyond the margin of the basis and are thus visible in part from above; surface smooth, slightly convex, posterior margin nearly straight, transverse sutural line present. Palpi flattened on their inner faces, plate absent on article 1.

Hypostome: Large, broad, bluntly rounded, and notched apically. Median denticles smaller than the laterals. Denticles arranged 5/6 apically, then successively 5/5, 4/4, and 3/3 to the base. Length of toothed portion about 0.44.

Scutum: Length, 1.26; width, 1.39; evenly rounded posteriorly. Emargination broad and shallow, scapulae bluntly rounded. Lateral carinae absent. Cervical grooves as broad depressions, deeper anteriorly, extending almost to the posterolateral margins. Punctations few, small, and scattered, but somewhat more numerous in the anterior and lateral fields. Hairs few, short, and inconspicuous.

Legs: Long and slender. Tarsi long, narrowed abruptly subapically, and without distinct subapical dorsal humps. Length of tarsus I, 1.13; metatarsus, 0.63. Length of tarsus IV, 0.86; metatarsus, 0.67. Coxae I to IV each with a stout, flattened, external spur, that on coxa I the largest. Internal spur on coxa I present as a projected flattened corner; on II, III, and IV the internal spurs are suggested by marginal saliences. Trochantal spurs present, equal in size on trochanters I, II, and III, smaller on IV.

Spiracular plate: Short oval, longer axis transverse, length 0.49; width 0.39. Goblets numerous.

Genital aperture: Situated at about the level of the interval between coxae II and III.

Anal groove: Circular, with the anus nearer the anterior rim of the circle.

Male and immature stages unknown.

*Remarks.*—The combination of the fused palpal articles 2 and 3, the large conspicuous auriculae, the markedly elongate tarsus of leg I, and the circular anal groove distinguish this tick at once from all described species of *Ixodes*.

*Ixodes werneri* sp. nov. (Figure 3.)

*Holotype.*—Female, from south slope of Mt. Balabag, Mantalingajan Range, southern Palawan Island, May 15, 1947 (T. Oañe) 24797. Host: *Rattus palawanensis*. In the Chicago Natural History Museum.

*Paratype.*—From *Rattus* sp.: 1 female, locality same, May 5, 1947 (F. Werner and T. Oañe) 24796. In the Chicago Natural History Museum.



Also examined: Two females lacking capitulum, collected with the paratype. From *Rattus fulvescens*: 1 female, Brinchong Hill, elevation 5500 feet, Cameron Highlands, Malaya, July 18, 1948 (R. Traub and B. Insoll) 25797.

*Description*.—Female. Capitulum, scutum, and legs, yellow brown. Length of unfed or very slightly fed specimen, tips of palpi to posterior margin of body, 2.87; width about 1.13. Oval, widest back of middle.

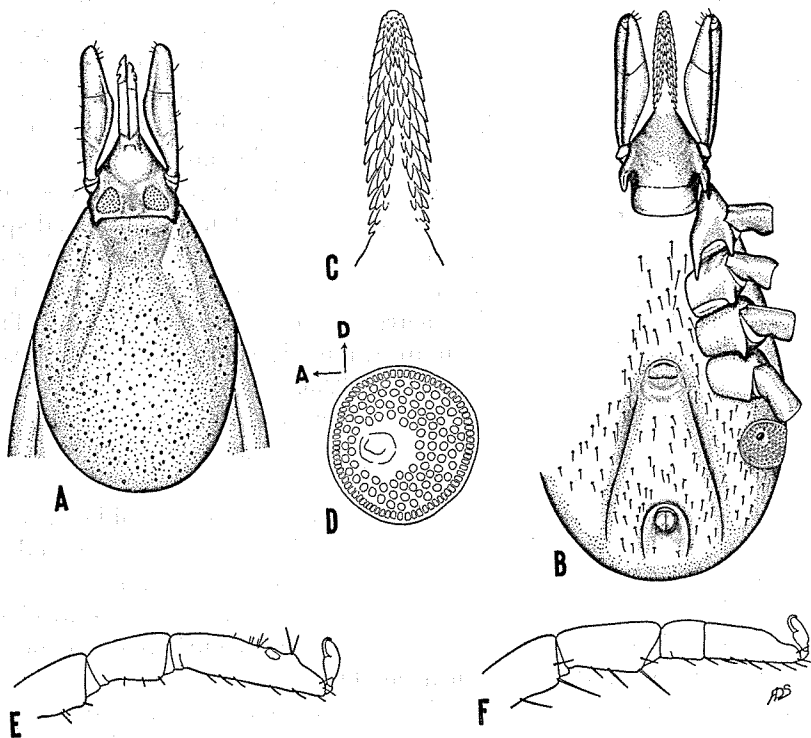


FIGURE 3.—*Ixodes werneri* sp. nov. Female. A. Capitulum and scutum, dorsum. B. Capitulum, coxae and body, venter. C. Hypostome. D. Spiracular plate (A=anterior; D=dorsal). E. Metatarsus and tarsus, leg. I. F. Metatarsus and tarsus, leg. IV.

Capitulum: Length from tips of palpi to tips of cornua, 0.88; width of basis, 0.44. Basis triangular and with the lateral margins mildly converging behind. Cornua, short, bluntly pointed, distance between the tips, 0.37. Posterior margin of basis between the cornua straight. Porose areas large, subtriangular, somewhat depressed, separated by about the width of one. Lateral margins of palpi nearly straight, median margins curved, widest near the apex of article 2. Combined length of articles 2 and 3, 0.66. In ventral view the basis is flattened and mildly constricted behind the prominent, posteriorly directed

auriculae. Transverse sutural line distinct. Palpi flattened on their inner faces, article 1 with a small ventral plate.

Hypostome: Long, sides slightly convex, rounded apically. Dentition 4/4 for most of the length, then 3/3 near the base. Lateral denticles conspicuously larger than the medians. Length of toothed portion, 0.48.

Scutum: Length, 1.44; width, 1.01. Oval, widest a little anterior to the middle, broadly rounded posteriorly. Lateral carinae faint, arising in the scapular region and extending almost to the posterolateral margins. Cervical grooves shallow, first converging then diverging, and terminating about midway of the length of scutum. Punctations moderate in size and number, smaller and fewer in the anterior region. Hairs few, fine, and inconspicuous.

Legs: Moderate in size and length. Tarsi abruptly narrowed subapically, tarsus I with a mild, subapical, dorsal hump. Internal spur on coxa I long; absent on II, III, and IV. External spurs progressively shorter on coxae I to IV; that on I about half the length of the internal spur. Posterior margins of all coxae salient. Trochanteral spurs absent. Length of tarsus I, 0.55; metatarsus, 0.30. Length of tarsus IV, 0.50; metatarsus, 0.35.

Spiracular plate: Nearly circular. Greatest dimension, 0.25.

Genital aperture: Situated at the level of coxae IV.

Male and immature stages unknown.

*Remarks.*—In some respects this new species resembles *Ixodes granulatus* Supino which occurs widely in southeast Asia and in Indonesia and is first reported for the Philippines in this paper. It is readily distinguished from *granulatus*, however, by several characters including the presence of cornua and large auriculae, the longer spurs on coxae I, and by the dentition of the hypostome.

The species also suggests *Ixodes radfordi* Kohls, 1947, which to the present is known only from rats in Manipur State, eastern India. The presence of the internal spur on coxa I and the much more prominent external spurs on all coxae, the dentition and shape of the hypostome, the differently shaped auriculae as well as characters of the scutum, all serve to distinguish the new species from *radfordi*.

#### *Haemaphysalis centropi* Kohls

1949. *Haemaphysalis centropi* Kohls. J. Parasitology 35: 388-390.

This bird tick is known from Upper Burma, Malaya, and the Philippines, as reported by the writer (1949). Philippine records are as follows: From *Centropus bengalensis javanensis* (Dumont): 2 males, Puerto Princesa, Palawan Island, April 16, 1947 (H. Hoogstraal) 24556; 2 males, 1 female, host, locality, and collector as above, April 9, 1947, 24557. The type is in the Rocky Mountain Laboratory.

*Haemaphysalis hoogstraali* sp. nov. (Figure 4)

*Holotype*.—Male, from Puerto Princesa, Palawan Island, April 29, 1947 (H. Hoogstraal) 24510. Host: *Mydaus marchei* Huet. In the Chicago Natural History Museum.

*Allotype*.—Female, with data as for the holotype.

*Paratypes*.—From *Mydaus marchei* Huet: 1 male with data as for holotype and allotype; 3 males, Dimaniang, Busuanga Island, Palawan Province, March 17, 1947 (H. Hoogstraal) 24481; 3 males, Brooke's Point, Palawan Island, April 29, 1947 (M. Celestino) 24523. Paratypes are deposited in the Chicago Natural History Museum and the Rocky Mountain Laboratory.

*Description*.—Male. Length from tips of palpi to posterior margin from 2.33 to 2.60 (8 specimens); width from 1.31 to 1.39. Shape ovoid, widest near the middle.

Capitulum: Length from tips of palpi to tips of cornua, 0.50 to 0.56. Length of basis from base of palpi to tips of cornua, 0.22 to 0.24; width, 0.41 to 0.44. Lateral margins of basis mildly convergent posteriorly; posterior margin between the cornua nearly straight. Lateral submarginal areas of basis with a longitudinal elevation. Surface of basis with a few scattered punctations. Cornua strong, moderately long, pointed. Palpal article 2 strongly salient laterally and with the dorsolateral angle of the posterior margin spur-like; a mild, blunt protuberance near the middle of the posterior margin of the article and another on the inner margin near the articulation with article 3. Article 3 shorter than article 2 and without a dorsal spur. In ventral view the basis is mildly convex, the posterior margin broadly rounded. Palpal article 2 with a stout, sharp, retrograde spur, and the inner margin with 3 or 4 flattened hairs directed toward the base of the hypostome. Palpal article 3 with a long, sharp, retrograde spur.

Hypostome: Shape as figured. Corona moderate, dentition 4/4 with 8 or 9 denticles in each file. Denticles about equal in size in each file. Length about 0.288.

Scutum: Length from tips of scapulae to posterior margin ranges from 1.92 to 2.25. Median field strongly arched. A mild, lateral, submarginal elevation extends from near the level of coxa II to the anterior margin of the first festoon. Lateral grooves ill defined and enclosing no festoons. Cervical grooves consist of oval pits, each with a short, shallow continuation. Punctuations fine, moderate in number, and rather evenly distributed. Festoons about twice as long as broad.

Legs: A moderately long, sharp, spur on coxa I; spurs progressively shorter on II, III, and IV. Similar although smaller spurs on trochanters I to IV. Length of tarsus I, 0.49; metatarsus, 0.31. Length of tarsus IV, 0.42; metatarsus 0.31. Tarsi without ventral spurs.

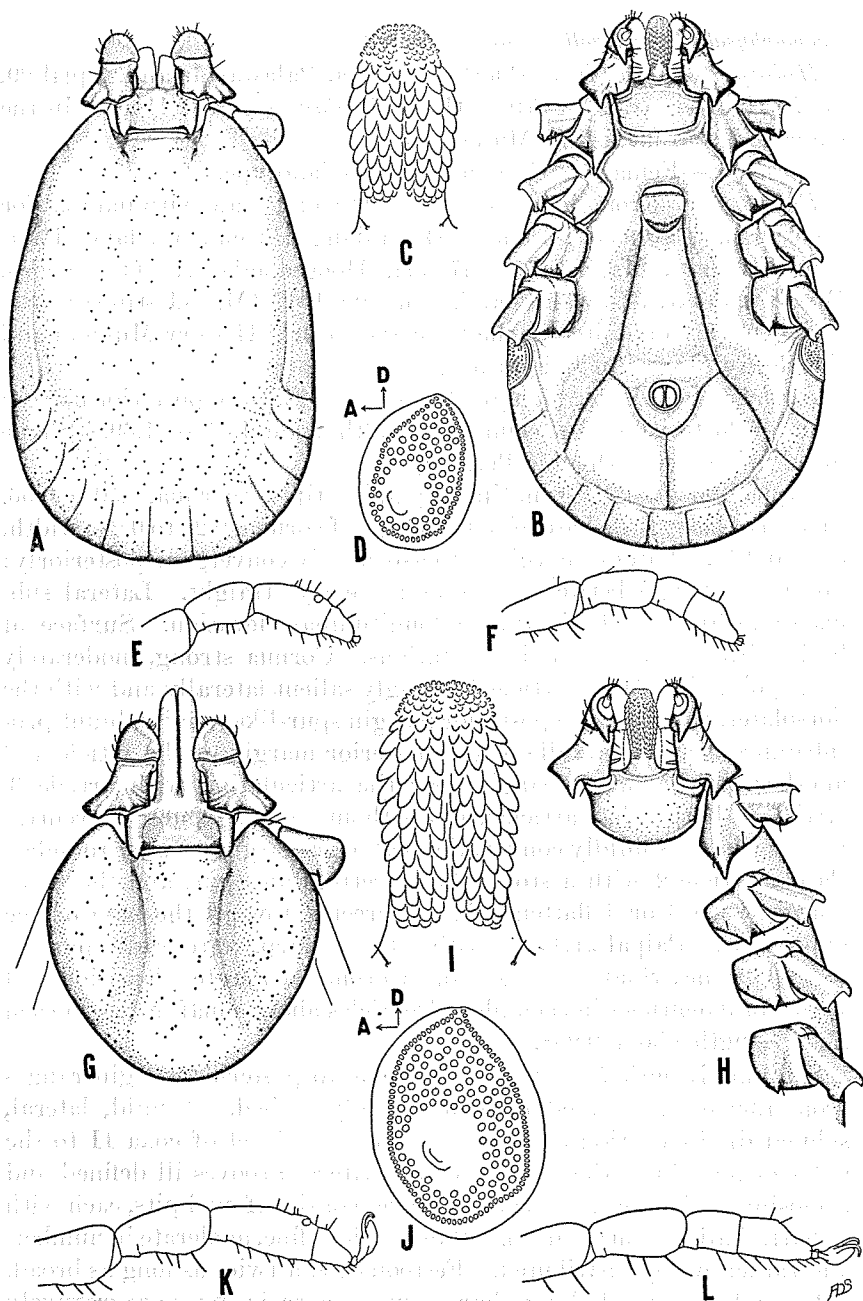


FIGURE 4.—*Haemaphysalis hoogstraali* sp. nov. A. Male capitulum and scutum, dorsum. B. Male capitulum, coxae and body, venter. C. Male hypostome. D. Male spiracular plate (A=anterior; D=dorsal). E. Male metatarsus and tarsus, leg I. F. Male metatarsus and tarsus, leg IV. G. Female capitulum and scutum, dorsum. H. Female capitulum and coxae, venter. I. Female hypostome. J. Female spiracular plate. K. Female metatarsus and tarsus, leg I. L. Female metatarsus and tarsus, leg IV.

Spiracular plate: Shape as figured. Greatest dimension about 0.236.

Genital aperture: Situated between coxae II.

Female: The one female collected is partially engorged. The lateral grooves are distinct and begin near the scutum and cross one festoon on each side. Festoons subquadrate.

Capitulum: Length from tips of palpi to tips of cornua, 0.64; length of basis about 0.25, width of basis 0.56. Lateral margins of basis mildly convergent posteriorly. Posterior margin between the cornua straight. Lateral submarginal areas of the basis elevated as in the male. Porose areas oval, well separated, depressed. Palpi as in the male dorsally and ventrally, but larger.

Hypostome: Essentially as in the male, but with 10 or 11 denticles in each file. Corona somewhat smaller. Length about 0.360.

Scutum: Shape as figured. Length, 1.21; width, 1.26. Cervical grooves begin as moderately deep furrows and continue as broad, shallow depressions which terminate near the posterolateral margins of the scutum. Punctations sparse and scattered. Surface smooth, shining, and without hairs.

Legs: Coxae and trochanters as in the male. Length of tarsus I, 0.66; metatarsus, 0.43. Length of tarsus IV, 0.56; metatarsus, 0.43.

Spiracular plate: Shape as figured. Greatest dimension about 0.390.

Genital aperture: Situated at the level of the intervals between coxae II and III.

*Remarks.*—This new species is distinguished from other Asiatic-Pacific species of this genus by the peculiar palpi, article 2 of which is strongly salient laterally and is provided with a prominent ventral, retrograde spur, also by other characters including those of the hypostome, spiracular plate, and scutum.

*Haemaphysalis palawanensis* sp. nov. (Figure 5)

*Holotype.*—Male, from Puerto Princesa, Palawan Island, April 29, 1947 (H. Hoogstraal) 24510. Host: *Mydaus marchei* Huet. In the Chicago Natural History Museum.

*Allotype.*—Female, same data as for the holotype. In the Chicago Natural History Museum.

*Paratypes.*—From *Mydaus marchei* Huet: 4 males, 1 female, same data as for holotype; 1 male, Iwahig Penal Colony, Palawan Island, March 7, 1947 (F. Werner) 24467; 3 males, 3 females, Dimaniang, Busuanga Island, March 17, 1947 (H. Hoogstraal) 24481; 9 males, 1 female, Iwahig, Iwahig, Palawan Island, May 7, 1947 (H. Hoogstraal) 24515; 2 females, Brooke's Point, Palawan Island, April 27, 1947 (M. Celestino) 24522. From *Sus philippinensis* Nehring: 2 males, 3 females, Lapulapu, Iwahig, Palawan Island, March 5, 1947

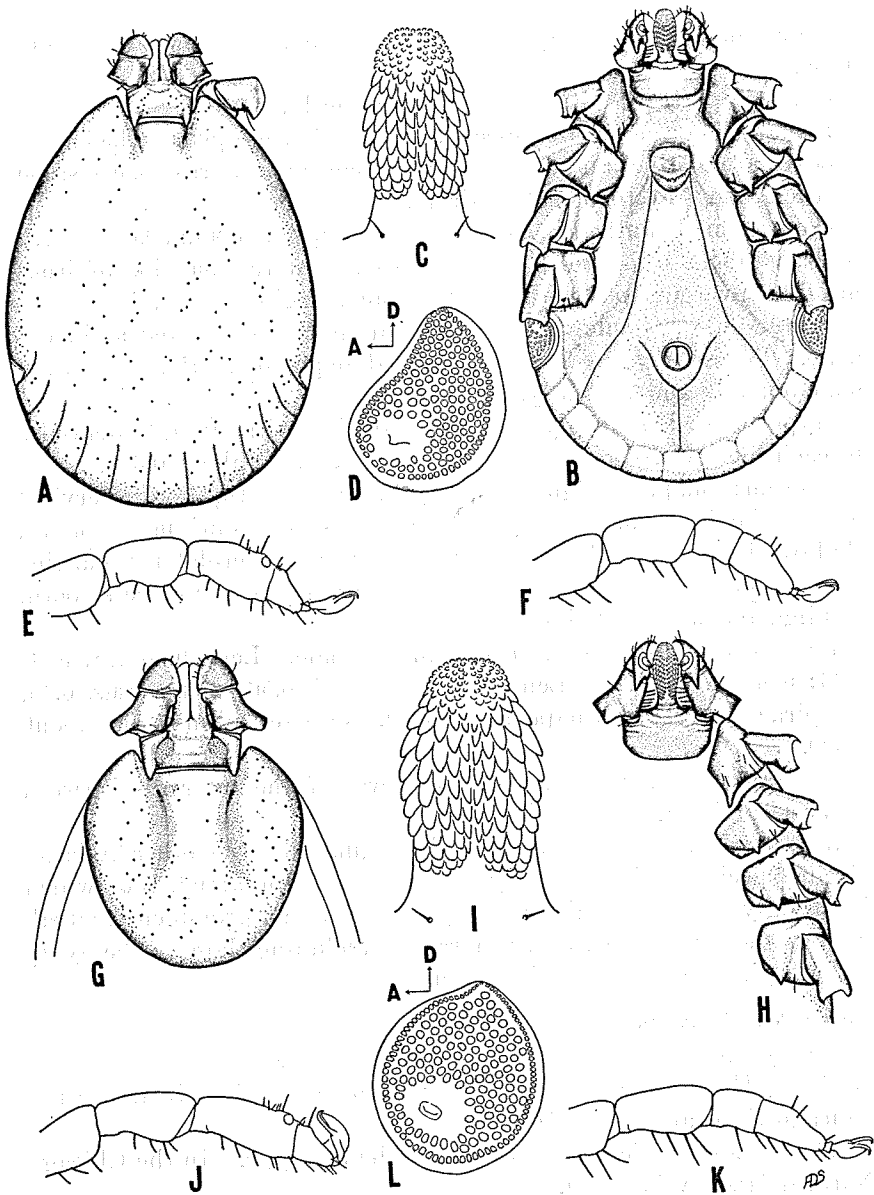


FIGURE 5.—*Haemaphysalis palawanensis* sp. nov. A. Male capitulum and scutum, dorsum. B. Male capitulum, coxae and body, venter. C. Male hypostome. D. Male spiracular plate (A=anterior; D=dorsal). E. Male metatarsus and tarsus, leg I. F. Male metatarsus and tarsus, leg IV. G. Female capitulum and scutum, dorsum. H. Female capitulum and coxae, venter. I. Female hypostome. J. Female metatarsus and tarsus, leg I. K. Female metatarsus and tarsus, leg IV. L. Female spiracular plate.

(M. Celestino) 24464; 5 males, 2 females, Sinamay, Busuanga Island, March 14, 1947 (P. Añonuevo) 24484; 1 male, 1 female, Binuan, Iwahig, Palawan Island, May 3, 1947 (A. Castro) 24513. From

*Thecurus pumilus* Gunther: 4 males, 1 female, Dimaniang, Busuanga Island, March 17, 1947 (H. Hoogstraal) 24482. From *Viverra zangalunga* Gray: 1 male, 2 females, Dimaniang, Busuanga Island, March 18, 1947 (H. Hoogstraal) 24485; 1 male, locality as above, March 19, 1947 (H. Hoogstraal) 24488. From *Rusa* sp.: 1 male, Pangawaran, Busuanga Island, March 21, 1947 (H. Hoogstraal) 24489. From *Felis minuta* Temminick: 1 male, Sikatuna, Iwahig, Palawan Island, April 18, 1947 (A. Castro) 24507. From *Chiropodomys calamanensis* Taylor: 1 male, Puerto Princesa, Palawan Island, May 9, 1947 (H. Hoogstraal) 24514. From *Hylopotes nigripes* Thos.: 1 male, 2 females, Tigoplan River, Brooke's Point, Palawan Island, May 1, 1947 (F. Werner and T. Oañe) 24517. From *Mungos palawanus* Allen: 2 males, Brooke's Point, Palawan Island, May 12, 1947 (M. Celestino) 24528. *Crawling on arm of man*: 1 female, south slope of Mt. Balabag, Mantalingajan Range, southern Palawan Island, May 1947 (F. Werner) 24565.

Paratypes are deposited in the Chicago Natural History Museum, the U. S. National Museum, the National Museum of the Philippines (Manila), and the Rocky Mountain Laboratory.

*Description*.—Male. Length from tips of palpi to posterior margin of body (10 specimens measured), 1.77 to 2.37; width 1.14 to 1.51. Oval, widest at about the fourth coxae.

Capitulum: Length from tips of palpi to tips of cornua, from 0.38 to 0.47. Length of basis including cornua ranges from about 0.16 in the smaller specimens to about 0.22 in the larger ones; width from 0.28 to 0.35. Basis broad, lateral margins slightly convergent posteriorly, posterior margin between the cornua nearly straight. Dorsal surface of basis with a few scattered punctations. Cornua moderate in length, pointed. Palpal article 2 moderately salient laterally, about as long as article 3, and with a small rounded protuberance on the inner margin apically. No dorsal spur on palpal article 3 but the posterior margin is somewhat salient. In ventral view the surface of the basis is mildly convex, the posterior margin broadly rounded. Palpal article 2 without a spur, inner margin with 4 or 5 flattened hairs. Palpal article 3 with a long retrograde spur.

Hypostome: Shape as figured. Corona moderate. Dentition 5/5 with 6 or 7 teeth in each file. Denticles in the outer files somewhat larger than those of the inner files. Length about 0.256.

Scutum: Length from tips of scapulae to posterior margin ranges from 1.52 to 2.05 in the 10 specimens measured. Lateral grooves absent. Cervical grooves consist of small, deep pits followed by short, shallow depressions. Punctations fairly numerous, though small and inconspicuous.

**Legs:** Coxa I with a moderately long spur; spurs on II, III and IV are shorter and diminish progressively in size. Trochanters each with a short, blunt, ventral spur, smallest on IV. Length of tarsus I, 0.50; metatarsus, 0.33. Length of tarsus IV, 0.45; metatarsus, 0.37. Tarsus IV with a small, terminal, ventral spur.

**Spiracular plate:** Shape as figured. Greatest dimension about 0.31.

**Genital aperture:** Situated between coxae II.

**Female:** Length from tips of palpi to posterior margin (2 unfed or very slightly fed specimens), 2.53 and 2.66. Width, 1.46 and 1.59. Oval, widest at about the level of the fourth coxae. Marginal grooves begin at about the level of coxae II and continue across two festoons on each side. Festoons about as long as wide.

**Capitulum:** Length from tips of palpi to tips of cornua (10 specimens measured), 0.50 to 0.60. Length of basis, from about 0.19 to 0.23; width, from 0.44 to 0.50. Lateral margins of basis slightly convergent posteriorly, posterior margin between the cornua straight or slightly concave. Cornua moderate in length, pointed. Porose areas ovoid, well separated, depressed. Palpi longer than in the male, article 2 is more salient laterally and is longer than article 3. A small rounded protuberance on the inner margin of article 2 near the apex as in the male. No dorsal spur on article 3, although there is a slight salience at the point where the spur would be expected. In ventral view the surface of the basis is mildly convex, the posterior margin somewhat more sharply rounded than in the male. Palpal article 2 with the posterolateral angle of the salience in the form of a broad, short spur, the inner margin of the article with 4 short flattened hairs directed toward the base of the hypostome. Article 3 with a ventral retrograde spur as in the male.

**Hypostome:** Essentially as in the male. Length about 0.31.

**Scutum:** Usually slightly longer than broad. Measurements of 10 specimens range from 0.88 to 1.01 in length and from 0.84 to 1.01 in width. Cervical grooves begin as short, deep furrows and continue as shallower depressions which terminate before reaching the posterolateral margins. Punctations moderate in size and number, somewhat larger and more numerous in the lateral fields.

**Legs:** Essentially as in the male but without ventral spurs on the trochanters and the terminal, ventral spur on tarsus IV. Length of tarsus I, 0.56; metatarsus, 0.39. Length of tarsus IV, 0.49; metatarsus, 0.38.

**Spiracular plate.** Shape as figured. Greatest dimension about 0.33.

**Genital aperture:** Situated at the level of the intervals between coxae II and III.



*Remarks.*—The male of this new species resembles *Haemaphysalis birmaniae* Supino, 1897, as exemplified by 3 males at hand from Ceylon which were determined by Nuttall and Warburton. The principal difference is in the shape of the palpi which are much more salient basolaterally in *palawanensis*. Also, article 2 has a small rounded protuberance on the inner margin dorso-apically, and the ventral retrograde spur on article 3 is notably longer.

The female resembles that of *H. hoogstraali* sp. nov., but differs in lacking the prominent ventral retrograde spur on palpal article 2, as well as in characters of the hypostome, scutum, and spiracular plate.

***Haemaphysalis papuana* Thorell**

1882. *Haemaphysalis papuana* Thorell. Annali del Museo civico di St. Nat. di Genova 18: 62.

The known distributional range of this species extends from Indo-China to New Guinea but to the present it apparently has not been reported for the Philippines. The collections here reported are all from wild pig, *Sus philippinensis* Nehring, from Mindanao and Palawan Islands. The specimens agree well with *papuana* as described by Nuttall and Warburton (1915), Krijgsman and Ponto (1932) and Toumanoff (1944) as well as with specimens in the Rocky Mountain Laboratory collection from New Guinea, Sarawak (det. Nuttall) and Sumatra, except that those from Mindanao have dentition of the hypostome in both sexes 5/5 (in one male 6/6), instead of 4/4.

Three males, 2 females, Madaum, Tagum, Davao Province, Mindanao, October 11 and 12, 1946 (F. Werner) 24452 and 24454; 2 males, Calian, Malita, Davao Province, Mindanao, January 2, 1947 (M. Celestino) 24458; 5 males, 3 females, Pikit, Cotabato Province, Mindanao, December 16, 1946 (G. Alcasid) 24461; 3 males, 2 females, Lapulapu, Iwahig, Palawan Island, March 5, 1947 (M. Celestino) 24464; 1 female, Binuan, Iwahig, Palawan Island, May 3, 1947 (A. Castro) 24513.

***Haemaphysalis rusae* sp. nov. (Figure 6)**

*Holotype.*—Male, from Todaya, Mt. Apo, elevation of about 2400 feet, Davao Province, Mindanao Island, November 20, 1946 (H. Hoogstraal) 24457. Host: *Rusa* sp. In the Chicago Natural History Museum.

*Paratypes.*—Two males, same data, in the Chicago Natural History Museum and in the Rocky Mountain Laboratory.

*Description.*—Male. Length from tips of palpi to posterior margin of body, 1.89, width, 1.24. Oval, widest anterior to the middle of the scutum.

Capitulum: Length from tips of palpi to tips of cornua, 0.37. Length of basis, including cornua, 0.17; width, 0.31. Basis broad,

lateral margins slightly convex, posterior margin between the cornua straight. Cornua moderate in length, pointed. Palpal article 2 moderately salient laterally and longer than article 3. No dorsal spurs present but the posterior margin of article 3 is slightly salient. In ventral view basis is mildly convex, posterior margin nearly straight. Palpal articles 2 and 3 each with a long retrograde spur, article 2 with 3 long, slender hairs on the internal margin.

Hypostome: Shape as figured. Corona large. Principal denticles arranged 6/6 but becoming 5/5 near the base. Denticles progressively smaller from the lateral to the inner files, innermost files with 3 or 4 in each and about 8 in the others. Length about 0.164.

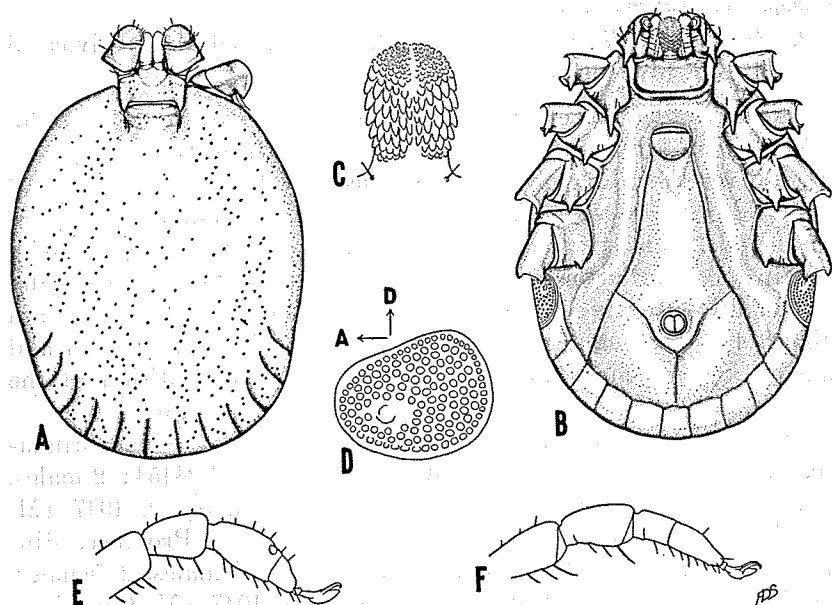


FIGURE 6.—*Haemaphysalis rusae* sp. nov. Male. A. Capitulum and scutum, dorsum. B. Capitulum, coxae and body, venter. C. Hypostome. D. Spiracular plate (A=anterior; D=dorsal). E. Metatarsus and tarsus, leg I. F. Metatarsus and tarsus, leg IV.

Scutum: Length from tips of scapulae to posterior margin, 1.69. Lateral grooves absent. Cervical grooves short but distinct. Punctations numerous but small and inconspicuous.

Legs: Coxa I with a long, slender, spur; a moderate spur, diminishing progressively in size on II, III, and IV. Trochanters each with a distinct, ventral, retrograde spur, smallest on trochanter IV. Length of tarsus I, 0.41; metatarsus, 0.26. Length of tarsus IV, 0.37; metatarsus, 0.27. A minute terminal ventral spur on tarsus IV.

Spiracular plate: Shape as figured, greatest dimension about 0.23.

Genital aperture: Situated between coxae II.

Female and immature stages unknown.

*Remarks.*—In Nuttall and Warburton's (1915) key to the species of *Haemaphysalis* this species runs to couplet 4, *hystrioides* and *birmaniae*. It is readily distinguished from *hystrioides* by its smaller size, the presence of the spur on palpal article 2 ventrally, the absence of a dorsal spur on article 3, and by the notably longer coxal spurs. It differs from *birmaniae* in several respects including the more salient palpi, the presence of the spur on palpal article 2 ventrally, the much longer ventral spur of palpal article 3, as well as the shape and dentition of the hypostome.

*Haemaphysalis sciuri* sp. nov. (Figure 7)

*Holotype.*—Male, from Burungkot, Upi, elevation about 1500 feet, Cotabato Province, Mindanao Island, January 8, 1947 (F. Werner) 24462. Host: *Sciurus mindanensis* Steere. In the Chicago Natural History Museum.

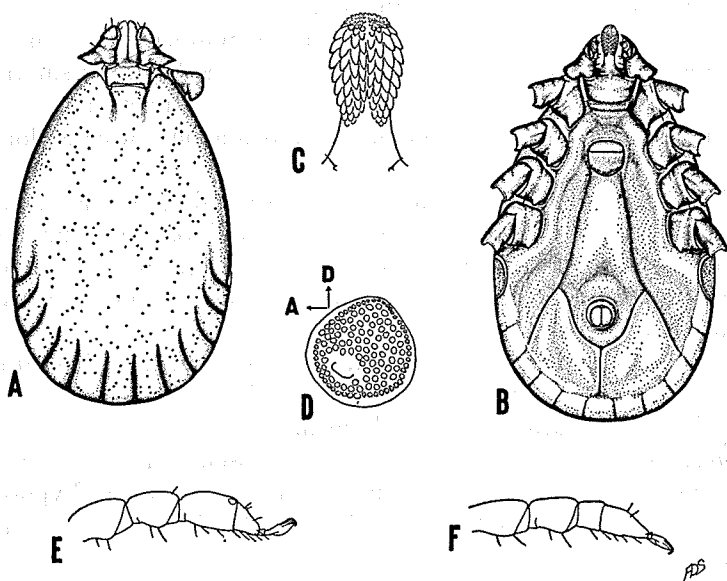


FIGURE 7.—*Haemaphysalis sciuri* sp. nov. Male. A. Capitulum and scutum, dorsum. B. Capitulum, coxae and body, venter. C. Hypostome. D. Spiracular plate (A=anterior; D=dorsal). E. Metatarsus and tarsus, leg I. F. Metatarsus and tarsus, leg IV.

*Paratypes.*—From *Sciurus mindanensis* Steere: 1 male, same data; 1 male, Madaum, Tagum, near sea level, Davao Province, Mindanao Island, October 12, 1946 (F. Werner) 24453. One in the Chicago Natural History Museum, and one in the Rocky Mountain Laboratory.

*Description.*—Male. Length from tips of palpi to posterior margin of body (3 specimens measured), 1.52, 1.64, 1.74; width, 0.80, 0.91, 0.98. Long oval, widest slightly anterior to the spiracular plates.

**Capitulum:** Length from tips of palpi to tips of cornua from about 0.25 to 0.28. Length of basis including cornua about 0.10; width, 0.22. Surface of basis with a few scattered punctations. Lateral margins convergent posteriorly, posterior margin between the cornua nearly straight. Cornua short but definite, pointed. Palpi shorter than the hypostome, very salient laterally, external margins concave inner margins nearly straight. Palpal article 3 much smaller than article 2, no dorsal retrograde spur present. In ventral view basis is broad and broadly rounded posteriorly. Palpal article 2 with 2 long slender hairs on the inner margin; article 3 with a short, retrograde spur.

**Hypostome:** Shape as figured. Corona small. Dentition 4/4 for most of the length, then 3/3 basally. Denticles progressively smaller from the lateral to the inner files, innermost files with 5 or 6 denticles, the others with 7 or 8. Length about 0.174.

**Scutum:** Length from tips of scapulae to posterior margin about 1.43. Lateral grooves absent. Cervical grooves begin as small pits and continue as shallow divergent depressions. Punctations numerous, small, and evenly distributed. Fестоons about twice as long as broad.

**Legs:** Coxal spurs small but definite, decreasing progressively in size from I to IV. Trochanter I with a small ventral spur, an insignificant spur on II, none on III and IV. Length of tarsus I, 0.32; metatarsus, 0.18. Length of tarsus IV, 0.29; metatarsus, 0.19. Tarsi without ventral spurs.

**Spiracular plate:** Shape as figured, greatest dimension about 0.17.

**Genital aperture:** Situated between coxae II.

Female and immature stages unknown.

**Remarks.**—The small size of this tick, the absence of lateral grooves, the strongly salient palpi, and the shape and dentition of the hypostome taken together will distinguish *sciuri* from other known species of this genus.

#### ***Haemaphysalis* spp.**

Several species in this genus are as yet unknown in the immature stages. The collection contained the following larvae and nymphs which are not specifically determinable at this time.

*Crawling on arm of man:* 2 nymphs, south slope Mt. Balabag, Mantalingajan Range, Palawan Island, May 1947 (F. Werner) 24565. From *Rattus* sp.: 2 nymphs, Siuk, Culion Island, Palawan Province, April 7, 1947 (M. Celestino) 24500. From *Sciurus mindanensis* Steere: 1 larva, Madaum, Tagum, Davao Province, Mindanao, October 12, 1946 (F. Werner) 24453. From *Sciurus* sp.: 6 nymphs, 5 larvae, Dimaniang, Busuanga Island, Palawan Province, March 19, 1947 (H. Hoogstraal) 24487. From *Callosciurus juvencus* Thos.: 20 nymphs, 5 larvae, Bacungan, Puerto Princessa, Palawan Island, March 30, 1947

(F. Werner) 24470; 5 nymphs, 3 larvae, Puerto Princesa, Palawan Island, April 9-22, 1947 (H. Hoogstraal) 24473, 24474, 24504; 2 nymphs, Lapulapu, Iwahig, Palawan Island, March 7, 1947 (M. Celestino) 24465. From *Callosciurus mollendorffi* Matschie: 4 nymphs, San Pedro, Culion Island, Palawan Province, March 28-29, 1947 (H. Hoogstraal) 24495-96; 7 nymphs, 1 larva, Siuk, Culion Island, April 4-8, 1947 (M. Celestino) 24497, 24498, 24501. From *Callosciurus steeri* Gunther: 4 nymphs, Brooke's Point, Palawan Island, May 3-5, 1947 (M. Celestino) 24525, 24526. From *Callosciurus* sp.: 60 nymphs, 13 larvae, Dimaniang, Busuanga Island, March 15-17, 1947 (H. Hoogstraal) 24479, 24480, 24483. From *Hylopetes nigripes* Thos.: 9 nymphs, 7 larvae, Lapulapu, Iwahig, Palawan Island, March 4, 1947 (M. Celestino) 24463. From *Mydaus marchei* Huet: 15 nymphs, 12 larvae, Iwahig Penal Colony, Palawan Island, March 7, 1947 (F. Werner) 24467; 2 nymphs, Iwahig, Iwahig, Palawan Island, May 7, 1947 (H. Hoogstraal) 24515; 10 nymphs, Puerto Princesa, Palawan Island, April 29, 1947 (H. Hoogstraal) 24510; 3 nymphs, Brooke's Point, Palawan Island, April 27, 1947 (M. Celestino) 24522. From *Thecurus pumilus* Gray: 2 nymphs, Dimaniang, Busuanga Island, March 17, 1947 (H. Hoogstraal) 24482; 1 nymph, Iwahig Penal Colony, Palawan Island, April 14, 1947 (H. Hoogstraal) 24502. From *Paradoxurus philippinensis* Jourdan: 1 nymph, Sorsogan, Iwahig, Palawan Island, April 17, 1947 (A. Castro) 24506; 1 nymph, Puerto Princesa, Palawan Island, May 4, 1947 (H. Hoogstraal) 24511. From *Tupaia* sp.: 12 nymphs, Dimaniang, Busuanga Island, Palawan Province, March 19-22, 1947 (H. Hoogstraal) 24486, 24494. From *Viverra zibetha* Gray: 18 nymphs, 1 larva, Dimaniang, Busuanga Island, March 18-19, 1947 (H. Hoogstraal) 24485, 24488. From *Mungos palawanus* Allen: 3 nymphs, Brooke's Point, Palawan Island, May 12, 1947 (M. Celestino) 24528. From *Polypteron emphanum*: 2 nymphs, 5 larvae, Lapulapu, Iwahig, Palawan Island, March 6, 1947 (M. Celestino) 24555. From *Gallus gallus*: 3 nymphs, 26 larvae, Dimaniang, Busuanga Island, March 19, 1947 (H. Hoogstraal) 24558. From *Pitta sordida sordida*: 1 nymph, data as above, 24560.

***Rhipicephalus sanguineus* (Latreille)**

1806. *Ixodes sanguineus* Latreille. Gen. Crust. Ins. p. 157.

Although this almost cosmopolitan species was not represented in the present Philippine collection its presence in the Islands was noted as early as 1897 by Neumann who recorded specimens from Bohol. In all probability the species is widely distributed throughout the Islands in view of the statement by de Jesus (1939) that it is very prevalent among dogs in the Philippines. In the Rocky Mountain Laboratory collection there are numerous adults from dogs, Manila, November 1945 (D. Conroy).

***Rhipicephalus haemaphysaloides pilans* Schulze**

1935a. *Rhipicephalus pilans* Schulze. Karakorum Exped. Zool. p. 180.

1936. *Rhipicephalus pilans* Schulze. Schulze, Zeit. f. Parasitenk. 8 (5): 524.

1943. *Rhipicephalus haemaphysaloides pilans* Schulze. Zumpt, Zeit. f. Parasitenk. 13 (1): 22.

This tick has not been previously recorded from the Philippine Islands nor was it present in the materials collected by the Chicago Natural History Museum Philippine Expedition. However, in the collection of the Rocky Mountain Laboratory there are two lots as follows: (1) Mindoro, from "cogan grass", April 1945, 7 males, 5 females (C. B. Philip) and (2) San Jose, Mindoro, probably from "cogan grass", October 1945, 1 male, 5 females (E. S. Ross). The specimens appear to be typical of *pilans* as described by Schulze and Zumpt and show little or no intergradation with *haemaphysaloides* Supino. Zumpt gave as the distribution of *pilans* the Greater and Lesser Sunda Islands. This is probably the species which was the basis for complaints of attack on United States troops at the time of reoccupation of this Island in early 1945.

***Boophilus microplus* (Canestrini)**

1887. *Haemophysalis micropla* Canestrini. Atti. Soc. Veneto-Trent. di Sci. Nat. 11: 104.

This widely distributed species was not represented in the Philippine collection but it was reported from Manila as early as 1904 by Banks. According to de Jesus (1934) it is "very prevalent among cattle in the Philippines." In the collection of the Rocky Mountain Laboratory there are numerous specimens sent by de Jesus from cattle, without locality data. In addition there are two lots also from cattle, as follows: Jaro, Leyte Island, October 31, 1935 (Jose O. Mendo); Aglalana Passi, Iliolo, Panay Island, August 11, 1934 (M. Rodriguez).

***Indocentor* spp.**

The genus *Indocentor* was erected by Schulze (1933a) with *Dermacentor auratus* Supino 1897 as the type species. Included in the genus were *Dermacentor compactus* Neumann 1901 (Borneo), *Indocentor compactus tricuspis* n. subsp. (Philippines), *Indocentor confractus* n. sp. (Java), *D. atrosignatus* Neumann 1906 (New Guinea), *Indocentor steini* n. sp. (New Guinea), and *I. steini leviculus* n. subsp. (Sumatra and Java). The distribution of *auratus* was given as from India to the Netherlands East Indies. In 1935 Schulze described *Indocentor bellulus* n. sp. from Formosa and revised the spelling of *confractus* to *confragus*. In the same year Sugimoto described *Dermacentor taiwanensis* n. sp. (an *Indocentor*) from Formosa, and in 1937 he reduced *bellulus* Schulze to a synonym of *atrosignatus* Neumann.

In 1939 Schulze proposed the name *ater* for the New Guinea tick he had previously identified as *atrosignatus* and described a new subspecies, *Indocentor compactus sumatranus*, from Sumatra. In a personal communication to the writer (1948) Schulze stated that *atrosignatus* of Neumann is either *auratus* or *compactus* and that without the type it would be impossible to come to a decision.

The writer is left in doubt by study of the Philippine specimens listed below, as well as over 60 adults from various hosts in Burma and Assam, lesser numbers from Formosa, Sumatra, Malaya and Dutch New Guinea, and co-types of *ater* and *steini* furnished by Dr. P. Schulze, as to the number of species in addition to *auratus* that should be recognized in this genus. All of the described forms closely resemble *auratus*, which was originally described from Burma. In *auratus*, coxa I has two short widely separated spurs while in other "species" the spurs on coxa I are notably longer and closer together. Schulze has emphasized differences in color and color patterns but the amount of variation evident in materials studied by the writer and in American species of the closely allied genus *Dermacentor* brings into question the value of the criteria employed by Schulze in specific and subspecific differentiation in *Indocentor*. In the Philippine series at hand the spurs of coxa I are long and contiguous but in other respects these ticks do not appear to be separable from *auratus* as typified by specimens from Burma. Significant differences in host relationships between *auratus* and the related forms that have been described are not apparent. Wild pigs appear to be important hosts of the adults but several of the other larger wild and domestic animals also serve as hosts. The Philippine collections, as well as unpublished records in the Rocky Mountain Laboratory of collections from Burma, Assam, and Malaya indicate that the larvae and nymphs occur more commonly on the smaller animals.

All of the Philippine collections are from Palawan Province. From *Sus philippinensis* Nehring: 18 males, 11 females, Lapulapu, Iwahig, Palawan Island, March 5, 1947 (M. Celestino) 24464; 2 females, Tulawa, Busuanga Island, March 15, 1947 (H. Hoogstraal) 24478; 2 males, 2 females, Binuan, Iwahig, May 3, 1947 (A. Castro) 24513; 1 nymph, Brooke's Point, Palawan Island, May 14, 1947 (M. Celestino) 24529. From *Callosciurus juvencus* Thos.: 1 nymph, Lapulapu, Iwahig, Palawan Island, March 5, 1947 (M. Celestino) 24465; 10 nymphs, Bacungan, Puerto Princesa, Palawan Island, March 26, 1947 (A. Castro) 24469; 6 nymphs, locality as above, March 30, 1947 (F. Werner) 24470; 13 nymphs, locality as above, April 11, 1947 (H. Hoogstraal) 24476. From *Callosciurus* sp.: 108 nymphs, 22 larvae, Dimaniang, Busuanga Island, March 15-17, 1947 (H. Hoogstraal) 24479, 24480, 24483. From *Callosciurus mollendorffi* Matschie: 5 nymphs, 1 larva, Siuk, Culion Island, April 4, 1947 (M. Celestino) 24498. From

*Callosciurus steeri* Gunther: 14 nymphs, 5 larvae, Brooke's Point, Palawan Island, April 26–May 5, 1947 (M. Celestino) 24521, 24524, 24525, 24526. From *Sciurus* sp.: 46 nymphs, 1 larva, Dimaniang, Busuanga Island, March 19, 1947 (H. Hoogstraal) 24487. From *Hyloupetes nigripes* Thos.: 1 nymph, Babuyan, Puerto Princesa, Palawan Island, March 15, 1947 (F. Werner) 24468; 1 nymph, Tigoplan River, Brooke's Point, Palawan Island, May 1, 1947 (F. Werner and T. Oañe) 24517. From *Tupaia palawanensis* Thos.: 2 nymphs, Puerto Princesa, Palawan Island, April 11, 1947 (H. Hoogstraal) 24475, 24477; 3 nymphs, Dimaniang, Busuanga Island, March 19–22, 1947 (H. Hoogstraal) 24486, 24494; 1 nymph, south slope Mt. Balabag, Mantalingajan Range, Palawan Island, May 13, 1947 (F. Werner and T. Oañe) 24518. From *Paradoxurus philippinensis* Jourdan: 1 nymph, 2 larvae, San Pedro, Culion Island, March 31, 1947 (H. Hoogstraal) 24497. From *Rattus* sp.: 4 nymphs, Siuk, Culion Island, April 7, 1947 (M. Celestino) 24500. From *Felis minuta* Temminck: 1 nymph, Brooke's Point, Palawan Island, April 24, 1947 (M. Celestino) 24519. From *Mungos palawanus* Allen: 1 nymph, Brooke's Point, Palawan Island, May 12, 1947 (M. Celestino) 24528.

***Amblyomma cyprium aeratipes* Schulze**

1933b. *Amblyomma cyprium aeratipes* Schulze, Zool. Anz. 104: 321.

The subspecies *aeratipes* was established by Schulze for a male from Momangen, Mindanao and a female from Pt. Banga, Mindanao, host not stated. It was characterized by the presence of thick, greenish, metallic ornamentation on the leg joints, the brighter ornamentation of the scutum of both sexes, and the ground color was stated to be somewhat darker brown than in the typical subspecies.

The material at hand is also from Mindanao and it agrees better with *aeratipes* than with *cyprium* from New Guinea, the Solomon Islands, and Fiji in the Rocky Mountain Laboratory collection. It is possible that Neumann's (1911) record of *cyprium* from the Philippines is based on specimens which would now be regarded as *aeratipes*.

From *man.*: 8 females, east slope Mt. McKinley, Davao Province, August 19 to September 10, 1946 (H. Hoogstraal) 24561, 24562, 24566, and 24567; 1 female, Baclayan, east slope Mt. McKinley, Davao Province, November 13, 1946 (G. Alcasid) 24563; 1 male, 2 females, Todaya, Mt. Apo, Davao Province, November 1946 (H. Hoogstraal) 24569. "In house": 1 female, east slope Mt. McKinley, Davao Province, September 3, 1946 (H. Hoogstraal) 24568. "On front of house": 1 female, locality as above, October 1, 1946 (F. Werner) 24574. *Source not stated*: 1 female, locality as above, November 1946 (H. Hoogstraal) 24573; 1 male, Burungkot, Upi, Cotabato Province, January 1, 1947 (F. Werner) 24576. From *Harpactes ardens rhodosternus*, 1 male, east slope Mt. McKinley, Davao Province, August 19, 1946 (H. Hoogstraal) 24553.



Although none of the ticks from man showed any evidence of having fed, in one instance the label stated that the tick was actually attached.

*Amblyomma helvolum* Koch

1844. *Amblyomma helvolum* Koch, Arch. f. Naturg. 10: 230.  
 1844. *Amblyomma decoratum* Koch, Arch. f. Naturg. 10: 230. (Degraded to a synonym of *helvolum* by Robinson 1926, Ticks, pt. 4, p. 216).  
 1899. *Amblyomma quadrimaculatum* Neumann, Mem. Soc. Zool. France 12: 245. (Degraded to a synonym of *decoratum* by Neumann 1911, Das Tierreich, 26 Lieferung, p. 87).  
 1901. *Amblyomma furcosum* Neumann, Mem. Soc. Zool. France 14: 299. (Degraded to a synonym of *decoratum* by Neumann 1911, Das Tierreich, 26 Lieferung, p. 87).  
 1910. *Amblyomma* (*Aponomma*) *tenimberense* Hirst and Hirst, Ann. and Magaz. of Nat. Hist. ser. 8, vi, p. 307. (Degraded to a synonym of *helvolum* by Robinson 1926, Ticks, pt. 4, p. 216).

Schulze (1933c) accepted the synonymy of *decoratum* with *helvolum* but maintained that *quadrimaculatum* was distinct. He stated that these two species and a new species, *feuerborni*, are always being confused with one another and he presented keys and reference figures purporting to distinguish between them. The variation evident in the Philippine series listed below, even among specimens from the same individual host, does not support the view that *quadrimaculatum* is separable from *helvolum* and raises doubt as to whether *feuerborni* is actually distinct. Recorded hosts of all three "species" are reptiles. According to Robinson (1926) the distributional range extends from the Nicobar Islands to New Guinea and Australia.

From *Varanus salvator*: 36 males, 9 females, Maco, Tagum, Davao Province, Mindanao, October 11 to 24, 1946 (H. Hoogstraal, F. Werner, A. Castro) 24530 to 24534; 1 female, Puerto Princesa, Palawan Island, March 17, 1947 (F. Werner) 24537; 2 females, San Pedro, Culion Island, Palawan Province, March 26, 1947 (H. Hoogstraal) 24545-46. From "*monitor lizard*": 1 female, Lacaron, Malita, Davao Province, Mindanao, February 6, 1947 (F. Werner) 24551. From *Mabuya multifasciata*: 2 females, 2 nymphs, San Pedro, Culion Island, Palawan Province, May 28, 1947 (H. Hoogstraal) 24549; 1 female, Brooke's Point, Palawan Island, April 25, 1947 (D. Rabor) 24543. From "*python*": 10 males, 2 females, 1 nymph, Caburan, Davao Province, Mindanao, January 20, 1947 (H. Hoogstraal) 24552. From "*snake*": 1 male, 1 female, locality as above, January 21, 1947 (H. Hoogstraal) 24535. From *Hydrosaurus pustulosus*: 1 male, 4 females, Davao City, Mindanao, January 30, 1947, 26910.

*Amblyomma javanense* (Supino)

1897. *Rhipicephalus javanensis* supino. Atti. Soc. Veneto-Trent, di Sci. Nat. 3 (2) : 233.

This species has been previously reported from India, Burma, China, Siam, Indo-China, Malay States, Sumatra, and Java. The principal hosts are pangolins, *Manis* spp., but it has also been recorded from *Varanus*, *Python*, *Micoria tricarinata*, *Hyena, sambar* (*Rusa* sp.), wild boar, *Euprepes* sp., and *Vesperugo abramus*.

The following Philippine records are all from Palawan Island. From *Paramanis culionensis* Casto de Elera: 49 males, 11 females, 59 nymphs, Santa Teresa, Iwahig, March 6, 1947 (F. Werner) 24466; 16 males, 5 nymphs, Iwahig Penal Colony, April 14, 1947 (H. Hoogstraal) 24503; 1 male, 2 nymphs, Iwahig, May 1, 1947 (A. Castro) 24512; 13 males, 3 females, 50 nymphs, 120 larvae, Brooke's Point, May 9, 1947 (M. Celestino) 24527. From "ant hill in grassland": 1 female, Puerto Princesa, April 29, 1947 (H. Hoogstraal) 24575.

*Amblyomma testudinarium* Koch

1844. *Amblyomma testudinarium* Koch. Arch. f. Naturg. 10: 226.

This tick has an extensive distribution in the Far East. It has been reported from Japan, Formosa, India, Ceylon, Burma, Indo-China, Malay States, and from several islands of the Netherlands East Indies. Its hosts include a wide variety of wild and domestic animals and it attacks man occasionally. The present records appear to be the first from the Philippines.

From *Sus philippinensis* Nehring: 1 male, Lapulapu, Iwahig, Palawan Island, March 5, 1947 (M. Celestino) 24464; 6 males, 1 female, Binuan, Iwahig, Palawan Island, May 3, 1947 (A. Castro) 24513.

Five collections of nymphs which are probably *testudinarium* are recorded below. From *Mydaus marchei* Huet: 1 nymph, Iwahig Penal Colony, Palawan Island, March 7, 1947 (F. Werner) 24467; 1 nymph, Dimaniang, Busuanga Island, Palawan Province, March 17, 1947 (H. Hoogstraal) 24481. From *Thecurus pumilus* Gunther: 9 nymphs, locality, date and collector as above, 24482. From *Paradoxurus philippinensis* Jourdan: 1 nymph, Puerto Princesa, Palawan Island, April 5, 1947 (F. Werner) 24471. From *Callosciurus mollen-dorffi* Matschie: 1 nymph, San Pedro, Culion Island, Palawan Province, March 28, 1947 (H. Hoogstraal) 24495.

*Amblyomma* spp.

Larvae and nymphs which are not assignable specifically at this time are recorded below: From *man*: 15 larvae, Bacungan, Puerto Princesa, Palawan Island, March 26, 1947 (F. Werner) 24564. From *Viverra zangalunga* Gray: 1 nymph, Dimaniang, Busuanga Island, Palawan Province, March 19, 1947 (H. Hoogstraal) 24488. From

*Thecurus pumilus* Gunther: 4 nymphs, Iwahig Penal Colony, Palawan Island, April 14, 1947 (H. Hoogstraal) 24502; 1 nymph, Sorsogan, Iwahig, Palawan Island, April 17, 1947 (H. Hoogstraal) 24505; 6 nymphs, 3 larvae, Tagbuni, Iwahig, Palawan Island, April 22, 1947 (H. Hoogstraal) 24508; 5 nymphs, Montible, Iwahig, Palawan Island, April 29, 1947 (H. Hoogstraal) 24509. From *Rattus* sp.: 6 nymphs, east slope Mt. McKinley, Davao Province, Mindanao, August 25, 1946 (H. Hoogstraal) 24450; 3 nymphs, Todaya, Mt. Apo, Davao Province, Mindanao, October 20, 1946 (H. Hoogstraal and D. Heyneman) 24456. From *Urogale everetti* Thos.: 7 nymphs, locality as above, November 1946 (H. Hoogstraal) 24570. From *Gallus gallus*: 52 larvae, Mahupa, Culion Island, Palawan Province, March 28, 1947 (H. Hoogstraal) 24559.

The nymphs from *Thecurus* probably are of one species; they are notable in having the spiracular plate margined ventrally with long hairs. Those from *Rattus* and *Urogale* are another species and may well be *cyprum*, the nymph of which is as yet undescribed.

***Aponomma ecinctum* Neumann**

1901. *Aponomma ecinctum* Neumann. Mem. Soc. Zool. France 14: 293.

The only record of this tick in the Philippines is that of Neumann (1911) who reported it from Luzon as well as from New South Wales and Samoa. Reported hosts of the species include the beetle, *Aulacocyclus kaupi*, and the snakes, *Diemenia superciliosa* and *Engryus samoensis*, and a lizard, *Hydrosaurus giganteus*.

***Aponomma fimbriatum* (Koch)**

1844. *Amblyomma fimbriatum* Koch. Arch. f. Naturg. 10: 231.

The original description of *fimbriatum* was based on a male from Manila without mention of host. Neumann (1901) degraded the species to a synonym of *Amblyomma decoratum* Koch, also from the Philippine Islands, which in turn was reduced to a synonym of *Amblyomma helvolum* Koch by Robinson (1926). Schulze (1933c) stated that *fimbriatum* was wrongly interpreted as a synonym of *helvolum* and related it subspecifically to *Aponomma undatum* (Fabr.). In 1935 (c) he stated that he had examined the poorly preserved type, and with specimens at hand from Manila and East New Guinea he briefly described the male, female, and nymphs, raising *fimbriatum* to specific rank. Hosts were *Python reticulatus* and *Varanus* sp. The species was considered to be closely related to *Aponomma trabeatum* Schulze, 1933 (from *Varanus* sp., North New Guinea) which was said to have a brighter color pattern. This and other differences mentioned appear to be rather inconsequential and it seems improbable that *trabeatum* can be maintained as a distinct species.

The following specimens agree best with *fimbriatum* as characterized by Schulze. From *Varanus salvator*: 3 males, 6 nymphs, Maco,

Tagum, Davao Province, Mindanao, October 17, 1946 (H. Hoogstraal) 24530; 5 males, Madaum, Tagum, Davao Province, Mindanao, October 24, 1946 (F. Werner and A. Castro) 24533; 4 males, locality as above, October 27, 1946 (F. Werner and A. Castro) 24534; 12 males, Davao City, Mindanao, November 27, 1946 (H. Hoogstraal) 24536; 36 males, 5 females, Babuyah, Puerto Princesa, Palawan Island, March 17, 1947 (F. Werner) 24537; 1 male, locality as above, April 9, 1947 (F. Werner) 24538; 1 male, 1 female, locality as above, April 12, 1947 (F. Werner) 24539; 25 males, 4 females, locality as above, April 15, 1947 (H. Hoogstraal) 24541-24542; 1 female, Brooke's Point, Palawan Island, April 26, 1947 (D. Rabor) 24544; 2 males, San Pedro, Culion Island, Palawan Province, March 26, 1947 (H. Hoogstraal) 24545; 3 females, locality as above, May 11, 1947 (M. Celestino) 24548. From "*monitor lizard*": 3 males, Lacaron, Malita, Davao Province, Mindanao, February 6, 1947 (F. Werner) 24551. From "*python*": 22 males, 1 female, Cebu City, Cebu, November 20, 1946 (J. N. Hamlet) 24550. From *unstated source*: 2 males, 2 females, 1 nymph, Puerto Princesa, Palawan Island, April 13, 1947 (H. Hoogstraal) 24540.

Following is a list of the ticks now known from the Philippine Islands. Asterisks mark the names of the species that are first reported from the Islands in this paper.

#### Argasidae

\**Argas pusillus* Kohls sp. nov.

\**Ornithodoros batuensis* Hirst

#### Ixodidae

\**Ixodes granulatus* Supino

\* " *mindanensis* Kohls sp. nov.

\* " *wernerii* Kohls sp. nov.

*Haemaphysalis centropi* Kohls

\* " *hoogstraali* Kohls sp. nov.

\* " *palawanensis* Kohls sp. nov.

\* " *papuana* Thorell

\* " *rusae* Kohls sp. nov.

\* " *sciuri* Kohls sp. nov.

*Rhipicephalus sanguineus* (Latreille)

\* " *haemaphysaloides pilans* Schulze

*Boophilus microplus* (Canestrini)

*Indocentor* sp.

*Amblyomma cyprum aeratipes* Schulze

\* " *helvolum* Koch

\* " *javanense* (Supino)

\* " *testudinarium* Koch

*Aponomma ecinctum* Neumann

\* " *fimbriatum* (Koch)