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IXODES SIGELOS, N. SP. (ACARINA : IXODIDAE),
A PARASITE OF RODENTS IN CHILE, WITH A METHOD
FOR PREPARING TICKS FOR EXAMINATION
BY SCANNING ELECTRON MICROSCOPY

BY

J. E. KEIRANS, C. M. CLIFFORD, AND D. CORWIN. *

ABSTRACT

The female, nymph, and larva of Ixodes sigelos, n. sp., are described. A total of 7 ♀, 3 N, and 8 L were collected from Santiago, Maule, and Malleco Provinces, Chile, on chinchilla rat (Abrocoma bennetti), degus (Octodon degus), leaf-eared mouse (Phyllotis sp.), and rock rat (Aconaemys fuscus). A method of preparing ticks for study by scanning electron microscopy is described.

RÉSUMÉ

Description de la femelle, la nymphe et la larve d'Ixodes sigelos, n. sp. 7 femelles, 3 nymphes et 8 larves ont été récoltées dans les provinces de Santiago, Maule et Malleco au Chili, sur Abrocoma bennetti, Octodon degus, Phyllotis sp. et Aconaemys fuscus. Une méthode de préparation des tiques pour l'étude au microscope à balayage est décrite.

The new species described herein was collected by Mr. Robert E. MARTIN, Laboratorio de Ecologia, Casilla 114-D, Universidad Católica de Chile, Santiago, and submitted to us for identification by Mr. James P. WEBB of Texas Tech University, Lubbock.

We have not assigned I. sigelos to a subgenus because the features of the female suggest placement in Ixodes while the strong anterior and posterior projections on the first palpal article of the nymph and larva indicate an association with Pholeioxodes. If these features are found to be consistent in the immature stages of the closely related species I. longiscutatum, erection of a new subgenus should be considered.

Preparation of ticks for scanning electron microscopy

1. Ticks are placed in a one- or two-dram screw-cap vial containing a solution of Alconox® **.


** Use of trade names is for identification purposes only and does not constitute endorsement by the Public Health Service or U. S. Department of Health, Education, and Welfare.

water (± 4 gm/liter), put in an ultrasonic cleaner and shaken for 15-20 minutes. The ticks are then examined for cleanliness under a dissecting microscope.

2. Specimens are washed in tap water, again using the ultrasonic cleaner.

3. They are then taken through a graded series of alcohol/water (25 %, 50 %, 75 %, 100 % ETOH), remaining one hour in each dilution.

4. Following this, specimens are transferred through a graded series of alcohol/freon II to 100 % freon II, using the same concentrations and time intervals as for the alcohol/water series.

5. From 100 % freon II, ticks are placed in a critical point dryer (Bomar SPC-900/EX) and dried, using freon 13.

6. Dried specimens are glued (usually vertically to present dorsal and ventral surfaces) to the SEM stub with silver conducting paint (Ladd #6300). Note — If the tick falls into the paint, a one-minute rinse in acetone using the ultrasonic cleaner will usually clean it.

7. Samples mounted on SEM stubs are put on a tilting-rotating table (Ladd #6000) which is placed in a vacuum evaporator. Two evaporation sources are used — one at 45° from the horizontal surface of the table 10 cm from the specimens, the second at 20°, 10 cm. Three cm of 8 mil palladium wire is put on each tungsten filament, the vacuum evaporator evacuated to 10^-4 Torr, and the palladium deposited. The procedure is repeated using 3 cm of 8 mil gold wire per filament.

**Ixodes sigelos, n. sp.**

All measurements are given in millimeters. Terminology for larval chaetotaxy is that of Clifford and Anastos (1960).


**Paratypes** — 3 ♀, 1 N, 1 L. Data and depository as for holotype. 2 ♀, 1 N deposited in the collection of Texas Tech University, Lubbock.

**Female** (Fig. 1-9) : Measurements based on slightly engorged holotype followed by the average, in parentheses, of 5 partially to fully engorged specimens. Length from apices of hypostome to posterior body margin 2.45 (5.26), breadth 1.30 (3.18).

**Capitulum** : Length from palpal apices to cornua apices 0.68 (0.73). *Basis capituli* dorsally (Fig. 1) 0.36 (0.36) broad; cornua broadly triangular, posterior margin between cornua sinuous. Porose areas moderately large, not depressed into basis, separated by the width of one porose area. Ventrally (Fig. 2) with posterior margin straight; transverse suture faintly indicated just posterior to small irregular laterally positioned auriculae. *Palpi* (Fig. 3) fusiform 0.56 (0.61) long, 0.14 (0.14) broad; article II, 0.30 (0.33) one-third longer than article III, 0.20 (0.21); articulation between the two segments distinct. Article IV recessed within ventrolateral surface of III. Article I ventrally with one or two very long, fringed setae (Fig. 2). Hypostome (Fig. 4) pointed apically with flaring denticles, length of toothed portion 0.35 (0.37); dental formula 3/3 throughout length, about 14 teeth in files 1 and 2, about 11 in file 3.
Scutum (Fig. 5) : Very elongate and narrow; length 1.13 (1.24), breadth 0.58 (0.58). Lateral carinae absent; cervical grooves converging then diverging for anterior 1/3 of scutum; punctations few; setae long, evenly distributed, and numerous.

Spiracular plate (Fig. 6) : Shape as illustrated; greatest diameter 0.20 (0.20).

Legs : Rather long and slender. Coxae I – IV (Fig. 7) with a moderately large, bluntly triangular external spur decreasing in size from I – IV; coxa I with a short, triangular internal spur; internal spurs lacking on II – IV. Trochanters lack spurs. Tarsus I (Fig. 8) as illustrated; 0.35 (0.34) long; 0.11 (0.13) broad. Tarsus IV 0.33 (0.35) long; 0.10 (0.10) broad.

Genital aperture (Fig. 7) : Situated between coxae III.

Anal groove (Fig. 9) : Horseshoe-shaped, arms do not reach posterior margin of body. Anal valves with 4 pairs of setae.

Nymph (Fig. 10-19) : Three measurements are given; one from an unengorged specimen and two from fully engorged specimens. SEM photographs are from the unengorged specimen.

Body : Length from apices of palpi to posterior body margin 1.05, 1.95, 2.08; breadth 0.54, 1.24, 1.25.

Capitulum : Length from palpal apices to cornua apices 0.25 (all specimens); breadth at level of lateral protuberances 0.20, 0.24, 0.24. Basis capituli dorsally with prominent triangular posteriorly directed cornua (Fig. 10); posterior margin between cornua straight; external margins of basis diverging to small but distinct lateral protuberances (Fig. 11); ventrally (Fig. 12) with 2 pr post hypostomal setae, basis constricted posterior to midlength, posterior margin convex; auriculae absent. Palpi calvate 0.162; 0.187, 0.187 long, 0.063 (all specimens) broad, suture between articles II and III indistinct (Fig. 13, 14); setae number 18 on articles II and III combined, 14 on IV and 1 on I; palpal article I with large anterior and posterior spurs plus an additional large posterolateral spur and a very small lateral protuberance near the insertion of palpal article II (Fig. 15). Hypostome (Fig. 16) moderately elongate not arising from an anterior projection of basis; apically with a small corona of fine denticles; length 0.150, 0.150, 0.125; dental formula 2/2 except for apical row of 3/3 (difficult to distinguish without aid of SEM).

Scutum (Fig. 17) : Length 0.46, 0.45, 0.43, breadth 0.34, 0.38, 0.33. Outline as illustrated. Lateral carinae indicated by a straight row of fine setae and delicate shagreening of cervical fields ending along this line; cervical grooves shallow but distinct converging then diverging to junction with lateral carinae. Scutal surface smooth with few setae or punctations.

Spiracular plate (Fig. 18) : Nearly circular, longest dimension 0.10.

Legs (Fig. 19) : Coxa I with a small triangular internal and external spur; II – IV each with a small external spur and lacking an internal spur. Trochanters lack spurs. Tarsus I 0.237, 0.237, 0.212 long; 0.100, 0.075, 0.088 broad. Tarsus IV 0.200, 0.187, 0.187 long; 0.050, 0.063, 0.063 broad.

Larva (Fig. 20-22) : Measurements were from five slightly engorged specimens mounted on slides.
Figs. 1-9. — *Ixodes sigelos* ♂, Chile.

1, 2) Basis capituli dorsal (309 ×) and ventral (263 ×) views; 3) Palpus dorsal view 249 ×; 4) Hypostome A 270 ×; 5) Scutum 88 ×; 6) Spiracular plate D 709 ×; 7) Coxae I — IV 128 ×; 8) Tarsus I 302 ×; 9) Anal groove 270 ×.

**Body:** Subcircular, broadest near midlength; 0.61-0.66 (0.63) long (including capitulum); 0.39-0.43 (0.41) broad. *Sensilla sagittiformia* absent. **Dorsal setae:** 10 pairs; 2 pairs of central dorsals (a few specimens had a seta in position CD₂), CD₁ 0.012-0.022 (0.021), CD₂ 0.012-0.015 (0.013); 8 pairs marginal dorsals, MD₁ 0.014-0.024 (0.019), MD₈ 0.019-0.024 (0.022). **Ventral setae** 11 pairs plus 1 pair on anal valves; 3 pairs of sternals, ST₁ 0.029-0.036 (0.031) (4 specimens); 2 pairs of preanals, PA₁ 0.019-0.026 (0.024); PA₂ 0.024-0.029 (0.026); 3 pairs of premarginals; 3 pairs of marginal ventrals (pair MV₁ occasionally missing) MV₁ 0.019-0.026 (0.023). **Anal groove** open anteriorly.
Figs. 10-19. — *Ixodes sigelos* nymph, Chile.

10) Basis capituli dorsal view 599 X; 11) Lateral protuberance on basis capituli 751 X; 12) Basis capituli ventral view 429 X; 13, 14) Palpi dorsal (839 X) and ventral (936 X) view; 15) Palpal article I 946 X; 16) Hypostome 873 X; 17) Scutum 273 X; 18) Spiracular plate 1237 X; 19) Coxae I — IV 331 X.

Capitulum: Length from apex of hypostome to apices of cornua 0.118-0.134 (0.128); breadth 0.125-0.146 (0.130). Basis capituli dorsally with posterior margin straight; lateral margins diverging. Cornua moderately large, distinct. Ventrally basis constricted posterior to midlength, auriculae absent; posterior margin very slightly curved. Posthypostomal setae 2 pairs, PH1 0.014-0.026 (0.023); PH2 0.007-0.014 (0.011); distance between PH1 0.043-0.048 (0.045); between PH2 0.036-0.048 (0.039). Palpi short, bluntly rounded, from 0.101-0.110 (0.107) long by 0.034-0.039 (0.037) broad; setae, 0 on segment 1, 9 dorsally and 3 ventrally on segments 2 and 3 combined.
(suture between 2 and 3 indistinct), segment 4 with about 8; palpal segment 1 with a large anterior projection and ventrally with a moderately large, bluntly rounded, posteriorly directed spur. Hypostome blunt anteriorly; 0.065-0.072 (0.069) long; 0.034-0.036 (0.035) broad; dentition 2/2 throughout length with a minute corona of fine denticles apically; 8-9 denticles in file 1, 7-8 in file 2.

Scutum: Length 0.22-0.23 (0.23), breadth 0.25-0.30 (0.27). Outline diverging posteriorly to midlength then converging as a slightly concave arc to bluntly rounded posterior margin. Cervical grooves indistinct on slide-mounted material. Setae 4 pairs, SC3 0.010-0.017 (0.013) (4 specimens), SC4 0.007-0.019 (0.014); SC5 0.010-0.012 (0.011) (4 specimens).

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Dorsum (Fig. 20) and venter (Fig. 21) as illustrated.

Legs: Coxa I with a broadly rounded internal spur and a small, bluntly triangular external spur; definite spurs absent on remaining legs but coxa II broadly thickened internally. Coxal setae: 3 each on I and III, 2 on II. Tarsus I (Fig. 22) 0.156-0.168 (0.164) long, breadth of tarsus I 0.060 (all samples); setae number 2 prehalleral pairs and 3 groups of 4 each, ventrally and externally.
A total of 7 ♀, 3 N, and 8 L I. sigelos were collected from rodent hosts in Chile by R. E. Martin as follows:

Santiago Province, 10 km W Til Til, 1250 m (33° 04' S, 71° 04' W) 4-XI-1974, 1 nymph (RML 65435) ex ♀ Abrocoma bennetti; 2.5 km NE Cerro Manquelue, 900 m (33° 20' S, 70° 33' W), 20.XII.1974, 4 larvae (RML 65436), 3 larvae (RML 65437) ex 2 ♀ Octodon degus. Maule Province, Vilches Alto, 57 km ESE Talca, 1350 m (35° 35' S, 71° 04' W), 26.1.1975, 1 ♀ (RML 65438) ex ♀ Phyllotis sp. (probably P. darwini). Malleco Province, Parque Nahuelbuta, 25 km W Angol, 1260 m (37° 50' S, 72° 57' W), 1.II.1975, 6 ♀, 2 nymphs, 1 larva (RML 65439) ex ♀ Aconaemys fuscus.

Abrocoma bennetti was collected among Litrea cuastica trees in the small to moderately large hills of Cuesta de la Lormida (Andean coastal range). Phyllotis sp. and Aconaemys fuscus were collected in a timbered area, with primarily Notofagus sp. in the Andean foothills of the southern provinces. The two Octodon degus were collected near Santiago in an area of small trees, principally Acacia caven and Litrea cuastica.

Little is known of the behavioral ecology of these caviomorph rodents but species of Octodon and Abrocoma are known to utilize the same burrow systems (Martin, pers. commun.). Additional information on the biology and social behavior of Octodon degus is given by Wilson and Kleiman (1974).

Species relationships

The female of Ixodes sigelos is most closely related to I. longiscutatum Boero, 1944, a parasite of horses in Argentina and Cavia sp. in Uruguay, but sigelos can be separated from it by the following characters: cornua broader in sigelos, narrower and more posteriorly directed in longiscutatum; posterior margin of basis sinuous in sigelos, almost straight in longiscutatum; scutum with darker brown areas laterally and with few setae in longiscutatum, scutum uniformly dark brown with numerous setae in sigelos; genital aperture between coxae II in longiscutatum, between coxae III in sigelos. Ixodes longiscutatum is accurately figured in Boero (1957).

The males of both species are undescribed as are the nymph and larva of longiscutatum.

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Paru en Novembre 1976.