

Aponomma (Bothriocroton) glebopalma, n. subgen., n. sp., and *Amblyomma glauerti* n. sp. (Acari: Ixodida: Ixodidae), Parasites of Monitor Lizards (Varanidae) in Australia

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ABSTRACT *Aponomma (Bothriocroton) glebopalma*, n. subgen., n. sp., and *Amblyomma glauerti*, n. sp. (Acari: Ixodidae), are described from the monitor lizards *Varanus glebopalma* Mitchell and *Varanus glauerti* Mertens in Western Australia and the Northern Territory, Australia. The new subgenus is erected to accommodate *A. (Bothriocroton) glebopalma*, a new species with a deeply pitted and pilose scutum in both the adult and immature stages, unlike all other described species of *Aponomma*. This new species is found in an area where *Aponomma fimbriatum* Koch, a parasite of varanid lizards and various species of snakes, was the only known member of the genus found in both Western Australia and the Northern Territory. *Amblyomma glauerti* n. sp., an ornate Australian reptile tick found on the same two hosts in Western Australia and the Northern Territory, is also described. These two new species were recovered from formalin-preserved lizard specimens; therefore, nothing is known of their life cycles, except that all stages parasitize varanid lizards.

KEY WORDS Ixodidae, lizards, Australia

IN THEIR EARLY PUBLICATIONS on the ticks of Australia, Ferguson (1924) and Fielding (1926) listed five species within the genus *Aponomma*. Roberts (1953) cited 11 *Aponomma* species in Australia and later (Roberts 1964) reduced that number to nine species. Finally, in his monograph on the Australian ticks (Roberts 1970) he reduced the number of valid *Aponomma* species to eight. Kaufman (1972) further reduced the number of *Aponomma* species in Australia to six with only *A. fimbriatum* (C. L. Koch) known from Western Australia and the Northern Territory. Subsequently Sharrad & King (1981) reported *A. hydrosauri* (Denny) from four isolated areas along the south western coast of Australia.

Four of the 12 *Amblyomma* species found in Australia are ectoparasites of reptiles; they are *A. moreliae* (L. Koch), *A. albolimbatum* Neumann, *A. calabyi* Roberts, and *A. limbatum* Neumann. The two last-named species are present in both Western Australia and the Northern Territory.

Herein we describe *Aponomma (Bothriocroton) glebopalma*, new subgenus and new species, and *Amblyomma glauerti*, new species, parasites of both *Varanus glebopalma* and *V. glauerti* from Western Australia and the Northern Territory. All measurements are in millime-

ters; a range is given with a mean in parentheses. Specimens were prepared for scanning electron microscopy by the method of Corwin et al. (1979).

Bothriocroton Keirans, King & Sharrad, new subgenus

Adults. Body small, subcircular (males \approx 1.5 mm long). Both sexes with scutal ornamentation; lateral carinae absent; large deep punctations, each with a short peglike seta giving the scutum a very irregular appearance unlike that of any known species of *Aponomma*. Female idiosoma also beset with numerous short peglike setae. Capitulum deeply recessed in scutal emargination; hypostomal dentition 2/2. Legs with 1 spur on each coxa; tarsal dorsal surface undulating or humped, especially on tarsi II-IV, claws long, pulvilli very small to absent.

Nymph. Generally similar to female in most respects except lacking sexual features and lacking scutal ornamentation.

Larva. Scutum broader than long, cervical grooves deep and posteriorly directed. Dorsal body setae number 10 pairs, ventral body setae number 12 pairs plus 1 pair on anal valves. Basis capituli lacks cornua, hypostome apically rounded, dentition 2/2.

Type of the Subgenus. *Aponomma (Bothriocroton) glebopalma*, new species by monotypy.

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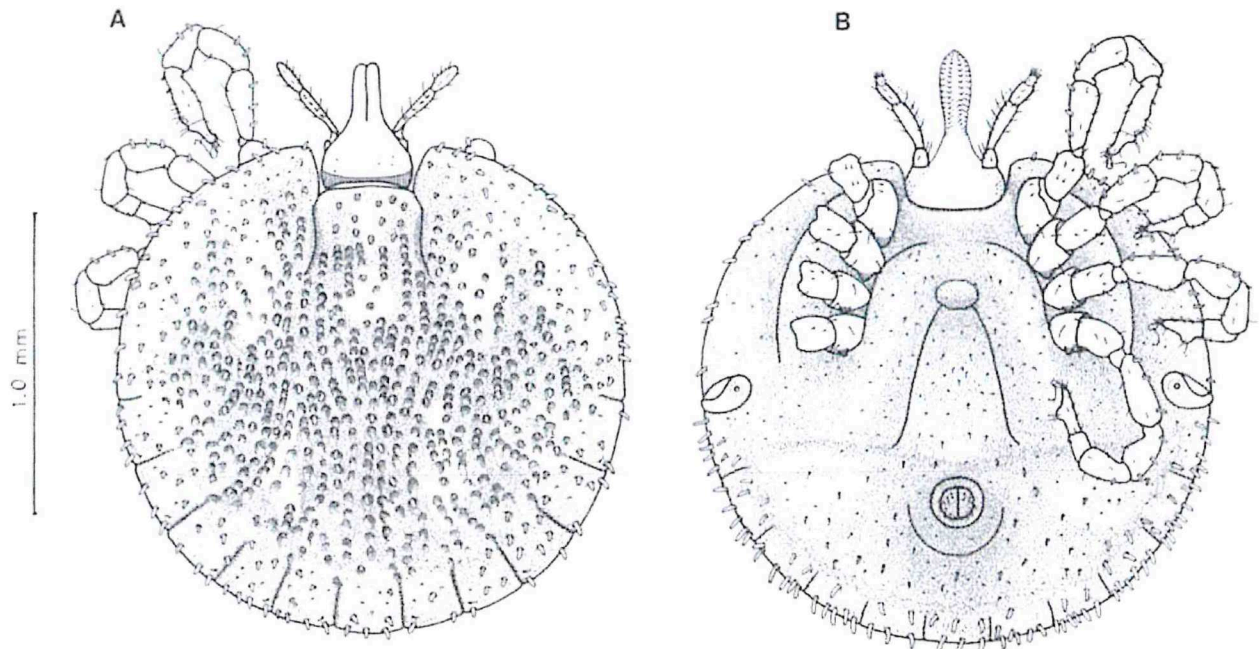


Fig. 1. Male, *Aponomma (B.) glebopalma* (RML118531). (A) Dorsal view showing scutal ornamentation pattern. (B) Ventral view.

Etymology. From the Greek: *bothrio*, pitted; *croton*, tick.

Aponomma (Bothriocroton) glebopalma
Keirans, King & Sharrad, new species.

Male (Figs. 1 A and B, 2 A–D). *Body.* Length from scapular apices to posterior body margin 1.48–1.75 (1.57); breadth 1.58–1.84 (1.68), broadest at level of spiracular plates, outline subcircular.

Capitulum (Figs. 2 A and B). Length from palpal insertion to tips of coruna 0.19–0.25 (0.22), breadth 0.26–0.33 (0.31). Basis capituli inserted deeply between scapular scutal area. Posterior margin slightly sinuous between small pointed cornua. Palpi elongate with numerous long white setae. Average length of palpal segments I 0.04, II 0.17, III 0.11. Hypostome (Fig. 2C) broad basally, then narrowing at level of crenulations, broadening at toothed portion then narrowing to apex. Total length 0.29–0.33 (0.31); length of toothed portion 0.18–0.21 (0.19). Dental formula 2/2 throughout length with a corona of fine denticles apically and numerous crenulations basally.

Scutum (Fig. 1A). Ornate, typically with 8 ivory-white patches of ornamentation as follows: 2 small semicircular patches between the cervical grooves; 1 large inverted V-shaped patch in each scapular field; a small horizontal patch near each festoon 1; a small vertical patch anterior to each festoon 4. A combination of the fusing of the 2 intracervical patches and the patches near festoon 1 with the scapular field patches can vary the number of ornamented spots from 5 to 8.

In the 21 males examined, ornamented patches were 5 (4 males), 6 (4), 7 (5), and 8 (8). Punctations very large, numerous, and deep, giving the dorsum an extremely roughened appearance. Each punctation with a short, broad, white, peg-like seta. The overall effect dorsally is of a very small but extremely rough, spiny tick. Marginal grooves absent. Lateral carinae absent. Cervical grooves long and deep, extending posteriorly and then slightly lateral, 0.198–0.344 (0.251) long. Festoons 11, often obscured dorsally by the numerous punctations and setae. Venter (Fig. 1B) with peglike setae fewer and shorter, most of the larger setae peripheral. Anal groove present, posterior to anus, broadly U-shaped. Genital opening at level of Coxae II and III. Spiracular plate with a narrowly elongate dorsal prolongation, 0.19–0.25 (0.22) long, 0.09–0.18 (0.14) broad.

Legs (Fig. 2D). Moderate in length. Coxa I–IV each with a single broadly rounded spur decreasing in size from I to IV. Tarsus I gradually tapered distally, 0.21–0.34 (0.29) long, 0.08–0.13 (0.10) wide. Tarsus IV with large subapical hump, 0.21–0.31 (0.25) long, 0.08–0.11 (0.09) broad.

Female (Figs. 3 A and B, 4 A–D). Measurements from 4 unengorged to fully engorged specimens.

Body (Fig. 3 A and B). Length from apices of scapulae to posterior body margin 2.48–3.48 (2.96), breadth 2.43–2.61 (2.53), outline subcircular, broadest at level of spiracular plates. Spiracular plate short, broad 0.148–0.557 (0.357) long, 0.230–0.441 (0.350) broad. Genital aperture (Fig. 4A) as illustrated.

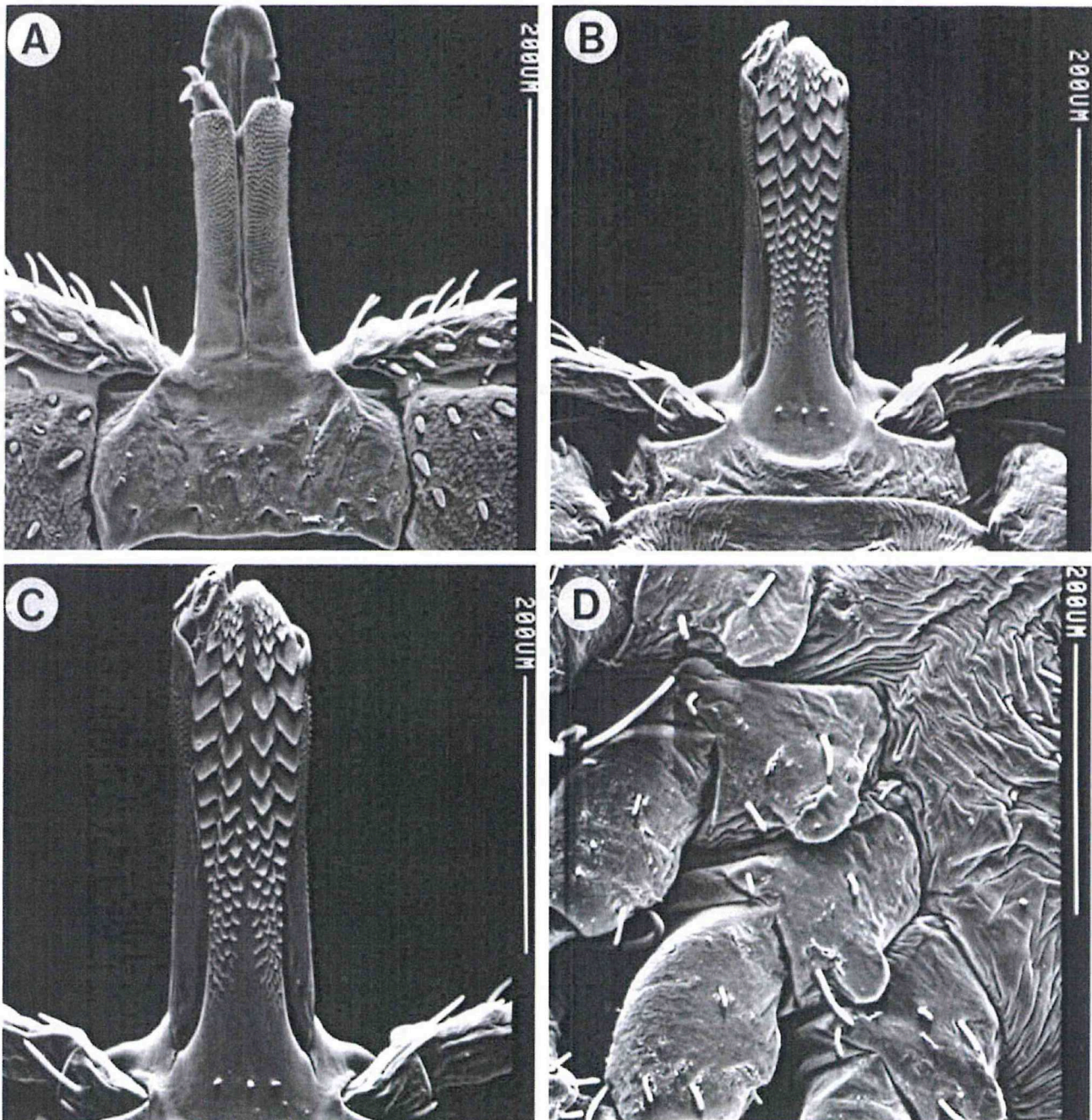


Fig. 2. Male, *Aponomma (B.) glebopalma* (RML118531). (A) Capitulum, dorsal view. (B) Capitulum, ventral view. (C) Hypostome. (D). Coxae I-IV.

Capitulum (Fig. 4 B and C). Length of basis capituli from palpal insertion to posterior margin of basis 0.203–0.282 (0.243), breadth 0.437–0.703 (0.552), posterior margin very slightly concave, cornua absent. Porose areas large, depressed, occupying a large portion of the basis, diameter of one area 0.104–0.117 (0.108) interporose area 0.052–0.076 (0.067). Palpi length 0.374–0.785 (0.557), breadth 0.142–0.293 (0.209), suture between segments 2 and 3 distinct. Total length of hypostome 0.272–0.732 (0.511), dentition 2/2, 5–8 teeth per file, length of toothed portion 0.181–0.344 (0.282).

Scutum (Fig. 3A). Length 0.943–1.86 (1.34), breadth 1.25–2.01 (1.63). Ornate, typically with 3

large ivory patches, 1 in each lateral field and 1 elongate patch occupying most of median field. Background color light brown. Scutal surface beset with small, white, peglike setae similar to those covering dorsal and ventral body surfaces, cervical grooves deep, narrow anteriorly and becoming broad and shallow posteriorly.

Legs (Figs. 3B, 4D). Coxae I–IV each with a small subtriangular external spur, internal spurs absent. Trochanters without spurs. Tarsus I 0.372–0.630 (0.492) long, 0.109–0.218 (0.154) broad. Tarsus IV 0.280–0.495 (0.406) long, 0.123–0.148 (0.134) broad.

Nymph (Fig. 5 A–D). Measurements from 5 engorged specimens.

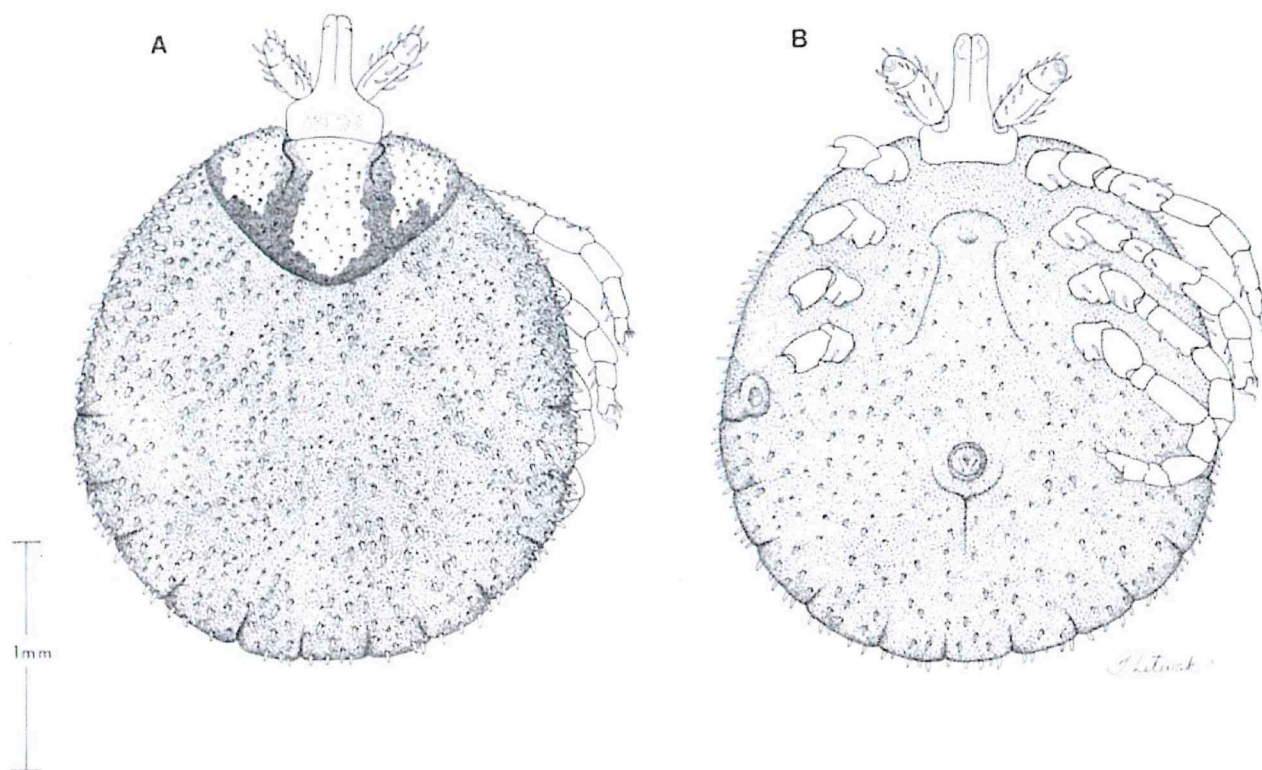


Fig. 3. Female, *Aponomma (B.) glebopalma* (RML120443). (A) Dorsal view showing scutal ornamentation pattern. (B) Ventral view.

Body. Length from scapular apices to posterior body margin 0.997–1.35 (1.18), breadth 0.998–1.31 (1.17), subcircular in outline, idiosoma covered with numerous, short, white, peglike setae, more numerous dorsally. Spiracular plate 0.110–0.126 (0.117) long, 0.091–0.135 (0.115) broad, with slight dorsal prolongation.

Capitulum (Fig. 5A). Length from palpal insertion to posterior capitular margin 0.096–0.142 (0.115), breadth 0.218–0.256 (0.241). Basis capituli dorsally (Fig. 5A) \approx 2 times as broad as long, triangular, cornua slight. Basis capituli ventrally with posterior margin convex. Palpi 0.184–0.200 (0.194) long, 0.077–0.099 (0.088) broad, segment 2 slightly longer than segment 3. Hypostome (Fig. 5B) rounded apically, dental formula 2/2, total length 0.181–0.193 (0.188).

Scutum (Fig. 5C). Length 0.374–0.505 (0.442), breadth 0.602–0.714 (0.675), outline as illustrated. Cervical grooves deep and broad, posteriorly directed. Scutum unornamented but dark brown peripherally, lighter brown between cervical grooves; several punctations with minute setae scattered over scutal surface.

Legs (Fig. 5D). Coxae I–IV without spurs, although in some specimens there is an indication of slight spurring on coxa I. Trochanters lack spurs. Tarsus I 0.200–0.221 (0.209) long, 0.056–0.091 (0.078) broad; tarsus IV 0.176–0.207 (0.191) long, 0.060–0.073 (0.065) broad.

Larva (Fig. 6 A–D). Measurements from 5 engorged specimens.

Body. Length from anterior scutal margin to posterior body margin 0.632–0.768 (0.715), breadth 0.737–0.897 (0.782), broadest posterior to coxa III. Dorsal body setae 10 pairs; 2 pairs central dorsals, 8 pairs marginal dorsals. Ventral setae 12 pairs and 1 pair on anal valves; 3 pairs sternals, 2 pairs preanals, 2 pairs premarginals, and 4 or 5 pairs marginal ventrals.

Capitulum (Fig. 6 A and B). Length from posterior margin of cheliceral sheaths to posterior margin of basis capituli 0.031–0.043 (0.038), breadth 0.144–0.156 (0.149). Basis capituli dorsally (Fig. 6A) with posterior margin straight, cornua absent. Ventrally (Fig. 6B) with posterior margin broadly rounded. Posthypostomal setae 1 minute pair. Palpi 0.156–0.160 (0.158) long, 0.429–0.468 (0.452) broad, suture between segments 2 and 3 distinct, segment 2 slightly longer than 3. Hypostome rounded apically with a small corona of fine denticles, dentition 2/2 with \approx 6 denticles in each file and crenulations extending basally.

Scutum (Fig. 6C). Length 0.273–0.331 (0.299), breadth 0.378–0.421 (0.393); setae 2 minute pairs situated in pits. Cervical grooves deep, troughlike, extending posteriorly almost to posterolateral scutal margin.

Legs (Fig. 6D). Coxae I–III lacking spurs. Tarsus I 0.137–0.191 (0.175) long, 0.047–0.066 (0.054) broad. Haller's organ, the prehalleral group of setae (*dml* group sensu Klompen & Oliver [1993]) in all stages consists of one serrate

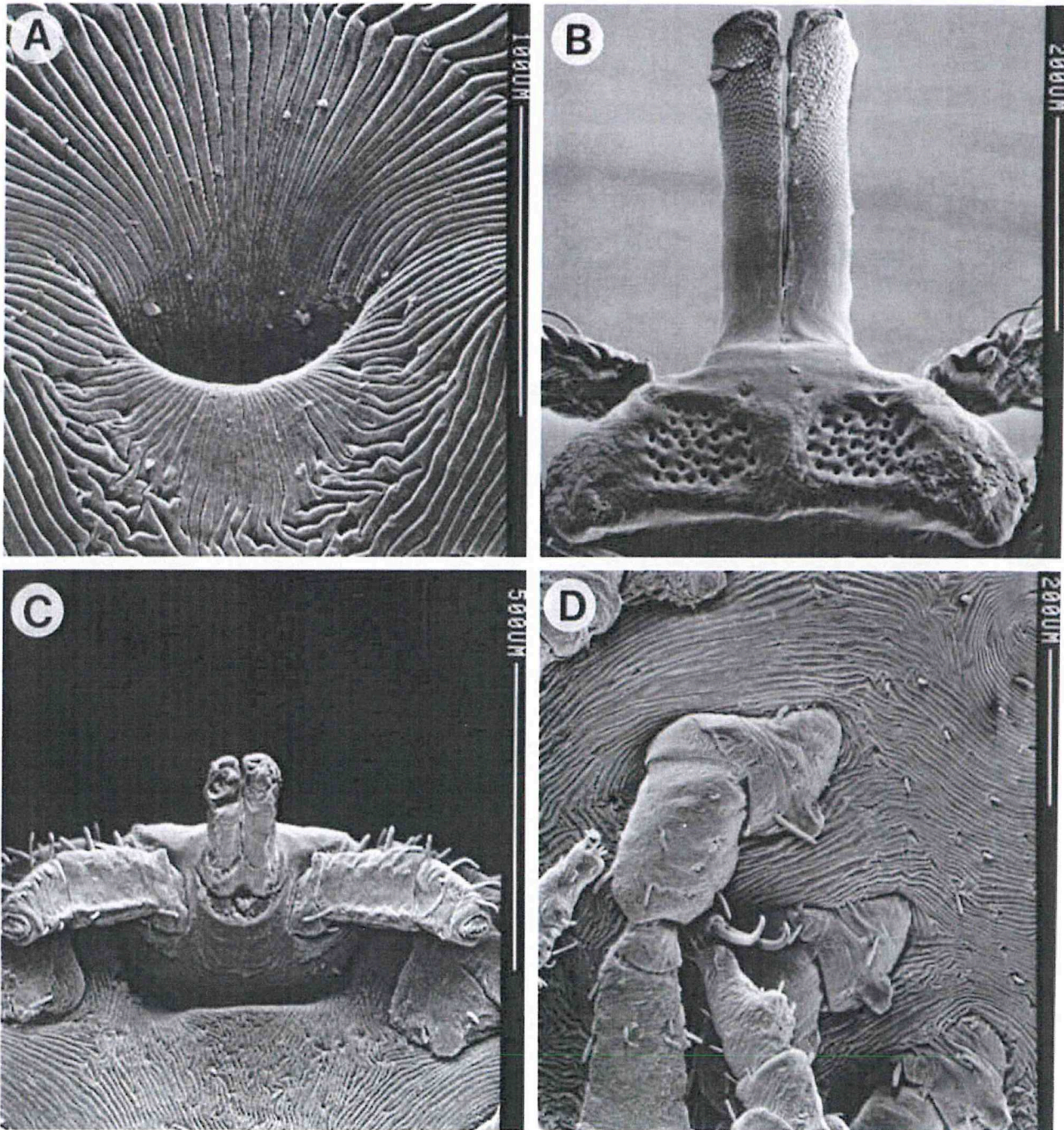


Fig. 4. Female, *Aponomma* (*B.*) *glebopalma* (RML120443). (A) Genital aperture. (B) Capitulum, dorsal view. (C) Capitulum, ventral view. (D) Coxae I-IV.

and one porose seta. This condition is shared with all other Amblyomminae examined. The anterior pit in the larva contains 1 conical, 2 fine, 1 porose, and 1 grooved seta, the standard complement for both Amblyomminae and Ixodidae. One porose and one grooved seta are added in the postlarval stages. The addition of a second grooved seta is widespread among Ixodidae, but the addition of the second porose seta to the anterior pit is restricted to *Haemaphysalis*, some *Amblyomma* (e.g., *A. americanum* [L.]), and some *Ixodes* (e.g., subgenus *Sternalixodes*)

(Balashov & Leonovich 1978, 1981; Homsher et al. 1988). The capsule aperture in all stages is small and round with a smooth rim (no incisions). It strongly resembles the aperture shape observed in *Ixodes* (*Sternalixodes*) (Homsher et al. 1988) but differs distinctly from that observed in most other Amblyomminae. In most Amblyomminae, the capsule aperture is a transverse slit, with or without distal or proximal incisions (Balashov & Leonovich 1981). A possible transition form, slitlike but in a tight horseshoe shape, has been reported for some other *Aponomma*

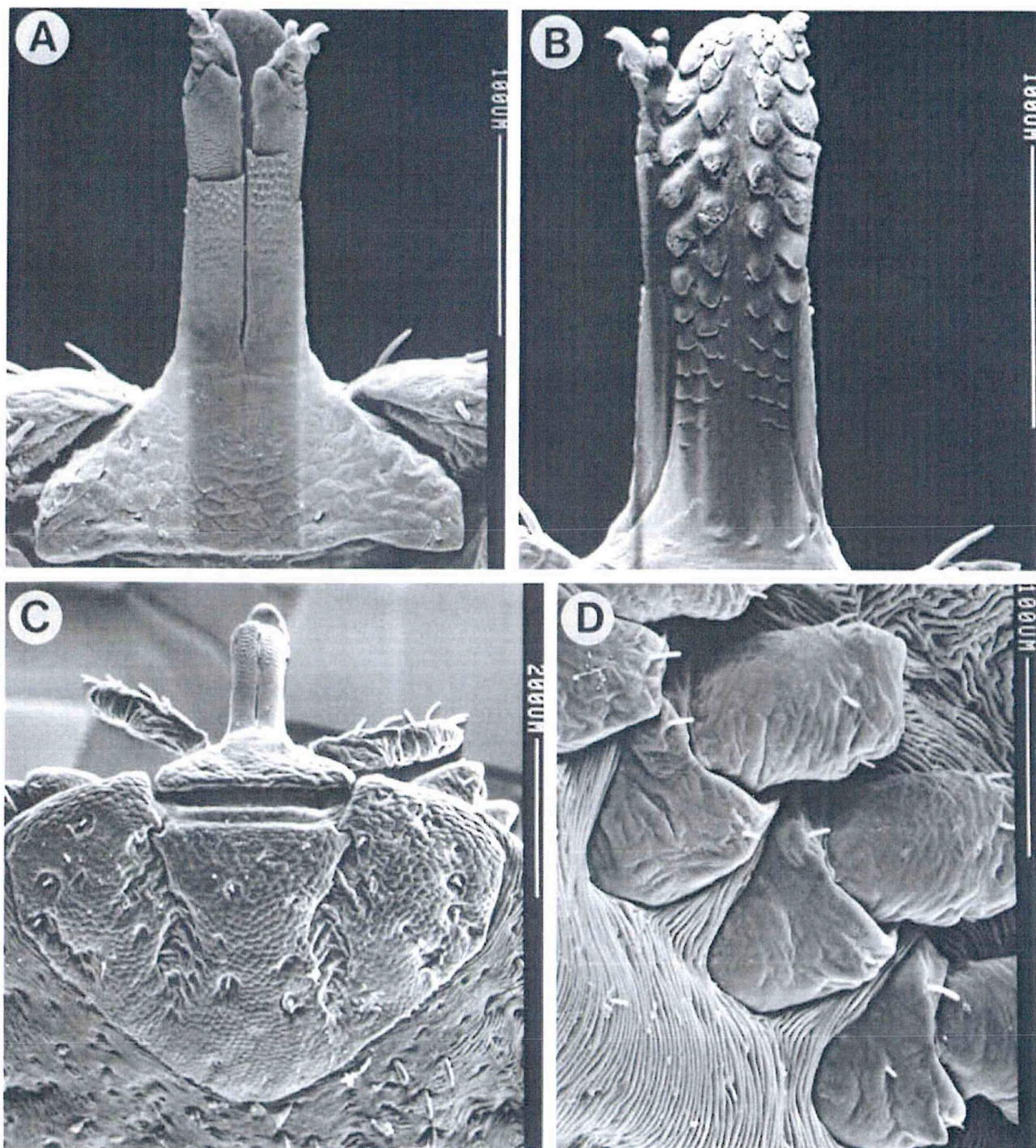


Fig. 5. Nymph, *Aponomma* (B.) *glebopalma* (RML120443). (A) Capitulum, dorsal view. (B) Hypostome. (C) Scutum. (D) Coxae I-IV.

species (*elaphense* Price, *hydrosauri*, *komo-doense* Oudemans) (Balashov & Leonovich 1981, Keirans & Degenhardt 1985).

Material Examined

Holotype male, allotype female, 30 nymphs, 11 larvae paratypes (91/1153-1211) (RML120443)

ex. *Varanus glebopalma* (R47034), Prince Regent River Reserve (15°32'S, 125°19'E), Western Australia, Australia, 26 August 1974, collected by the Western Australia Museum Survey and deposited in the Western Australia Museum, Perth. Other paratypes listed in Table 1 are deposited in the Western Australia Museum; Northern Territory Museum, Darwin; U.S. National Tick Collection, Georgia Southern University, Statesboro; and the Natural History Museum, London.

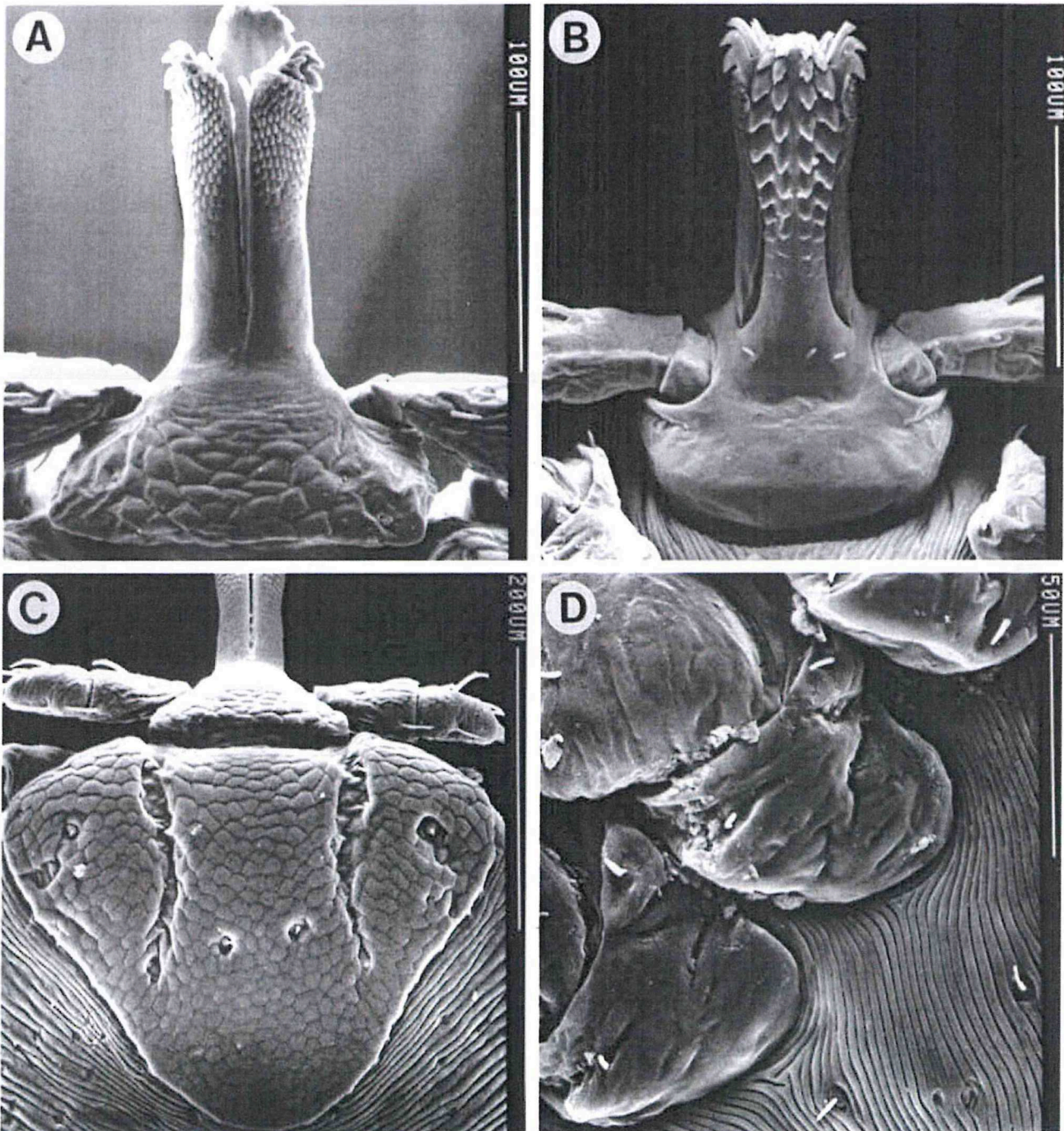


Fig. 6. Larva, *Aponomma* (*B.*) *glebopalma* (RML120443). (A) Capitulum, dorsal view. (B) Capitulum, ventral view. (C) Scutum. (D) Coxae I-III.

Species Relationships

The genus *Aponomma* Neumann currently contains two subgenera, the subgenus *Aponomma* characterized by the presence of an anal groove and a convex posterior scutal margin in the females, and *Africaniella*, for *Aponomma transversale* (Lucas), the single species of *Aponomma* lacking an anal groove and having a concave posterior scutal margin in the females (Santos Dias 1952, 1974). Both *A.* (*Aponomma*) and *A.* (*Africaniella*) are subgenera containing ticks whose adults are dorsally smooth and relatively

impunctate in appearance and without numerous peglike setae. The new subgenus, *Bothriocroton*, showing distinct scutal characteristics of large, deep punctations and peglike setae, clearly falls outside any of the currently recognized subgenera.

There are only four species of *Aponomma* that have a 2/2 hypostome or at most a 3/3 then 2/2 hypostome. They are *A.* (*A.*) *elephense* on the trans-Pecos rat snake, *Elaphe subocularis*, in Texas, New Mexico, and northern Mexico; *A.* (*A.*) *auriginans* Schulze parasitic on wombats in

Table 1. *Aponomma (B.) glebopalma* examined from Western Australia and the Northern Territory

♂	♀	Nymph	Larva	Locality	Date	Accession No.
From <i>V. glebopalma</i>						
21	—	—	—	Byam Martin Island Bonaparte Archipelago (15°23'S, 124°21'E)	11 July 1973	77/69-108 RML118531
—	1	—	—	Kimberly Division	—	91/1261-3 RML120440
2	—	—	—	Kimberly Division	—	91/1259-60 RML120447
9	—	—	—	Pr. Regent Riv. Res. (15°19'S, 125°35'E)	14 August 1974	91/1141-9 RML120448
2	—	6	—	Kalumburu (14°18'S, 126°38'E)	February 1966	91/1218-25 RML120452
1	—	—	—	Oenpelli Mission (12°19'S, 133°03'E)	October 1968	91/1248-9 RML120453
2	—	—	—	Pr. Regent Riv. Res. (15°32'S, 125°14'E)	30 August 1974	91/1212-3 RML120454
14	1	30	11	Pr. Regent Riv. Res. (15°32'S, 125°19'E)	26 August 1974	91/1153-1211 RML120443
1	—	4	—	Wotjulum (16°11'S, 123°37'E)	1955	91/1243-7 RML120456
10	—	—	—	Hidden Is. Buccaneer Archipelago (16°15'S, 123°31'E)	20 June 1982	91/1266-75 RML120457
8	—	—	—	Nicholson Riv. Res. (17°54'S, 137°53'E)	4 June 1974	R.34376 RML46021
1	—	1	—	Keep River (15°51'S, 129°03'E)	26 September 1973	R.34375 RML46022
3	—	—	—	Stuart Highway (13°29'S, 132°54'E)	18 December 1965	R.34420 RML46023
5	1	3	—	Bauhinia Creek (16°05'S, 135°22'E)	1 September 1985	R.34383 RML46024
5	—	2	—	Keep River (15°45'S, 129°05'E)	17 September 1975	R.34377 RML46025
3	—	—	—	Nicholson River (17°56'S, 137°01'E)	27 August 1967	R.34378 RML46028
From <i>V. glauerti</i>						
1	—	—	—	4km NE of Mission Kalumburu (14°15'S, 126°40'E)	15 June 1960	91/1291-2 RML120482
1	—	—	—	Mitchell Plateau (14°35'S, 125°45'E)	20 September 1978	91/1313-5 RML120485
3	—	—	—	Pr. Regent Riv. Res. (15°07'S, 125°33'E)	15 August 1974	91/1299-1301 RML120484
1	—	—	—	Drysdale Riv. Nat. Pk. (14°44'S, 126°56'E)	15 August 1975	91/1306-7 RML120486
—	—	—	1	Pr. Regent Riv. Res. (15°20'S, 124°56'E)	25 August 1974	91/1298 RML120487
2	—	1	—	Byam Martin Is., Bonaparte Archipelago (15°22'S, 124°21'E)	11 July 1973	91/1295-7 RML120488

Australia; *A. (A.) sphenodonti* Dumbleton on the tuatara, *Sphenodon punctatus*, in New Zealand; and *A. (B.) glebopalma* n. sp. on *Varanus glebopalma* from Western Australia and the Northern Territory, Australia.

Aponomma (A.) sphenodonti and *A. (A.) auriginans* possess distinct marginal grooves, are ornate ticks, and have 3/3 then 2/2 hypostomes. *A. (B.) glebopalma* lacks marginal grooves, has a 2/2 hypostome, and is ornamented. *A. (A.) elephense* is inornate and has a smooth impunctate scutum (see Keirans & Degenhardt 1985). *A. (B.) glebopalma* is ornate with a deeply punctate scutum.

Amblyomma glauerti Keirans, King & Sharrad, new species

Male (Figs. 7 A and B, 8 A–D). Five engorged specimens measured.

Body (Fig. 7A). Length from apices of scapulae to posterior body margin 2.34–3.07 (2.80), breadth 1.95–2.57 (2.31). Outline oval broadest at level of spiracular plates.

Capitulum (Fig. 8 A and B). Length of basis capituli from palpal insertion to posterior margin of basis 0.204–0.292 (0.252), breadth 0.507–0.590 (0.552). Posterior margin slightly sinuous, cornua very short, blunt; external margins

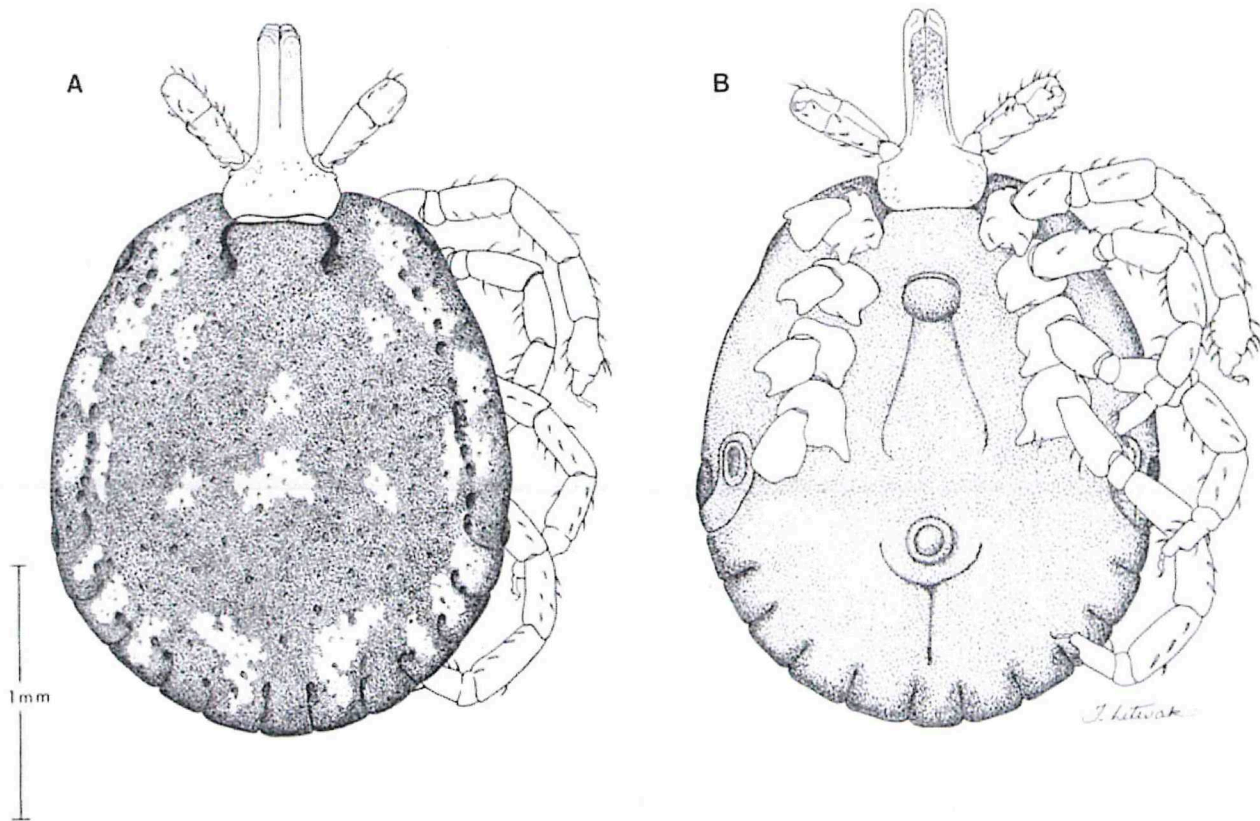


Fig. 7. Male, *Amblyomma glauerti* (RML120442). (A) Dorsal view showing scutal ornamentation pattern. (B) Ventral view.

rounded. Palpi length 0.550–0.637 (0.603), breadth 0.214–0.245 (0.235); proportions and setae as illustrated. Palpal segment 2 \approx 1.5 times longer than 3. Intersegmental suture distinct. Hypostome (Fig. 8C) elongate; length (of two specimens, others broken or covered with host tissue) 0.544, 0.427 breadth 0.144, 0.145; length of toothed portion 0.311, 0.235, with a large corona of fine denticles apically; dental formula 4/4 throughout length.

Scutum (Fig. 7A). With shallow emargination; scapulae short, bluntly rounded. Cervical pits comma-shaped, relatively deep. Marginal groove consisting of a series of deep, irregularly spaced pits beginning anteriorly in the vicinity of the eye and becoming more numerous and contiguous near festoon 1. Background color medium brown, pattern of coloration essentially as in Fig. 7A, often with the patch of coloration arching from festoons 3 to 5, festoon 6 occasionally ornamented. Coloration typically reddish orange centrally with greenish border. Punctations few but more numerous in scapular areas, scutal surface essentially smooth.

Legs (Fig. 8D). Coxae I–IV each with a relatively slender, triangular external spur; the spur on coxa IV directed somewhat posteromedially; coxa I with a short, blunt internal spur; internal spurs absent on coxae II–IV. Trochanters without spurs. Tarsus I 0.449–0.556 (0.494) long, 0.148–

0.205 (0.178) broad. Tarsus IV 0.353–0.440 (0.397) long, 0.111–0.142 (0.131) broad.

Female (Figs. 9 A and B, 10 A–D). Only 2 engorged females available for study; 1 used for illustration, the other for measurements.

Body (Fig. 9). Length from apices of scapulae to posterior body margin 3.49, breadth 2.58, outline broadly elongate, broadest at level of spiracular plates. Genital aperture (Fig. 10A) as illustrated.

Capitulum (Fig. 10 B and C). Length of basis capituli from palpal insertion to posterior margin of basis 0.346, breadth 0.668, posterior margin straight, lateral margins bluntly rounded, cornua absent. Porose areas small, deeply depressed, diameter of one area 0.091, interporose area 0.185. Palpi length 0.803, breadth 0.281, suture between 2 and 3 distinct. Total length of hypostome 0.733, length of toothed portion 0.378, dentition 3/3 with 1 or 2 rows of 4/4 apically with 5–8 teeth per file. Hypostomal apex notched, with a corona of fine denticles.

Scutum (Fig. 10C). Length 1.84, breadth 2.02, ornate, with a large metallic orange patch ringed in green in each scapular area and extending around the eye, a small green patch in each posterolateral area, and a single small green patch in the posterior angle. Background color light brown. Cervical grooves short, deep, comma-

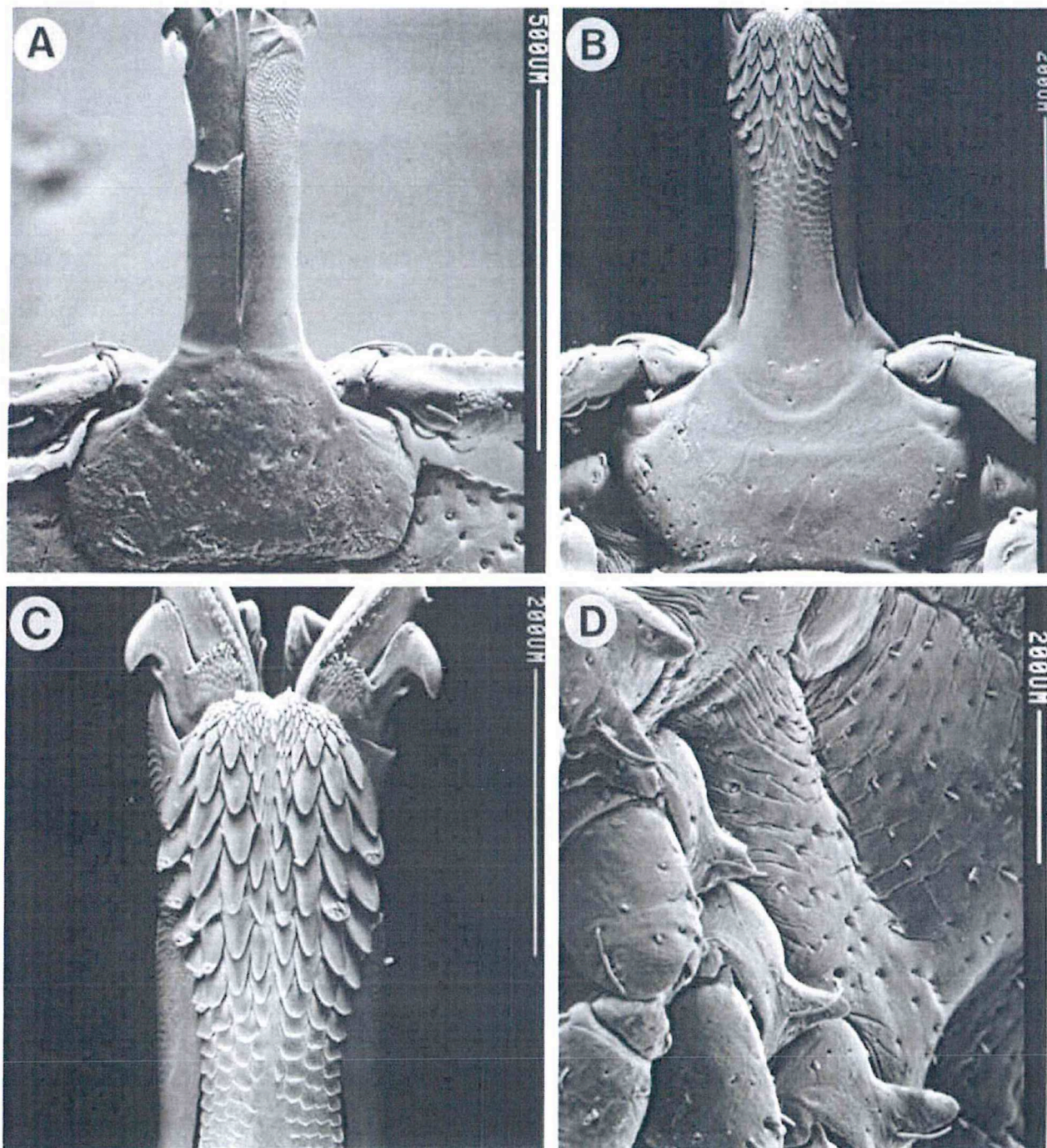


Fig. 8. Male, *Amblyomma glauerti* (RML 120445). (A) Capitulum, dorsal view. (B) Capitulum, ventral view. (C) Hypostome. (D) Coxae I-IV.

shaped. Punctations numerous and deep in the anterolateral areas, otherwise almost absent.

Legs (Fig. 10D). Coxa I with a short triangular internal spur and a longer triangular external spur. Coxae II-IV each with a short external spur, longest on coxa IV; internal spurs absent. Trochanters without spurs. Tarsus I 0.632 long, 0.231 broad. Tarsus IV 0.480 long, 0.148 broad.

Nymph (Fig. 11 A-D). Measurements from 5 engorged specimens.

Body. Length from scapular apices to posterior body margin 1.31-1.88 (1.54), breadth 1.03-1.34 (1.19), broadly oval in outline, idiosoma dorsally crenulate with numerous small pits and elongate white setae. Spiracular plate 0.087-0.180 (0.134) long, 0.135-0.154 (0.145) broad, with narrow dorsal prolongation.

Capitulum (Fig. 11A). Length from palpal insertion to posterior capitular margin 0.101-0.153 (0.120), breadth 0.260-0.297 (0.284). Basis capit-

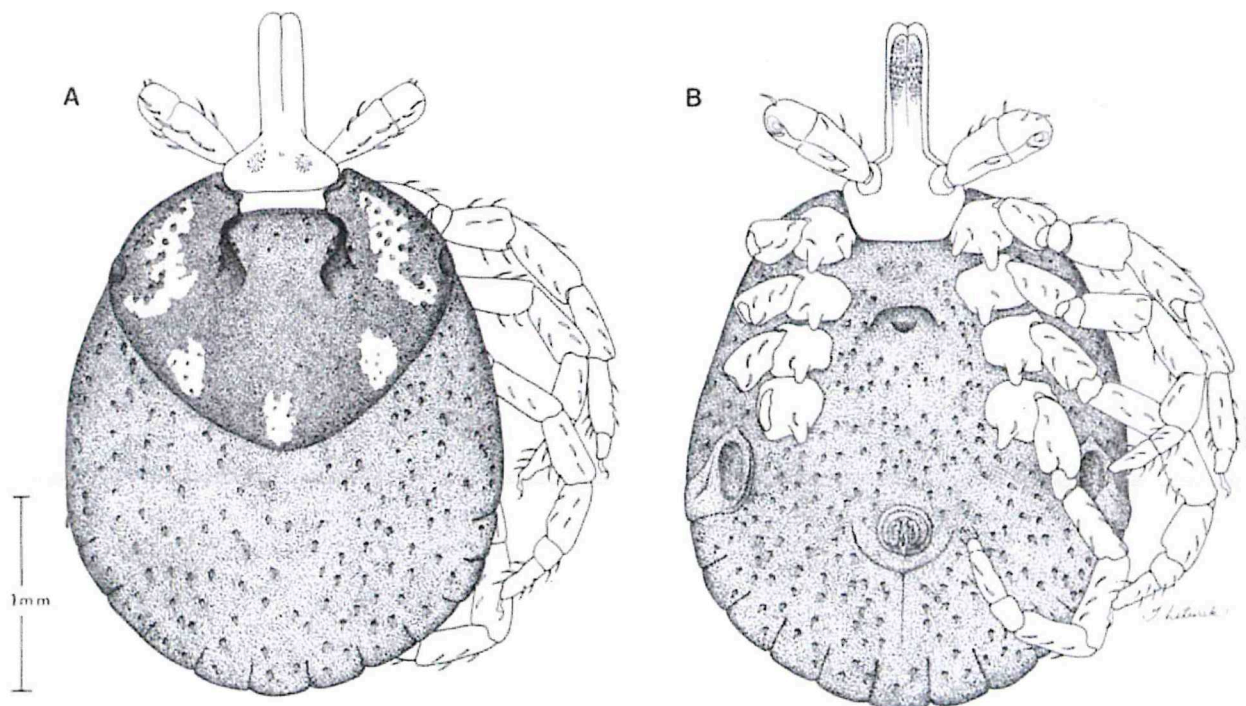


Fig. 9. Female, *Amblyomma glauerti* (RML120441). (A) Dorsal view showing scutal ornamentation pattern. (B) Ventral view.

uli ventrally broadly quadrate. Palpi 0.223–0.299 (0.266) long, 0.086–0.117 (0.105) broad, segment 2 distinctly longer than 3, intersegmental suture discrete. Hypostome (Fig. 11B) slightly notched apically, dental formula 3/3, total length 0.207–0.238 (0.222).

Scutum (Fig. 11C). Length 0.435–0.594 (0.552), breadth 0.725–0.809 (0.784), outline as illustrated. Cervical grooves very slightly diverging, then converging medially before diverging toward posterolateral scutal margin. Punctations large and deep laterally, less numerous medially and posteriorly. Scutum unornamented but darker brown emargination outlining eyes.

Legs (Fig. 11D). Coxa I with two spurs; internal spur short, bluntly rounded, external spur longer than internal, narrowly triangular; coxa II and III each with a short triangular spur; coxa IV with a narrow bluntly rounded spur. Trochanters without spurs. Tarsus I 0.231–0.315 (0.277) long, 0.086–0.105 (0.093) broad; tarsus IV 0.194–0.253 (0.231) long, 0.064–0.079 (0.070) broad.

Larva (Fig. 12 A–D). Measurements from 5 engorged specimens.

Body. Length from anterior scutal margin to posterior body margin 0.660–1.01 (0.815), breadth 0.585–0.858 (0.694), elongate in outline. Dorsal body setae 10 minute pairs; 2 pairs central dorsals, 8 pairs marginal dorsals. Ventral body setae 12 pairs and 1 pair on anal valves; 3 pairs sternals, 2 pairs preanals, 2 pairs premarginals, and 5 pairs marginal ventrals.

Capitulum (Fig. 12A). Length from posterior margin of cheliceral sheaths to posterior margin of basis capituli 0.058–0.086 (0.075), breadth 0.164–0.168 (0.166). Basis capituli dorsally (Fig. 12A) with posterior and lateral margins convex, cornua absent. Ventrally, posterior margin broadly rounded. Posthypostomal setae 1 minute pair. Palpi 0.136–0.156 (0.149) long, 0.039–0.054 (0.046) broad, suture between segments 2 and 3 distinct; average length of segment 2, 0.068, of segment 3, 0.059. Hypostome (Fig. 12B) elongate, slightly notched apically with a small corona of fine denticles, dentition 2/2 with ≈ 6 denticles in each file and a few crenulations extending basally.

Scutum (Fig. 12C). Length 0.269–0.296 (0.280), breadth 0.468–0.507 (0.491); setae, 3 minute pairs in shallow pits. Cervical grooves narrow, moderately deep, extending posteriorly to level of anterior edge of eyes.

Legs (Fig. 12D). Coxa I–III with a small, bluntly rounded external spur; internal spurs absent although a slight thickening is usually present on coxa I. Tarsus I 0.183–0.222 (0.201) long, 0.051–0.062 (0.056) broad. Haller's organ: setal arrangement and ontogeny in the prehalleral group and anterior pit as in *Aponomma glebopalma* but without the addition of a second porose seta in the postlarval stages. Capsule aperture shape in all stages a narrow, more or less transverse slit without distal or basal inclusions. This shape differs distinctly from the round

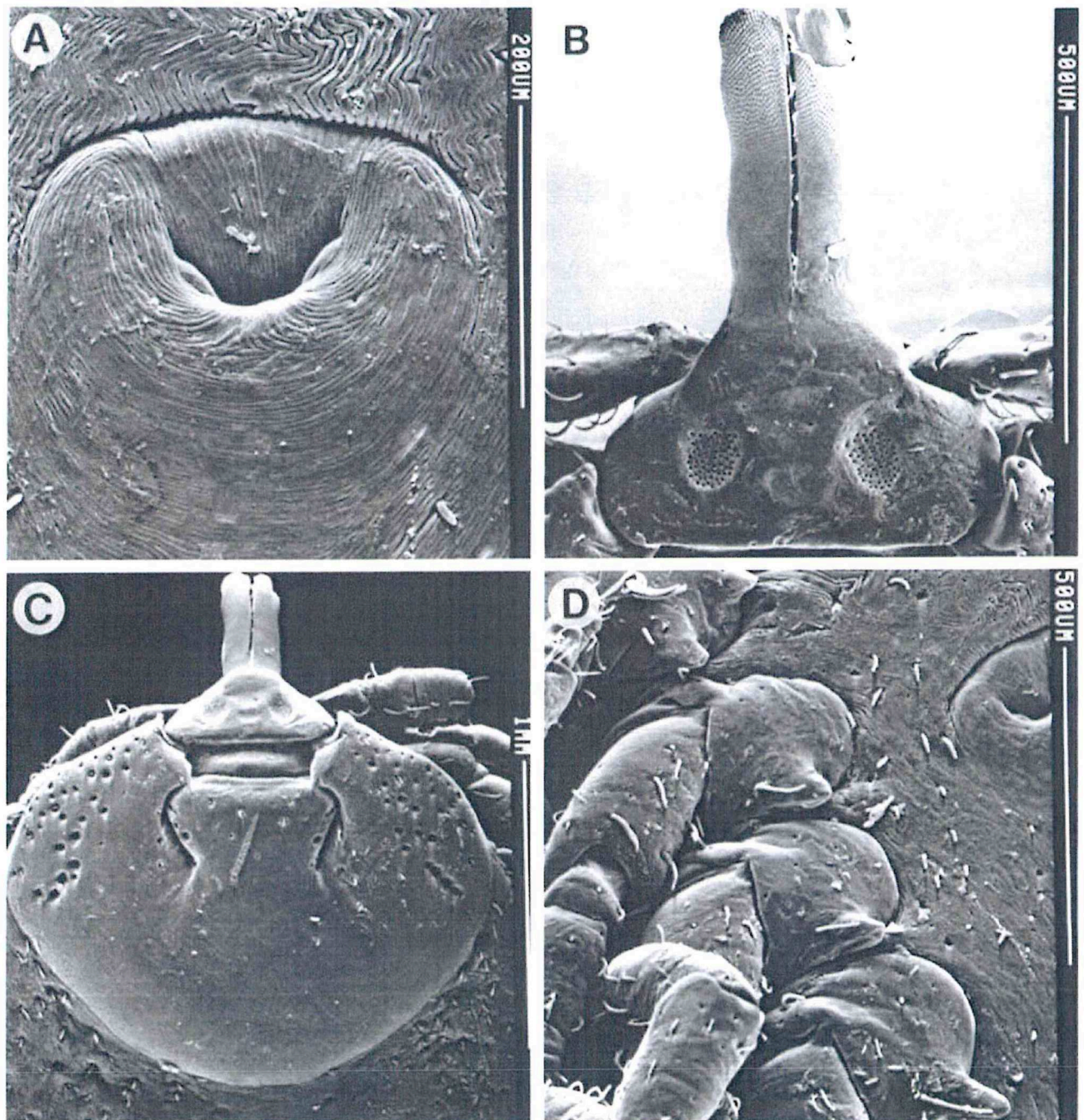


Fig. 10. Female, *Amblyomma glauerti* (RML120440). (A) Genital aperture (B) Capitulum, dorsal view. (C) Capitulum, ventral view. (D) Coxae I-IV.

shape observed in *Aponomma glebopalma* but resembles that found in many other species of *Amblyomma* (Balashov & Leonovich 1981).

Material Examined

Holotype female, allotype male (91/1264-5; RML 120441), ex *Varanus glebopalma* (R80045), Lachlan Island (16°37'S, 123°31'E), Buccaneer Archipelago, Western Australia, Australia, 15 June 1982, collected by the Fisheries and Wildlife Department; deposited in the Western Aus-

tralia Museum, Perth. Other paratypes listed in Table 2 are deposited in the Western Australia Museum; Northern Territory Museum, Darwin; U.S. National Tick Collection, Georgia Southern University, Statesboro; and The Natural History Museum, London.

Species Relationships

Males of *Amblyomma glauerti* have a scutum with lateral grooves represented by a series of punctations, hypostomal dentition 4/4, one spur

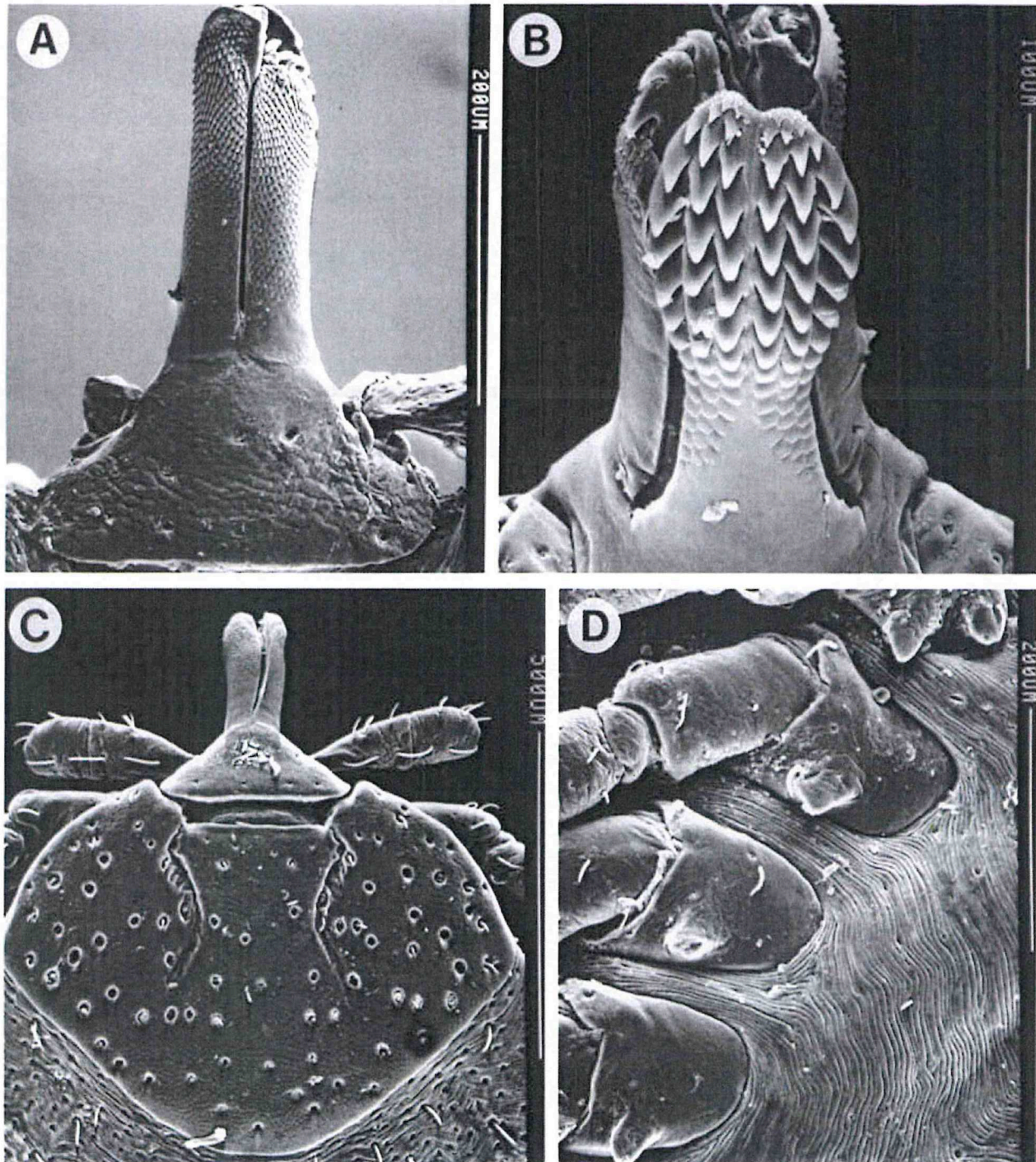


Fig. 11. Nymph, *Amblyomma glauerti* (RML120450). (A) Capitulum, dorsal view. (B) Hypostome. (C) Scutum. (D) Coxae I-IV.

on coxae II-IV, and are ornate. The only Australian species of *Amblyomma* that most closely approximates both the male and female of *A. glauerti* is *A. limbatum* Neumann, 1899. However, males of *A. limbatum* are large ticks with few punctations in the lateral groove area, less scutal ornamentation, especially on the festoons and centrally, and the basis capituli have a distinctly concave posterior margin. Female *A. limbatum* are also much larger in all respects than *A. glauerti*, have more extensive, deeper orange

scutal ornamentation, and lack the internal protrusions in the genital aperture which are present in *A. glauerti*.

Roberts (1969) described the larva of *Amblyomma limbatum* based on five larvae from *Amphibolurus decressii*, South Australia. Based on his description and illustrations, we note no significant differences between what he called *A. limbatum* and our specimens. However, it should be noted that, unlike larval *Ixodes*, chaetotaxy is not a reliable method for separat-

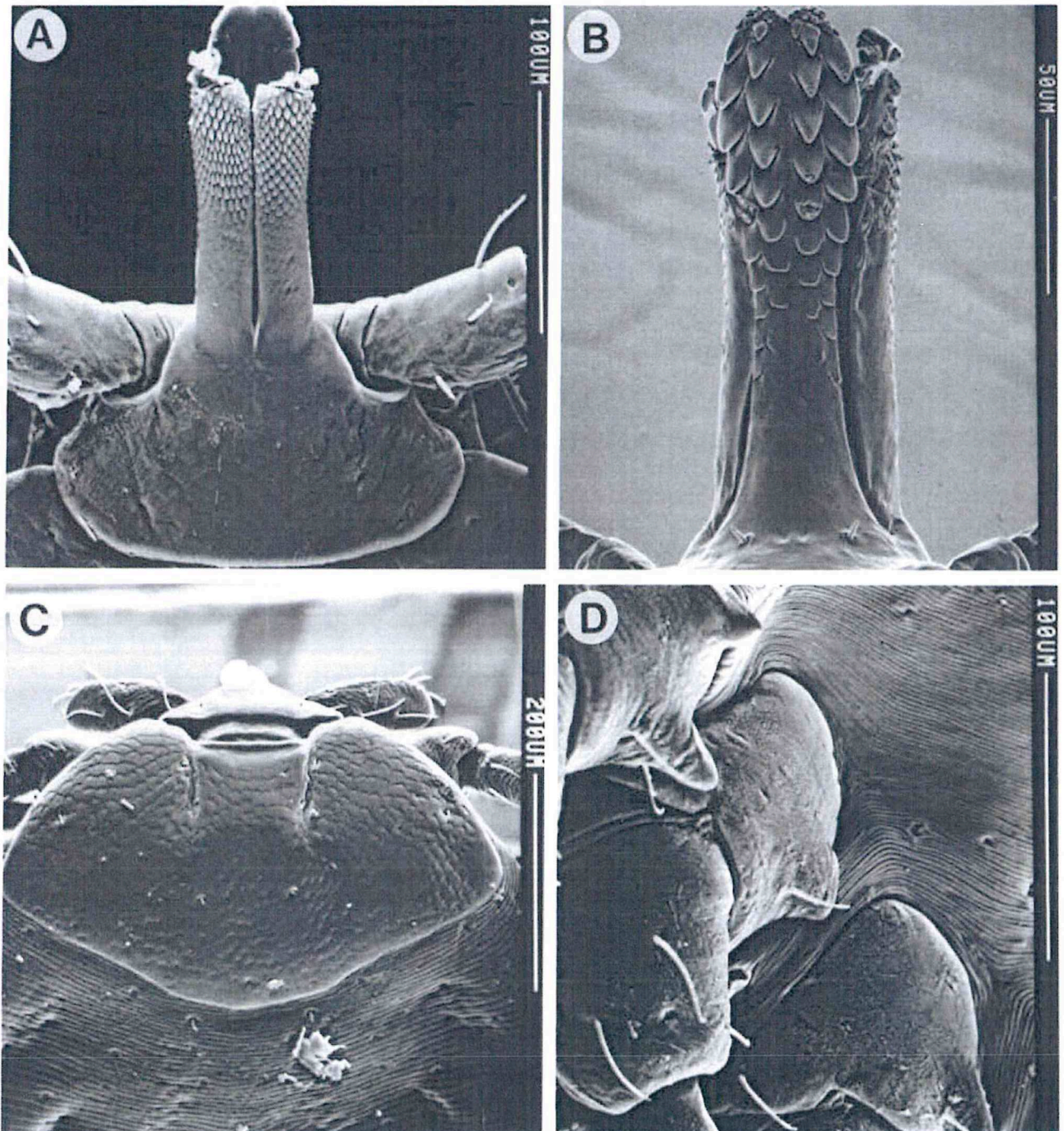


Fig. 12. Larva, *Amblyomma glauerti* (RML120483). (A) Capitulum, dorsal view. (B) Hypostome. (C) Scutum. (D) Coxae I-III.

ing larvae of other genera, including *Amblyomma*.

The nymphal stage of *A. limbatum* is unknown.

Hosts, Distribution and Ecology

Varanus glebopalma is found in gorges and escarpments (particularly sandstone) of northern Australia from near Derby in the Kimberley re-

gion of Western Australia to the Mt. Isa district of Queensland (Wilson & Knowles 1988). It is a moderately large, agile, and wary rock monitor up to 1 m long (Storr et al. 1983, Wilson & Knowles 1988). Although normally a diurnal predator (Cogger et al. 1983), it has been reported to be crepuscular in hot weather and active in caves after dark (Wilson & Knowles 1988). *V. glebopalma* appears to specialize in feeding on lizards, but orthopterans are also important in

Table 2. *Amblyomma glauerti* examined from Western Australia and the Northern Territory

♂	♀	Nymph	Larva	Locality	Date	Accession No.
From <i>V. glebopalma</i>						
1	1	—	—	Kimberly Division	—	91/1261-3
1	—	1	—	Kalumburu (14°18'S, 126°38'E)	—	RML120440 91/1288-9 RML120444
1	—	—	—	Pr. Regent Riv. Res. (15°07'S, 125°33'E)	15 August 1974	91/1150 RML120445
—	—	3	—	Drysdale Riv. Nat. Pk. (15°03'S, 126°45'E)	16 August 1975	91/1256-8 RML120446
2	—	4	—	Drysdale Riv. Nat. Pk. (15°03'S, 126°45'E)	19 August 1975	91/1250-5 RML120449
—	—	11	6	Kalumburu (14°18'S, 126°38'E)	February 1966	91/1226-42 RML120450
1	1	—	—	Lachlan Is., Buccaneer Arch. (16°37'S, 123°31'E)	15 June 1982	91/1264-5 RML120441
10	—	2	—	Kalumburu (14°18'S, 126°38'E)	—	91/1276/87 RML120442
2	—	2	—	Mount Anderson (18°02'S, 123°56'E)	4 November 1973	91/1214-7 RML120451
—	—	1	—	Oenpelli Mission (12°19'S, 133°03'E)	October 1968	91/1248-9 RML120453
—	—	2	—	Pr. Regent Riv. Res. (15°32'S, 125°19'E)	26 August 1974	91/1153-1211 RML120443
1	—	11	—	Nicholson Riv. Res. (17°54'S, 137°53'E)	4 June 1974	R.34376 RML46021
1	—	7	—	Stuart Highway (≈13°29'S, ≈132°54'E)	18 December 1965	R.34420 RML46023
—	—	8	—	Bauhinia Creek (16°05'S, 135°22'E)	1 September 1985	R.34383 RML46024
—	—	3	—	Mount Borradaile (12°03'S, 132°55'E)	3 November 1968	R.34379 RML46026
—	—	2	—	Mount Borradaile (12°03'S, 132°55'E)	8 November 1968	R.34380 RML46027
—	—	4	2	Deaf Adder Creek (13°03'S, 132°54'E)	27 September 1969	R.34381 RML46029
From <i>V. glauerti</i>						
—	—	2	1	14 km SSE Walsh Pt., Port Warrender (14°40'S, 125°53'E)	23 February 1979	91/1321-3 RML120473
—	—	—	1	Drysdale Riv. Nat. Pk. (14°46'S, 127°05'E)	09 August 1975	91/1305 RML120474
—	—	2	1	13.5 km NE Crystal Hd. SW Osborne Island (14°23'S, 125°57'E)	June 1988	91/1327-30 RML120475
—	—	—	5	14 km SSE Walsh Pt., Port Warrender (14°40'S, 125°53'E)	23 February 1979	91/1316-20 RML120476
—	—	1	1	5.6 km W Evelyn Is. (14°06'S, 127°31'E)	3 June 1988	91/1325-6 RML120477
—	—	—	4	20 km SSE Barton Plns. Outcamp, Carson Escrpmt. (14°20'S, 126°57'E)	17 June 1975	91/1309-12 RML120478
—	—	—	1	E face Mitchell Plateau in watercourse (14°14'S, 125°52'E)	21 October 1976	91/1308 RML 120479
—	—	1	—	Carlton Reach Bore (15°48'S, 128°45'E)	28 December 1959	91/1290 RML120480
—	—	1	—	14 km SE Walsh Pt., Port Warrender (14°40'S, 125°53'E)	23 February 1979	91/1324 RML120481
—	—	—	1	4 km NE of Mission Kulumburu (14°15'S, 126°40'E)	15 June 1960	91/1291-2 RML120482

their diet (James et al. 1992). The breeding season is from mid-dry season to early wet season (June–December), and the clutch size is about five (James et al. 1992).

Varanus glauerti occurs in rocky areas of the wet-dry tropics in the northern Kimberley region of Western Australia and the adjacent area of the Northern Territory, and a disjunct population oc-

curs on the Arnhem Land escarpment, Northern Territory (Wilson & Knowles 1988). It is a long-tailed, long-limbed, medium-sized lizard, up to 79 cm long (Storr et al. 1983) and is a rock-dwelling species which is extremely wary (Wilson & Knowles 1988). Invertebrates (principally Orthoptera, Araneae, and Blattodea) comprise the majority of its diet (James et al. 1992). It

breeds in the mid-dry season to early wet season (June–November), and has a clutch size of about three (James et al. 1992).

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