

## NOTES ON AFRICAN HAEMAPHYSALIS TICKS. XIII. IDENTITY OF *H. (RHIPISTOMA) COOLEYI*, A PARASITE OF THE ROCK HYRAX IN SOUTH AFRICA (ACARINA: IXODIDAE)<sup>(1)</sup>

H. HOOGSTRAAL and HILDA Y. WASSEF, Medical Zoology Department, United States Naval Medical Research Unit Number Three (NAMRU-3), American Embassy, Cairo, Arab Republic of Egypt<sup>(2)</sup>

### ABSTRACT

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The lectotype male, allotype female, and paratype nymph of *Haemaphysalis (Rhipistoma) cooleyi* Bedford, 1929, a parasite of the rock hyrax, *Procavia capensis*, in the Transvaal, are redescribed and illustrated to provide reliable criteria for differentiating between haemaphysaline parasites of hyraxes. Keys are included for identifying adults of these *Haemaphysalis* spp. (*orientalis* Nuttall & Warburton, 1915; *bequaerti* Hoogstraal, 1956; *cooleyi* Bedford, 1929; *hyracophila* Hoogstraal, Walker & Neitz, 1971).

### Résumé

NOTES SUR LES TIQUES AFRICAINES HAEMAPHYSALIS. XIII. IDENTITÉ DE *H. (RHIPISTOMA) COOLEYI*, UN PARASITE DU DAMAN DE ROCHER EN AFRIQUE DU SUD (ACARINA: IXODIDAE)

Le lectotype mâle, l'allotype femelle et la nymphe paratype de *Haemaphysalis (Rhipistoma) cooleyi* Bedford, 1929, un parasite du daman de rocher, *Procavia capensis*, au Transvaal, sont décrites et illustrées afin de fournir des critères convenables pour permettre la différenciation entre les espèces haemaphysalines infestant les damans. Des clefs sont incluses pour l'identification des adultes de ces espèces d'*Haemaphysalis*.

### INTRODUCTION

For several years we have stored numerous *Haemaphysalis* ticks collected from hyraxes without identification to the species level because of uncertainty over the precise identity of *H. (Rhipistoma) cooleyi* Bedford. Experience with specialized haemaphysaline groups has taught us that the earlier descriptions of this taxon (Bedford, 1929; Hoogstraal, 1956) are not sufficiently detailed to provide criteria that can be used confidently for differentiating haemaphysaline species parasitizing hyraxes. Therefore, the type material of *H. (R.) cooleyi* has been restudied and reillustrated. The results, reported here, are being applied to identify the stored specimens. The data from these materials, which contribute much to knowledge of hyrax-parasitizing haemaphysalines, will be reported separately.

*Haemaphysalis (Rhipistoma) cooleyi* Bedford, 1929  
Cooley's rock-hyrax haemaphysaline

(Fig. 1-29)

*Haemaphysalis cooleyi*.—Bedford, 1929, pp. 494, 495, Plate II, Fig. 3A-D, briefly described and sketched ♂ and ♀ and described nymph from 3 ♂ (1 stated to be holotype), 1 ♀, and 3 nymphs from *Procavia capensis coombi* Roberts [currently considered as *P. capensis* (Pallas)], near Onderstepoort [Transvaal, South Africa], 22 August 1928, R. A. Cooley and G. A. H. Bedford; deposited in collections of the Veterinary Research Institute, Onderstepoort, but labelled 20 August 1928 and only G. A. H. Bedford as collector. No holotype label is associated with any of the 3 ♂ in this lot. [The map coordinates of the type locality are near 26° 15' S, 28° 00' E.]

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<sup>(2)</sup> Request reprints from Medical Zoology Department, NAMRU-3, FPO, New York 09527/0007, U.S.A.

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*Haemaphysalis cooleyi* Bedford.—Hoogstraal, 1956, pp. 163-170, Fig. 37-57, redescribed and illustrated type materials, mentioned other collecting records, and discussed species relationships in *H. cooleyi* group as known at that time.

*Haemaphysalis (Rhipistoma) cooleyi* Bedford.—Hoogstraal, 1965, pp. 997-1 000, resurrected and defined the subgenus *Rhipistoma* and included the taxon *cooleyi* in this assemblage. Hoogstraal & Morel, 1970, pp. 820, 821, proposed the *H. (R.) orientalis* subgroup (including the taxon *cooleyi*) of hyrax parasites in the *H. (R.) asiatica* group of the subgenus *Rhipistoma*.

### REDESCRIPTION

*Male lectotype* (Fig. 1, 2, 5-12). *Length* from palpal apices to posterior scutal margin 2,14 mm; *breadth* 1,35 mm. *Color* yellowish brown.

*Capitulum* (Fig. 5-7). *Basis capituli* dorsally *c.* 2 times as broad as long; external margins diverging anteriorly; cornua lacking (posteroexternal junctures convex), posterior margin essentially straight. *Basis capituli* ventrally as illustrated; setae 3 pairs posteroexternal, (anteroexternal setae missing or absent), 1 pair posthypostomal. *Palpi* breadth 1,6 times breadth of basis capituli; each palpus 1,2 times as broad as long; broadest near level of palpal mid-length. Segment 1 dorsally obsolete; ventrally as a small undifferentiated pedicle, 1 ventral seta. Segment 2 *c.* 2,5 times as broad as long; posterodorsal margin horizontal (slightly crenulate), external juncture obtuse; posteroventral margin at an angle, external juncture broadly subtriangular; external profile diverging almost to level of intersegmental suture, thence acutely recurving to suture; internodorsal margin not bulging anteriorly; dorsointernal seta single, minute; ventrointernal setae number 4; setae dorsally number 3 posteriorly, 3 anteriorly, ventrally single posteriorly and anteriorly (some missing?). Segment 3 0,6 times as long as 2; external profile converging to bluntly rounded apex; posterodorsal margin mildly convex; ventral spur broad, margins gradually converging to bluntly rounded apex at level of anterior 1/3 of length of segment 2;

setae number 7 dorsally, 4 ventrally, 2 internoventrally adjacent to spur, at least 1 apicointernally. *Hypostome* (Fig. 7) almost as long as palpi, 1.75 times as long as broad, outline slightly diverging from base to broadly rounded apex; corona conspicuous, *c.* 1/4 as long as denticle files, hooklets numerous in *c.* 8 close rows; dental formula 4/4, denticles in files of 7 (external) to 5 (internal).

*Scutum* (Fig. 1). Broadly rounded, 1.4 times as long as broad; anterior emargination narrow, shallow; scapulae blunt; margins convex, broadest at level of spiracular plates, posteriorly broadly rounded. *Cervical grooves* linear, shallow, very short. *Lateral grooves* shallow, narrow, distinct; extending to level of coxa III, enclosing first festoons. *Punctations* few, shallow, small, inconspicuous. *Festoons* number 11.

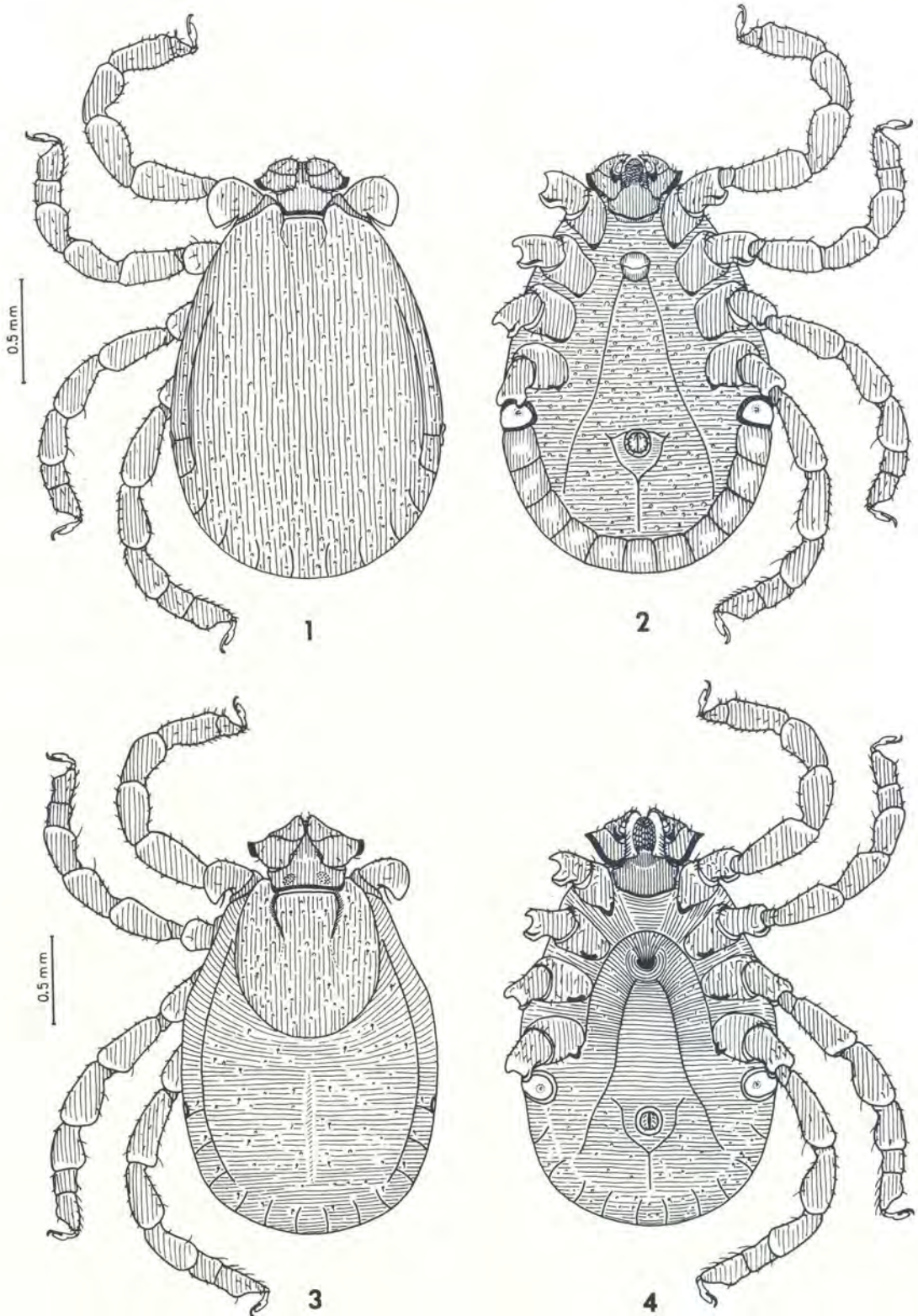


FIG. 1-4 *Haemaphysalis (Rhipistoma) cooleyi* Bedford, lectotype male and allotype female (HH45,516), (1, 2) male, dorsal and ventral views; (3, 4) female, dorsal and ventral views

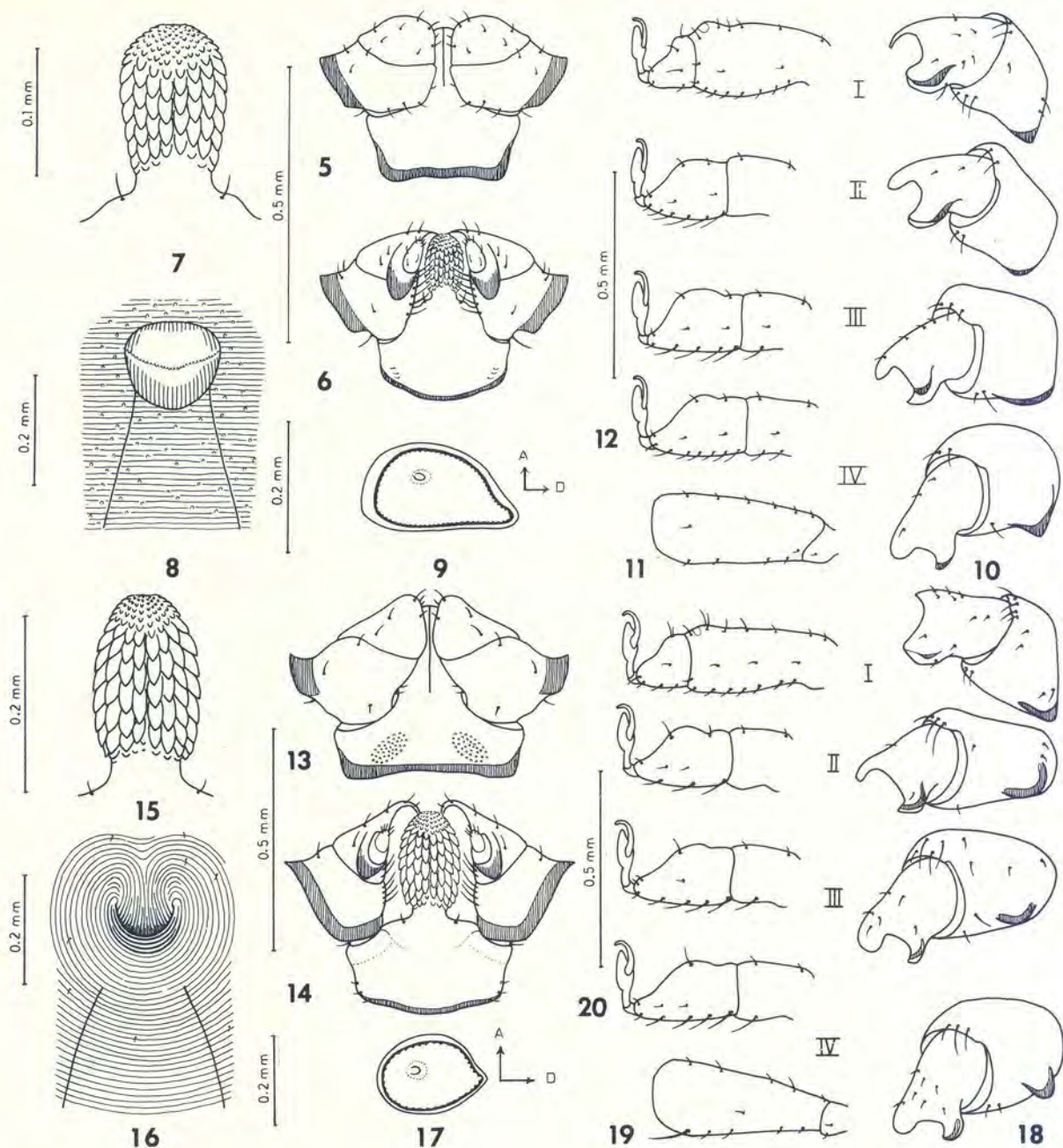


FIG. 5-20 *Haemaphysalis (Rhipistoma) cooleyi* Bedford, lectotype male and allotype female (HH45,516), (5, 6) male capitulum, dorsal and ventral views; (7) male hypostome, ventral view; (8) male genital area; (9) male spiracular plate (A=anterior; D=dorsal); (10) male coxae and trochanters I to IV; (11) male femur IV, internal view; (12) male tarsi I to IV, external view; (13, 14) female capitulum, dorsal and ventral views; (15) female hypostome, ventral view; (16) female genital area; (17) female spiracular plate; (18) female coxae and trochanters I to IV; (19) female femur IV, internal view; (20) female tarsi I to IV, external view

*Venter* (Fig. 2) and *genital area* (Fig. 8) as illustrated. *Spiracular plates* (Fig. 9) 1,7 times as long as broad, dorsal projection continuous with plate, tapering to bluntly rounded apex.

*Legs* (Fig. 1, 2, 10-12). *Coxae* (Fig. 10) I and IV spurs each short, broadly triangular; II and III spurs each replaced by an inconspicuous rounded marginal ridge. *Trochanter* I dorsal shield (Fig. 1) large, broadly triangular; trochanters ventrally (Fig. 10) lacking spurs. *Femur* IV (Fig. 11) ventrointernal setae minute, number 4 (? missing). *Tarsi* (Fig. 12) short, stout; dorsally slightly humped, distally abruptly tapering; ventrally lacking hooks and ridges. *Claws* small. *Pulvilli* reaching to or almost to curvature of claws.

*Female allotype* (Fig. 3, 4, 13-20). The female differs in sexual characters but is quite similar to the male in diagnostic details. *Length* (unfed) 2,43 mm, *breadth* 1,50 mm.

*Capitulum* (Fig. 13-15). *Basis capituli* dorsally 3,4 times as broad as long; external margins slightly diverging anteriorly; cornua lacking; posterior margin mildly concave medially; porose areas small, oval, tilted, widely spaced. *Basis capituli* ventrally as illustrated; setae numbers as in male. *Palpi* differing from those of male as follows. Each palpus 1,1 times as broad as long. Segment 1 minute dorsally and ventrally; 1 ventral seta (as in male). Segment 2 1,52 times as broad as long; posterodorsal margin oblique, external juncture at almost right angle close to level of

segmental midlength, external profile short, slightly diverging, thence acutely recurving and converging to intersegmental suture; posteroventral margin horizontal, short, external juncture (in plane with external margin of basis capituli) broadly rounded; external profile long, diverging to acutely recurving juncture at same level as dorsally; dorsointernal and ventrointernal setae number 2 and 4, respectively; dorsal setae number 4, ventral seta single. Segment 3 sub-

triangular, 0,9 times as long as segment 2, apex more narrowly rounded than in male; ventral spur as in male but shorter, apex at level of intersegmental suture; setae number 4 dorsally, 5 ventrally, 2 interno-ventrally adjacent to spur. *Hypostome* (Fig. 15) not as long as palpi, 1,87 times as long as broad, profile convex, apex blunt; corona *c.* 1/5 as long as denticle files, hooklets in 6 close rows; denticles each more elongate but dental formula and files as in male.

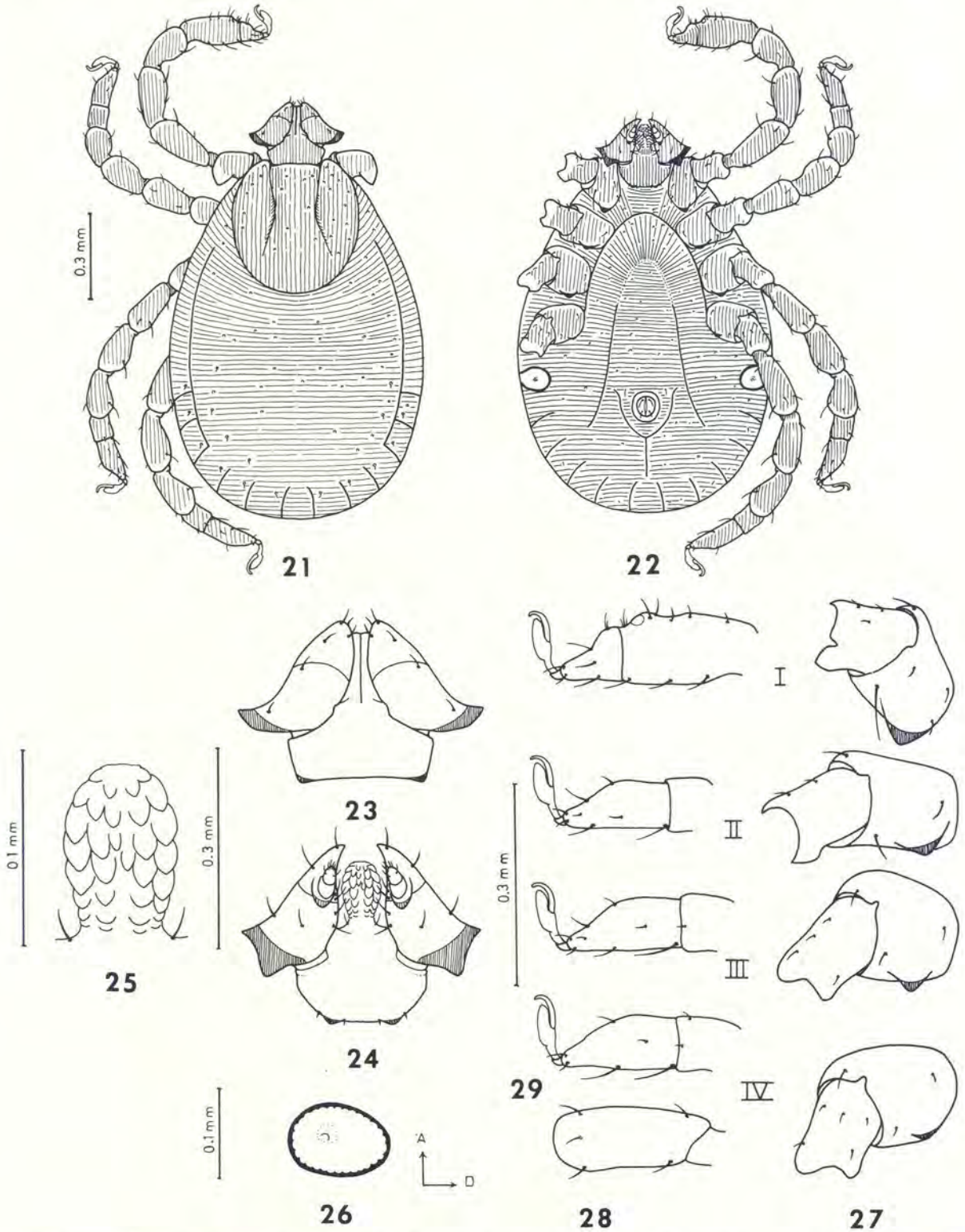


FIG. 21-29 *Haemaphysalis (Rhipistoma) cooleyi* Bedford, paratype nymph (HH45,516), (21, 22) dorsal and ventral views; (23, 24) capitulum, dorsal and ventral views; (25) hypostome, ventral view; (26) spiracular plate; (27) coxae and trochanters I to IV; (28) femur IV, internal view; (29) tarsi I to IV, external view

*Scutum* (Fig. 3) 1,1 times as long as broad; anterior emargination broad, shallow; scapulae bluntly rounded; margins convex, posteriorly broadly rounded. *Cervical grooves* extending only to level of anterior 1/3 of scutal length, converging posteriorly. *Punctations* as in male. *Dorsum* (Fig. 3) and *venter* (Fig. 4, 16, 17) as illustrated. *Genital operculum* (Fig. 16) semicircular. *Spiracular plates* (Fig. 17) subcircular; dorsal projection short, broadly triangular.

*Legs* (Fig. 3, 4, 18–20) essentially as in male; femur IV ventrointernal setae number 5.

*Nymph paratype* (Fig. 21–29). *Length* (unfed) 1,47 mm; *breadth* 0,91 mm.

*Capitulum* (Fig. 23–25). *Basis capituli* dorsally 3,4 times as broad as long, external margins slightly diverging anteriorly; cornua triangular, minute. *Basis capituli* ventrally as illustrated; setae 2 pairs posteriorly, 1 pair posthypostomal. *Palpi* broadly salient posteriorly, combined breadth 1,7 times that of basis capituli. Segment 1 minute dorsally and ventrally, setae lacking. Segment 2 1,6 times as broad as long; posterodorsal margin horizontal, external juncture obtuse, external profile dorsally a deep arc; posteroventral margin forming a broadly triangular median spur with apex at level of anterior 1/3 of length of basis capituli, external profile of spur continuing as an arc to acutely recurving juncture near level of segmental midlength; internodorsal margin slightly indented posteriorly; dorsointernal and ventrointernal setae number 1 and 2, respectively; dorsal and ventral setae each number 2. Segment 3 elongately triangular, 1,1 times as long as 2, apically pointed; ventral spur small, broadly rounded, extending slightly beyond intersegmental suture; setae number 3 dorsally, 2 ventrally, 2 internoventrally adjacent to spur. *Hypostome* (Fig. 24, 25) shorter than palpi, 1,4 times as long as broad; profile convex, apex blunt; corona obscure; dental formula essentially 2/2 but with 2 or 3 median denticles anteriorly; denticles broad, in files of 7 and 6.

*Scutum* (Fig. 21) 0,96 times as long as broad; anterior emargination shallow, broad; scapulae rounded; margins mildly convex, broadly rounded posteriorly. *Cervical grooves* extending to posterior 1/3 of scutal length, converging anteriorly, diverging posteriorly. *Punctations* small, few, most in anterior and lateral fields; no setae visible. *Dorsum* (Fig. 21) and *venter* (Fig. 22, 26) as illustrated. *Spiracular plates* (Fig. 26) subcircular.

*Legs* (Fig. 21, 22, 27–29). *Coxae* (Fig. 27) I spur broadly angular, extending somewhat beyond coxal margin; II–IV spurs each as I but progressively smaller (IV spur not extending beyond margin). *Femur IV* (Fig. 28) ventrointernal setae number 2. *Tarsi* (Fig. 29) moderately long; dorsally flat, distally gradually tapering. *Claws* moderate. *Pulvilli* long, reaching to curvature of claws.

*Larva*. This stage is not represented in the type material.

*Lectotype selection*. Bedford (1929) designated one of 3 male specimens as the holotype of this taxon. These 3 males were now (1979) found together, without a holotype label, in a vial with the single female (allotype) and 2 nymphs (paratypes). We have

selected the male in best condition and labelled it the *lectotype*. We can detect no structural differences between these 3 males, which measure (length × breadth) as follows (mm): 2,14 × 1,35 (*lectotype*), 2,14 × 1,35 (*paratype*), and 2,25 × 1,43 (*paratype*).

*Diagnosis (adults)*. A small haemaphysaline [subgenus *Rhipistoma* (*asiatica* group, *orientalis* subgroup)] [total length × breadth (mm): ♂ 2,14 × 1,35, ♀ 2,43 × 1,50]. *Basis capituli* 2 (♂) or 3,4 times (♀) as broad as long; cornua obsolete, posteroexternal junctures convex; porose areas (♀) small, oval, widely spaced. *Palpi c.* 1,61 (♂) or 1,47 times (♀) as broad as basis capituli. Segment 2 posterodorsal margin horizontal (♂) or oblique (♀), external juncture obtuse (♂) or almost right angle (♀); external profile dorsally long (♂; ♀ ventrally) or short (♀ dorsally), acutely recurved at level near that of intersegmental suture; dorsointernal setae number 1 (♂) or 2 (♀); ventrointernal setae number 4 (♂, ♀). Segment 3 ventral spur broad, margins gradually converging to bluntly rounded apex at level slightly beyond (♂) or same as (♀) intersegmental suture. *Hypostome* corona conspicuous; dental formula 4/4, denticles in files of 7–5 (♂) or 7–6 (♀). *Scutum* (♂) broadly rounded, 1,4 times as long as broad; cervical grooves very short; lateral grooves extending to level of coxa III; punctations few, shallow, small, inconspicuous. *Scutum* (♀) 1,1 times as long as broad; margins convex, posteriorly broadly rounded; punctations as in male. *Coxae* I and IV spurs short, broadly subtriangular, blunt apically; II and III spurs reduced to rounded marginal ridges. *Femur IV* ventrointernal setae number 4 (♂) or 5 (♀). *Tarsi* short, stout, humped. *Pulvilli* reaching to or almost to curvature of claws.

**Key to hyrax-parasitizing haemaphysalines**

(subgenus *Rhipistoma*, group *orientalis*, subgroup *asiatica*)

**Males**

1. Cornua lacking. Palpal segment 2 interno-dorsal margin not bulging anteriorly; segment 3 ventral spur moderately broad, outline gradually converging to bluntly rounded apex. Scutum punctations few, shallow, small, inconspicuous (South Africa)..... *cooleyi*  
 Cornua present. Palpal segment 2 interno-dorsal margin bulging anteriorly; segment 3 ventral spur broadly rounded or tusklike. Scutum punctations distinct, some deep, medium-sized and small mixed (South Africa to Sudan)..... 2
2. Palpal segment 2 posterodorsal margin horizontal, external juncture obtuse, this juncture ventrally broadly subtriangular; segment 3 ventral spur exceptionally broad, outline convex. Scutum 1,6 times as long as broad. Coxal spurs each short, broad, extending somewhat beyond posterior margins. Tarsi distinctly humped (South Africa, Zimbabwe) ..... *hyracophila*  
 Palpal segment 2 posterodorsal margin oblique or horizontal, external juncture as a posteriorly directed spur. Coxal II–IV spurs reduced to broad ridges not extending beyond posterior margins. Tarsi not humped..... 3

3. Palpal segment 2 posterodorsal margin oblique; external juncture spur distinctly large, this juncture ventrally obtuse; segment 3 ventral spur broadly rounded. Dental formula 4/4. Cornua small. Scutal punctations mostly deep (Malawi, Tanzania, Zambia)..... *orientalis*

Palpal segment 2 posterodorsal margin horizontal, external spur small; posteroexternal juncture ventrally broadly triangular, short-spurlike. Dental formula chiefly 3/3. Cornua moderately large. Scutal punctations mostly shallow (Sudan, Ethiopia, Uganda, Kenya)..... *bequaerti*

Females

1. Cornua lacking. Palpal segment 2 posterodorsal margin oblique, external juncture an almost right angle at level of segmental midlength; posteroventral margin horizontal, external juncture broadly rounded near plane of external margin of basis capituli. Scutal punctations faint, shallow, few; cervical grooves not reaching scutal midlength. Genital operculum semicircular. Coxa IV spur small but distinctly extending beyond posterior margin..... *cooleyi*

Cornua present. Palpal segment 2 posterodorsal margin horizontal or almost so, external juncture triangular at level close to that of palpal insertion; posteroventral external juncture angular and more distad. Scutal punctations few but discrete, mostly deep; cervical grooves reaching scutal midlength. Genital operculum not semicircular. Coxa IV spur replaced by rounded ridge..... 2

2. Palpal segment 2 posterodorsal margin horizontal; posteroexternal junctures dorsally and ventrally broadly angular or rounded, not distinctly spurlike. Genital operculum U-shaped. Coxa I spur relatively large, II-IV ridges extending slightly beyond posterior margins. Tarsi distinctly humped.... *hyracophila*

Palpal segment 2 posterodorsal margin oblique, external juncture as a posteriorly directed spur; other margins and structures also differing from those above. Tarsi not humped..... 3

3. Cornua quite large. Palpal segment 2 posteroexternal juncture ventrally extended as a distinct spur close to palpal insertion. Hypostome denticles in files of 7-9. Genital operculum elongate, distinctly narrowing posteriorly. Coxa I spur moderately large; II-IV ridges inconspicuous, small..... *orientalis*

Cornua small. Palpal segment 2 posteroventral margin horizontal to level well beyond plane of external margin of basis capituli, external juncture an obtuse angle. Hypostome denticles in files of 5-7. Genital operculum broadly U-shaped. Coxa I spur/ridge small, extending only slightly beyond posterior margin; II-IV spurs small, broadly triangular, extending slightly beyond posterior margins (IV spur much reduced)..... *bequaerti*

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