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Rhipicephalus exophthalmos sp. nov., a new tick species from southern Africa, and redescription of *Rhipicephalus oculatus* Neumann, 1901, with which it has hitherto been confused (Acari: Ixodida: Ixodidae)

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ABSTRACT

KEIRANS, J.E., WALKER, JANE B., HORAK, I.G. & HEYNE, HELOISE 1993. *Rhipicephalus exophthalmos* sp. nov., a new tick species from southern Africa, and redescription of *Rhipicephalus oculatus* Neumann, 1901, with which it has hitherto been confused (Acari: Ixodida: Ixodidae). *Onderstepoort Journal of Veterinary Research*, 60: 229–246

Rhipicephalus exophthalmos sp. nov., a species which has in the past been confused with *Rhipicephalus oculatus* Neumann, 1901, is described and illustrated from laboratory-reared specimens. Preferred hosts for the adults of this tick are various domestic and wild ungulates and hares. It is widely distributed in Namibia and in the south-eastern Cape Province, South Africa, with only scattered records from elsewhere.

The adults of *R. oculatus* are redescribed and illustrated, and the immature stages are described and illustrated for the first time. All stages feed virtually exclusively on leporids. It is common in parts of the eastern and southern Cape Province, with few records as yet from other parts of South Africa and Namibia.

INTRODUCTION

Neumann (1901) described *Rhipicephalus oculatus* from two males, two females collected from *Lepus timidus* in Damaraland, D.S.W. Afrika (Namibia), by Borchmann, plus one female from a bovine at Kilossa (= Kilosa, Tanzania), collected by the "K(ais). Gesundheitsamt de Berlin" (presumably a member of the Kaiser's Health Department of Berlin). Of these specimens only one male, one female (Zoological Museum, Berlin 17613, 17614) are now known to exist (Moritz & Fischer 1981) and they have been re-examined by the senior author. Studies by Yeoman & Walker (1967) in Tanzania and by Walker (1974) in Kenya demonstrated that *R. oculatus* does not occur in eastern Africa. Although now lost, the Kilosa specimen was, in all likelihood, *R. pravus*. The host, *Lepus timidus*, was most probably *Lepus capensis*, although it may have been *Lepus saxatilis*, since both these species of hares occur in Damaraland (R.H.N. Smithers, personal communication to J.B. Walker, Pretoria, *c.* 1985).

Zumpt (1942), in a comparison of *Rhipicephalus evertsi* and *R. oculatus*, observed (translated from the German): "*R. oculatus*, however, is more extensively, and sometimes more irregularly, punctate.

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Then there are finer punctations among larger ones, which probably caused this species to be confused with *pravus*. Also, in the male the central festoon can be protruded, which is never the case in *evertsi*. The female has pronounced scutolateral grooves, which are also lacking in *evertsi*." Judging by these statements, Zumpt was probably describing what we consider to be *Rhipicephalus exophthalmos* sp. nov. rather than true *R. oculatus*. Subsequently, Zumpt (1949) published a key to adult *Rhipicephalus* spp. in which he included, and illustrated, a species he thought to be *R. oculatus*, but in reality his diagnosis and illustrations clearly refer to what is now regarded as *R. exophthalmos*.

Sousa Dias (1950) described and illustrated what is probably *R. exophthalmos* from Angola, and Santos Dias (1983a, b) later recorded collections of *R. oculatus sensu lato* from several areas there. Theiler & Robinson (1953) redescribed what they thought to be *R. oculatus*, including first descriptions of the nymph and larva, but these specimens (Onderstepoort Tick Collection 2810), reared from a female collected at Omandumba, Omaruru, Namibia, are definitely *R. exophthalmos*. Theiler & Robinson (1953) also recorded *R. oculatus* from Bulawayo and "Sitalika (Barotseland)" in Southern Rhodesia (= Zimbabwe). Subsequently, Theiler (1962) correctly relocated Barotseland in Northern Rhodesia (= Western Province, Zambia), from which she listed Sitaleka and Sesheke. The source of these records is unknown, and we ourselves have seen no specimens of either *R. oculatus* or *R. exophthalmos* from Zambia. Norval (1985) did not list *R. oculatus* in his survey of lesser known *Rhipicephalus* species in Zimbabwe, and said there was no evidence that it was established there. Theiler & Robinson (1953) reported *R. oculatus* from Palapye and Nokanen in Bechuanaland (= Botswana), as did Zumpt (1958), who recorded it from Palapye, Debeete (= Dibete) and Tsessebe (= Tshesebe). From the information provided by these authors, these collections were possibly a mixture of *R. oculatus* and *R. exophthalmos*.

Clifford & Anastos (1960) examined larvae listed as *R. oculatus* for their seminal paper on the use of chaetotaxy in the identification of ixodid ticks. These larvae were provided by Dr G. Theiler but, from the data available to us, we cannot say whether or not they were from OP 2810, i.e. the series originating from Namibia used by Theiler & Robinson (1953).

DESCRIPTIONS

In the following descriptions, measurements are in millimeters. Chaetotaxic terminology is according to Clifford & Anastos (1960).

Rhipicephalus exophthalmos Keirans & Walker, sp. nov.

HOLOTYPE. ♂, laboratory reared, F_2 generation from ♀ collected on farm "Kosos 11", Karas region (formerly Bethanien), Namibia, on *c.* 10 March 1970; host not recorded (Series no. WON 3396). Deposited in the Onderstepoort Tick Collection 3144.

ALLOTYPE. ♀, data as above.

PARATYPES. ♂♂, ♀♀, nymphs and larvae, data as above, deposited in the Onderstepoort Tick Collection 3144. Five ♂♂, five ♀♀, nymphs and larvae, data as above, deposited in the U.S. National Tick Collection, RML 65729; five ♂♂, five ♀♀, nymphs and larvae deposited in the Natural History Museum, London.

MALE (Fig. 1, 3–5)

Inornate, typically both scutum and lateral idiosomal area light brown; legs uniformly light brown.

CAPITULUM (Fig. 3). Approximately as broad as long, the length (including cornua) x breadth varying from 0,737 x 0,759–0,531 x 0,556.

BASIS CAPITULI. Length from palpal insertion to cornual apices varying from 0,428–0,287. Anterolateral margins straight, diverging posterolaterally; posterolateral margins concave, extending anteriorly over the apical processes of coxa I. Cornua triangular, bluntly rounded, about as long as wide. Dorsal setae of basis capituli as in Fig. 3.

PALPS (Fig. 3). Article I visible dorsally; article II longer than article III; both broader than long.

BODY (Fig. 1). Length (from scapular apices to posterior body margin) x breadth varying from 3,346 x 2,075–2,247 x 1,445, broadest at level of spiracular plates, broadly rounded posteriorly. In engorged specimens the idiosomal wall bulges laterally and an elongate caudal process protrudes posteromedially.

CONSCUTUM (Fig. 1). Eyes submarginal, bulging, deeply orbited. The orbit in some specimens round as in this illustration; in others the orbit is extended somewhat anteriorly or posteriorly, giving it a slightly elongate appearance. Cervical pits relatively deep; internal cervical margins shallow, converging initially then diverging posterolaterally; cervical fields shallow, external cervical margins usually marked by a few punctations. Marginal lines well developed, deep, punctate; extending posteriorly from just behind eyes to festoon one, which is occasionally delimited by the marginal line. Posteromedian and posterolateral grooves well developed; posteromedian broad posteriorly, narrowing anteriorly, posterolaterals ovoid, deep. Punctations generally as illustrated (Fig. 1), but in some specimens large, deep punctations vary in number and intensity.

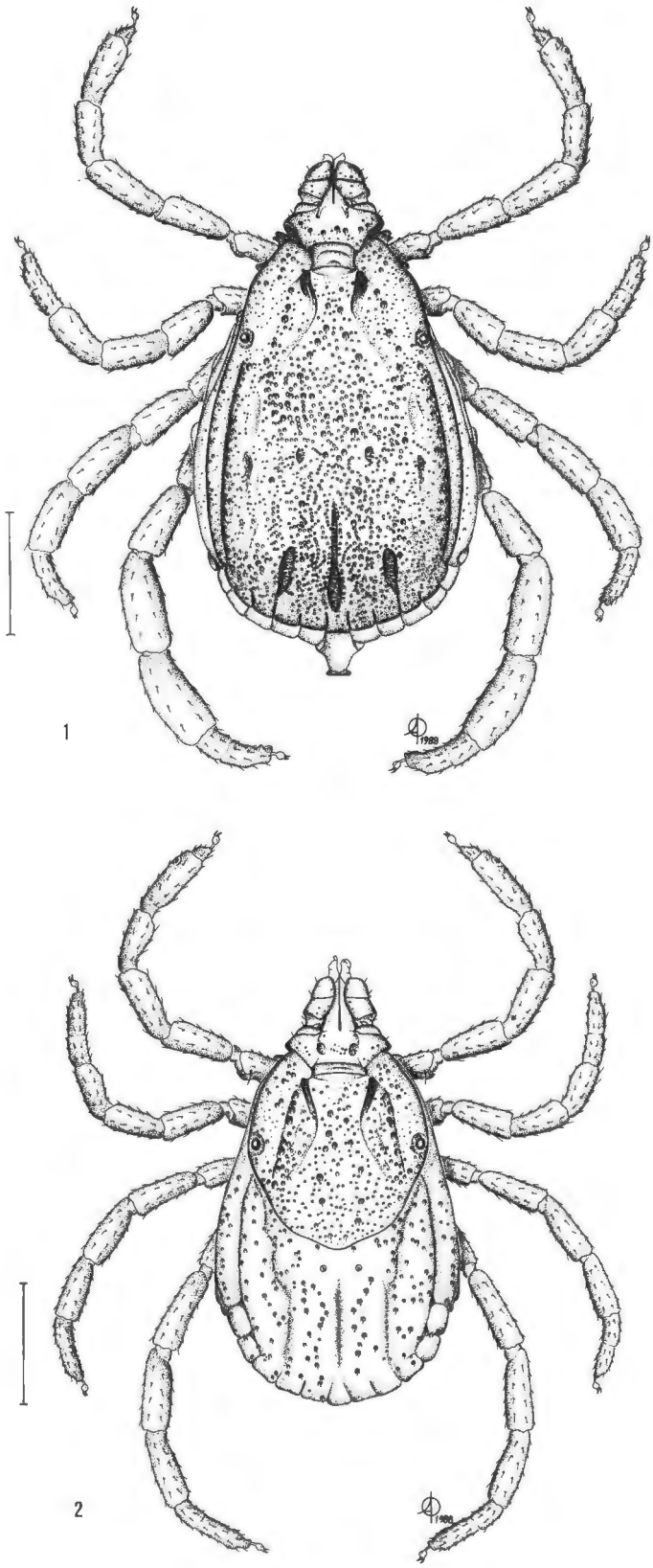

FIG. 1–2 *Rhipicephalus exophthalmos* sp. nov. (from Onderstepoort Tick Collection 3144). 1. Male, dorsal view. 2. Female, dorsal view. A. Olwage *del*. Scales represent 1 mm

LEGS (Fig. 1). Increasing slightly in size from I–IV. Anterior projection of coxa I sharp, easily visible dorsally.

VENTRAL SURFACE: SPIRACLE (Fig. 5). Narrowly elongate with a long tail that can often be seen from the dorsal surface.

ADANAL PLATES (Fig. 4). With external margin mildly convex; posterior margin broad and slightly convex; internal margin nearly straight and, in almost all specimens examined, leading posteriorly to a small medially directed point as illustrated.

FEMALE (Fig. 2, 6–8)

CAPITULUM (Fig. 6). Slightly broader than long, the length x breadth varying from 0,746 x 0,830–0,670 x 0,778.

BASIS CAPITULI (Fig. 6). Length from palpal insertion to cornual apices varying from 0,370 x 0,305, porose areas small, subcircular.

PALPS (Fig. 6). Article I short, but visible from the dorsal surface. Article II longer than article III.

BODY (Fig. 2). Length (from scapular apices to posterior body margin) x breadth varying from 3,220 x 1,948–2,720 x 1,775. Dorsally the marginal line extends posteriorly from the scutum and usually delimits the first two festoons.

SCUTUM (Fig. 2, 7). Outline as illustrated. Length x breadth varying from 1,535 x 1,477–1,409 x 1,328, broadest at eye level. Eyes submarginal, bulging, deeply orbited. The orbit either round (Fig. 2) or often slightly extended anteriorly and/or posteriorly (Fig. 7). Cervical pits (Fig. 7) deep; internal cervical margins converging as sharp declinations, then diverging as shallow ridges; cervical fields scalpel-shaped, often with irregular ridges centrally (Fig. 2), but sometimes quite smooth (Fig. 7); external cervical margins usually ridge-like and often well delineated with somewhat larger punctations containing small white setae. Scutal punctations as illustrated.

LEGS (Fig. 2). Uniform in size, light brown.

VENTRAL SURFACE: GENITAL APERTURE (Fig. 8). Situated between coxae II, a broadly rounded U in shape, the area within the opening bulging.

SPIRACLE. Short, rounded, with a small dorsal prolongation.

NYMPH (Fig. 9–12)

CAPITULUM (Fig. 9, 10). Length (measured from tip of hypostome to posterior border of basis capituli) x breadth varying from 0,257 x 0,316–0,198 x 0,287, much broader than long.

BASIS CAPITULI (Fig. 9, 10). Length from palpal insertion to posterior margin of basis varying from 0,111–0,086. Posterolateral margins straight, diverging anteriorly over scapulae and apical processes of coxa I. Ventrally broadly rounded posteriorly, without posterolateral spurs, with two pairs of setae, one pair posthypostomal and one pair postpalpal.

PALPS (Fig. 9, 10). Article I visible from dorsal surface, article II longer than III. Broadest basally, narrowing appreciably to the apices.

BODY. Length (from scapular apices to posterior body margin) x breadth varying from 1,080 x 0,655–0,840 x 0,532, broadest at level of coxa IV. Marginal line extends posteriorly from scutum to 1st festoon. Posteromedian and posterolateral grooves extending anteriorly from festoons to body midlength.

SCUTUM (Fig. 11). Length x breadth varying from 0,581 x 0,552–0,496 x 0,485. Scapulae bluntly rounded. Eyes as prominent bulges, partially orbited, situated on the lateral border immediately anterior to the posterolateral scutal angle. External cervical margin ridge-like, extending from junction with the internal cervical margin almost to posterior scutal margin; internal cervical margin shallow and short, not reaching scutal midlength. Cervical and median fields shagreened; raised lateral border smooth except around eyes. Setae fine, short, about the same length as dorsal body setae.

VENTRAL SURFACE: LEGS (Fig. 12). Coxa I with an elongate triangular external spur and a short triangular internal spur; coxae II-IV each with a small triangular external spur; internal spurs absent. Legs I–IV equal in size.

SPIRACLE. Subcircular.

LARVA (Fig. 13–16)

CAPITULUM (Fig. 13, 14). Slightly longer than broad, the length x breadth varying from 0,129 x 0,125–0,109 x 0,121.

BASIS CAPITULI (Fig. 13, 14). Length (from base of cheliceral sheaths to posterior margin of basis) x breadth varying from 0,051 x 0,125–0,043 x 0,121, dorsally with posterior margin straight, cornua absent. Ventrally with posterior margin broadly rounded; posthypostomal setae one pair.

PALPS. Broad proximally, tapering gently to bluntly rounded apices, suture between segments two and three only faintly indicated (Fig. 13, 14); palpal setae, segment two with three dorsal and three ventral, segment three with four dorsal and two ventral, segment four with about 12.

BODY. Ovoid, broadest posterior to coxa III. Length (from scapulae to posterior body margin) x breadth varying from 0,663 x 0,523–0,624 x 0,468. Dorsal body setae number ten pairs; two pairs central dorsals and eight pairs marginal dorsals. Ventral setae number 14 pairs plus one pair on anal valves; three pairs sternals, two pairs preanals, four pairs premarginals, five pairs marginal ventrals.

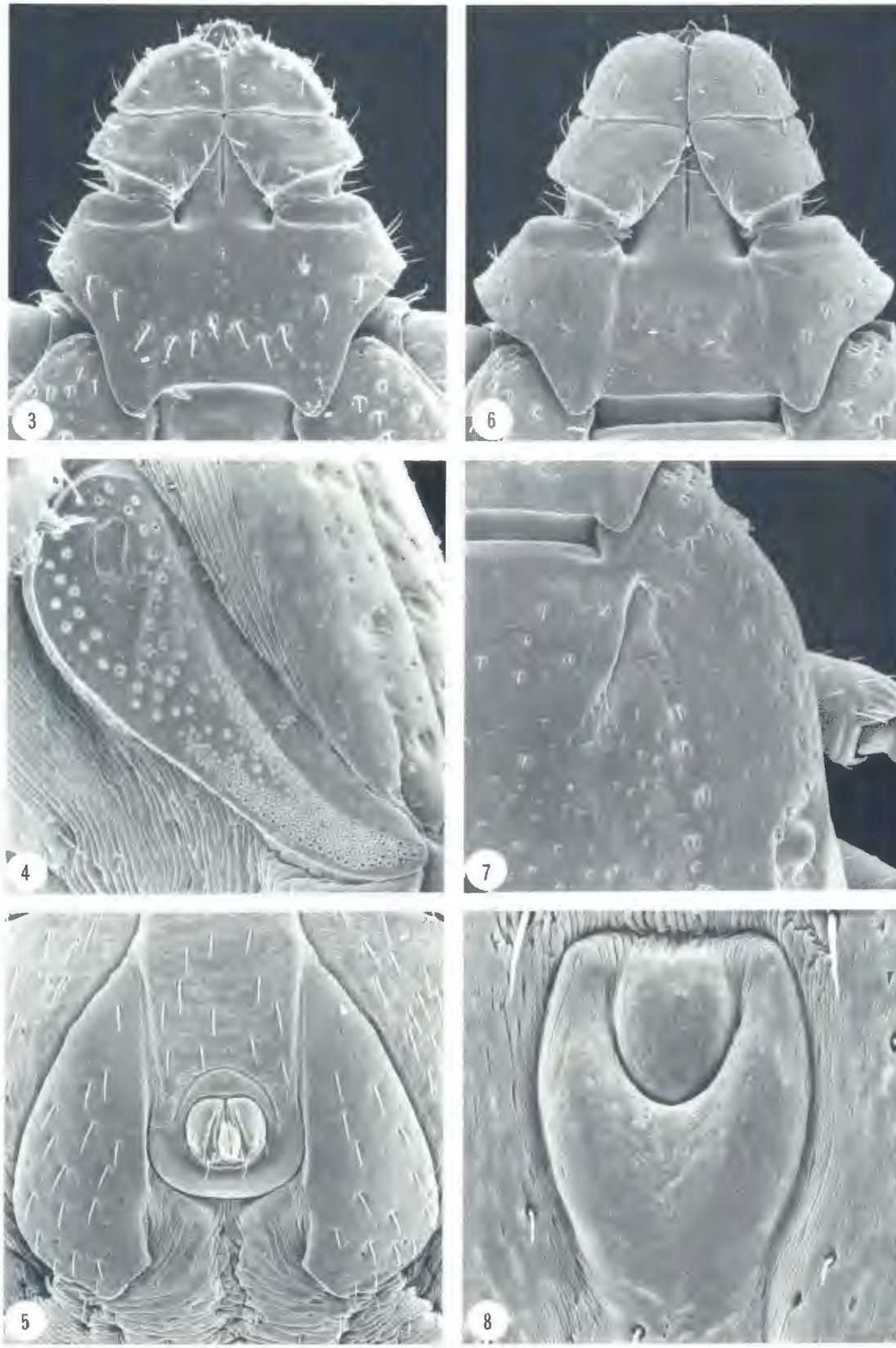

FIG. 3–8 *Rhipicephalus exophthalmos* sp. nov. (from Onderstepoort Tick Collection 3144). Male: 3. Capitulum, dorsal. 4. Spiracle. 5. Adanal plates. Female: 6. Capitulum, dorsal. 7. Scapular area. 8. Genital aperture. SEMs by M.D. Corwin

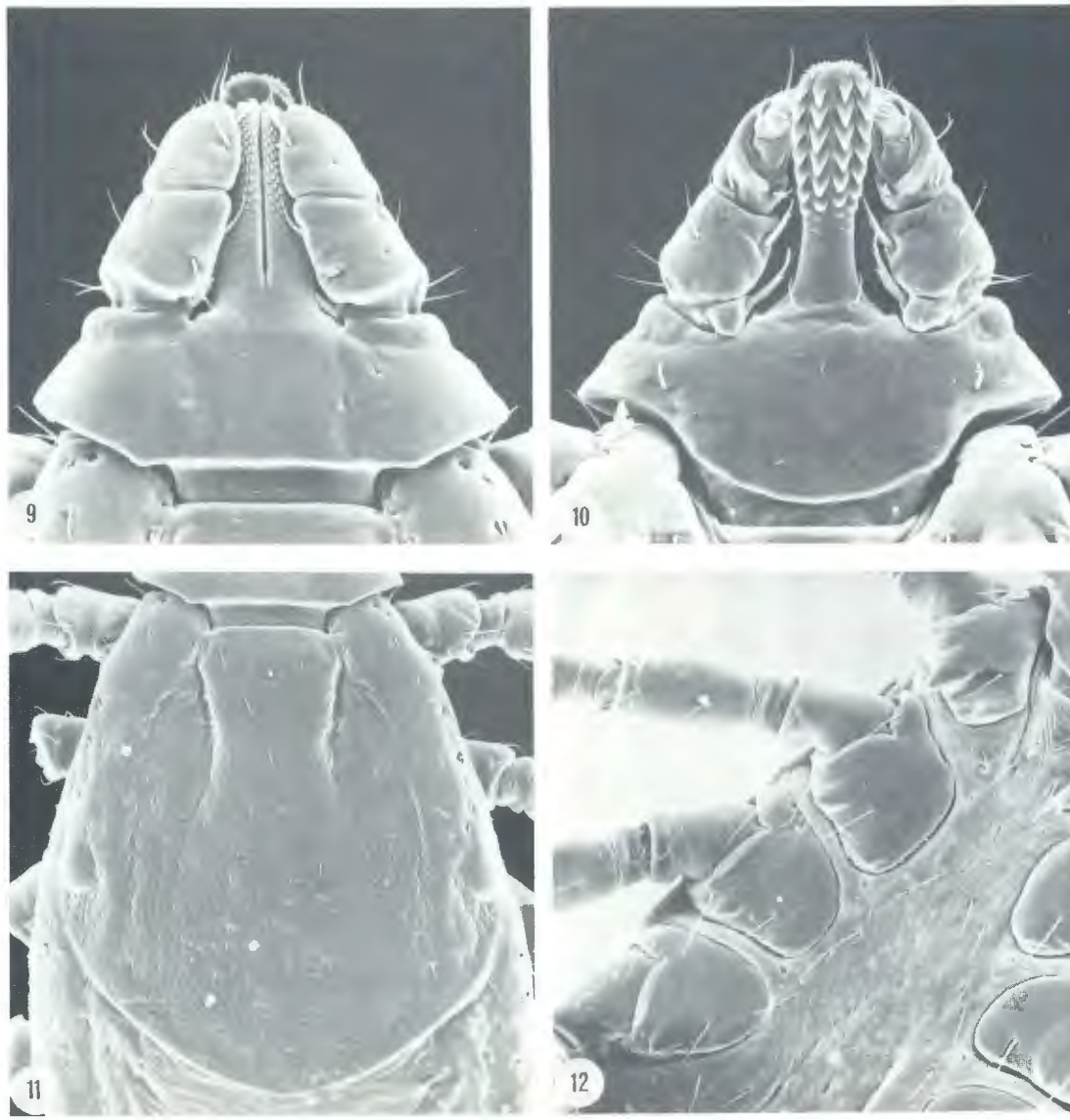

FIG. 9–12 *Rhipicephalus exophthalmos* sp. nov. (from Onderstepoort Tick Collection 3144). Nymph: 9. Capitulum, dorsal. 10. Capitulum, ventral. 11. Scutum. 12. Coxae. SEMs by M.D. Corwin

SCUTUM (Fig. 15). Length x breadth varying from 0,308 x 0,109–0,293 x 0,102; anterolateral borders smoothly curved, posterior border a smooth, relatively shallow curve; internal cervical margins short, moderately deep, posteriorly directed; external cervical margins absent; eyes at posterolateral angles of scutum, large, bulging, rounded, slightly orbited; scutal setae three pairs.

VENTRAL SURFACE: LEGS (Fig. 16). Coxa I with moderately large, triangular, pointed internal spur; coxa II lacks an internal spur, but a noticeable internal bulge is present; coxa III with a very small triangular internal spur; external spurs absent on all coxae. Coxal setae, three on I, two on II and on III.

LIFE CYCLE

Rhipicephalus exophthalmos is a three-host tick (Table 1). Theiler & Robinson (1953) did not state what hosts were used to rear this species in the laboratory. The survival periods recorded for the adults were extremely short, suggesting that the conditions under which they had been kept were far from ideal. Subsequently, this species was reared again on rabbits by W.O. Neitz & J. de V. Hoffman (unpublished data 1970-1972) and by Rechav & Knight (1983) (Table 1). The latter authors mistook this tick for *R. oculatus*, but examination of their material, plus the fact that they collected their original adult stock from Angora goats, indicate that it is *R. exophthalmos*.

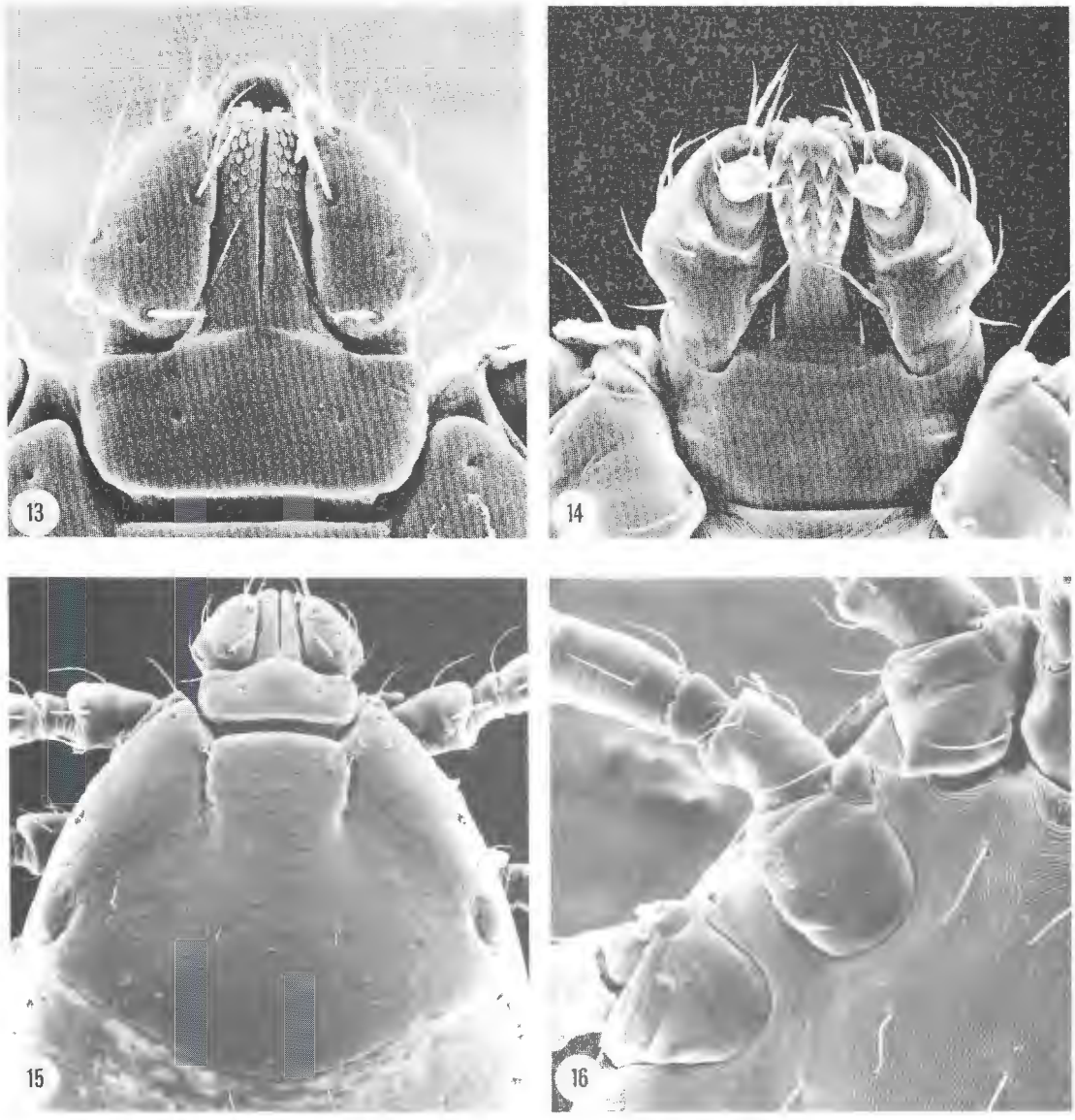

FIG. 13–16 *Rhipicephalus exophthalmos* sp. nov. (from Onderstepoort Tick Collection 3144). Larva: 13. Capitulum, dorsal. 14. Capitulum, ventral. 15. Scutum. 16. Coxae. SEMs by M.D. Corwin

BIOLOGY IN THE FIELD

The records of *R. exophthalmos* listed below represent collections that we have identified ourselves.

Hosts

Rhipicephalus exophthalmos adults commonly parasitize cattle and sheep, sometimes goats, but rarely other domestic animals (Table 2). Their wild animal hosts are almost exclusively members of the families Artiodactyla and Leporidae. Among the artiodactyls both small antelopes, such as the springbuck and large species, such as the gemsbok and greater kudu, are frequently infested. The scrub hare is the favourite leporid host of the adults, and the only animal from which nymphs have as yet been recorded.

During a 2-year survey of ticks on a farm and an adjacent game reserve in the eastern Cape Province, *R. exophthalmos* [then referred to as *Rhipicephalus* sp. (near *R. oculatus*)] was recovered from Dorper sheep (Horak, Williams & Van Schalkwyk 1991a), Angora goats (Horak, Knight & Williams 1991d), scrub hares (Horak & Fourie 1991), kudus (Horak, Boomker, Spickett & De Vos 1992b) and cattle. The burdens of these animals are summarized in Table 3.

Although a greater proportion of kudus than any other host were infested, cattle harboured the largest

TABLE 1 Life cycle and survival periods of *Rhipicephalus exophthalmos* in the laboratory

Developmental stages	Developmental periods (days)		
	OP 2810 [a]	WON 3348 & 3396 [b]	Rechav & Knight (1983)
Pre-oviposition	13–15	5–6	6,0
Eggs hatch	13–17	32–33	26,8
Larvae feed	2–8	4	6,6
Larvae moult	8–16	11	8,0
Nymphs harden	3		
Nymphs feed	4–10	5	8,3
Nymphs moult	13	17–19	14,6
Adults harden	No data	No data	No data
Adults feed	8–14	8	7,2
Survival periods	Months	No data available	
Unengorged larvae	3		
Unengorged nymphs	5		
Unengorged adults	2–2½		

[a] Theiler & Robinson (1953)
[b] W.O. Neitz & J. de V. Hoffman (unpublished data 1970–1972)

TABLE 2 Host records of *Rhipicephalus exophthalmos* sp. nov.

Hosts	No. of collections
Domestic animals	
Cattle	37
Sheep [a]	38
Goats [b]	14
Pig	1
Horses	2
Donkey	1
Dogs	2
Wild animals	
Lion (*Panthera leo*)	1
Burchell's zebra (*Equus burchelli*)	1
Warthog (*Phacochoerus aethiopicus*)	8
Springbuck (*Antidorcas marsupialis*)	19
Steenbok (*Raphicerus campestris*)	5
Impala (*Aepyceros melampus*)	1
Grey rhebok (*Pelea capreolus*)	1
Gemsbok (*Oryx gazella*)	22
Greater kudu (*Tragelaphus strepsiceros*)	30
Eland (*Taurotragus oryx*)	4
Mountain reedbuck (*Redunca fulvorufula*)	2
Cape hare (*Lepus capensis*)	1
Scrub hare (*Lepus saxatilis*)	32
"Hare" (*Lepus* sp.)	17
Namaqua rock mouse (*Aethomys namaquensis*)	1

[a] Sheep include Dorpers, Black-headed Persians and Karakuls; in many cases the breed was not specified
[b] Goats include Boer goats and Angoras; in many cases the breed was not specified

TABLE 3 The relative abundance [a] of *Rhipicephalus exophthalmos* on cattle, sheep, goats, kudus and scrub hares on a farm and adjacent nature reserve in the eastern Cape Province [b]

Hosts	Number examined	Number infested	Number of ticks recovered				
			Larvae	Nymphs	♂	♀	Total
"Bucklands"							
Cattle	46	19	0	0	223	75	298
Sheep	48	1	0	0	2	0	2
Goats	48	3	0	0	6	2	8
Scrub hares	45	15	11	8	21	6	46
Kudus	9	6	0	0	30	13	43
Andries Vosloo Kudu Reserve							
Scrub hares	42	14	28	4	18	12	62
Kudus	16	13	0	0	104	41	145

[a] Tick counts according to the methods of Horak & Fourie (1991) and Horak *et al.* (1992b)
[b] 76 helmeted guineafowls examined on the two properties were free of infestation

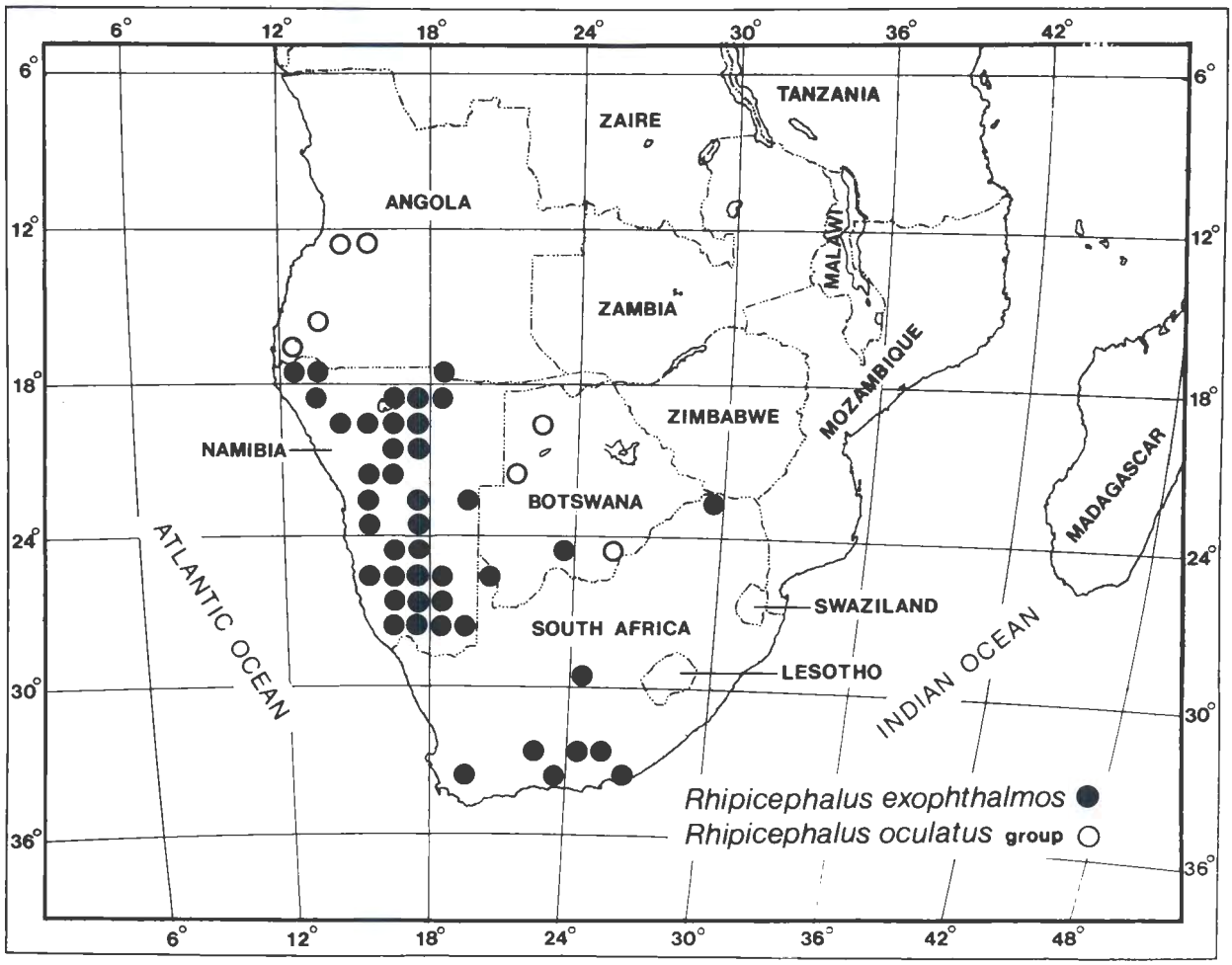

FIG. 17 *Rhipicephalus exophthalmos* sp. nov.: distribution

individual burdens. No ticks were found during May, but they were recovered during every other month. The largest numbers were recovered and all mammal host species were infested in January.

A 13-month survey conducted on gemsbok in southern Namibia revealed that all animals examined during the period November to March were infested. The largest burdens were present during November (Horak, Anthonissen, Krecek & Boomker 1992a).

Zoogeography

To date, *R. exophthalmos* has been recorded most frequently in Namibia, especially in the central and southern parts of the country (Fig. 15). In South Africa the majority of our records come from the south-eastern Cape Province, with few from elsewhere in the country. The record in Horak, Boomker & Flamand (1991e) of *R. exophthalmos* [then identified as *Rhipicephalus* sp. (near *R. oculatus*)] from a red duiker in north-eastern Natal has, upon subsequent re-examination, proved to be *Rhipicephalus evertsi evertsi* Neumann, 1897. In Botswana there is one confirmed record only, from Sekoma Pan in the south. In Angola Sousa Dias (1950) recorded what is probably this species from Bocaio. Collections from Angola that can be designated only as belonging to the *R. oculatus* group have been recorded from Nova Lisboa (= Huambo) (G. Theiler, unpublished data) and Luapasso, Espinheira and Hunguéria (= Onguéria) (Santos Dias 1983a, b).

The vegetation in many of the areas in which *R. exophthalmos* occurs is semi-desert, bushy Karoo-Namib shrubland or dry wooded grassland and bushland (White 1983). In the south-eastern Cape it is common in the evergreen and semi-evergreen bushland and thicket referred to locally as Fish River bush.

TABLE 4 Course of paralysis in a rabbit caused by *Rhipicephalus exophthalmos* (W.O. Neitz, unpublished data 1970)

Day of observation	Degree of paralysis of rabbit	No. of engorged ♀ ticks collected	Notes
1			Ticks placed on rabbit's ears
7	++++		Rabbit not feeding well. Ascending paralysis developing
8	++++++		Rabbit neither feeding nor drinking
9	++++++	9	Rabbit neither feeding nor drinking
10	++++++	10	Rabbit neither feeding nor drinking
11	++++++	0	Rabbit neither feeding nor drinking
12	++++	2	Rabbit neither feeding nor drinking
13	++++	0	Rabbit feeding and drinking water again
14	++	1	Rabbit feeding and drinking water again
15		0	Rabbit feeding and drinking water again
Total no. of engorged ♀ ticks collected		22	

DISEASE RELATIONSHIPS

W.O. Neitz (unpublished data 1970) reported that a rabbit on which *R. exophthalmos* adults were fed became completely paralysed while the female ticks were feeding, but subsequently recovered (Table 4). Two rabbits on which F_2 generation adults of the same strain of this species were fed also became paralysed. Of these rabbits one recovered but the other died.

Rhipicephalus oculatus Neumann, 1901

MALE (Fig. 18, 20–22)

Inornate; scutum brown to very dark brown in large, heavily punctate specimens and lateral idiosomal area light to dark brown; legs uniformly brown.

CAPITULUM (Fig. 20). Broader than long, the length (including cornua) x breadth varying from 0,632 x 0,641–0,521 x 0,539.

BASIS CAPITULI (Fig. 20). Length from palpal insertion to cornual apices varying from 0,344–0,293. Anterolateral margins straight, diverging posterolaterally; posterolateral margins slightly concave, extending anterolaterally over the apical processes of coxa I. Cornua triangular, bluntly rounded, slightly broader than long. Dorsal setae of basis capituli as in Fig. 20.

PALPS (Fig. 20). Article I visible dorsally; article II longer than III; both broader than long.

BODY (Fig. 18). Length (from scapular apices to posterior body margin) x breadth varying from 2,905 x 1,982–2,355 x 1,528. In unengorged specimens, broadest at level of coxa IV and broadly rounded posteriorly. In engorged specimens the lateral idiosomal wall bulges significantly just anterior to the spiracular plates, and a very small, pointed caudal process protrudes posteromedially.

CONSCUTUM (Fig. 18). Eyes submarginal, round, bulging, deeply orbited. The orbit is usually round without anterior or posterior extensions. Cervical pits deep, internal cervical margins shallow, converging initially then diverging posterolaterally. In some specimens the internal cervical margins and cervical fields are inapparent. External cervical margins slightly raised from cervical fields and often indicated by a few punctations. Marginal lines well developed, deep, punctate; extending anteriorly from just behind eyes to 1st festoon. Posteromedian and posterolateral grooves well developed; posteromedian narrows abruptly as it extends anteriorly from festoon 6; posterolaterals oval, deep, the scutal areas anterior to posterolaterals often broadly indented. Scutal punctations generally as illustrated (Fig. 18), but some specimens may have slightly smaller punctations centrally.

LEGS (Fig. 18). Increasing slightly in size from I–IV. Anterior projection of coxa I visible dorsally.

VENTRAL SURFACE: SPIRACLE (Fig. 21). Narrowly elongate with long tail projecting dorsalwards.

ADANAL PLATES (Fig. 22). Broadly triangular in general shape, with bluntly rounded apex and mildly concave internal margin; external margin slightly convex; posterior margin almost straight, characteristically somewhat crenellated.

FEMALE (Fig. 19, 23–25)

CAPITULUM (Fig. 23). Broader than long, the length x breadth varying from 0,683 x 0,765–0,661 x 0,762.

BASIS CAPITULI (Fig. 23). Length from palpal insertion to cornual apices varying from 0,360–0,307; porose areas small, subcircular.

PALPS (Fig. 23). Article I short but visible from the dorsal surface; article II longer than article III.

BODY (Fig. 19). Length (from scapular apices to posterior body margin) x breadth varying from 2,849 x 1,755–2,773 x 1,674. Dorsally marginal line extends posteriorly from the scutum and usually delimits the first two festoons.

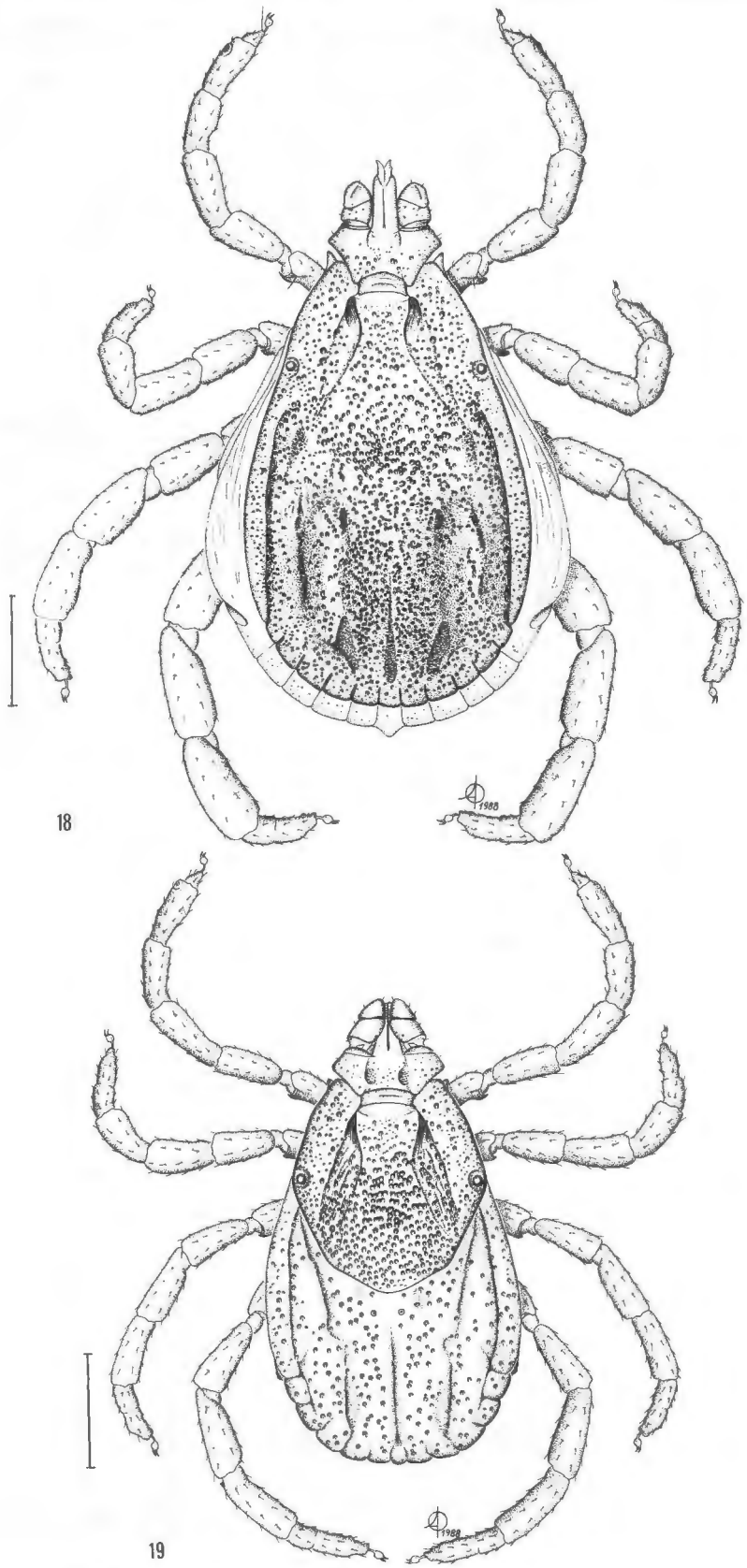

FIG. 18–19 *Rhipicephalus oculatus* [from scrub hare (H39), Andries Vosloo Kudu Reserve, Grahamstown, 24 Nov. 1986, I.G. Horak]. 18. Male, dorsal view. 19. Female, dorsal view. A. Olwage *del*. Scales represent 1 mm

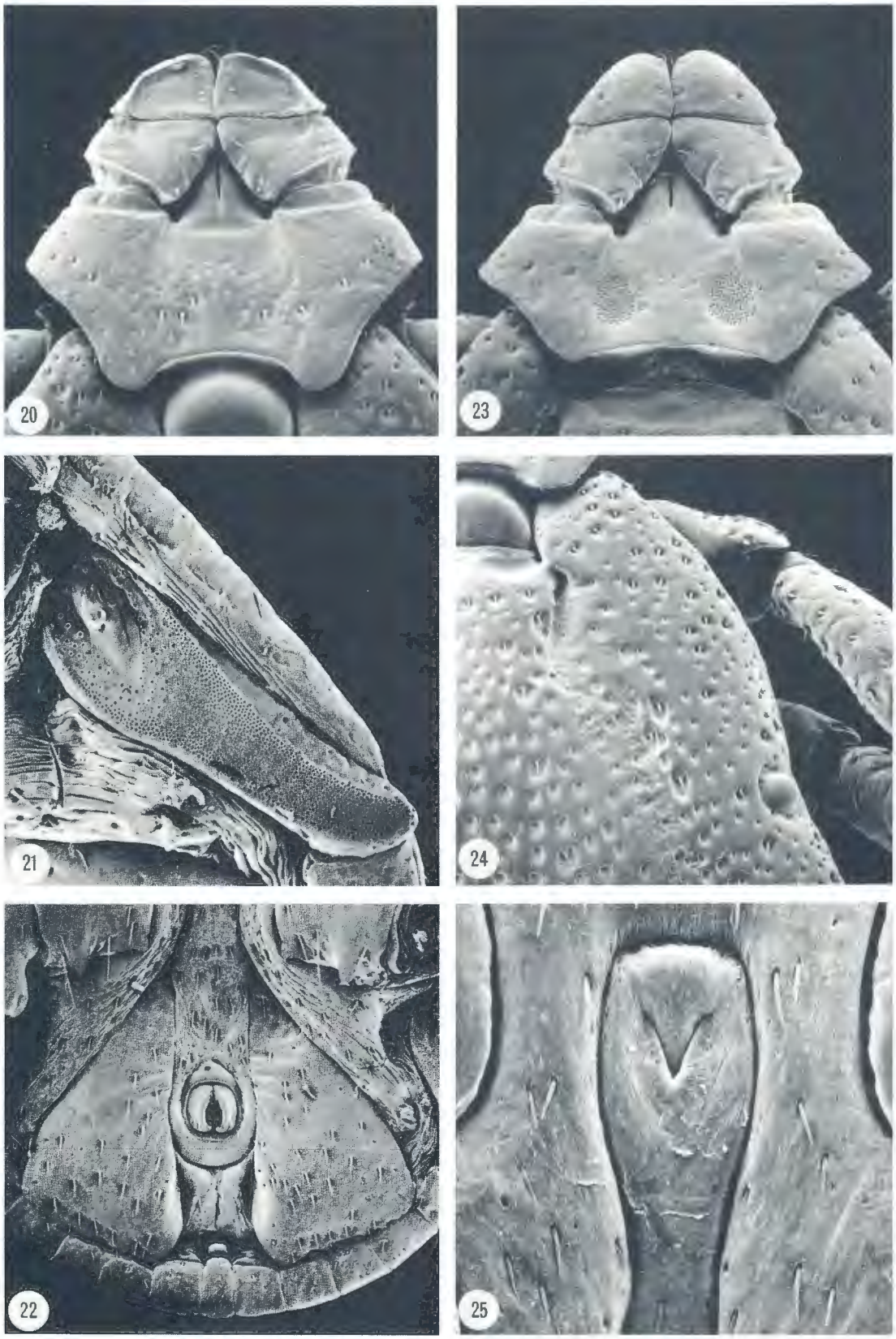

FIG. 20–25 *Rhipicephalus oculatus* [from scrub hare (H12), Andries Vosloo Kudu Reserve, Grahamstown, 18 Aug. 1985, I.G. Horak]. Male: 20. Capitulum, dorsal. 21. Spiracle. 22. Adanal plates. Female: 23. Capitulum, dorsal. 24. Scapular area. 25. Genital aperture. SEMs by J.F. Putterill

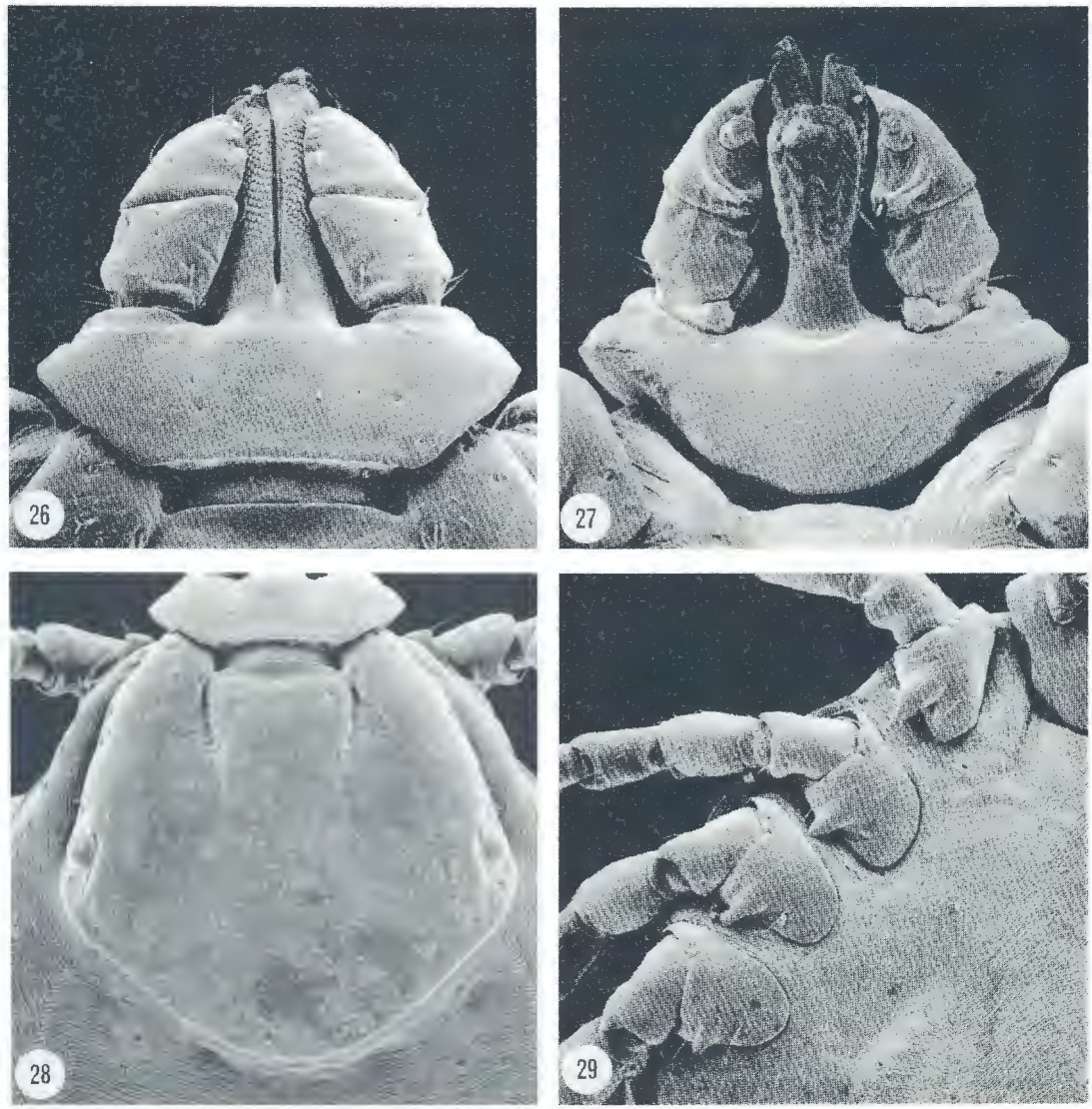

FIG. 26–29 *Rhipicephalus oculatus* [from scrub hare (H28), Andries Vosloo Kudu Reserve, Grahamstown, 19 June 1986, I.G. Horak]. Nymph: 26. Capitulum, dorsal. 27. Capitulum, ventral. 28. Scutum. 29. Coxae. SEMs by J.F. Putterill

SCUTUM (Fig. 19, 24). Outline as illustrated. Length x breadth varying from 1,500 x 1,313–1,447 x 1,248, broadest at eye level. Eyes submarginal, bulging, hemispherical, deeply orbited; the orbit round, typically without an anterior or posterior extension. Cervical pits deep; internal cervical margins converging, then diverging as roughened extensions, or fading into numerous punctations. Cervical fields narrow, external and internal edges almost parallel. External cervical margins ridge-like and well delineated, often outlined with punctations. Scutal punctations as illustrated, with fewer, smaller punctations on the raised lateral areas.

LEGS (Fig. 19). Uniform in size, brown.

VENTRAL SURFACE: GENITAL APERTURE (Fig. 25). Situated between coxae II, a narrow V in shape, bluntly rounded posteriorly, the area within the opening depressed.

SPIRACULAR PLATE. Short, rounded, with a short tail.

NYMPH (Fig. 26–29)

CAPITULUM (Fig. 26, 27). Length (measured from tip of hypostome to posterior border of basis capituli) x breadth varying from 0,253 x 0,364–0,211 x 0,262, much broader than long.

BASIS CAPITULI (Fig. 26, 27). Length from palpal insertion to posterior margin of basis varying from 0,108–0,106; posterolateral margins straight to very slightly curved, diverging anteriorly over scapulae and apical process of coxa I, lateral angles relatively anterior in position. Ventrally broadly rounded posteriorly, without posterolateral spurs; two pairs of

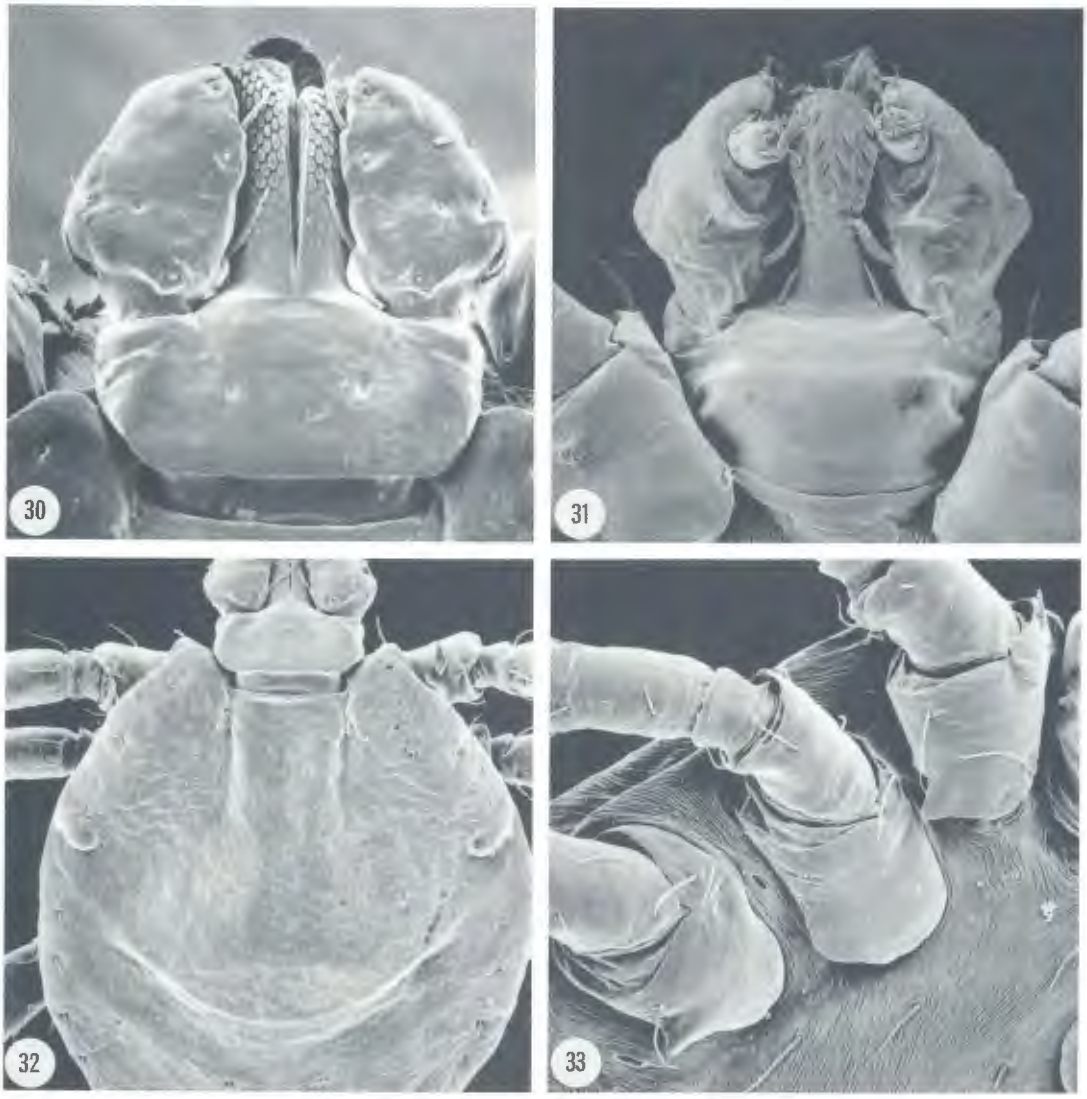

FIG. 30–33 *Rhipicephalus oculatus* [from scrub hare (H28), Andries Vosloo Kudu Reserve, Grahamstown, 19 June 1986, I.G. Horak]. Larva: 30. Capitulum, dorsal. 31. Capitulum, ventral. 32. Scutum. 33. Coxae. SEMs by J.F. Putterill

setae, one pair posthypostomal and one pair postpalpal.

PALPS (Fig. 26, 27). Article I visible from dorsal surface, article II longer than III. Broadest basally, apices broadly rounded.

BODY. Length (from scapular apices to posterior body margin) x breadth varying from 1,150 x 0,800– 0,849 x 0,496, broadest just posterior to coxa IV. Marginal line extends posteriorly from scutal margin to first festoon. Posteromedian and posterolateral grooves extending anteriorly from festoons to body midlength.

SCUTUM (Fig. 28). Length x breadth varying from 0,525 x 0,638–0,514 x 0,462. Scapulae bluntly rounded. Eyes orbited, prominent, bulging, situated immediately anterior to posterolateral scutal angle. External cervical margin ridge-like, extending posteriorly from junction with the internal cervical margin to or nearly to posterior scutal margin. Internal cervical margins shallow, reaching approximately to eye level. Cervical and median fields shagreened; raised lateral border smooth. Setae numerous, short, about the same length as dorsal body setae.

VENTRAL SURFACE: LEGS (Fig. 29). Coxa I with a long, pointed external spur and a stout, triangular internal spur; coxa II–IV with a long, pointed external spur, slightly decreasing in size from II–IV; internal spurs absent. Legs I–IV equal in size.

SPIRACLE. Subcircular, macula located anteriorly.

LARVA (Fig. 30–33)

CAPITULUM (Fig. 30, 31). Approximately as long as broad; the length x breadth varying from 0,136 x 0,140–0,109 x 0,133.

BASIS CAPITULI (Fig. 30, 31). Length (from base of cheliceral sheaths to posterior margin of basis) x breadth varying from 0,585 x 0,140–0,429 x 0,133. Dorsally with posterior margin straight, cornua absent. Ventrally posterior margin broadly rounded, posthypostomal setae one pair.

PALPS (Fig. 30). Bulbous proximally, tapering to broadly rounded apices, suture between segments two and three inapparent; palpal setae, segment two with three dorsal and three ventral, segment three with four dorsal and two ventral, segment four with about ten.

BODY: Ovoid. Widest posterior to coxa III. Length (from scapulae to posterior body margin) x breadth varying from 0,741 x 0,636–0,538 x 0,468. Dorsal body setae number ten pairs; two pairs central dorsals and eight pairs marginal dorsals. Ventral setae number 14 pairs plus one pair on anal valves; three pairs sternals, two pairs preanals, four pairs premarginals, five pairs marginal ventrals.

SCUTUM (Fig. 32). Length x breadth varying from 0,331 x 0,448–0,277 x 0,394; anterolateral borders slightly curved, posterior border a broad, smooth curve; internal cervical margins short, moderately deep, posteriorly directed; external cervical margins absent; eyes immediately anterior to posterolateral scutal angle, large, transversely ovoid, inner sides bulging markedly, partially orbited; setae three pairs (pair two broken off in Fig. 32).

VENTRAL SURFACE: LEGS (Fig. 33). Coxae all much broader than long. Coxa I with a large, broadly triangular internal spur; coxa II without spurs; coxa III with a moderately long, pointed internal spur; external spurs absent on all coxae. Coxal setae, three on I, two on II and on III.

TABLE 5 Host records of *Rhipicephalus oculatus*

Hosts	No. of collections
Wild animals	
"Duiker" (species unknown)	1
Mountain reedbuck (*Redunca fulvorufula*)	1
Springhare (*Pedetes capensis*)	2
Cape hare (*Lepus capensis*)	8
Scrub hare (*Lepus saxatilis*)	65
Smith's red rock rabbit (*Pronolagus rupestris*)	1
Helmeted guineafowl (*Numida meleagris*)	4

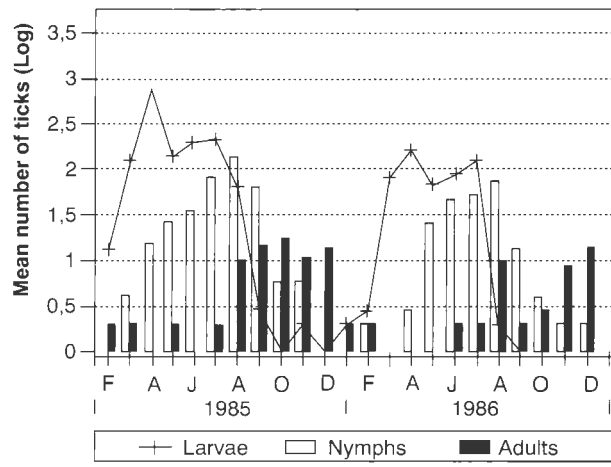

FIG. 34 The seasonal abundance of *Rhipicephalus oculatus* on scrub hares on the farm "Bucklands" and in the Andries Vosloo Kudu Reserve, eastern Cape Province (from Horak & Fourie, 1991)

LIFE CYCLE

Unknown.

BIOLOGY IN THE FIELD

The records of *R. oculatus* listed below represent collections that we ourselves have identified.

Hosts

Undoubtedly the primary hosts of all stages of *R. oculatus* are members of the Leporidae, particularly the scrub hare (Table 5). In our experience, occasional infestations of this tick on other hosts have always been small and are probably accidental.

With the exception of helmeted guineafowls, which harboured a few larvae and nymphs (Horak, Spickett, Braack & Williams 1991c), only the scrub hares examined in the 2-year survey mentioned under *R. exophthalmos* were infested with *R. oculatus* (Table 6). The largest numbers of larvae were recovered from the latter animals from March to July or August, nymphs from May to August or September, and adults from August to December (Fig. 34). In a survey conducted in the Mountain Zebra National Park in the eastern Karoo, the scrub hares were found to be heavily infested, but a Smith's red rock rabbit, two springhares and a mountain reedbuck harboured just a few ticks (Table 6). At this locality the periods of seasonal activity were March to August for the larvae, June to October for the nymphs and August to November for the adults (Horak, Fourie, Novellie & Williams 1991b). This pattern of seasonal abundance indicates that only a single life cycle will be completed annually.

Zoogeography

As far as we know, *R. oculatus* is confined to parts of southern Africa (Fig. 35). It has been found most

TABLE 6 The relative abundance [a] of *Rhipicephalus oculatus* on scrub hares on a farm and two nature reserves in the eastern Cape Province

Hosts	Number examined	Number infested	Number of ticks recovered				
			Larvae	Nymphs	♂	♀	Total
"Bucklands"							
Scrub hares	45	41	6010	1397	97	80	7584
Helmeted guineafowls	37	4	3	4	0	0	7
Andries Vosloo Kudu Reserve							
Scrub hares	42	37	1196	839	118	70	2223
Helmeted guineafowls	39	0	0	0	0	0	0
Mountain Zebra National Park							
Scrub hares	26	19	957	306	21	23	1307
Smith's red rock rabbits	28	1	0	0	2	1	3
Springhares	17	2	2	0	0	0	2
Mountain reedbuck	18	1	4	0	0	0	4
Helmeted guineafowls	16	0	0	0	0	0	0

* Tick counts according to the method of Horak & Fourie (1991)

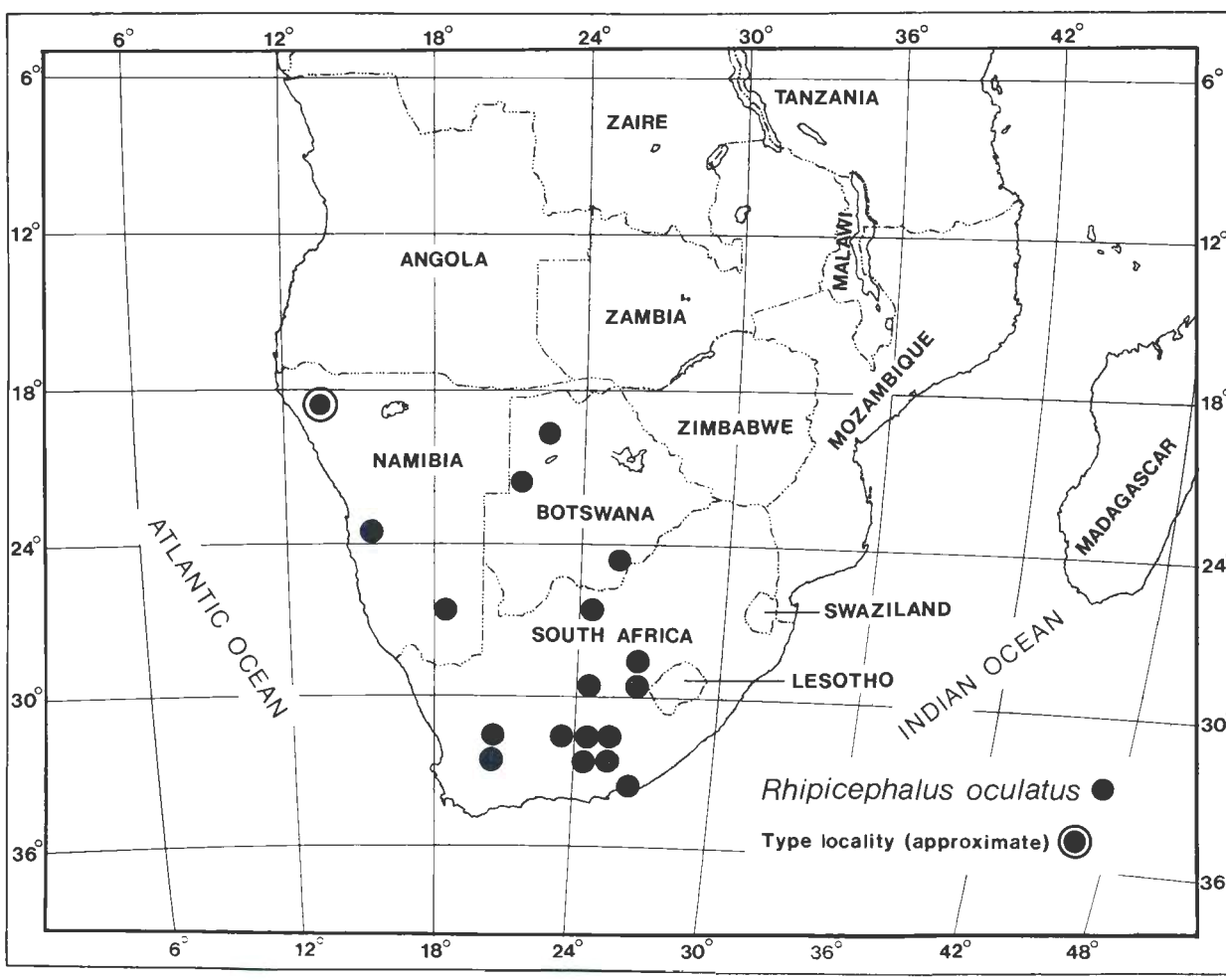

FIG. 35 *Rhipicephalus oculatus*: distribution

commonly in South Africa in the south-eastern Cape Province, where its distribution sometimes overlaps that of *R. exophthalmos*. There are also scattered records from the northern and western Cape Province, and from the Orange Free State, from the vicinity of Glen and Bloemfontein. The type specimens, though, were collected in Namibia, at an unspecified location in Damaraland. The only other places in Namibia where the species has been found are the Namib Desert, west of the Kuiseb Canyon, and Keetmanshoop.

Judging from these localities, it is apparent that *R. oculatus* can survive various extremes of climate: great summer heat (as in Keetmanshoop and parts of the eastern Cape Province); severe winter cold (as in Sutherland in the western Cape), and dryness (as in the Namib Desert). The vegetation in these areas ranges from the evergreen and semi-evergreen bushland and thicket (Fish River bush) of the eastern Cape Province, through semi-desert types of montane, grassy, bushy and dwarf Karoo shrubland, to the Namib Desert itself.

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R. exophthalmos (Serial Nos. WON 3260, 3348, 3396) was reared at Onderstepoort by the late Dr W.O. Neitz and Mr J. de V. Hoffman.

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