

PARACOOPERIOIDES PELEAE GEN. ET SP. N. (NEMATODA: TRICHOSTRONGYLIDAE) FROM THE VAAL RIBBOK, PELEA CAPREOLUS (FORSTER, 1790)

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ABSTRACT

BOOMKER, J., HORAK, I. G. & DE VOS, V., 1981. *Paracooperioides peleae* gen. et sp. n. (Nematoda: Trichostrongylidae) from the vaal ribbok, *Pelea capreolus* (Forster, 1790). *Onderstepoort Journal of Veterinary Research*, 48, 169-174 (1981).

A new genus and species of trichostrongylid nematode, *Paracooperioides peleae*, was collected from the small intestines of vaal ribbok, *Pelea capreolus* (Forster, 1790), from the Bontebok National Park, Swellendam, Cape Province.

These nematodes are small and slender with a small cephalic inflation. The cuticle bears numerous transverse striations which are more pronounced anteriorly. The dorsal ray is long and is similar to that of *Gazellostrongylus* Yeh, 1956, and *Cooperioides hepaticae* Ortlepp, 1938, but differs in that it bifurcates in its distal quarter. Each branch divides again, giving rise to a thinner, outer branch and a thicker inner branch. The latter recurves upon itself to form a small, elongated knob. The spicules of *Paracooperioides peleae* resemble those of *C. hepaticae* but can be differentiated from them in that they bear small lateral barbs on their tips. Ten longitudinal ridges, supported by sclerotized rods, are present at the middle of the body. In transverse section, *Paracooperioides peleae* is intermediate between *Cooperioides* Daubney, 1933 and *Paracooperia* Travassos, 1935.

Résumé

PARACOOPERIOIDES PELEAE GEN. ET SP. N. (NEMATODA: TRICHOSTRONGYLIDAE) DE L'ANTILPE VAAL RIBBOK, PELEA CAPREOLUS (FORSTER, 1790)

Un nouveau genre et espèce de trichostrongyle *Paracooperioides peleae*, a été récolté des intestins grêles d'antilopes vaal ribbok, *Pelea capreolus* (Forster, 1790) provenant du Parc National Bontebok, Swellendam Province du Cap.

Ces nématodes sont petits et minces avec un petit gonflement céphalique. Le cuticule porte de nombreuses striations transverses qui sont plus prononcées antérieurement. La raie dorsale est longue et similaire à celle de *Gazellostrongylus*, Yeh, 1956, et *Cooperioides hepaticae* Ortlepp, 1938, mais diffère par le fait qu'elle se bifurque dans son quartier distal. Chaque branche se divise à nouveau, donnant naissance à une branche plus fine externe et une branche plus épaisse interne. Cette dernière s'incurve sur elle même pour former un petit noeud allongé. Les spicules de *Paracooperioides peleae* ressemblent à celles de *C. hepaticae* mais peuvent être différenciées de celles-ci par le fait qu'elles portent de petites barbes latérales sur leurs lèvres. Dix arêtes longitudinales, supportées par des tiges sclérosées sont présentes au milieu du corps. En section transversale, *Paracooperioides peleae* est intermédiaire entre *Cooperioides* Daubney, 1933 et *Paracooperia* Travassos, 1935.

INTRODUCTION

The vaal ribbok, *Pelea capreolus* (Forster, 1790), is an antelope indigenous to South Africa, and there is an unconfirmed report that it occurs also in extreme south-eastern Botswana (Meester & Setzer, 1971). Various isolated populations exist in South Africa and one such population occurs in the present Bontebok National Park (S. 34°2', E. 20°25').

The Bontebok National Park was initially proclaimed near Bredasdorp in the Cape Province in 1931 and comprised about 685 ha of inhospitable territory in which the bontebok could not survive (Van der Walt & Ortlepp, 1960). During 1960 land was acquired near Swellendam in the Cape Province and the entire herd consisting of 83 bontebok was moved from Bredasdorp to the new locality (Van der Walt, & Ortlepp, 1960; Barnard & Van der Walt, 1961). The name Bontebok National Park was retained for the new Park, and it was there that the current parasite survey was conducted.

Theron (1967) describes the Park as consisting of a series of gravel terraces which gradually rise toward the north-eastern corner. Sand flats, surrounded by low hills, occur in the south-east and the Breede River forms the south-eastern boundary.

The vegetation, which forms part of the Cape macchia, consists mainly of low shrubs, 30-70 cm high, but tall trees are found along the Breede River (Grobler & Marais, 1967).

According to Bateman (1961), at the time of its proclamation the Park contained vaal ribbok, *P. capreolus*, steenbok, *Raphicerus campestris* (Thunberg, 1811) and grey duiker, *Sylvicapra grimmia* (Linnaeus, 1758). Bontebok, *Damaliscus dorcas dorcas* (Pallas, 1766) and red hartebeest, *Alcelaphus buselaphus* (Pallas, 1766), were subsequently introduced (Barnard & Van der Walt, 1961), as were Cape buffalo, *Syncerus caffer* (Sparrman, 1779), eland, *Taurotragus oryx* (Pallas, 1766), bushbuck, *Tragelaphus scriptus* (Pallas, 1766), mountain reedbuck, *Redunca fulvorufula* (Afzelius, 1815) and springbok, *Antidorcas marsupialis* (Zimmerman, 1780) (Penzhorn, 1971). During 1974 and 1975, however, the buffalo, eland and red hartebeest were removed to reduce competition for the bontebok (Van der Walt, 1976; Van der Walt, De Graaff & Van Zyl, 1976; De Graaff, Van der Walt & Van Zyl, 1976). At present the Park, which comprises an area of 2 786 ha, contains 363 bontebok, 200 vaal ribbok, 83 springbok, 5 steenbok, 3 grey duiker, 5 bushbuck and 7 Cape grysbok, *Raphicerus melanotis* (Thunberg, 1811) (Pieterse, 1979, personal communication).

During December 1979, a survey was conducted to determine the parasites present in the most prevalent antelope species in the Park. A trichostrongylid nematode, belonging to a new genus and species, was found in the small intestine of the vaal ribbok.

MATERIALS AND METHODS

Specimens collected from the small intestines of vaal ribbok culled during the survey were fixed in 10% formalin and cleared in lactophenol. The heads were mounted *en face* in hard glycerine jelly, and the

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number and arrangement of the longitudinal cuticular ridges were studied by mounting hand-cut sections of the middle region of the body in hard glycerine jelly. All drawings were made with a Nikon Optiphot compound microscope with Nomarski differential interference contrast illumination and a Sankei drawing tube.

DIAGNOSIS

Description of Paracooperioides peleae gen. et sp. n.

Material: Nineteen males and 19 females from *Pelea capreolus*, Bontebok National Park, Swellendam, Cape Province; 14 males and 14 females (syntypes) now deposited with the Onderstepoort Helminthological Collection, No. 2155, and 5 males and 5 females (paratypes) with the Commonwealth Institute of Helminthology.

Habitat: Small intestine

Description: The principal measurements are listed in Table 1.

TABLE 1 The principal measurements of *Paracooperioides peleae* gen. et sp. n.*

	♂	♀
Length (mm).....	4,4-5,4	4,9-6,3
Width.....	80,5-118,8	80,5-122,5
Head width.....	28-32,4	28-38,5
Cephalic inflation, length.....	35-43,2	28,5-42
Cephalic inflation, width.....	31,5-45,5	35-43,5
Oesophagus, length.....	309-370,8	304,5-374,5
Oesophagus, width at base.....	28-50,4	28-56
Distance of nerve ring from anterior end.....	183,6-245	180,6-227,5
Distance of excretory pore from anterior end.....	219-277	189-266
Distance of cervical papillae from anterior end.....	237,4-288,8	197,8-276,5
Distance between cephalic inflation and lat. alae.....	27,2-38,5	24,5-35
Spicule, length.....	183,6-218,8	
Distance of hooks from tip of spicule.....	19,5-35	
Bursa, length.....	151,2-252	
Dorsal ray, length.....	122,5-196	
Externo-dorsal rays, length.....	97-147	
Lateral branches of dorsal ray, length.....	18-39,6	
Distance from tail to anus.....		140-192
Distance from anus to vulva.....		861-1 456
Distance from vulva to tail.....		1 008-1 607
Length of ovjector, including sphincters.....		280-462
Eggs, length.....		59,5-77
Eggs, width.....		31,5-45,5

* All measurements are given in μm unless stated otherwise

Small, slender worms which are sometimes coiled anteriorly. A small cephalic inflation is present (Fig. 1, 2 & 4). The mouth is small and surrounded by 3 indistinct lips, and 4 cephalic papillae are present (Fig. 3). The cuticle bears numerous transverse striations, which are more pronounced anteriorly (Fig. 1 & 4). There are 10 longitudinal ridges supported by sclerotized rods at the middle of the body; they originate at different levels anteriorly, leaving an area behind the cephalic inflation devoid of ridges (Fig. 4). The dorso-lateral ridges are larger than the other 8 (Fig. 5 b), and form 2 narrow alae (Fig. 4). This arrangement was found to be constant in 4 males sectioned. Small cervical papillae are present (Fig. 4) and the nerve ring is visible in some specimens only; the excretory pore opens approxi-

mately at the level of the cervical papillae. The oesophagus is simple and slightly wider distally than proximally.

Males: The bursa is symmetrical, small and compact, and can only be opened with difficulty; the dorsal lobe is distinct (Fig. 6). Numerous closely packed tubercles are present on the ventral surface of the bursa (Fig. 7). The ventral rays have a common origin and both curve anteriorly. The ventro-ventral ray is considerably smaller than the latero-ventral ray. The lateral rays are more or less equally well developed and arise from a common stem; they curve posteriorly in the opened bursa (Fig. 8). The externo-dorsal rays arise near the base of the dorsal ray. They are curved and reach the edge of the bursa.

The dorsal ray is long and bifurcates in the distal quarter. Each branch divides again to form a thinner outer branch and a thicker inner branch. The latter recurves upon itself to form a small, elongated knob (Fig. 8 & 14a). The spicules are equal, similar in appearance and well sclerotized (Fig. 9). Narrow membranous alae are present on the spicules, the median alae continuing for almost the entire length of the spicule, whereas the lateral alae are indistinct. From approximately the distal third each spicule divides into a stout main branch, and a shorter, more slender median branch. The spicules terminate in small ovoid, non-sclerotized knobs and small barbs are present laterally (Fig. 9 & 10f). There is no gubernaculum. The genital cone is a fairly large, complex structure (Fig. 11).

Females: The vulva is situated in the posterior third of the body and is a simple transverse slit surrounded by slightly thickened cuticula (Fig. 12). The ovjector is well developed and the uterus is didelphic. The tail is fairly long and ends acutely (Fig. 13). Eggs are thin-walled, ovoid to elongate and when laid contain a morula.

DISCUSSION

The genus *Paracooperioides* shows certain similarities to the genus *Gazellostrongylus* Yeh, 1956, *Paracooperia* Travassos, 1935, and *Cooperioides* Daubney, 1933. For comparative purposes, the synlophe, spicules and dorsal rays of *Paracooperioides*, *Paracooperia* and *Cooperioides* are illustrated in Fig. 5, 10 & 14 respectively.

According to Khalil & Gibbons (1975), 24 ridges, supported by equal sized rods, are present in *Gazellostrongylus*. Those of *Cooperioides* have 10 ridges, also supported by equal sized rods (Fig. 5a). *Paracooperia*, as described by Gibbons (1978), has 10 ridges, supported by 3 small dorsal and 3 small ventral rods, as well as 2 large dorso-lateral and 2 intermediately sized ventro-lateral rods (Fig. 5c). *Paracooperioides peleae* has 3 dorsal and 5 ventral rods, all small, and 2 large dorso-lateral rods (Fig. 5b). This arrangement appears to be intermediate between that of *Paracooperia* and *Cooperioides*.

From Fig. 10 it can be seen that the spicules of *Paracooperioides peleae* (Fig. 10f) are similar to those of especially *Cooperioides hepaticae* Ortlepp, 1938 (Fig. 10a & b). They differ, however, from those of *C. hepaticae* in that the tips are less curved and bear small lateral barbs. The spicules of *Cooperioides antidorca* (Mönnig, 1931) (Fig. 10c) and *Cooperioides hamiltoni* (Mönnig, 1932) (Fig. 10d) are easily differentiated from those of *Paracooperioides peleae*.

According to Gibbons (1978), all the species in the genus *Paracooperia* have serrated edges on the spicules (Fig. 10e) and these serrations are lacking in *Paracooperioides peleae*. The spicules of *Gazellostrongylus* are trifurcate and enclosed in large transparent membranes (Khalil & Gibbons, 1975), and bear no resemblance to those of *Paracooperioides peleae*.

The dorsal rays of 3 out of the 4 genera under discussion are illustrated in Fig. 14. The dorsal ray of *Paracooperioides* differs from that of *Gazellostrongylus* (not illustrated) as described by Yeh (1956) and Khalil & Gibbons (1975), both in its size and in that the tips of the median branches are recurved and form fairly large knobs. *C. hepaticae* (Fig.

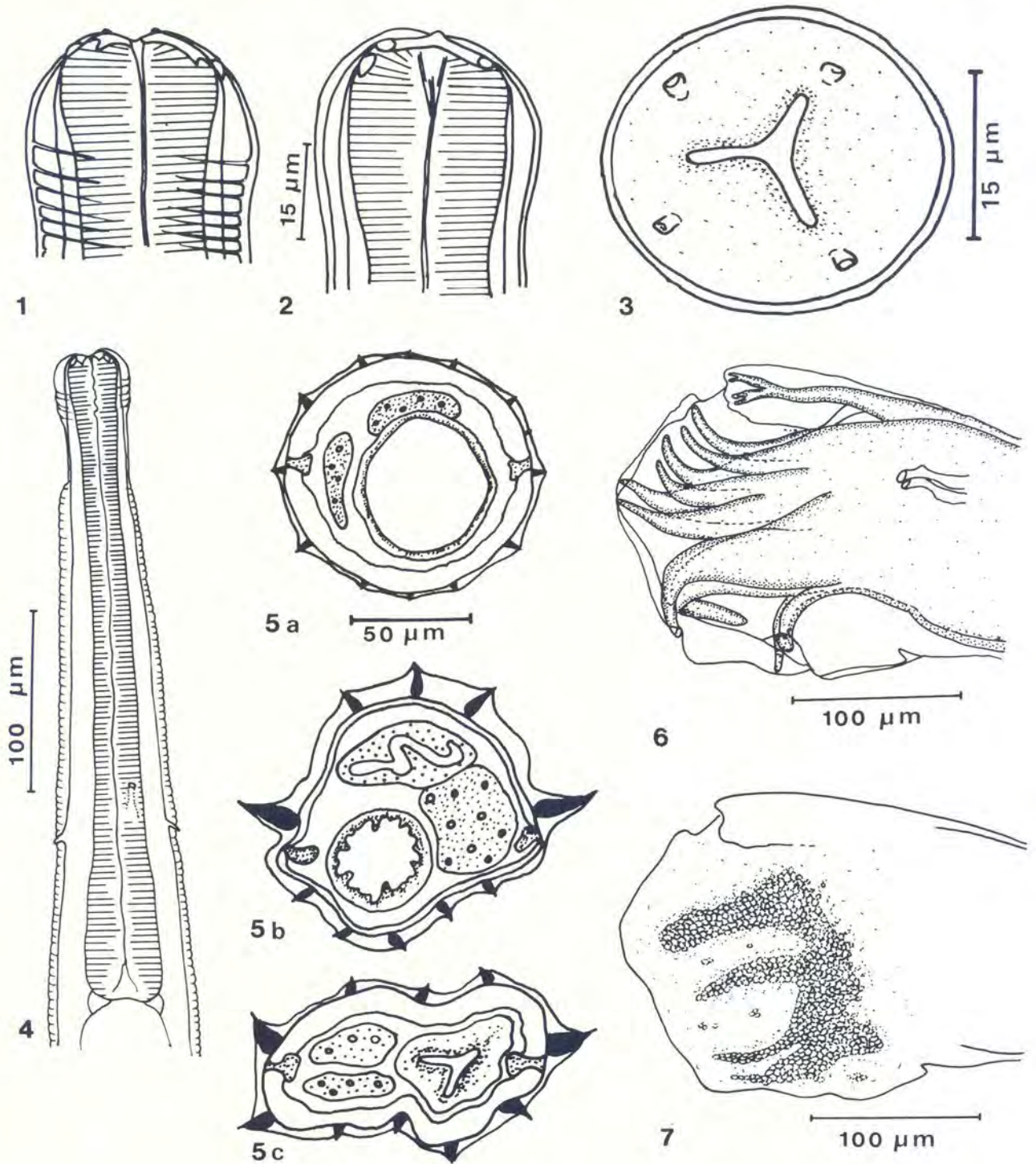


FIG. 1 *Paracooperioides peleae*, lateral view of head
 FIG. 2 *Paracooperioides peleae*, ventral view of head
 FIG. 3 *Paracooperioides peleae*, en face view of head
 FIG. 4 *Paracooperioides peleae*, ventral view of anterior end
 FIG. 5 Transverse sections of (a) *C. antidorca*; (b) *Paracooperioides peleae*; (c) *Paracooperia serrata*
 FIG. 6 *Paracooperioides peleae*, male bursa, lateral view
 FIG. 7 *Paracooperioides peleae*, male bursa, median view, showing arrangement of tubercles

14b) has a dorsal ray that is proportionally shorter than that of *Paracooperioides* (Fig. 14a), and bifurcates approximately halfway along its length. In addition, the dorsal ray does not reach the edge of the bursa, and the tips of the median branches are not recurved (Ortlepp, 1938) as in *Paracooperioides*. The dorsal ray of *C. antidorca* (Fig. 14c), *C. hamiltoni* (Fig. 14d) and the *Paracooperia* species (Fig. 14e) bear little resemblance to that of *Paracooperioides*.

In conclusion, *Paracooperioides* appears to be a distinct genus which, according to the classification

of Skrjabin, Shikhobalova & Schultz (1954), belongs to the tribe Cooperiea. *Gazellostrongylus* belongs to the tribe Ostertagia (Khalil & Gibbons, 1975) and the 2 genera are easily separated on the number of cephalic papillae (4 in *Paracooperioides*, 4+4 in *Gazellostrongylus*), the configuration of the tip of the dorsal ray, and the structure of the spicules. *Gazellostrongylus* is a large nematode that occurs in nodules in the abomasum of its host, whereas *Paracooperioides* is small and is found in the small intestine. In addition, they differ markedly in cross section.

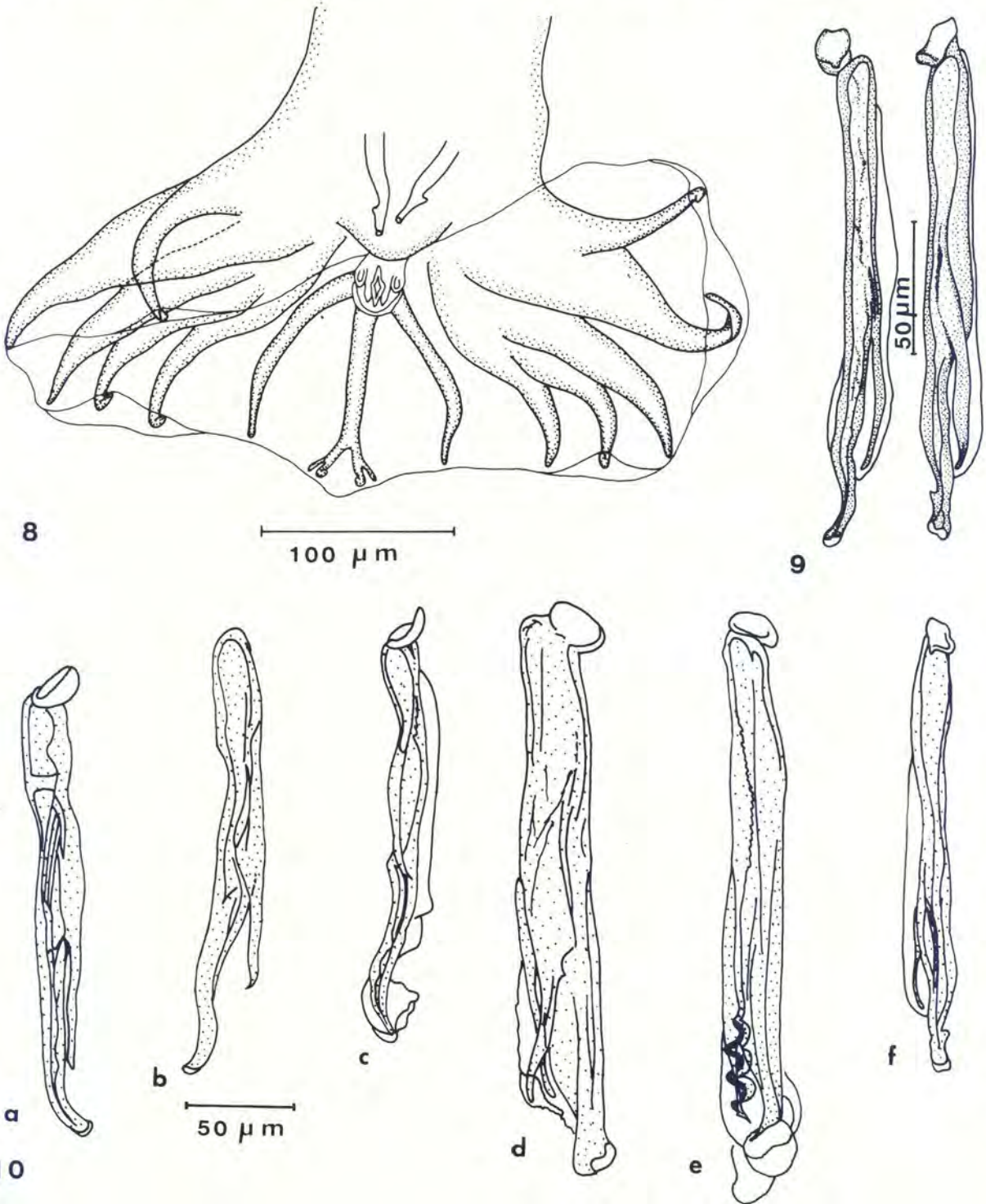


FIG. 8 *Paracooperioides peleae*, male bursa, ventral view

FIG. 9 Spicules of *Paracooperioides peleae*, left, dorsal view, right, lateral view

FIG. 10 Comparison of spicules of *Cooperioides*, *Paracooperia* and *Paracooperioides*; (a) and (b) *C. hepaticae*, (c) *C. antidorca*, (d) *C. hamiltoni*, (e) *P. serrata* and (f) *P. peleae*

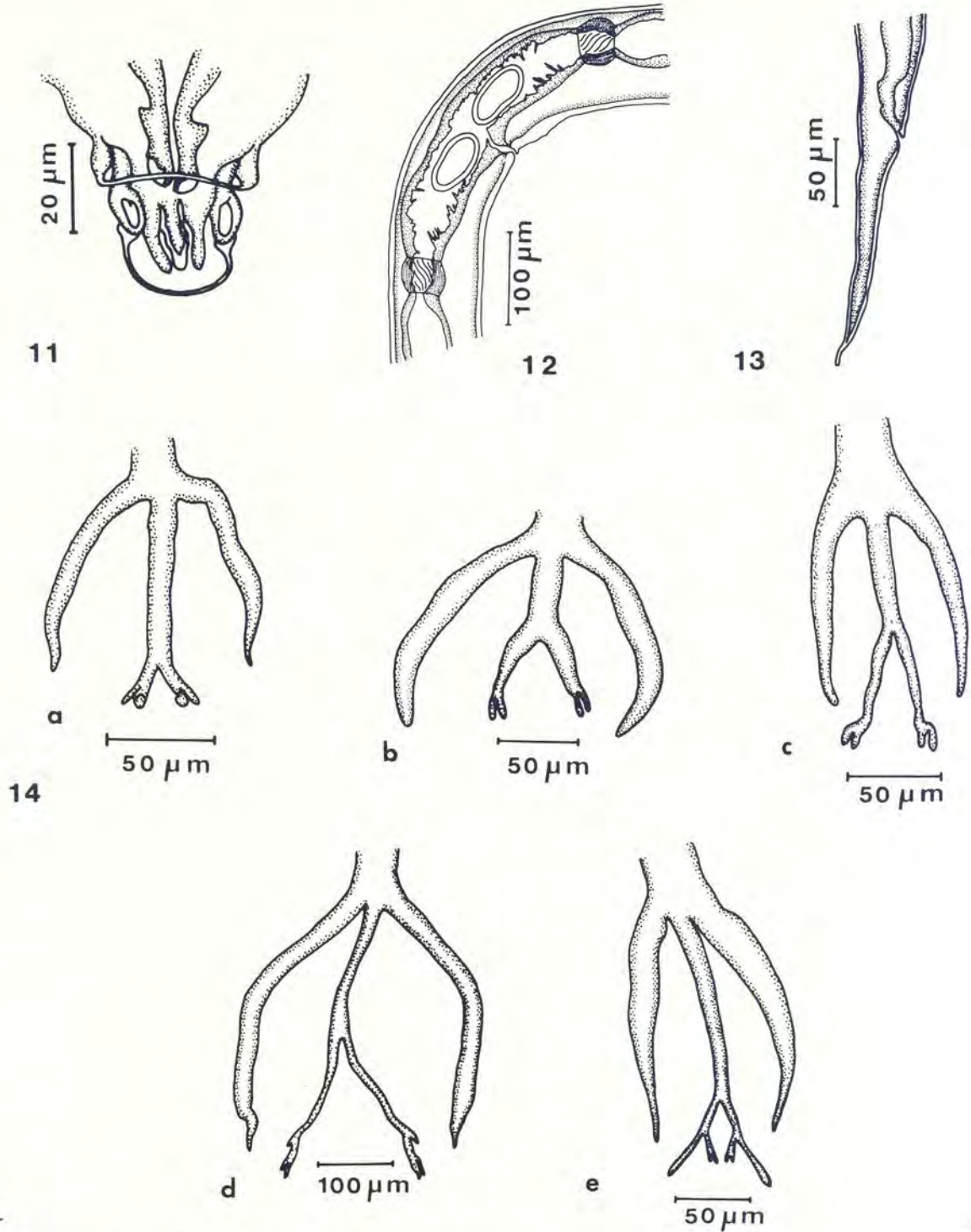


FIG. 11 *Paracooperioides peleae*, genital cone of male, ventral view
 FIG. 12 *Paracooperioides peleae*, lateral view of vulvar region and ovijector of female
 FIG. 13 *Paracooperioides peleae*, tail of female, lateral view
 FIG. 14 Dorsal ray of (a) *Paracooperioides peleae*, (b) *C. hepaticae*, (c) *C. antidorca*, (d) *C. hamiltoni* and (e) *Paracooperia serrata*

Paracooperioides and *C. hepatica* can be separated by the presence of the lateral barbs on the tips of the spicules of *Paracooperioides* and the short dorsal ray of *C. hepatica*. The other 2 species of *Cooperioides*, *C. antidorca* and *C. hamiltoni* differ from *Paracooperioides*, and the genus *Paracooperia* is well-defined and cannot be confused with *Paracooperioides*.

It seems possible that *Paracooperioides peleae* could have been introduced with some other host when the Bontebok Park was proclaimed near Swellendam and relocation of the animals took place. On the

other hand, vaal ribbok were already present when the Park was proclaimed and since few parasites have been described from these animals (Round, 1968), it is not surprising that a new genus of nematode should occur in them.

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REFERENCES

- BARNARD, P. J. & VANDER WALT, K., 1961. Translocation of the bontebok (*Damaliscus pyrrargus*) from Bredasdorp to Swellendam. *Koedoe*, 4, 105-109.
- BATEMAN, J. A., 1961. The mammals occurring in the Bredasdorp and Swellendam districts, Cape Province, since European settlement. *Koedoe*, 4, 78-100.
- DE GRAAF, G., VAN DER WALT, P. T. & VAN ZYL, L. J., 1976. Lewensloop van 'n elandbevolking *Taurotragus oryx* in die Bontebok Nasionale Park. *Koedoe*, 19, 185-188.
- GIBBONS, LYNDIA M., 1978. Revision of the genus *Paracooperia* Travassos, 1935 (Nematoda, Trichostrongylidae). *Journal of Helminthology*, 52, 231-249.
- GROBLER, P. J. & MARAIS, J., 1967. Die plantegroei van die Nasionale Bontebokpark, Swellendam. *Koedoe*, 10, 132-146.
- KHALIL, L. F. & GIBBONS, LYNDIA M., 1975. *Gazellostrongylus lerouxi* Yeh, 1956, from antelopes in East Africa and its relation to the genus *Paracooperia* Travassos, 1935. *Journal of Helminthology*, 49, 271-279.
- MEESTER, J. & SETZER, H. W., 1971. The mammals of Africa: an identification manual. Washington: Smithsonian Institution Press.
- ORTLEPP, R. J., 1938. South African helminths. Part V. Some avian and mammalian helminths. *Onderstepoort Journal of Veterinary Science and Animal Industry*, 11, 63-104.
- PENZHORN, B. L., 1971. A summary of the re-introduction of ungulates into South African National Parks (to December, 1970). *Koedoe*, 14, 145-159.
- ROUND, M. C., 1968. Checklist of the helminth parasites of African mammals of the orders Carnivora, Tubulidentata, Proboscidea, Hyracoidea, Artiodactyla and Perissodactyla. Technical Communication No. 38 of the Commonwealth Bureau of Helminthology, 252 p.
- SKRJABIN, K. I., SHIKHOBALOVA, N. P. & SCHULTZ, R. E. S., 1954. Essentials of nematology. Vol. III: Trichostrongylids of animals and man. English translation, 1960, published for the National Science Foundation, Washington, D.C.
- THERON, J. M., 1967. Die geologie van die Bontebokpark, distrik Swellendam. *Koedoe*, 10, 147-148.
- VAN DER WALT, K. & ORTLEPP, R. J., 1960. Moving the bontebok from Bredasdorp to Swellendam. *Journal of the South African Veterinary Medical Association*, 31, 459-463.
- VAN DER WALT, P. T., 1976. Lewensloop van 'n Kaapse buffelbevolking (*Syncerus caffer*) in die Bontebok Nasionale Park. *Koedoe*, 19, 189-191.
- VAN DER WALT, P. T., DE GRAAFF, G. & VAN ZYL, L. J., 1976. Lewensloop van 'n rooihartbeesbevolking *Alcelaphus buselaphus caama* in die Bontebok Nasionale Park. *Koedoe*, 19, 181-184.
- YEH, L. S., 1956. On a collection of helminths from Thomson's gazelle (*Gazella thomsoni*) from Tanganyika. *Journal of Helminthology*, 29, 203-228.