A REDESCRIPTION OF *FILARINEMA DISSIMILE* (WOOD, 1931), WITH NEW RECORDS OF OTHER SPECIES OF *FILARINEMA* MOENNIG, 1929 (NEMATODA: TRICHOSTRONGYLOIDEA) FROM MACROPODID MARSUPIALS

By JAN BEVERIDGE* & D. M. SPRATT†

Summary

BEVERIDGE, I. & SPRATT, D. M. (1988) A redescription of *Filarinema dissimile* (Wood, 1931), with new records of other species of *Filarinema* Moennig, 1929 (Nematoda: Trichostrongyloidea) from macropodid marsupials. *Trans. R. Soc. S. Aust.* 112(2), 57–61, 31 May 1988.

Filarinema dissimile (Wood, 1931) (Nematoda: Trichostrongyloidea) is redescribed from material collected from the type host, *Macropus robustus* Gould, 1841, from *Petrogale assimilis* Ramsay, 1877 and from *Lagorchestes conspicillatus* Gould, 1842, all from Queensland. *F. cassonei* nom. nov. is proposed as a new name for *F. asymmetricum* (Cameron, 1926) *sensu* Cassone & Baccam, 1985 from free-living *Macropus rufogriseus* (Desmarest, 1817) and *Wallabia bicolor* (Desmarest, 1804) and from captive *M. robustus* Gould, 1841 and *M. antilopinus* (Gould, 1842). *F. woodi* Cassone & Baccam, 1985 is suppressed as a synonym of *F. asymmetricum* (Wood, 1931). Host records are revised. New records are given for *F. australe* (Wood, 1931), *F. asymmetricum*, and *F. mawsonae* Cassone & Baccam, 1985.

KEY WORDS: Nematoda, Trichostrongyloidea, *Filarinema*, Macropodidae.

Introduction

Species of the nematode genus *Filarinema* Moennig, 1929 are restricted to the pyloric antrum of the sacculated stomachs of kangaroos and wallabies (family Macropodidae). The genus was recently reviewed by Cassone & Baccam (1985) who redescribed all but one of the known species and added five new ones. *F. dissimile* (Wood, 1931) was not redescribed since no new material was available and because the male types deposited by Wood (1931) are apparently no longer extant. Since publication of the revision by Cassone & Baccam (1985), considerable additional material has been collected, including new material of *F. dissimile*, and hence a full description of this species can be given for the first time. While undertaking this redescription, and identifying the many additional specimens recently collected from related macropodid hosts, it became evident that an additional species, previously referred to as *F. asymmetricum* by Cassone & Baccam (1985), existed within the genus. This new species is named in this paper.

Materials and Methods

Specimens examined were from the Helminth Collection (AHC), of the South Australian Museum, Adelaide (SAM) and from the helminth collection of the Division of Wildlife and Ecology, C.S.I.R.O, Canberra. Specimens deposited in the British Museum (Natural History), London (BMNH), the CAB International Institute of Parasitology, St Albans (CIP) and in SAM were also examined. Nematodes were cleared in lactophenol for examination and drawings were made with the aid of a drawing tube attached to an Olympus BH microscope. *En face* preparations of the cephalic end and mid-body sections were cut by hand, under a stereomicroscope, using a fragment of razor blade mounted in a holder. Specimens of the species described in this paper have been deposited in SAM and BMNH. Measurements are given in the text in millimetres as the range followed by the mean in parentheses.

Filarinema dissimile (Wood, 1931)

FIGS 1–13

Trichostrongylus dissimilis Wood, 1931
Asymmetricostrongylus dissimilis (Wood, 1931) Nagaty, 1932

Types: 5♂ cotypes, from stomach of *Macropus robustus woodwardi*, Western Australia. Whereabouts unknown.

Material examined: From *M. robustus*: 6♂♂ Warrawee Station via Charters Towers, Qld (SAM V4032–4034; AHC 16281; BMNH 1986.1005–1006); from *Petrogale assimilis*: 5♂♂, Frederick Creek, Collinsville, Qld (AHC 14447); from *Lagorchestes conspicillatus*: 1♂, Fletcher View Station via Charters Towers, Qld (AHC 12325).

Description (measurements of 6 specimens from *M. robustus*): Small slender nematodes, 8.0–10.4 (9.5) long, maximum width 0.10–0.15 (0.12). Body covered with numerous, fine, transverse striations. Synlophe absent; slight cuticular thickening present on right-hand side of body (Fig. 5). Mouth opening triangular in apical view (Fig. 3); 2 lateral amphids and 4 sub-median cephalic papillae present. Buccal capsule poorly developed, tri-radiate in section,

* Central Veterinary Laboratories, South Australian Department of Agriculture, c/o Institute of Medical and Veterinary Science, Frome Road, Adelaide, S. Aust. 5000.

† Division of Wildlife and Ecology, C.S.I.R.O., Canberra, A.C.T.

surrounded by musculature of oesophagus; dorsal tooth present but very poorly developed (Figs 2, 4). Oesophagus filiform 0.74–0.85 (0.79); nerve ring in anterior oesophageal region, 0.20–0.30 (0.26) from anterior end; excretory pore immediately posterior to nerve ring, 0.21–0.32 (0.27) from anterior end (Fig. 1); deirids not seen. Bursa covered with fine striations; lobes of bursa indistinct (Fig. 7); ventro-ventral rays symmetrical, divergent, anteriorly directed, thick, almost reach margin of bursa; ventro-lateral and lateral rays grouped together; ventro-lateral ray terminates near margin of bursa; externolateral ray short, terminates some distance from margin of bursa; mediolateral ray longer than other rays, terminates near margin of bursa; posterolateral rays slender, shorter, do not reach margin of bursa; externo-dorsal rays broad, slightly asymmetrical, left ray thicker than right, arise from base of dorsal ray, do not reach margin of bursa; dorsal ray asymmetrical (Fig. 8), trunk divides at ⅓ length into 2 unequal branches, which terminate at bursal margin in small but distinct bifurcations. Genital cone prominent (Figs 6, 7); ventral lobe small, appears as low eminence in ventral view with simple papilla; dorsal lobe longer, composed of two separate raylets. Spicules heavily sclerotised, dark brown in colour, 0.20–0.23 (0.21) long (Figs 9–11); body of spicule tapers gradually to fine point; dorsal subsidiary branch 0.080–0.095 (0.086) long, arises at middle of spicule body, 0.078–0.096 (0.083) from anterior end, pointed at extremity; ventral branch 0.072–0.087 (0.078) long, arises just posterior to origin of dorsal branch, more robust than dorsal branch, blunt and enlarged at tip. Gubernaculum thick, curved (Figs 12, 13), 0.13–0.15 (0.14) long, 0.010–0.020 (0.015) thick, slightly curved ventrally in lateral view.

Variation: specimens from *P. assimilis* and *L. conspicillatus* exhibit greater variation in dimensions of spicules than specimens from *M. robustus*. From *P. assimilis* (5 specimens): body length 8.6–9.5 (9.2), maximum width 0.11–0.12 (0.12), oesophagus 0.66–0.77 (0.72), nerve ring 0.20–0.25 (0.23) from anterior end, excretory pore 0.24–0.28 (0.25) from anterior end, spicule length 0.15–0.20 (0.17), gubernaculum 0.11–0.14 (0.12); single specimen from *L. conspicillatus*: length 11.6, maximum width 0.18, oesophagus 0.96, nerve ring 0.20 from anterior end, excretory pore 0.35 from anterior end, spicules 0.28, gubernaculum 0.17.

Filarinema cassonei nom. nov.

Filarinema asymmetricus (sic) (Cameron, 1926) *sensu* Cassone & Baccam, 1985 (from *Macropus rufogriseus*) pp. 353–355, fig. 2 A–H.

Types: Holotype ♂ from pylorus of *Macropus rufogriseus* (Desmarest, 1817), Cape Barren Island, Tas., 12.iii.1973, in SAM V3678.

Material examined: From *M. rufogriseus:* holotype; 9♂♂, same collection data (AHC 16284, BMNH 1986.1007–1008); 2♂♂, Melbourne Zoological Gardens, Vic.; 1♂, Grampian Ranges, Vic.; 4♂♂, Cape Conran, Vic.; 8♂♂, Bondo State Forest, Tumut, N.S.W.; 4♂♂, Timbillica State Forest, Eden, N.S.W.; 23♂♂, "Icena", Gladstone, Tas.; from *Wallabia bicolor* (Desmarest, 1804): 3♂♂, Orbost, Vic. (det. as *F. woodi* by Cassone & Baccam); from *M. fuliginosus* (Desmarest, 1817): 2♂♂, Melbourne Zoological Gardens, Vic.; from *M. antilopinus* (Gould, 1842): 1♂, captive colony, CSIRO, Canberra, "Gunghalin".

Description: See Cassone & Baccam (1985). Spicules amber in colour, 0.29–0.25 (0.22) long (mean of 10 measurements), tapering distally to extremely fine point; anterior undivided part of spicule 0.076–0.090 (0.078) long; dorsal branch of spicule arises proximal to ventral branch, blunt-tipped, 0.052–0.070 (0.060) long; ventral branch sharper-tipped, 0.050–0.060 (0.053) long; gubernaculum 0.12–0.15 (0.13) long, slightly sinuous in lateral view, very thick, maximum thickness 0.014–0.022 (0.016).

New host records

The following collections represent new host records.

Filarinema mawsonae Cassone & Baccam, 1985: *Petrogale assimilis* Ramsay, 1877, South Edge Stn via Mareeba, Qld (AHC 13404), Mt Claro near Ingham, Qld (AHC 13394), Expedition Creek, Blue Range, Qld (AHC 11921), Lander's Creek Stn via Clare, Qld (AHC 13397), Valley of Lagoons Stn via Ingham, Qld (AHC 13393), Glen Harding Stn via Ingham, Qld (AHC 11929); *Petrogale godmani* Thomas, 1923, Kings Plains Stn via Cooktown, Qld (AHC 13399); *Thylogale stigmatica* Gould, 1860, Peeramon, Qld (AHC 8978); *Aepyprymnus rufescens* (Gray, 1837), Inkerman Stn via Home Hill, Qld (AHC 11935).

Filarinema australe (Wood, 1931): *Lagorchestes conspicillatus* Gould, 1842, Barrow Island, W.A. (AHC 10860); *Petrogale inornata* Gould, 1842, Mynna Stn via Collinsville, Qld (AHC 14398); *Petrogale assimilis* Ramsay, 1877, Frederick Creek, Collinsville, Qld (AHC 14446), Mt Claro via Ingham, Qld (AHC 13394), Mt Wickham Stn via Collinsville, Qld (13398), Natal Downs Stn via Charters Towers, Qld (AHC 11928).

Filarinema asymmetricum (Cameron, 1926): *Potorous tridactylus* (Kerr, 1792), Tas. (AHC 11915).

Discussion

F. dissimile is most similar to *F. asymmetricum* (Cameron, 1926) (syn. *F. woodi* Cassone & Baccam, 1985), *F. cassonei* nom. nov. (= *F. asymmetricum sensu* Cassone & Baccam 1985) and *F. haycocki* Cassone & Baccam, 1985 in having a long slender spicule, tapering gradually to a long, fine point, and two branches of equal length arising from the spicule body. *F. dissimile* differs from *F.*

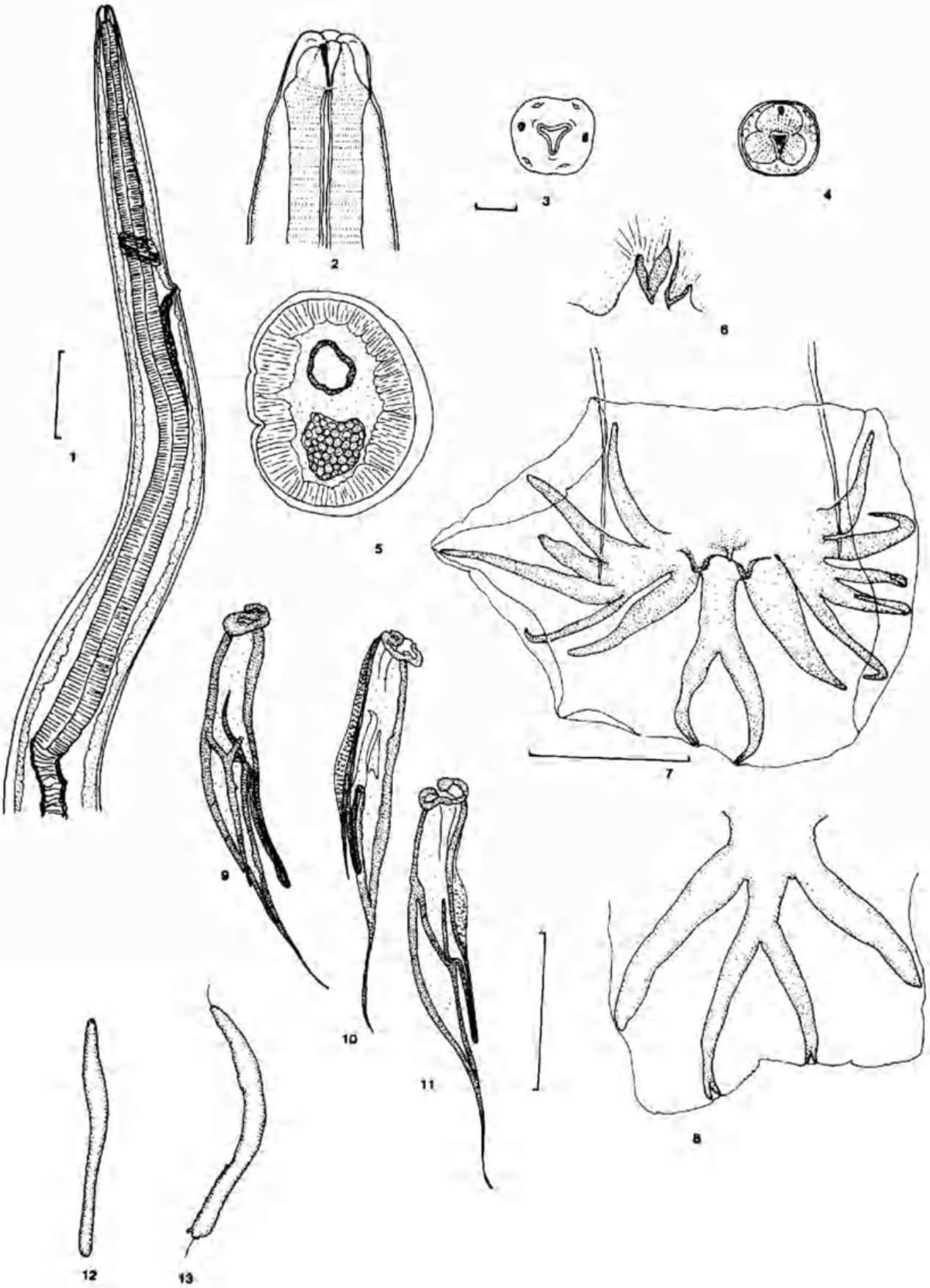
asymmetricum in having much more robust spicules which are dark brown in colour compared with amber in the latter species, and in having much longer and more robust spicule branches than in *F. asymmetricum*. The gubernaculum of *F. asymmetricum* has a characteristic twist when viewed laterally, and a similar twist is lacking in the gubernaculum of *F. dissimile*. *F. cassonei*, for which an excellent discription was given by Cassone & Baccam (1985) (as *F. asymmetricum*), is distinguished by its amber coloured spicules, and by the level at which the spicule branches terminate, being closer to the spicule tip in *F. dissimile*. In addition, the shorter spicule branches in *F. cassonei* and the fact that the more robust of the two spicule branches is dorsal in *F. cassonei* but ventral in *F. dissimile* distinguish the two species. *F. dissimile* differs from *F. haycocki* in having darker spicules as well as in the shape and disposition of the branches of the spicule.

Wood (1931) provided a very poor description of *F. dissimile* based on specimens obtained from several *Macropus robustus* (syn. *M. woodwardi*) which died soon after their importation into England from Western Australia. The original description is brief, lacks many important details, and the legends to the figures of his paper are incorrectly applied. Nagaty (1983) re-examined Wood's type specimens and gave a more detailed description of them in support of the erection of the genus *Asymmetricostrongylus* Nagaty, 1932 to which he had earlier assigned the species. By contemporary standards, Nagaty's drawings of the spicules are poor, but they agree in all important features with the new material. A redescription of the species is warranted to facilitate its separation from congeners. The male types are no longer present in BMNH and we have therefore deposited additional specimens in that museum.

The present specimens of *F. dissimile* are from the same host species as Wood's specimens, though not the same subspecies. Wood's material came from *M. robustus woodwardi*, a subspecies limited to northern Western Australia and the Northern Territory, while the present material comes from *M. robustus robustus* which occurs along the Great Dividing Range from Cape York to New South Wales (Richardson & Sharman 1976). The new specimens differ from Wood's and Nagaty's descriptions only in the following details. Wood (1931) and Nagaty (1938) described a cuticular "flange" on the right-hand side of the body and similar cuticular thickenings were described in several species by Cassone & Baccam (1985). In our specimens, the thickening is slight and is only evident in transverse sections of the body. Wood (1931) described the lateral lobes of the bursa as being markedly asymmetrical and the ventro-ventral ray being more divergent on one side of the body than the other. In our specimens, the asymmetry is not as marked, the ventro-ventral rays are equally divergent and only the externodorsal rays are obviously asymmetrical. In spite of these minor differences, our specimens are assigned to *F. dissimile* pending the availability of new collections from *M. robustus woodwardi* from Western Australia to resolve the significance of the differences noted.

In their redescription of *F. asymmetricus* (sic) from *Macropus rufogriseus* (syn. *M. benetti*), Cassone & Baccam (1985) noted discrepancies between the original description of Cameron (1926) and the comments made on the same species by Wood (1931). Wood (1931) himself noted that Cameron's description was inaccurate in several points, and sought to correct it based on a re-examination of the type specimens deposited in the British Museum. Nagaty (1938) provided a more detailed description of the same species. Cassone & Baccam (1985) hypothesised that Cameron in fact had two species in his material, but failed to recognise the fact. They concluded that Cameron had prepared the description from one of the species but had deposited as types, specimens of the second. Wood's (1931) comments on Cameron's inaccurate description would then stem from the fact that Wood had examined only the specimens which Cameron had deposited as types, and not the specimens which formed the basis of his published description. Cassone & Baccam's (1985) views are certainly supported by an examination of Cameron's figures of the spicules of *F. asymmetricum* which do not conform at all with the type specimens but do agree with a second species of *Filarinema* also found commonly in *M. rufogriseus*. On this basis, they designated a neotype for *F. asymmetricum* and renamed the type specimens of *F. asymmetricum* in BMNH as *F. woodi* Cassone & Baccam, 1985.

Recent collections from Tasmania, Victoria, New South Wales and Queensland indicate that there are indeed two species of *Filarinema* in the stomach of *Macropus rufogriseus* and that mixed infections are usual, thereby further supporting Cassone & Baccam's hypothesis that Cameron was dealing with a mixed infection of two species. Cameron deposited a total of 15 type specimens of *F. asymmetricum*. The holotype selected was a female and it, together with two males and two female paratypes, was deposited in 1926 (BMNH 1926.10.12.1-5). In addition, five male and five female paratypes were placed in the collection of the London School of Hygiene and Tropical Medicine, housed at the CAB International Institute


1
2
3
4
5
6
7
8
9
10
11
12
13

of Parasitology (collection no 178/A). We have examined all the type specimens and all the males are conspecific, belonging to the species described by Cassone & Baccam (1985) as *F. woodi*. The females are also similar to one another and conform to the description given by the same authors. The name *asymmetricum* is determined by the type specimens, rather than the published description, and all the male types clearly belong to the same taxon. We therefore propose that *F. woodi* be considered a synonym of *F. asymmetricum*. The co-parasitic species in *Macropus rufogriseus*, *F. asymmetricum sensu* Cassone & Baccam, 1985 therefore is un-named and we propose the name *F. cassonei* nom. nov. for it, in recognition of the important contributions made to the systematics of the genus by J. Cassone. The description of this species already published (Cassone & Baccam 1985) is excellent, and we have merely added metric data from the much wider range of specimens we have available to us. The additional material we examined came from the same host animal as that described by Cassone & Baccam (1985), and we have therefore designated as a holotype of *F. cassonei* the specimen in SAM formerly designated as the neotype of *F. asymmetricum* by Cassone & Baccam.

The nomenclatural changes made above result in significant alterations to host records. Cassone & Baccam (1985) recorded *F. woodi* from *Macropus rufogriseus*, *M. parryi*, *M. robustus* and *Wallabia bicolor*. We have re-examined all the available material to confirm the identifications and all now become records for *F. asymmetricum*.

Our new host records extend considerably the host range of *F. mawsonae*, *F. australe* and, to a more limited extent, that of *F. asymmetricum*.

Some confusion exists in the literature as to the gender of the genus *Filarinema*. *Nema* (= thread) is neuter both in Greek and Latin, and hence the gender of the genus is neuter. Moennig (1929) used the specific epithet *flagrifer* for the type species, and it is assumed he intended it to stand as a noun in apposition (= whipbearer) rather than as an adjective (= whip bearing), in which case it would have been *flagriferum*. We have retained Moennig's (1929) original spelling of the name, but have used *F. asymmetricum*, *F. dissimile* and *F. australe* in contradistinction to the use of Inglis (1968) and Cassone & Baccam (1985).

Acknowledgments

We wish to thank Dr D. I. Gibson, Mrs E. Harris and Dr L. Khalil for the loan of type specimens and ancillary information, and Dr R. Speare, Mr P. M. Johnson, Dr R. Close and Mr S. Barker for collecting specimens.

References

CAMERON, T. W. M. (1926) On a new species of trichostrongyle worm from the Bennett's wallaby. *J. Helminthol.* **4**, 23-26.

CASSONE, J. & BACCAM, D. (1985) Le genre *Filarinema* Moennig, 1929 (Nematoda, Trichostrongyloidea), parasites de marsupiaux australiens. *Bull. Mus. natn. Hist. nat., Paris, 4e sér.* **7**, 349-382.

INGLIS, W. G. (1968) The geographical and evolutionary relationships of Australian trichostrongyloid parasites and their hosts. *J. Linn. Soc. (Zool.)* **47**, 327-347.

NAGATY, N. F. (1938) The genera *Asymmetricostrongylus* Nagaty, 1932 and *Libyostrongylus* Lane, 1923 and relation to the genus *Trichostrongylus* Looss, 1905. *Livro Jubilar Prof. Travassos*, Rio de Janeiro, Brasil, **III**, 341-353.

RICHARDSON, B. J. & SHARMAN, G. B. (1976) Biochemical and morphological observations on the wallaroos (Macropodidae: Marsupialia) with a suggested new taxonomy. *J. Zool. Lond.* **179**, 499-513.

WOOD, W. A. (1931) Some new parasitic nematodes from Western Australia. *Report Dir. Inst. Anim. Path., Cambridge, 1929-1930* **1**, 209-219.

Figs. 1-13. *Filarinema dissimile* (Wood, 1931). 1, anterior end, lateral view; 2, cephalic extremity, lateral view, dorsal aspect on left-hand side; 3, mouth opening, *en face* view; 4, optical transverse section through buccal capsule, showing buccal tooth and oesophageal masculature surrounding capsule; 5, transverse section in mid-body region, showing thickening of cuticle on right-hand side; 6, genital cone, lateral view; 7, bursa, ventral view; 8, dorsal lobe of bursa, dorsal view, showing terminal bifurcations of dorsal ray; 9-11, spicule from various oblique views; 12, gubernaculum, ventral view; 13, gubernaculum, lateral view. Scale lines: Fig. 1, 0.1 mm, figs 2-4 to same scale, 0.01 mm; figs 5-13 to same scale, 0.1 mm.