

NEW RECORDS OF GLOBOCEPHALOIDINAE (NEMATODA: TRICHOSTRONGYLOIDEA) FROM MACROPODIDAE IN NORTH QUEENSLAND

by I. BEVERIDGE*, R. SPEARE† & P. M. JOHNSON‡

Summary

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Globocephaloides affinis Johnston & Mawson, 1939, is resurrected as a valid species and redescribed. The male is described for the first time. *G. affinis* differs from congeners by the possession of a gubernaculum, in the form of the spicules and in the size of the buccal capsule. It occurs in *Macropus dorsalis* and rarely in *M. giganteus*. *G. macropodis* Yorke & Maplestone, 1926, was found in *Macropus agilis*, *M. dorsalis*, *M. parryi*, *Wallabia bicolor*, *Lagorchestes conspicillatus* and *Aepyprymnus rufescens*. *M. parryi*, *W. bicolor*, *L. conspicillatus* and *A. rufescens* are new host records. *Amphicephaloides thylogale* Beveridge, 1979, was found only in *Thylogale stigmatica*, and has not previously been recorded from this host in Queensland.

KEY WORDS *Globocephaloides*, *Amphicephaloides*, Nematoda, distribution, hosts, morphology, Macropodidae.

Introduction

The trichostrongyloid subfamily Globocephaloidinae Inglis, 1968, consists of three nematode species belonging to the genera *Globocephaloides* Yorke & Maplestone, 1926 and *Amphicephaloides* Beveridge, 1979, occurring in the duodenum of macropodid marsupials and currently placed within the family Herpetostrongylidae (Durette-Desset & Chabaud 1981). In a recent review of the subfamily (Beveridge 1979), two species of *Globocephaloides* were recognised as valid and a new monotypic genus, *Amphicephaloides*, restricted to pademelons (*Thylogale* spp.) was described. The distribution and prevalence of *G. trifidospicularis*, a species occurring in south-eastern Australia, was reported. The lack of extensive parasite collections from northern areas of the continent restricted any considerations of the distribution and abundance of *G. macropodis* which is apparently limited to tropical Australia. Recent collections of nematodes from kangaroos and wallabies in north Queensland have provided additional information on the prevalence and distribution of *G. macropodis* and

Amphicephaloides thylogale as well as indicating that *G. affinis* Johnston & Mawson, 1939, a species described originally from females only and suppressed by Beveridge (1979) as a synonym of *G. macropodis*, is in fact a valid species. In this paper, *G. affinis* is resurrected, the male of *G. affinis* is described for the first time, and additional host and geographic records are given for *G. macropodis* and *A. thylogale*.

Methods

Nematodes were collected from the content of the duodenum of kangaroos and wallabies either immediately following the death of the host or from viscera preserved in 10% formol saline. Duodenal content was washed in a fine sieve and the residue examined using a dissection microscope. Live nematodes were fixed in boiling 70% ethanol and stored in 70% ethanol with 5% glycerine. All specimens are deposited in the Australian Helminthological Collection (AHC) housed in the South Australian Museum, and collection numbers are cited in the text.

Drawings were made with the aid of a camera lucida from specimens cleared in lactophenol. In the descriptions, measurements are given in millimetres as the range followed by the mean of five measurements in parentheses.

Results

The prevalence of *Globocephaloides* and *Amphicephaloides* in macropodids from north Queensland is shown in Table 1.

* Veterinary Sciences Division, S.A. Department of Agriculture, C/- Institute of Medical and Veterinary Science, Frome Road, Adelaide, S. Aust. 5000.

† Graduate School of Tropical Veterinary Science, James Cook University of North Queensland, Townsville, Qld. 4810.

‡ Queensland National Parks and Wildlife Service, Northern Regional Centre, Pallarenda, Townsville, Qld. 4810.

TABLE 1. Prevalence of *Globocephaloides* and *Amphicephaloides* in macropodids from northern Queensland.

Macropodid species	No. examined	<i>G. macropodis</i>		<i>G. affinis</i>		<i>A. thylogale</i>	
		Prevalence %	No. worms (mean)	Prevalence %	No. worms (mean)	Prevalence %	No. worms (mean)
<i>Macropus agilis</i> (Gould, 1842)*	40	30	1-10(3)	0	—	0	—
<i>Macropus antilopinus</i> (Gould, 1842)	10	0	—	0	—	0	—
<i>Macropus dorsalis</i> (Gray, 1837)	22	59	2-28(7)	68	1-11(4)	0	—
<i>Macropus giganteus</i> Shaw, 1790	26	0	—	4	1	0	—
<i>Macropus parryi</i> (Bennett, 1835)	15	13	1,32	0	—	0	—
<i>Macropus robustus</i> Gould, 1841	21	0	—	0	—	0	—
<i>Wallabia bicolor</i> (Desmarest, 1804)	9	11	1	0	—	0	—
<i>Aepyprymnus rufescens</i> (Gray, 1837)	11	9	4	0	—	0	—
<i>Thylogale stigmatica</i> Gould, 1860	10	0	—	0	—	40	1-28(9)
<i>Largorcheses conspicillatus</i> Gould, 1842	9	11	9	0	—	0	—
<i>Onychogalea unguifera</i> (Gould, 1841)	10	0	—	0	—	0	—

* Data from Speare *et al.* (1983).

Globocephaloides affinis Johnston & Mawson, 1939
(FIGS 1-18)

Material examined: From *Macropus dorsalis*: Qld: 6 ♂, 2 ♀, Milman, AHC 12741; 1 ♀, Mt Surprise, AHC 12742; 7 ♂, 18 ♀, Warrawee Station via Charters Towers, AHC 12321, 12316, 12737; 1 ♂, 6 ♀, Pallamana Station via Charters Towers, AHC 12738; 8 ♂, 16 ♀, Harvest Home Station via Charters Towers, AHC 12739.

From *Macropus giganteus*: Qld: 1 ♂, Harvest Home Station via Charters Towers, AHC 12740.

Description:

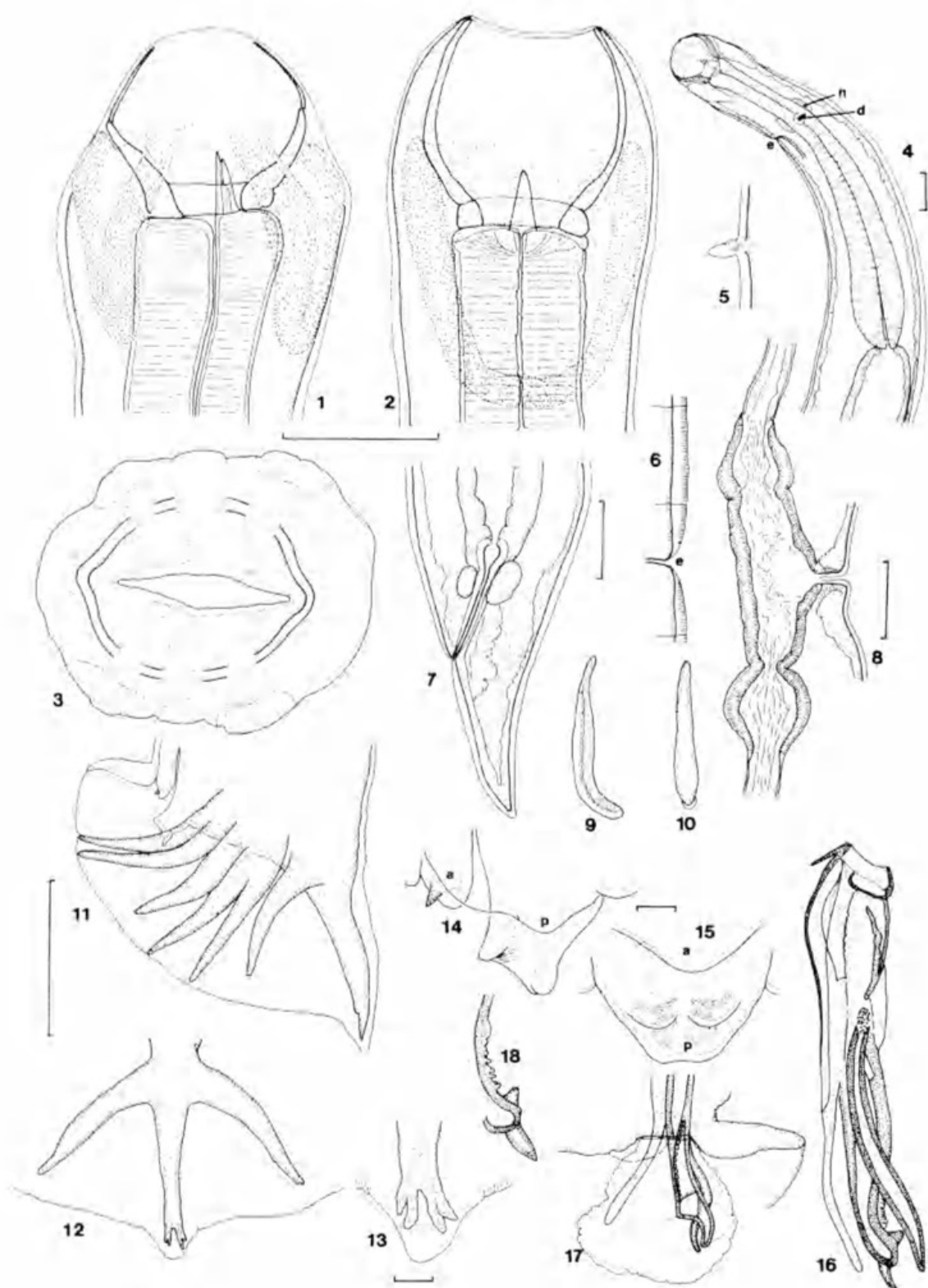
Small nematodes, coiled in loose, flat spiral, ventral surface on inside of coil. Body without longitudinal ridges or alae, covered by numerous transverse striations. Striations extremely fine, close together, interspersed irregularly with more prominent striations, 0.024-0.048 apart. Mouth opening oval, slit-like when closed, dorsoventrally elongate. Lips absent; mouth surrounded by 2 lateral, jaw-like structures joined at dorsal and ventral margins. Each jaw bears 3 finger-like extensions of pulp-tissue which reach mouth opening. Cephalic papillae not seen. Jaws supported posteriorly by U-shaped buttress-like elevations of cuticle and subcuticular tissues on dorsal and ventral aspects, extending from well posterior to anterior extremity of oesophagus, running anteriorly and laterally terminating at origin of 3 extensions of pulp-tissue. Buccal capsule large, urceolate, with thickened rim at base, thinning markedly anteriorly; walls also thin dorsally and ventrally. Single pointed, elongate dorsal tooth arises from oesophagus; subventral teeth absent. Dorsal oesophageal gland opens through apex of dorsal tooth. Oesophagus elongate, clavate, slightly wider at posterior end. Nerve ring encircles oesophagus near anterior extremity. Excretory pore at level of nerve ring. Deirid small, not lobed, at level of excretory pore.

Male

Length 4.9-5.6 (5.2); maximum width 0.25-0.32 (0.28); buccal capsule 0.11-0.13 (0.12) × 0.11-0.13 (0.12); tooth 0.035-0.044 (0.040) long; buttresses arise 0.20-0.23 (0.21) from anterior end; oesophagus 0.78-0.88 (0.82); nerve ring 0.37-0.40 (0.39) from anterior end; excretory pore 0.35-0.38 (0.37) from anterior end; deirids 0.35-0.37 (0.36) from anterior end; spicules 0.26-0.32 (0.29); gubernaculum 0.11 long. Lateral lobes of bursa enlarged, fused with ventral lobes. Dorsal lobe very small, not separated from lateral lobes. Ventroventral and ventrolateral rays separated, slender, each reaching margin of bursa. Lateral rays broad at origin, externolateral, not reaching margin of bursa; other lateral rays reaching margin of bursa. Externodorsal ray slender, originating from dorsal ray, not reaching margin of bursa. Dorsal ray slender, divided into 2 very short branches at distal extremity, each minutely divided at tips. Bullae over origin of lateral and ventral rays absent. Genital cone not prominent. Anterior lip of cone very small, conical, with tooth-like appendage ventrally. Posterior lip gives rise to rounded, distally bifid projection. Spicules short, complex, not heavily sclerotised, yellow. Spicules trifid distally. Main branch of spicule with serrated lateral margin, and bi-cornuate distal extremity. Lateral branch of spicule slender, simple, no longer than medial branches, tip simple. Third branch simple, elongate, poorly sclerotised. Distal tip of spicule with large transparent flange. Gubernaculum slender, elongate.

Female

Length 5.5-6.2 (5.9); maximum width 0.42-0.48 (0.45); buccal capsule 0.12-0.14 (0.13) × 0.13-0.15 (0.14); tooth 0.035-0.050 (0.044); buttresses arise 0.22-0.24 (0.23) from anterior end; oesophagus 0.87-0.98 (0.94); nerve ring 0.35-0.40 (0.37) from



Figs 1-18. *Globocephaloides affinis* Johnston & Mawson.

Fig. 1, Cephalic end, lateral view. Fig. 2, Cephalic end, ventral view. Fig. 3, Cephalic end, *en face* view. Fig. 4, Anterior end, lateral view. Fig. 5, Deirid, ventral view. Fig. 6, Transverse body striations in region of excretory pore. Fig. 7, Female tail, lateral view. Fig. 8, Vulva and ovejector, lateral view. Fig. 9, Gubernaculum, lateral view. Fig. 10, Gubernaculum, dorsal view. Fig. 11, Bursa, lateral view. Fig. 12, Dorsal lobe of bursa, dorsal view. Fig. 13, Termination of dorsal ray, dorsal view. Fig. 14, Genital cone, lateral view. Fig. 15, Genital cone, ventral view. Fig. 16, Spicule, lateral view. Fig. 17, Distal tip of spicule with surrounding cuticular flange, lateral view. Fig. 18, Main branch of spicule showing denticulate margin, lateral view. Scale lines: Figs 1-3, 5, 6, 9-12, 16-18 to same scale, 0.1 mm; Figs 4, 7, 8 to same scale, 0.1 mm; Figs 13-15 to same scale 0.01 mm.

Legend: a, anterior lip of genital cone; d, deirid; e, excretory pore; n, nerve ring; p, posterior lip of genital cone.

anterior end; excretory pore 0.35–0.39 (0.37) from anterior end; deirids 0.37–0.41 (0.39) from anterior end; tail 0.18–0.20 (0.19); vulva to posterior end 1.41–2.10 (1.76); egg 0.08–0.11 (1.10) \times 0.06. Tail short, simple, conical. Vulval lips not prominent; lips approximately equal. Ovejectors paired; vaginae uterinae short. Uteri large, sac-like opposed. Egg thin-shelled, ellipsoidal with two-cells when laid.

Site in host: duodenum.

Globocephaloides macropodis Yorke & Maplestone, 1926

Syn. *Globocephaloides wallabiae* Johnston & Mawson, 1939

Globocephaloides thetidis Johnston & Mawson, 1939

Material examined: From *Macropus agilis*: Qld: 1 ♂, 4 ♀, Townsville, AHC 7565; 1 ♂, 5 ♀, Hervey's Range (Townsville), AHC 7165; 1 ♀, Black River (Townsville), AHC 7515; 2 ♀, Inkerman Station via Home Hill, AHC 7525; 2 ♂, Wenlock River, Cape York, AHC 7407.

From *Macropus dorsalis*: Qld: 14 ♂, 19 ♀, Milman, AHC 12023, 12253; 7 ♂, 12 ♀, Clements Creek, Marlborough, AHC 12199; 2 ♂, 3 ♀, Warrawee Station via Charters Towers, AHC 12743, 11298; 2 ♂, Mt Surprise, AHC 11141; 1 ♂, 6 ♀, Pallamana Station via Charters Towers, AHC 12745; 8 ♂, 16 ♀, Harvest Home Station via Charters Towers, AHC 12744.

From *Macropus parryi*: Qld: 9 ♂, 24 ♀, Inkerman Station via Home Hill, AHC 11931, 12364.

From *Wallabia bicolor*: Qld: 1 ♀, Harvest Home Station via Charters Towers, AHC 12334.

From *Aepyprymnus rufescens*: Qld: 2 ♂, 2 ♀, Ayrsville, AHC 8841.

From *Lagorchestes conspicillatus*: Qld: 6 ♂, 3 ♀, Bohle, AHC 12837.

Amphicephaloides thylogale Beveridge, 1979

Material examined: From *Thylogale stigmatica*: Qld: 1 ♂, 3 ♀, Pearamon, AHC 11235; 1 ♂, 3 ♀, Tolga, AHC 7351; 1 ♂, El Arish, AHC 7383; 17 ♂, 11 ♀, Wongabel State Forest, AHC 12354.

Discussion

Globocephaloides affinis was initially described from the small intestine of *Macropus dorsalis* by Johnston & Mawson (1939) on the basis of female specimens only. Beveridge (1979) considered that the only distinguishing feature of this species, namely the larger buccal capsule, was not a valid specific character given the variation seen in other species, and in the absence of males suppressed *G. affinis* as a synonym of *G. macropodis*. In recent collections from *M. dorsalis*, male and female nematodes with extremely large buccal capsules, similar to the

original description of *G. affinis*, were found in association with *G. macropodis*. The characters of the male copulatory apparatus indicate clearly that *G. affinis* is a valid species and is not synonymous with *G. macropodis*. *G. affinis* possesses a gubernaculum, unlike congeners, lacks bullae overlying the lateral lobes of the bursa, has a much longer dorsal lobe of the bursa and the spicule bears denticulate processes on its main branch. The spicules are lightly sclerotised and yellow in colour, as in *G. macropodis*, but, like *G. trifidospicularis*, they have three distal branches compared with two branches in *G. macropodis*. The presence of two simple subsidiary branches of similar length differs markedly from *G. trifidospicularis* in which the minor branches are sinuous and differ in length. In addition, the genital cone differs from congeners in having a diminutive anterior lip, and a short, stout posterior lip. The simple deirid differs strikingly from the bilobed deirids present in both *G. macropodis* and *G. trifidospicularis*. The presence of a gubernaculum, denticulate spicules, the lack of paired bullae on the internal surface of the bursa, the features of the genital cone, the lack of subventral teeth in the buccal capsule and the presence of a thickened ring at the base of the capsule indicate similarities with *Amphicephaloides thylogale* rather than with congeners. The buccal capsule of *G. affinis* is considerably larger than either *G. macropodis* or *G. trifidospicularis* and appears to be a reliable distinguishing character. Females of *G. affinis* can be distinguished by the size of the buccal capsule, by the absence of prominent vulval lips, and by the extremely fine body striations, interspersed at irregular intervals by coarser striations.

G. affinis occurs commonly in *M. dorsalis* and is frequently found in mixed infections with *G. macropodis* (Table 1). In the Charters Towers area of Qld, *G. affinis* was found in 13 of 14 *M. dorsalis*, one of six *M. giganteus*, none of 21 *M. robustus* and none of five *Wallabia bicolor*, suggesting that *M. dorsalis* is the normal host species, but that it may occasionally infect other sympatric macropodid species.

G. wallabiae Johnston & Mawson, 1939 was placed as a synonym of *G. macropodis* by Beveridge (1979). Initially described from *Macropus dorsalis*, the type specimens have been lost, and in relegating the species to synonymy, Beveridge (1979) relied on new material collected from *M. dorsalis* which consisted of seven specimens only. The frequent occurrence of *G. macropodis* in *M. dorsalis* and careful comparison of this new material with a similarly extensive series of specimens from the type host, *M. agilis*, confirms the synonymy of *G. wallabiae* with *G. macropodis*.

G. thetidis Johnston & Mawson, 1939, was also placed as a synonym of *G. macropodis* by Beveridge (1979). *G. thetidis* had been described originally from a few specimens found in *Thylogale thetis* from the New England region of N.S.W., yet attempts to collect additional specimens of the parasite in New England and in southern Qld yielded only *A. thylogale* (Beveridge, 1979). Other nematode species described from the same host animal from New England from which Johnston & Mawson (1939) described *G. thetidis* suggest that the host has been misidentified. Species of *Rugopharynx* Moennig, 1927, and *Zoniolaimus* Cobb, 1898, originally described from "*T. thetis*" in fact occur only in *M. dorsalis* (Beveridge 1982, 1983). Misidentification of the host would account for the otherwise inexplicable occurrence of *G. macropodis* in *T. thetis*, and the common occurrence of *G. macropodis* in *M. dorsalis* (Table 1) therefore supports the synonymy of *G. thetidis* with *G. macropodis*.

G. macropodis has previously been reported from *M. agilis*, *M. dorsalis*, *M. giganteus* and *Petrogale inornata* in Qld (Beveridge 1979; Speare *et al.* 1983). Data presented in this paper confirm that *G. macropodis* is a common parasite of *M. dorsalis*. The failure to find *G. macropodis* in *M. giganteus* (Table 1), even when *M. giganteus* was sympatric with other infected macropodid species, suggests that it is only an incidental parasite of this host. Beveridge (1979) found only a single female *G. macropodis* in *M. giganteus* near Rockhampton. *G. macropodis* is reported for the first time from *Aepyprymnus rufescens*, *Macropus parryi*, *Lagorchestes conspicillatus* and *Wallabia bicolor*, but in each instance the prevalence is relatively low, sug-

gesting that they are incidental hosts, while *M. agilis* and *M. dorsalis* are the principal hosts of this nematode species (Table 1).

Beveridge (1979) concluded that both *G. trifidospicularis* and *G. macropodis* have an extremely wide host range, the former species occurring in southern Australia and being replaced by *G. macropodis* in the north. The recent collections support this view, *M. parryi*, *M. giganteus* and *W. bicolor* are hosts of *G. trifidospicularis* in Victoria and N.S.W. (Beveridge 1979), while in northern Qld the same host species are parasitised, if infrequently, by *G. macropodis*. By contrast, *G. affinis* is apparently restricted to *M. dorsalis*, with only an occasional infection in *M. giganteus* in areas where the two macropodid species are sympatric. *A. thylogale* occurs in *Thylogale thetis* in N.S.W. and southern Qld and in *T. stigmatica* from northern N.S.W., but has not been reported previously in *T. stigmatica* from northern Qld where it is apparently restricted to this host species.

To date, only *G. trifidospicularis* has been implicated in causing disease in kangaroos (Arundel *et al.* 1977). One of us (R.S.) has recently autopsied a 12 month old captive *M. giganteus* which died from anaemia and hypoproteinaemia caused by 2,300 *G. macropodis*. The juvenile *M. giganteus* grazed a confined area together with adult *M. agilis* and *M. parryi*, indicating that under confined conditions, *G. macropodis* as well as *G. trifidospicularis* can be a serious pathogen.

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