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Nematodes from New Caledonia. 1. Introduction and Mononchoidea

Gregor W. YEATES

DSIR Land Resources, Private Bag, Lower Hutt, New Zealand.

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Summary — Eighteen species of Mononchoidea from New Caledonia are recorded. Details are given of 30 localities under natural forests, plantation forests, traditional agriculture, vegetable, cropping and experimental areas sampled in June 1988. In addition to records of *Prionchulus punctatus, Iotonchus trichurus* and *I. monhystera* the following fifteen new species are described from forest or cultivated lands. *Clarkus dorsalis* n. sp. is characterised by bifurcate inner liplets, front of the dorsal tooth being flat, prominent swelling on the dorsal basal stoma plate, poorly developed caudal glands. *Clarkus ouinnensis* n. sp. is close to *C. dorsalis* n. sp. but is shorter (♀ L = 0.9-1.2 *vs* 1.6-2.1 mm), has a shorter stoma and relatively longer tail (c = 11-12 *vs* 16-19). *Actus neocaledonensis* n. sp. has four denticles in each subventral row, L = 1.1-1.5 mm, obscure caudal glands and duct opening. *Mylonchulus ciradi* n. sp. is prodelphic and distinguished from *M. index* by possessing a more conoid tail. *Mylonchulus vasis* n. sp. is distinguished by numerous denticles, c' ≈ 1.5, V = 56-58 and lacking vulval papillae. *Mylonchulus paitensis* n. sp. is closest to *M. sigmaturus* but lacks any dorsal curvature on the ventral side of the female tail. *Mylonchulus ananasi* n. sp. is larger than *M. contractus* and separated from *M. agriculturae* by normal intestinal overlap of gonads, possession of subventral teeth and males. *Cobbonchus couleensis* n. sp. has a shorter tail than *C. incultus* and is larger than *C. dianae* but has fewer supplements (6-8 *vs* 15). *Cobbonchus altitudinarum* n. sp. is distinguished from other didelphic species in lacking a depression/flexure on the ventral side of the female tail. *Cobbonchus dzumaci* n. sp. differs from *C. abrupticaudatus* in details of caudal gland ampulla and duct. *Cobbonchus orstomi* n. sp. differs from *C. dianae* in having a digitiform projection on the tail. *Iotonchus lacuplanarum* n. sp. is distinguished from other prodelphic species by the ventral opening of the caudal gland duct, tail = 320 µm and stoma 36 × 26 µm. *Iotonchus montanum* n. sp. differs from *I. indicus* in being twice as long, having the dorsal tooth near base of dorsal plate, lacking an oviduct-uterus sphincter; it has a single ventral pore on the male tail. *Iotonchus candelabri* n. sp. is smaller than *I. montanum* and has two ventral pores on the male tail. *Iotonchus recessus* n. sp. is unique among prodelphic *Iotonchus* in possessing a postvulval sac about 3.5 body widths long.

Résumé — ***Nématodes de Nouvelle-Calédonie. I. Introduction et Mononchoidea*** — Dix-huit espèces de Mononchoidea ont été recensées en Nouvelle-Calédonie. Des précisions sont fournies sur 30 sites — forêts naturelles, forêts plantées, agriculture traditionnelle, cultures maraîchères, cultures expérimentales — où ont été prélevés les échantillons, en juin 1988. En sus de la caractérisation de *Prionchulus punctatus, Iotonchus trichurus* et *I. monhystera*, les quinze espèces nouvelles suivantes sont décrites, provenant de forêts ou de terrains cultivés. *Clarkus dorsalis* n. sp. est caractérisé par la présence d'appendices labiaux internes bifurqués, l'aplatissement de la partie antérieure de la dent dorsale, un important gonflement de la plaque stomatale basale dorsale, le faible développement des glandes caudales. *Clarkus ouinnensis* n. sp. est proche de *C. dorsalis* n. sp., mais est plus petit (L = 0,9-1,2 *vs* 1,6-2,1 mm), a un stoma plus court, et une queue relativement plus longue (c = 11-12 *vs* 16-19). Chez *Actus neocaledonensis* n. sp. chaque rangée sub-ventrale comporte quatre denticules; L = 1,5-1,5 mm; glandes caudales et ouverture du conduit obscurs. *Mylonchulus ciradi* n. sp. est prodelphe et se distingue de *M. index* par sa queue plus nettement conoïde. *Mylonchulus vasis* n. sp. se distingue par ses nombreux denticules, c' voisin de 1,5, V = 56-58, et l'absence de papilles vulvaires. *Mylonchylus paitensis* n. sp. est très proche de *M. sigmaturus*, mais la queue de la femelle n'est pas coudée du côté ventral. *Mylonchulus ananasi* n. sp. est plus grand que *M. contractus* et se sépare de *M. agriculturae* par le recouvrement normal de l'intestin par les gonades, la présence de dents subventrales et celle de mâles. *Cobbonchus couleensis* n. sp. a une queue plus courte que celle de *C. incultus*, est plus long que *C. dianae* mais possède moins de suppléments (6-8 *vs* 15). *Cobbonchus altitudinarum* n. sp. se sépare des autres espèces didelphes par l'absence de dépression ou repli sur la face ventrale de la queue de la femelle. *Cobbonchus dzumaci* n. sp. diffère de *C. abrupticaudatus* par certaines structures de l'ampoule des glandes caudales et du conduit. *Cobbonchus orstomi* n. sp. diffère de *C. dianae* par la présence sur la queue d'un procès digitiforme. *Iotonchus lacuplanarum* n. sp. est différent des autres espèces prodelphes par la position ventrale de l'ouverture du conduit de la glande caudale, la queue longue de 320 µm et le stoma mesurant 36 × 26 µm. *Iotonchus montanum* n. sp. se sépare de *I. indicus* par une longueur double, la présence d'une dent dorsale située près de la base de la plaque dorsale, l'absence de sphincter à la limite entre l'utérus et l'oviducte. *Iotonchus candelabri* n. sp. est plus petit que *I. montanum* et la queue du mâle comporte deux pores ventraux. *Iotonchus recessus* n. sp. est unique parmi les espèces prodelphes par la présence d'un sac postvulval long de 3,5 diamètres du corps.

Key-words : Mononchoidea, New Caledonia.

New Caledonia lies at 20-22 °S and the main island is 50 × 400 km, with a mountainous ridge, largely covered in rainforest, reaching 1600 m. Both the flora and fauna are of biogeographic importance (Radovsky *et al.*, 1984; Bauer, 1988), while the geological pattern is complex (Lillie & Brothers, 1970) with ultrabasic, lateritic, grey-

wacke, shales and schists being parent materials contributing to distinctive vegetation (Cherrier, 1984) and soil patterns (Podwojewski & Beaudou, 1987). Mining is the principal industry with commercial agriculture being generally restricted to the coastal fringe.

The records of *Heterodera* sp. on six New Caledonian crops given by Brun and Chazeau (1986) are assumed to refer to " *Heterodera marioni* " the complex now included in the root-knot nematodes, *Meloidogyne*. Andrássy's (1978) description of two new genera of Rhabditida from the territory was the first published specific record of nematodes and Germani (1990) described two new species from New Caledonia. The island was not included in the surveys of the south-west Pacific (Orton Williams, 1980). An account of the nematode fauna of Vanuatu (formerly New Hebrides) some 500 km to the north east was given by Yeates (1973*a*, *b*).

This first paper, in addition to describing Mononchoidea, gives methods and site details. This work aims to give information on the nematode fauna of New Caledonia, to contribute to biogeography, to signal possible nematode limitations to land use and quarantine problems (Bridge, 1988), and to supplement the meagre information on nematodes in tropical forests (Petersen, 1982; Kitazawa, 1971). The general taxonomic approach of Maggenti (1982) is followed.

Methods

Between 10 and 20 June 1988, 53 sites were sampled. Allowing for up to four depths of samples at each site a total of 101 litter, soil and plant samples were collected for nematode extractions. In forests, samples were collected under the canopy of named tree species. Nematodes were extracted by decanting and sieving through 710, 250, 106, and 2 × 45 µm sieves and cleaned by filtering through tissue; some samples were also extracted by Baermann funnel; total nematodes were counted before the samples were fixed by addition of boiling double-strength F.A.4:1. After returning to New Zealand, approximately 100 specimens from each sample were processed to glycerol by Seinhorst's glycerol-ethanol method and mounted for identification and enumeration; where necessary for taxonomic purposes addtitional material was mounted. Methods and abbreviations used are detailed in Southey (1986).

Twenty-three soil samples were extracted for cysts of Heteroderidae, using the conical flask method and sieves of 710 and 250 µm. Thirty-one root samples were stained with lactophenol cotton blue and examined for endoparasitic nematodes.

Sites

The following list arranges the 101 field samples by vegetation type and locality, and the distribution of the 30 localities is shown in Figure 1. The soil units are those used for the soil map of New Caledonia by Podwojewski and Beaudou (1987). For each sample nematode abundance /250 g soil is indicated; where duplicate samples were extracted and counted the second result is shown in brackets, and where Baermann funnel extracts were counted results are marked with a *. The mean wet weights of litter, humus and mineral soil actually extracted by decanting and sieving were 75, 187 and 384 g while an average of 53 g was used on funnels.

These sites may be divided into : *i)* natural forests, 14 localities, 41 samples (Nos. 1 to 14); *ii)* plantation forests, 6 localities, 18 samples (Nos. 15-20); *iii)* traditional agriculture, 1 locality, 2 samples (No. 21); *iv)* vegetable, cropping and experimental areas, 9 localities, 40 samples (Nos. 22 to 30). They are listed below :

1. *Araucaria columnaris* stand on coastal cliff at Baie des Tortues, Bourail; litter 12 500 */250 g, humus 283/250 g, 0-10 cm mineral soil 165/250 g; soil unit 1.
2. *Araucaria bernieri* tree in dense mixed tropical forest on steep slope on Montagne des Sources; 500 m above sea level (asl); litter 312/250 g, humus 128/250 g, 0-10 cm mineral soil 58/250 g; soil unit 8.
3. *Araucaria subulata* tree in *A. subulata* rainforest on gentle slope on ultrabasic rocks in Ouinne Valley;

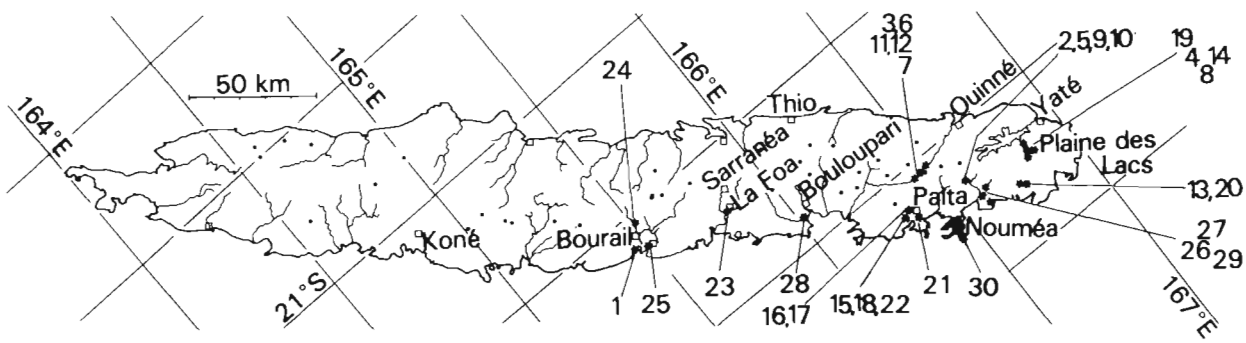

Fig. 1. Map of New Caledonia showing peaks over 1000 m (•), principal towns (□) and the 30 sampling localities.

750 m asl; litter 1320 (1135 *)/250 g, humus 1626/250 g, 0-15 cm mineral soil 451/250 g; soil unit 8.

4. An isolated *Agathis ovata* tree on flat site near turnoff to Chutes de la Madeleine, Plaine des Lacs; 200 m asl; litter 548 (560 *)/250 g, 0-5 cm mineral soil 390/250 g, 5-20 cm mineral soil 155/250 g; soil unit 8.
5. *Agathis ovata* tree in dense mixed tropical forest on moderate slope on ultrabasic rocks on Montagne des Sources; 500 m asl; litter 495/250 g, 15 cm root mat 77/250 g, 0-15 cm mineral soil 76/250 g; soil unit 8.
6. *Agathis lanceolata* tree in *Araucaria subulata* rainforest on gentle slope on ultrabasic rocks in Ouinne Valley; 750 m asl; litter 2205 */250 g, 18 cm root mat 444/250 g, 0-15 cm mineral soil 94/250 g; soil unit 8.
7. *Agathis ovata* in wood of " Kaoris de montagne " on slight slope on Mt Dzumac; 850 m asl; litter 1445 */250 g, 0-10 cm mineral soil 625/250 g and 10-20 cm mineral soil 50/250 g; also litter sample from amongst shrub vegetation some 20 m away from *Agathis* stand 265 */250 g; soil unit 8.
8. *Nothofagus aequilateralis* in a group of *Nothofagus* in mixed forest on flat site at the foot of Pic du Pin on Plaine des Lacs; 250 m asl; litter 745 (810 *)/250 g, humus 217 (1530 *)/250 g, 0-10 cm mineral soil 96/250 g and 10-20 cm mineral soil 37/250 g; soil unit 8.
9. *Nothofagus aequilateralis* between two 6 m high trees in dense mixed tropical forest on flat site on Montagne des Sources; 500 m asl; litter 1540 */250 g, humus 259/250 g, 0-10 cm mineral soil 37/250 g; soil unit 8.
10. *Nothofagus aequilateralis* between two 8 m high trees in dense mixed tropical forest on moderate slope about 1 km below saddle of Montagne des Sources; 500 m asl; litter 810 (1450 *)/250 g, humus 2455 (12 020 *)/250 g, 0-20 cm mineral soil 244/250 g; soil unit 8.
11. *Nothofagus codonandra* in a group of *Nothofagus* near *Strasburgeria* tree on Mt Dzumac road on a steep slope; 850 m asl; sampled the accumulation above a 25 m high tree with litter 934 (1345 *)/250 g, humus 281 (930 *)/250 g and 0-15 mineral soil amongst rocks 85/250 g; soil unit 8.
12. " Forêt à mousses " at the divide between east and west coasts on Mt Dzumac road; flora dominated by species of Myrtaceae (Cherrier, 1984); 1000-1100 m asl; litter 2095 */250 g, humus 338/250 g, 0-20 cm mineral soil 221/250 g; soil unit 8.
13. Dense broad-leaved undergrowth in native forest between two *Cerberiopsis candelabrum* trees 50 cm diameter and 8 m apart on rocky slope above road at Champ de bataille on Plaine des Lacs; 100 m asl; litter 590/250 g, 0-15 cm mineral soil 165/250 g; soil unit 8.
14. *Neocallitropsis pancheri* tree characteristic of shrub vegetation on flat to rolling topography at viewing area for Chutes de la Madeleine on Plaine des Lacs; 200 m asl; 0-10 cm mineral soil 61/250 g; soil unit 12.
15. *Araucaria columnaris* trees 30 m high on flat site at CIRARD experimental farm, Port Laguerre; 20-30 m asl; litter 9615/250 g, 0-20 cm mineral soil 357/250 g and 20-40 cm mineral soil 18/250 g; soil unit 15.
16. *Araucaria columnaris* trees 50 years old and 30 m high on flat site at Arboretum, Paita; 20 m asl; litter 2940/250 g, 0-15 cm mineral soil 455 (477)/250 g and 15-30 cm mineral soil 65 (63)/250 g; soil unit 11.
17. *Agathis moorei* trees 50 years old and 30 m high on flat site at Arboretum, Paita; 20 m asl; litter 1590/250 g, 0-15 cm mineral soil 132 (198)/250 g and 15-30 cm mineral soil 81 (65)/250 g; soil unit 11.
18. *Pinus caribaea* (introduced) grafted seed trees up to 8 m high in rough pasture on moderate slope at CIRAD experimental farm, Port Laguerre; 50 m asl; litter 370 (2345 *)/250 g, 0-20 cm mineral soil 75/250 g and 30-50 cm mineral soil 39/250 g; soil unit 2.
19. *Pinus caribaea* (introduced) trees some 20 years old and 8 m high with ferns etc. covering much of flat site near Chutes de la Madeleine; 200 m asl; litter 820 */250 g, 0-20 cm mineral soil 47/250 g and 20-40 cm mineral soil 6/250 g; soil unit 8.
20. *Pinus caribaea* (introduced) trees 20-25 years old and 8 m high with bracken and broad-leafed shrubs on flat site at Champs de bataille, Plaine des Lacs; 100 m asl; litter 565/250 g, 0-15 cm mineral soil 125/250 g and 15-30 cm mineral soil 18/250 g; soil unit 8.
21. Wallis Islanders' garden on recent alluvium at Paita which had been occupied for about 10 years; 10 m asl : *a)* 0-15 cm soil and roots from *Xanthosoma* sp. " tannia " (cf. the more aquatic form of " taro ", *Colocosia esculenta*) 136 (149)/250 g; *b)* 0-3 cm soil and roots from cooking banana, *Musa* sp. 368/250 g; soil unit 11.
22. CIRAD experimental farm, Port Laguerre; 20-30 m asl; generally soil unit 15 : *a)* five year old stand of *Digitaria pentzii* (" Pangola "); 0-15 cm soil 144 (154)/250 g; *b)* five year old stand of *Panicum* (" T58 ", large vigorous variety); 0-15 cm soil 158/250 g; *c)* five year old stand of *Panicum maximum* (Dumbea, guinee local); 0-15 cm soil 107/250 g; *d)* plot where *Stylosanthes* from Colombia failed and now in weeds and grasses; 0-15 cm soil

124/250 g; *e)* five year old stand of *Stylosanthes* guianensis (" Stylo Luzerne ", " Brésilienne "); 0-15 cm soil 239/250 g; *f)* cultivar trial of yam *Dioscorea* sp. (cultivars Ig 1.40A and Ig 1.74); 0-15 cm soil 75/250 g; *g)* trial of sweet potato *Ipomoea batatas* (cultivar 1-45); 0-15 cm soil 73/250 g; *h)* six year old banana (*Musa* sp.) plot recently abandoned; 0-15 cm soil 328/250 g; *i) Neonotonia wightii* (= *Glycine javanica*) plot; 0-15 cm soil 747/250 g; *j) Stylosanthes guianensis* plot; 0-15 cm soil 187/250 g; *k)* cultivar trial of pineapple *(Ananas comosus);* 0-15 cm soil 66/250 g; *l)* rice *(Oryza sativa)* field 2 weeds after harvest; 0-10 cm soil; soil unit 2 : 1469/250 g; *m)* 60-80 cm high tree of *Casuarina collina* growing in unsterilized soil mix in perforated plastic tube 6 × 20 cm 864/250 g; *n) Pinus caribaea* tree growing as for *m* 852/250 g; *o) Racosperma spirorbe* (= *Acacia spirorbis*) as for *m* 533/250 g.

23. Vegetable cropping areas in La Foa valley on recent alluvial soils; generally soil unit 16 : *a)* field in which potatoes *(Solanum tuberosum)* grown annually for about 20 years, sometimes with a second crop of another species; 5-15 cm soil 161/250 g; *b)* field in which potato *(Solanum tuberosum)* grown for 5-7 years, sometimes with cabbage; 5-15 cm soil 1246/250 g; *c)* from edge of canopy of lemon (*Citrus* sp.) trees about 15 years old; 0-15 cm soil 113/250 g; *d)* from edge of canopy of orange (*Citrus* sp.) trees about 7 years old; more grass than in c; 0-10 cm soil 505/250 g; *e)* cabbage (*Brassica* sp.) from area in vegetables for about 20 years; 0-15 cm soil 410/250 g; *f)* cucumber *(Cucumis sativus)* as for e, 2837/250 g; *g)* tomato *(Lycopersicon esculentem)* as for e, 715/250 g; *h)* young sweet potato *(Ipomoea batatas)* following cabbage; 0-10 cm soil 198/250 g; *i)* old pasture of " buffalo grass " *(Stenotaphrum secundatum)* c. 50 cm high 44/250 g.
24. Vegetable cropping areas in Bourail River valley on recent alluvial soils; about 10 m asl; soil unit 16 : *a)* land fallowed for 9 months after 10 years cropping but ploughed 2-4 weeks before sampling; 0-10 cm soil 704/250 g; *b)* recently prepared seedbed following potatoes; 0-10 cm soil 1772/250 g.
25. CREA experimental farm, Bourail which had run since 1967; samples from toeslope 2-4 m asl; soil unit 18 : *a) Panicum* pasture, never cropped; 0-10 cm soil 299/250 g; *b) Panicum* pasture, wet and puggy; 0-10 cm 83/250 g; *c)* area cropped for several years but now in " weeds " including *Portulaca, Sonchus, Sorghum, Eleusine, Echinochloa, Brachiaria;* 0-10 cm soil 2159/250 g.
26. Vegetable growing area at La Coulee (confluence of La Coulee and Lembi Rivers); flat site on recent alluvium; about 10 m asl; soil unit 12 : *a)* banana (*Musa* sp.) second planting on same site; 0-15 cm soil 100/250 g and 15-30 cm soil 3072/250 g; *b)* area in carrots *(Daucus carota)* but to be planted in bananas; 0-15 cm soil 373/250 g and 15-30 cm soil, 52/250 g.
27. Pineapple *(Ananas comosus)* growing area at La Coulee on gently sloping land surrounded by scrub and poor *Pinus caribaea;* — soil unit 5 : *a)* area in field with poor growth; 0-15 cm soil 189/250 g and 15-30 cm soil 75/250 g; *b)* area in field as *a)* but growth good; 0-15 cm soil 244/250 g; *c)* area in another field growing well after treatment with Nemacur; 0-15 cm soil 51/250 g.
28. Wheat *(Triticum aestivum)* field Ouenghen Valley in which 15 cm seedlings show burnt leaf tips; probably damage reflects soil reaction to applied urea; 0-12 cm soil 233/250 g; soil unit 19.
29. Tomato *(Lycopersicon esculentum)* growing area, Mt Dore; root-knotting marked although nematode (i.e. *Meloidogyne*) tolerant cultivars used; 0-15 cm soil 926/250 g; soil unit 8.
30. Ornamental grass *(Paspalum* sp.) lawn at ORSTOM, Noumea; on coral sand; 0-10 cm soil.

Type material

Slides bearing type material have been deposited in the following collections : National Nematode Collection of New Zealand, DSIR Plant Protection, Private Bag, Auckland, New Zealand (NNCNZ); Laboratoire des Vers, Muséum national d'Histoire naturelle, Paris, France (MNHN); and Nematode Collection, Department of Entomology and Nematology, Rothamsted Experimental Station, Harpenden, Herts, England (RES).

Prionchulus punctatus (Cobb, 1917) Andrássy, 1958

A single female was found at locality 12 (Mt Dzumac) which is similar to this species *sensu* Mulvey (1967) and indistinguishable from it as evaluated by Arpin *et al.* (1984). Its measurements are :

L = 1.93 mm; a = 29; b = 4.1; c = 14; c′ = 3.6; V = $^{15}63^{12}$; tail = 140 µm; stoma = 36 × 21 µm with dorsal tooth at 17 %; some fifteen denticles on ventromedian ridges. Width of lip region 29 (27-32) µm.

Clarkus dorsalis * n. sp.

(Figs 2 A-K, 3)

MEASUREMENTS

Females (pop. Port Laguerre; paratypes; n = 20) : L = 1.90 (1.60-2.13) mm (S.E.M. = 0.032 mm); a = 31.3 (28-33); b = 4.31 (3.8-5.2); c = 17.7 (16-19); c′ =

* The species name refers to the swelling on the basal dorsal plate of the stoma.

2.79 (2.5-3.2); V = $^{12.5(9-16)}59.4(57-61)^{10.9(10-14)}$; tail = 107 (95-125) µm; stoma 36.8 (35-39) × 21.9 (20-24) µm with dorsal tooth at 73 (68-78) %.

Juveniles, st. 2 (paratypes; n = 7) : L = 679 (565-810) µm; a = 24.8 (22-30); b = 3.38 (3.1-3.6); c = 14.0 (13-15); c′ = 2.42 (2.3-2.6); tail = 48 (40-55) µm; stoma = 20.1 (19-21) × 9.7 (9-10) µm with dorsal tooth at 79 (75-81) %.

Juveniles, st. 3 (paratypes; n = 7) : L = 1030 (850-1155) µm; a = 28.0 (26-29); b = 3.69 (3.3-3.8);

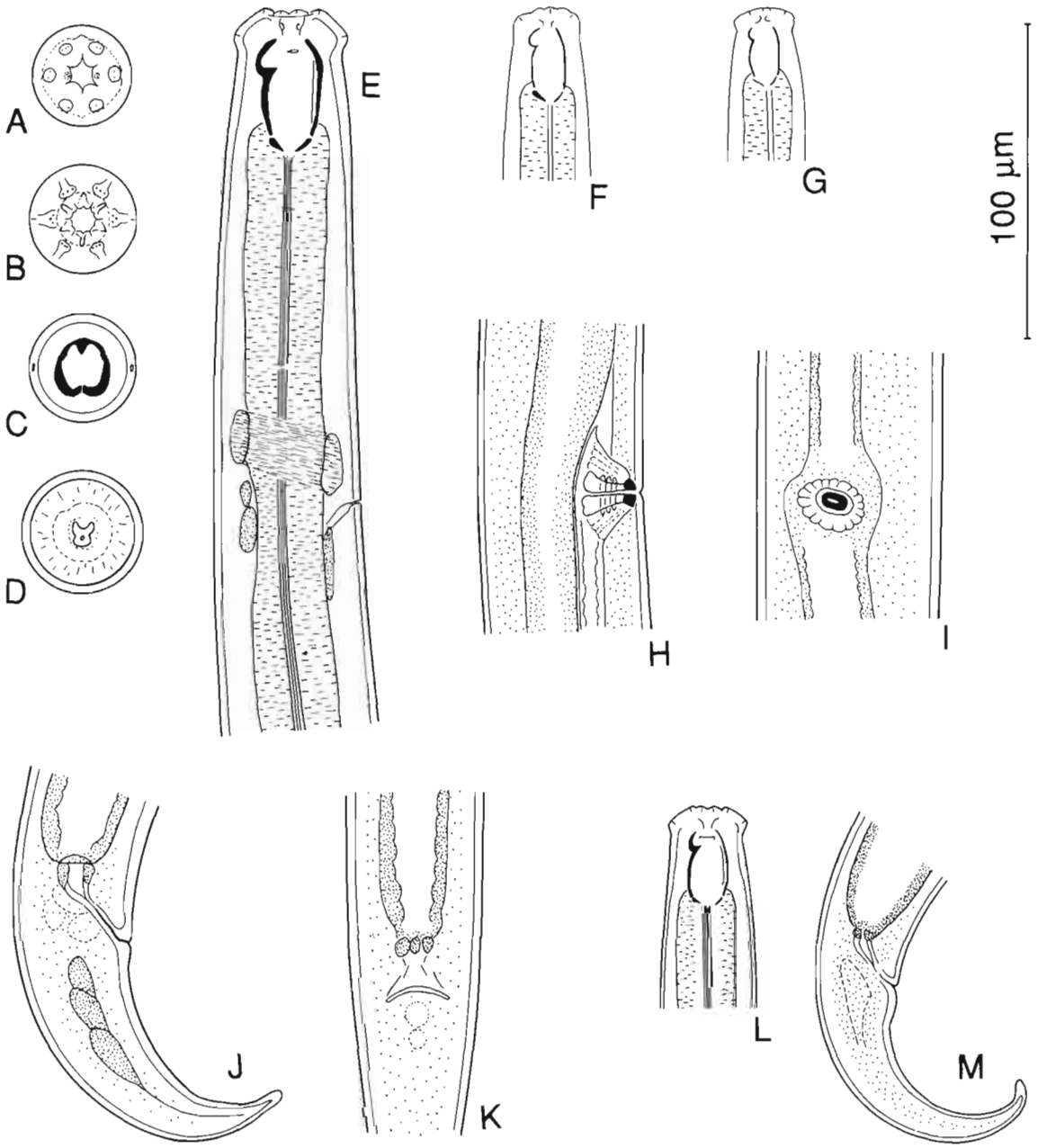

Fig. 2. *Clarkus dorsalis* n. sp. A-D : *En face* views; E : Stoma and anterior oesophagus; F : Stoma of 850 µm juvenile; G : Stoma of 570 µm juvenile; H : Lateral view of vulva; I : Ventral view of vulva; J : Lateral view of female tail; K : Ventral view of anal region. — *Clarkus ouinnensis* n. sp. L : Stoma region; M : Lateral view of female tail.

c = 16.6 (15-19); c′ = 2.47 (2.2-2.7); tail = 63 (54-77) µm; stoma = 24.7 (23-26) × 12.7 (12-13) µm with dorsal tooth at 79 (76-83) %.

Juveniles, st. 4 (paratypes; n = 18) : L = 1370 (1235-1575) µm; a = 31.3 (29-35); b = 3.92 (3.6-4.3); c = 16.2 (14-18); c′ = 2.79 (2.6-3.1); tail = 85 (76-96) µm; stoma = 29.7 (28-32) × 15.8 (14-18) µm with dorsal tooth at 76.6 (72-80) %.

Holotype (female) : L = 1.81 mm; a = 32; b = 4.3, c = 19; c′ = 2.5; V = $^{10}59^{11}$; tail = 95 µm; stoma = 35 × 23 µm with dorsal tooth at 71 %.

Females (pop. Paita; n = 5) : L = 1.86 (1.72-2.02) mm (S.E.M. = 0.067); a = 28.8 (26-31); b = 4.21 (4.0-4.6); c = 16.4 (14-18); c′ = 2.93 (2.7-3.1); V = $^{12.3(10-14)}59.4$ (57-61)$^{11.2(10-14)}$; tail = 114 (110-120) µm; stoma = 36 (35-37) × 21 (20-22) µm with dorsal tooth at 76.3 (74-78) %.

Female (pop. Mt Dzumac) : L = 1.86 mm; a = 28; b = 4.1; c = 14; c′ = 3.8; V = $^{10}58^{7}$; tail = 136 µm; stoma = 40 × 22 µm with dorsal tooth at 79 %.

Description

Female : Body gently curved ventrally when relaxed by gentle heat. Cuticle smooth (outer layers rather detached and loose in many of type series), inner cuticular layer finely annulated. Lip region 34 (32-36) µm wide, slightly wider than adjacent body which narrows in region of stoma; six lips visible in *en face* view but details of papillae obscure; liplets surrounding oral aperture each subdivided. Amphid aperture 4 (3.7-4.6) µm wide, about middle of anterior portion of stoma at level of base of lips. Stoma about one and a half times as long as wide tapering base; large dorsal tooth with apex at 68-78 % of stoma length; front edge of tooth about perpendicular to line of body; untoothed ventral ridge present; dorsal basal plate has a large swelling protruding into oesophageal tissue. In *en face* view the vertical plates show thickening along junctions anteriorly. Oesophagus cylindrical, surrounds basal plates of stoma and posterior of vertical plates; oesophago-intestinal junction non-tuberculate. Excretory pore opens ventrally just posterior to nerve ring; anterior portion of excretory system visible. Gonads paired, opposed and reflexed. No sphincter muscle detected at uterus/oviduct junction. Vulva opening a transverse slit, some 9 µm long in ventral view; not protuberant; vagina extends one third of way across body, with circular muscle bands; cuticularised pieces apparent in lateral view shown to be a single piece in ventral view. No body pores detected in vulval region. Cells of intestinal wall moderately pigmented; intestinal contents generally not distinct, but fungal spores present in some speciments. Prerectum not differentiated; rectum about as long as corresponding body width. Tail conoid, ventrally curved, two and a half to three anal body widths long. Anus a transverse slit about half as long as corresponding body width. Caudal gland cells apparently discernable; no caudal gland duct opening.

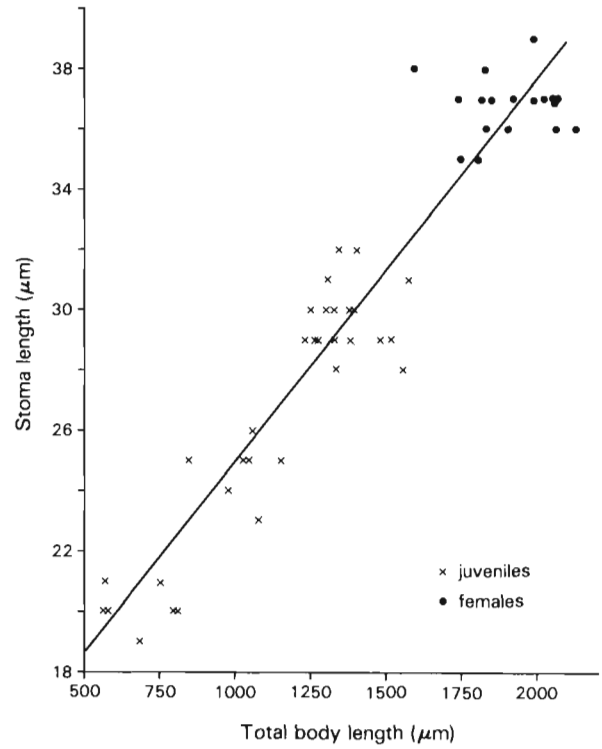

Fig. 3. Relationship between total body length and stoma length in female and juvenile specimens of *Clarkus dorsalis* n. sp. (the regression line is $y = 0.01267x + 12.27$ ($n = 50$) and $r = +0.9482$***).

Male : unknown.

Juveniles : Similar to female in general morphology. Thickening of dorsal basal plate of stoma not pronounced in smallest specimens found but distinct in next group.

Diagnosis and relationships

Inner liplets bifurcate. Stoma with ventral ridge; dorsal tooth at 68-78 % of stoma depth; anterior edge of dorsal tooth flat; stoma 35-39 × 20-24 µm. Excretory pore distinct. Vulva at 57-61 %; no vulval pores; female gonads paired without uterus/oviduct sphincter; vagina straight. Female tail conoid; 2.5-3.5 anal body widths long. Caudal glands moderately developed; no caudal gland duct opening. Male unknown.

C. dorsalis n. sp. is most similar to *C. sheri* (Mulvey, 1967) Jairajpuri, 1970 and *C. jugalis* (Coetzee, 1968) Jairajpuri, 1970 which themselves were differentiated in the description of *C. elongatus* Jairajpuri & Khan, 1977, but regarded as synonyms by Andrássy (1983). In

C. sheri the front of the dorsal tooth slopes anteriorly while in *C. dorsalis* it is flat; *C. sheri* lacks caudal glands and they are poorly developed in *C. dorsalis*. *C. jugalis* and *C. dorsalis* both have a flat anterior edge on the dorsal tooth and poorly developed caudal glands. However they are distinguished by *C. dorsalis* having a straight rather than curved vagina, lacking sphincter muscles at the junction of the uterus and oviduct, having a distinct excretory system and bifurcate rather than simple inner liplets.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes :* NNCNZ, MNHN, RES.

LOCALITIES

Type locality : 15, Port Laguerre. Other localities : 7, Mt Dzumac; 16, Paita; 18, Port Laguerre; 19, Chutes de la Madeleine.

REMARKS

The graph of stoma length against total body length (Fig. 3) shows clear separation of each of three juvenile stages and females. The increasing numbers recovered in successive stages (7, 7, 18, 20) indicates a maturing population and may explain the absence of stage 1 individuals.

The presence of a ventral ridge in the stoma is a " key character " in *Clarkus*, and other Mononchoidea, its appearance being due to the junction of the two subventral plates of the stoma (Fig. 2 E; see also Figs 4 C, 5 E, 8 D, 11 D).

Clarkus ouinnensis * n. sp.

(Fig. 2 L, M; Table 1)

MEASUREMENTS

Females (pop. Ouinne Valley; n = 5) : L = 1.04 (0.96-1.08) mm (S.E.M. = 0.022); a = 24.1 (22-26); b = 3.48 (3.3-3.6); c = 11.3 (10-12); c' = 3.38 (3.2-3.5); V = $^{13.4(11-17)}64.7\ (63-65)^{13.9(13-15)}$; tail = 93 (86-95) µm; stoma = 26 (25-28) × 14 (13-14) µm with dorsal tooth at 76 (73-78) %.

Females (pop. Mt Dzumac; n = 4) : L = 1.11 (1.08-1.15) mm (S.E.M. = 0.017); a = 26.5 (24-29); b = 3.73 (3.6-3.9); c = 11.6 (11-12); c' = 3.40 (3.2-3.5); V = $^{14.5(12-15)}62.9\ (62-64)^{15.5(12-16)}$; tail = 96 (94-100) µm; stoma = 27 (26-28) × 14 (14-15) µm with dorsal tooth at 76 (75-79) %.

Holotype (female) : L = 1.07 mm; a = 25; b = 3.5; c = 12; c' = 3.4; V = $^{13}65^{15}$; tail = 92 µm; stoma = 25 × 14 µm with dorsal tooth at 76 %.

DESCRIPTION

Female : Body gently curved ventrally, particularly posterior to gonads, when relaxed by gentle heat. Cuticle smooth, inner cuticle layer finely annulated. Lip region 24 (23-25) µm wide, slightly wider than adjacent body which narrows in region of stoma. Amphid aperture relatively broad, well forward in relation to stoma, about base of lip region. Stoma almost twice as long as wide with tapering base; large dorsal tooth with apex at 73-78 % of stoma length; anterior edge of tooth perpendicular to body axis; dorsal basal plate sometimes with marked swelling. Oesophagus cylindrical, surrounds basal plates of stoma and posterior of vertical plates; oesophago-intestinal junction non-tuberculate. Excretory pore opens ventrally just posterior to nerve ring. Gonads paired, opposed, reflexed. Many of type specimens gravid. No sphincter muscle observed at uterus/oviduct junction. Vulval lips not protuberant; no body pores in vulval region; vulva extends about one-third of way across body; muscle bands and cuticularised pieces similar to those in *C. dorsalis* n. sp. Cells of intestinal wall moderately pigmented; intestinal lumen commonly contains remains of nematode prey and (?) diatoms. Prerectum not differentiated; rectum about an anal body width long. Tail conoid, ventrally curved, three to three and a half anal body widths long. No caudal glands, caudal gland duct opening or caudal pores detected.

Male : Unknown.

Juveniles : Similar to female in general morphology.

DIAGNOSIS AND RELATIONSHIPS

Female length 0.95-1.15 mm. Stoma with ventral ridge; dorsal tooth at 73-79 % of stoma depth; anterior edge of dorsal tooth flat; stoma 25-28 × 13-15 µm. Excretory pore distinct. Vulva at 63-65 %; no vulval pores; female gonads paired, without uterus/oviduct sphincter. Female tail conoid; 3-3.5 anal body widths long; c = 11-12. Caudal glands, gland duct opening not detected. Male unknown.

C. ouinnensis n. sp. is closest to *C. dorsalis* n. sp. but differs from it and the other species in the "*sheri* "group in being shorter, having a shorter stoma and a relatively longer tail (c value low); details are given in Table 1.

C. papillatus (Bastian, 1865) *sensu* Andrássy (1983) embraces a range of morphology and tooth position. As *C. ouinnensis* n. sp. can be distinguished from the population containing the neotype of *Mononchus papillatus*, is tropical rather than temperate in occurrence, it is considered to represent a distinct form.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes :* NNCNZ, MNHN.

* The specific epithet refers to the type locality, the Ouinne Valley.

Table 1. Morphometrics of females of *Clarkus ouinnensis* n. sp. and other members of the " *sheri* group " of the genus *Clarkus*

Species	L (mm)	Stoma length (µm)	c
C. ouinnensis n. sp.	0.9-1.2	25-28	11-12
C. sheri (Mulvey, 1967) Jairajpuri, 1970	1.6-2.1	32-38	16-21
C. jugalis (Coetzee, 1968) Jairajpuri, 1970	1.5-1.9	41	14-19
C. elongatus Jairajpuri & Khan 1977	2.2-2.5	45-48	15-18
C. dorsalis n. sp.	1.6-2.1	35-39	16-19

LOCALITIES

Type locality : 3, Ouinne Valley. Other locality : 7, Mt Dzumac.

Actus neocaledonensis n. sp.
(Fig. 4 A-I. Table 2)

MEASUREMENTS

Females (pop. Port Laguerre; paratypes; n = 20) : L = 1.33 (1.21-1.47) mm (S.E. ± 0.017); a = 27.5 (24-31); b = 3.65 (3.5-3.9); c = 20.3 (19-25); c' = 2.22 (1.8-2.6); V = $^{10.7(7-19)}61.8$ (60-63)$^{9.4(5-14)}$; stoma 33 (31-36) × 19 (18-21) µm; dorsal tooth at 62 (56-64) %; tail = 66 (56-72) µm.

Females (pop. La Foa; paratypes; n = 8) : L = 1.35 (1.08-1.45) mm (S.E. ± 0.045); a = 28.9 (26-31); b = 3.72 (3.4-3.9); c = 20.8 (20-22); c' = 2.29 (2.0-2.5); $V^{8.0(7-9)}$ 60.6 (58-62)$^{7.7(6-9)}$; stoma 34 (32-36) × 20 (19-22) µm; dorsal tooth at 64 (61-69) %; tail = 65 (54-72) µm.

Holotype (female) : L = 1.40 mm; a = 30; b = 3.9; c = 19; c' = 2.6; V = $^{17}61^{14}$; tail = 70 µm.

DESCRIPTION

Female : Body gently curved ventrally, particularly posterior to vulva, when relaxed by gentle heat. Cuticle smooth. Lip region 29 (27-32) µm wide, slightly wider than adjacent body which narrows in region of stoma; six prominent lips and six liplets covering stoma visible in *en face* view. Amphid aperture and pouch small, located about base of lips near anterior of stoma. Stoma about twice as long as wide with tapering base; large dorsal tooth with apex at 55-70 % of stoma length; two subventral rows of four denticles. In *en face* view plates of stoma show thickening along junctions anteriorly; junctions obscure more posteriorly. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate. Excretory system not observed. Gonads paired, opposed and reflexed with tip of ovaries often within a body-width of vulva. Vulva a transverse slit in ventral view and flush with body. No pores observed in vulval region. Intestine darkly coloured, with distinct remains of prey. Prerectum not distinct. Rectum less than an anal-body-width long; anal aperture a broad slit in ventral view. Tail elongate conoid, evenly curved ventrally, about two anal-body-widths long; slight depression dorsally near terminus, no distinct caudal pores. Caudal glands moderately developed; caudal gland duct opening terminal, obscure.

Male : Unknown.

Juveniles : Similar to female in general morphology; intestine often with remains of prey. Dimensions of stages given in Table 2. In stage 1 the subventral denticles are not present. Tail similar to that of female.

DIAGNOSIS AND RELATIONSHIPS

Female length 1.1-1.5 mm. Stoma 31-36 × 18-22 µm; four denticles in each subventral row; dorsal tooth at 56-69 % of stoma depth. Vulva at 58-63 %; gonads paired; no vulval pores. Tail conoid; two anal body widths long; slight depression dorsally near terminus. Caudal glands moderately developed; caudal gland duct opening terminal. Male unknown.

The presence of four denticles in each subventral row distinguishes *A. neocaledonensis* n. sp. from *A. minutus* (Mulvey, 1963) Baqri & Jairajpuri, 1974 which is also smaller (L = 0.83-0.85 mm). *A. neocaledonensis* n. sp. is close to *A. salvadoricus* Baqri & Jairajpuri, 1974 but females have a more obscure caudal gland duct opening, the denticles lie more posteriorly and are larger both in body dimensions and stoma size, which is more conservative.

The amphid aperture in *A. neocaledonensis* n. sp. is near the base of the lips while in *A. minutus* it is at the level of the dorsal tooth apex and in *A. salvadoricus* it is midway between the anterior of the stoma and the dorsal tooth apex.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes :* NNCNZ, MNHN, RES.

LOCALITIES

Type locality : 22e, Port Laguerre. Other localities 22 a, b, j, 23 g, h, La Foa.

REMARKS

Actus minutus was described from Micronesia, *A. salvadoricus* from El Salvador and the genus was recorded from the Krakatau Archipelago by Suatmadji *et al.* (1988). Thus all records for the genus are in the tropics. The absence of subventral denticles in the first stage of *A. neocaledonensis* n. sp. while remarkable is not a unique departure from the normal pattern. Changing patterns have been described in *Anatonchus tridentatus*,

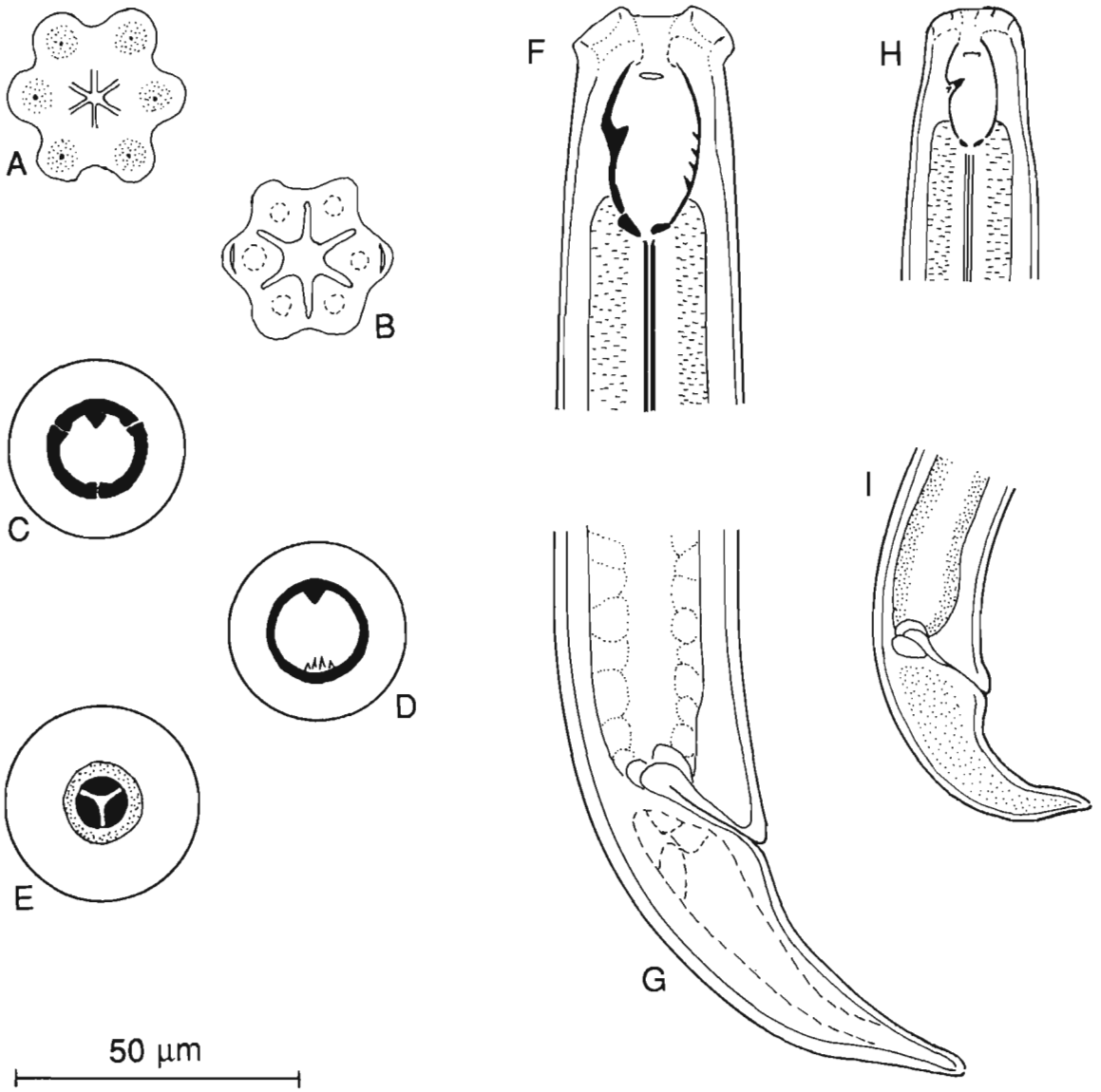

Fig. 4. *Actus neocaledonensis* n. sp. A-E : *En face* views; F : Stoma region of female; G : Lateral view of female tail; H : Stoma region of juvenile; J : Lateral view of juvenile tail.

A. dolichurus, A. amiciae and *A. killicki* (Mulvey, 1961*a*; Clark, 1963; Coomans & Lima, 1963).

Mylonchulus ciradi * **n. sp.**

(Fig. 5 A-C, 6 C)

MEASUREMENTS

Females (pop. Port Laguerre; paratypes; n = 8) : L = 1.00 (0.93-1.08) mm (S.E. = 0.018); a = 34.3 (29-39); b = 3.17 (3.0-3.3); c = 21.9 (20-23); c′ = 1.93 (1.7-2.1); V = $^{15.3(10-17)}$73.8 (72-76); stoma = 18 (17-20) × 11 (11-12) µm; dorsal tooth at 85 (81-91) %; tail = 46 (43-48) µm.

Holotype (female) : L = 1.06 mm; a = 36; b = 3.3; c = 20; c′ = 2.1; V = ^{16}73; tail = 53 µm.

DESCRIPTION

Female : Body gently curved ventrally, particularly

* The specific epithet refers to CIRAD who run the experimental station at Port Laguerre.

Table 2. Measurements of 44 juvenile *Actus neocaledonensis* n. sp.

Stage	n	L (µm)	a	b	c	c′	Tail (µm)	Stoma length (µm)	Stoma width (µm)	Location of dorsal tooth (%)	Subventral denticles
St. 1	10	588 (520-640)	24.1 (21-28)	2.99 (2.8-3.2)	15.7 (15-17)	2.03 (1.7-2.2)	37 (34-41)	18.4 (17-20)	9.2 (9-10)	67 (60-74)	absent
St. 2	6	792 (750-870)	26.3 (25-27)	3.21 (3.1-3.3)	18.2 (17-20)	1.99 (1.9-2.3)	44 (38-46)	22.0 (21-23)	11.8 (11-12)	71 (68-73)	present
St. 3	9	949 (910-985)	28.5 (25-30)	3.35 (3.2-3.4)	19.0 (17-22)	2.09 (1.7-2.4)	50 (42-60)	27.0 (25-28)	15.8 (15-17)	64 (61-68)	present
St. 4	19	1079 (1020-1180)	27.7 (24-29)	3.47 (3.4-3.6)	18.6 (17-21)	2.28 (1.9-2.5)	58 (54-66)	27.4 (24-29)	15.4 (12-17)	65 (63-67)	present

from anterior of gonad, when relaxed by gentle heat. Cuticle smooth. Lip region 18 (17-19) µm wide, slightly wider than adjacent body which narrows in region of stoma. Amphid aperture small. Stoma almost twice as long as wide with tapering base; massive dorsal tooth with apex well forward in stoma; denticles in two distinct transverse rows together with a median band which may be resolved into two or three rows; no denticles detected in posterior of stoma. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate. Gonad prodelphic and reflexed; no post-vulval sac present; no pores in vulval region. Intestine lightly coloured, without obvious remains of prey. Prerectum not distinct. Rectum about an anal-body-width long. Dorsal side of tail curved ventrally then dorsally to produce digitiform terminus with prominent terminal caudal gland duct. Caudal glands present; prominent transverse muscle bands in anterior portion of tail.

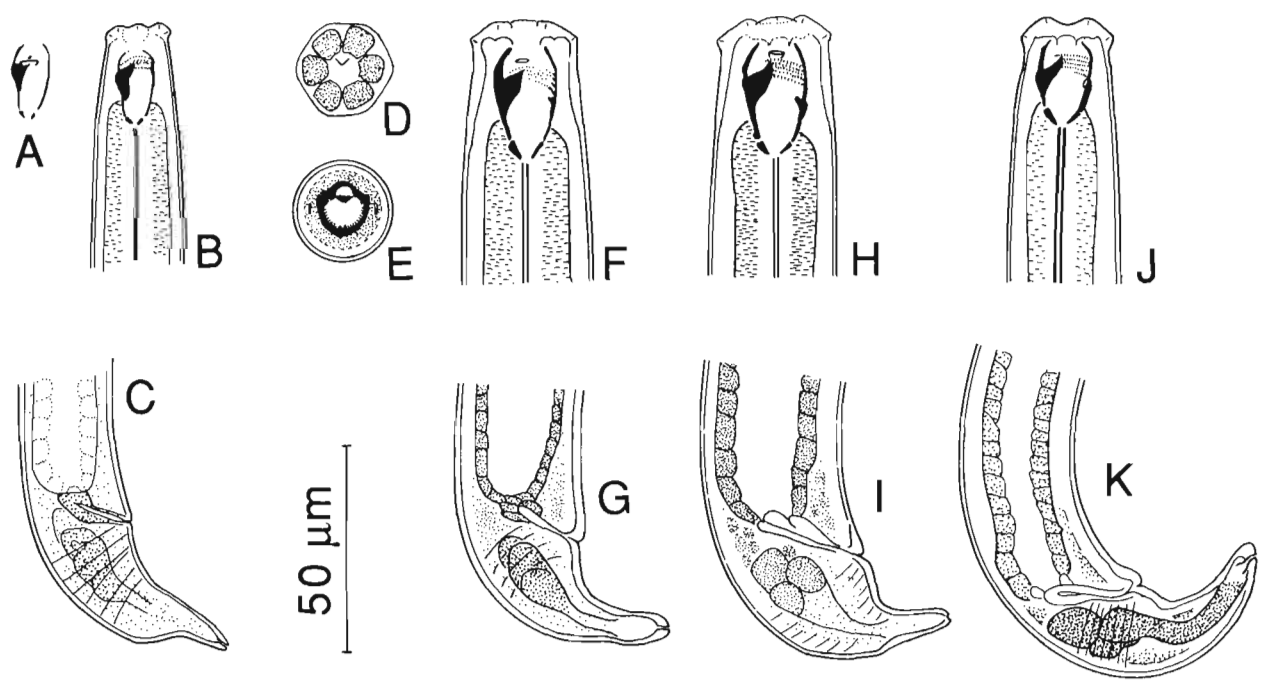

Fig. 5. *Mylonchulus ciradi* n. sp. A : Stoma with amphid; B : Stoma region of female; C : Lateral view of female tail. — *Mylonchulus vasis* n. sp. D-E : *En face* views; F : Stoma region of female; G : Lateral view of female tail. — H-I : *Mylonchulus paitensis* n. sp. H : Stoma region of female; I : Lateral view of female tail. — *Mylonchulus ananasi* n. sp.; J : Stoma region of female; K : Lateral view of female tail.

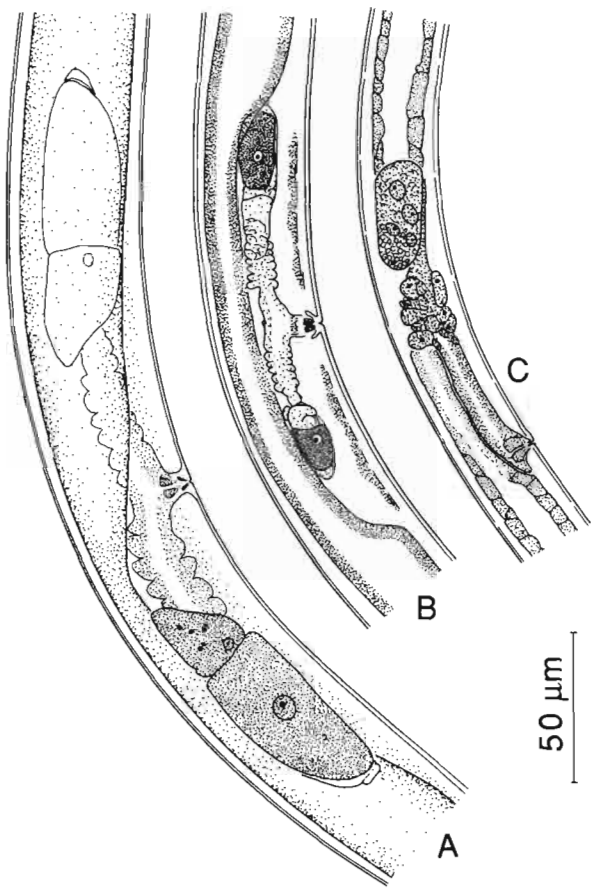

Fig. 6. — A : *Mylonchulus paitensis* n. sp. female genital region. — B : *Mylonchulus ananasi* n. sp. female genital region. — C : *Mylonchulus ciradi* n. sp. female genital region.

Male : Unknown.

Juveniles : Similar to female in general morphology; denticles in stoma less numerous than in female.

DIAGNOSIS AND RELATIONSHIPS

Denticles in stoma in two rows plus band; no distinct subventral teeth. Prodelphic; no post-vulval sac; no vulval pores. Female tail with digitiform terminus. Caudal gland duct opens terminally. Male unknown.

M. ciradi n. sp. comes closest to *M. index* (Cobb, 1906) [*nec sensu* Mulvey (1961*b*) who included what is now *M. californicus* Jairajpuri, 1970]. In *M. index* the tail is hemispherical with a ventrally directed digitiform projection while in *M. ciradi* n. sp. the tail is more conoid; *M. ciradi* n. sp. is apparently longer (L = 0.9-1.1 mm) than *M. index* (L = 0.6-0.8 mm). In both *M. mulveyi* Jairajpuri, 1970 and *M. mashhoodi* Khan & Jairajpuri, 1979 the tail is more conoid that in *M. ciradi* n. sp., in addition, *M. mulveyi* has a narrower stoma (6-9 µm) than *M. ciradi*, while in *M. mashhoodi* the doral tooth apex is at 69-80 % and the tail is 32-42 µm long.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes :* NNCNZ, MNHN.

LOCALITY

Type locality : 22 a, Port Laguerre. Other locality : 22 b, Port Laguerre.

REMARKS

The separation of prodelphic species of *Mylonchulus* which lack submedian teeth into *Paramylonchulus* Jairajpuri & Khan, 1982 is not accepted.

Mylonchulus vasis * n. sp.
(Figs 5 D-G, 7)

MEASUREMENTS

Females (pop. Port Laguerre; paratypes; n = 22) : L = 1.06 (0.94-1.28) mm (S.E. ± 0.020); a = 27.3 (25-31); b = 3.37 (3.2-3.6); c = 26.1 (24-29); c′ = 1.52 (1.3-1.8); V = $^{10.5(8-14)}57.4\ (56-58)^{10.0(7-14)}$; stoma 24 (21-28) × 15 (12-17) µm; dorsal tooth at 75 (67-81) %; tail = 39 (33-45) µm.

Holotype (female) : L = 1.16 mm; a = 28; b = 3.4; c = 27; c′ = 1.5; V = $^{10}58^{10}$; tail = 43 µm.

DESCRIPTION

Female : Body gently curved ventrally, particularly in posterior half of body, when relaxed by gentle heat. Cuticle smooth. Lip region 24 (22-26) µm wide, slightly wider than adjacent body which narrows in region of stoma. *En face* view shows six prominent lips, a hexaradiate oral aperture, thickened dorsal stoma plate, rows of small teeth and a larger denticle on each subventral stoma plate. Amphid aperture and pouch small, located just anterior to armature of stoma. Stoma about one and a half time as long as wide with tapering base; large dorsal tooth with apex about 75 % of stoma length; denticles on subventral walls with distinct anterior row and perhaps three less regular arrays; a pair of subventral teeth opposite base of dorsal tooth. Oesophagus cylindrical, surrounds base of stoma; ventral pore just posterior to nerve ring; oesophago-intestinal junction non-tuberculate. Gonads paired, opposed and reflexed, usually to within a body width of vulva. Vulva not protuberant; vulva a pore-like transverse slit, some 5 µm long, in ventral view; no ventral pores observed. Intestine moderately coloured; some individuals with obvious remains of prey. Prerectum not distinct; rectum less than one anal-body-width long. Tail strongly but evenly

* The specific epithet refers to the recovery of type material from pots of soil.

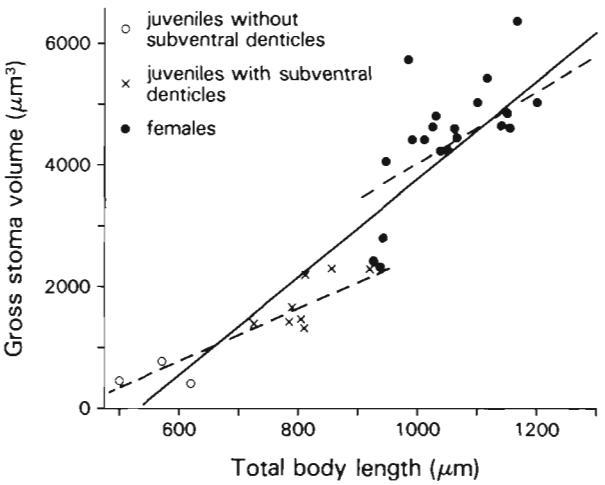

Fig. 7. Relationship between total body length and gross stoma volume in female and juvenile specimens of *Mylonchulus vasis* n. sp. (the regression lines are overall : $y = 8.094\,x - 4323$ $(n = 33)$ and $r = +0.8933$***; juveniles : $y = 4.359\,x - 1832$ $(n = 11)$ and $r = +0.89$***; females : $y = 5.896\,x - 1837$ $(n = 22)$ and $r = +0.5757$†).

curved ventrally and about one and a half anal-body-widths long; several distinct bands of transverse muscles; caudal glands well-developed; caudal gland duct opening essentially terminal. In ventral view anus a transverse slit about half of corresponding body width.

Male : Unknown.

Juveniles : Similar to female in general morphology. In small specimens the pair of subventral denticles was not observed, but material is inadequate to confirm this is characteristic of the first stage. One larger specimen contains prey remains in the intestine.

DIAGNOSIS AND RELATIONSHIPS

Denticles in stoma roughly in rows; a pair of subventral teeth. Didelphic; vulva at 56-58 %; no vulval pores. Female tail strongly curved ventrally; 1.5 anal body widths long. Caudal gland duct opening essentially terminal. Male unknown.

M. vasis n. sp. is closest to *M. apapillatus* Khan & Jairajpuri, 1979, and *M. dentatus* Jairajpuri, 1970. *M. apapillatus* differs from *M. vasis* in having very numerous denticles, c′ ≈ 2, and a more posterior vulva (V = 59-65 %). *M. dentatus* has vulval papillae, a less curved tail and numerous denticles in the stoma.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes :* NNCNZ, MNHN, RES.

LOCALITIES

Type locality : 22 m, Port Laguerre.

REMARKS

While stoma length was used in Fig. 3 for *C. dorsalis*, with the more complex dentition in *M. vasis* n. sp. it is considered that, by including stoma diameter, stoma volume represents a more biologically meaningful measurement. The differing relationship between stoma volume and body lengths for juveniles and females (Fig. 7) suggests there may be a step function in feeding habits or requirements at maturation.

Mylonchulus paitensis * n. sp.
(Fig. 5 H, I, 6 A)

MEASUREMENTS

Females (pop. Paita; paratypes; n = 7) : L = 1.38 (1.28-1.45) mm (S.E. ± 0.021); a = 31.4 (28-33); b = 3.43 (3.3-3.6); c = 34.0 (32-41); c′ = 1.28 (1.2-1.4); V = $^{11.4(10-13)}65.0\,(63-67)^{10.4(9-13)}$; stoma = 28.4 (28-29) × 17.3 (17-18) μm; dorsal tooth at 81 (78-84) %; tail = 41 (34-44) μm.

Holotype (female) : L = 1.38 mm; a = 31; b = 3.4; c = 32; c′ = 1.2; V = $^{12}65^{9}$; tail = 43 μm.

DESCRIPTION

Female : Body gently curved ventrally, particularly from anterior of gonads, when relaxed by gentle heat. Cuticle smooth; inner cuticular layer with fine annulation. Lip region 28 (25-29) μm wide, slightly wider than adjacent body which narrows in region of stoma. Amphid aperture of moderate width, at about level of apex of dorsal tooth. Stoma about one and a half times as long as wide, with tapering base; large dorsal tooth at about 80 % of stoma depth; small denticles in subventral sections in perhaps five rows; two larger, prominent subventral denticles. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate; cardia projecting into intestinal lumen. Excretory system not observed. Gonads paired, opposed and reflexed with tip of germinal zone often within a body width of, or past, vulva, but more distant when large oocytes present; vulva not protruding, with typical muscle bands; no vulval pores observed. Intestinal cells moderately coloured; intestine often with distinct remains of prey. No prerectum observed. Rectum less than an anal-body-width long. Tail up to one and a half anal-body-widths long, strongly conoid, curved ventrally with almost straight digitiform projection; anterior portion with transverse bands; ventral side not at all curved dorsally. Caudal glands moderately developed; caudal gland duct opening prominent, terminal.

* The specific epithet refers to the type locality.

Male : Unknown.

Juveniles : Similar to female in general morphology. The smallest and largest of seven juveniles from the type locality had the following dimensions : L = 0.61 mm; a = 23; b = 2.8; c = 24; c′ = 1.2; L = 1.19 mm; a = 31; b = 3.4; c = 33; c′ = 1.2.

DIAGNOSIS AND RELATIONSHIPS

Stoma denticles in perhaps five rows; two prominent subventral denticles. Didelphic; vulva at 63-67 %, no vulval pores. Female tail strongly conoid; almost straight digitiform projection; ventral side not at all curved dorsally. Caudal gland duct opening terminal. Male unknown.

M. paitensis n. sp. is closest to *M. sigmaturus* (Cobb, 1917) Altherr, 1953 but is distinguished from it by the absence of any dorsal curvature on the ventral side of the female tail; the curvature in the tail of *M. sigmaturus* is clearly illustrated by Mulvey (1961*b*) and Coetzee (1966). In the original description *M. incurvus* Cobb, 1917 has a similar length (1.4 mm) to *M. paitensis* n. sp. but a larger stoma (37 × 22 µm) and the oesophago-intestinal junction is described as flattish in *M. incurvus* whereas in *M. paitensis* n. sp. it clearly projects into the intestinal lumen.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes :* NNCNZ, MNHN.

LOCALITY

Type locality : 21 a, Paita.

*Mylonchulus ananasi** n. sp.
(Fig. 5 J, K, 6 B)

MEASUREMENTS

Females (pop. Port Laguerre; paratypes; n = 2) : L = 1.00, 1.10 mm; a = 31, 31; b = 3.3, 3.3; c = 26, 27; c′ = 1.7, 1.4; V = $^{7}58^{7}$, $^{6}58^{6}$; stoma 14 × 22, 14 × 23 µm; tail = 38, 41 µm.

Holotype (female) : L = 1.07 mm; a = 30; b = 3.4; c = 24; c′ = 1.6; V = $^{8}56^{5}$; stoma 13 × 24 µm; tail = 44 µm.

DESCRIPTION

Female : Body typically curved ventrally in fixed material. Cuticle smooth : inner cuticular layer with fine transverse striae. Lip region 22 (21-23) µm wide, slightly wider than adjacent body which narrows in region of stoma; lip region apparently typical. Amphid aperture not detected. Stoma almost twice as long as wide with tapering base; large dorsal tooth with apex at about 75 % of stoma length; five transverse rows of small denticles; no prominent subventral teeth observed but rather subventral pads just posterior to denticles. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate with cardia projecting into intestinal lumen. Excretory system not observed. Gonads paired, opposed, reflexed with intestine generally dorsal rather than lateral to them. No pores observed in vulval region. Intestine moderately coloured; no discrete prey remains observed; prerectum not distinct. Rectum less than an anal-body-width long. Tail about one and a half anal-body-widths long, conoid and fairly evenly curved ventrally; no distinct caudal pores; tip round with caudal gland duct opening dorsally; caudal glands well developed.

Male : Unknown.

Juvenile : Similar to female in general morphology. Caudal gland duct opening commonly opening more terminally than dorsally.

DIAGNOSIS AND RELATIONSHIPS

Stoma denticles in five rows; subventral pads posterior to denticles. Didelphic; no vulval pores. Intestine lies dorsal to female gonads. Tail conoid. Caudal gland duct opens dorsally. Male unknown.

M. ananasi n. sp. is close to *M. contractus* Jairajpuri, 1970 but that species has distinct submedian teeth. *M. agriculturae* Coetzee, 1966 is similar in size to *M. ananasi* n. sp. but has normal intestine overlap of gonads, has submedian teeth. Males are known for both *M. contractus* and *M. agriculturae.*

If the dorsal position of the intestine in relation to the gonads is not regarded as diagnostic *M. ananasi* n. sp. comes close to the New Zealand species *M. ubis* Clark, 1961 which has, *inter alia,* a more anterior tooth apex (79-86 %). *M. parabrachyuris* (Thorne, 1924) is a larger species (L = 1.5 mm) with a longer tail (61 µm) but a stoma of similar size to that of *M. ananasi* n. sp.

TYPE MATERIAL

Holotype and *Paratypes :* NNCNZ.

LOCALITY

Type locality : 22 k, Port Laguerre.

*Cobbonchus couleensis** n. sp.
(Fig. 8 A-G)

MEASUREMENTS

Females (pop. La Coulee; paratypes; n = 4) : L = 2.00 (1.94-2.40) mm (S.E. ± 0.034); a = 40.7 (40-42); b = 3.54 (3.5-3.6); c = 24.1 (23-25); c′ = 1.97 (1.8-2.1);

* The specific epithet refers to the crop at the type locality (*Ananas comosus,* pineapple).

* The specific epithet refers to the type locality, La Coulee.

V = $^{16.2(15-18)}$73.9 (72-75)$^{11.6(9-15)}$; stoma = 37 (35-38) × 21 (20-21) µm; dorsal tooth at 80 (77-84) %; submedian teeth at 51 (47-54) %; tail = 84 (77-90) µm.

Males (pop. La Coulee; paratypes; n = 12) : L = 2.12 (1.90-2.28) mm (S.E. ± 0.029); a = 46.5 (40-51); b = 3.62 (3.4-3.8); c = 25.3 (22-29); c′ = 1.97 (1.8-2.2); T = 34.4 (26-44) %; spicule chord = 50 (44-53) µm; supplements = 7.4 (6-8); stoma = 39 (38-40) × 21 (19-22) µm; dorsal tooth at 80 (77-84) %; submedian teeth at 50 (47-55) %; tail = 84 (75-89) µm.

Holotype (female) : L = 1.96 mm; a = 40; b = 3.5; c = 23; c′ = 2.0; V = ^{17}75^{12}; tail = 84 µm.

Allotype (male) : L = 2.02 mm; a = 46; b = 3.5; c = 23; c′ = 2.1; T = 31 %; tail = 89 µm; spicule chord = 52 µm; supplements = 8.

Description

Female : Body generally straight anterior to vulva then gently curved ventrally. Cuticle smooth; inner cuticular layer with fine annulations. Lip region 31 (30-32) µm wide, slightly wider than adjacent body which narrows in region of stoma. (*En face* view described below for male.) Broad amphid aperture located about base of lips, near level of dorsal tooth apex. Stoma almost twice as long as wide with tapering base; large dorsal tooth with apex at about 80 % of stoma length and two subventral teeth at about 50 % of stoma length. Oesophagus cylindrical, surrounds base of stoma, oesophago-intestinal junction non-tuberculate. Excretory system not observed. Anterior gonad well-developed, germinal zone reflexed; typically containing sperm. Posterior arm a well developed sac occupying full width of body; retains differentiation;

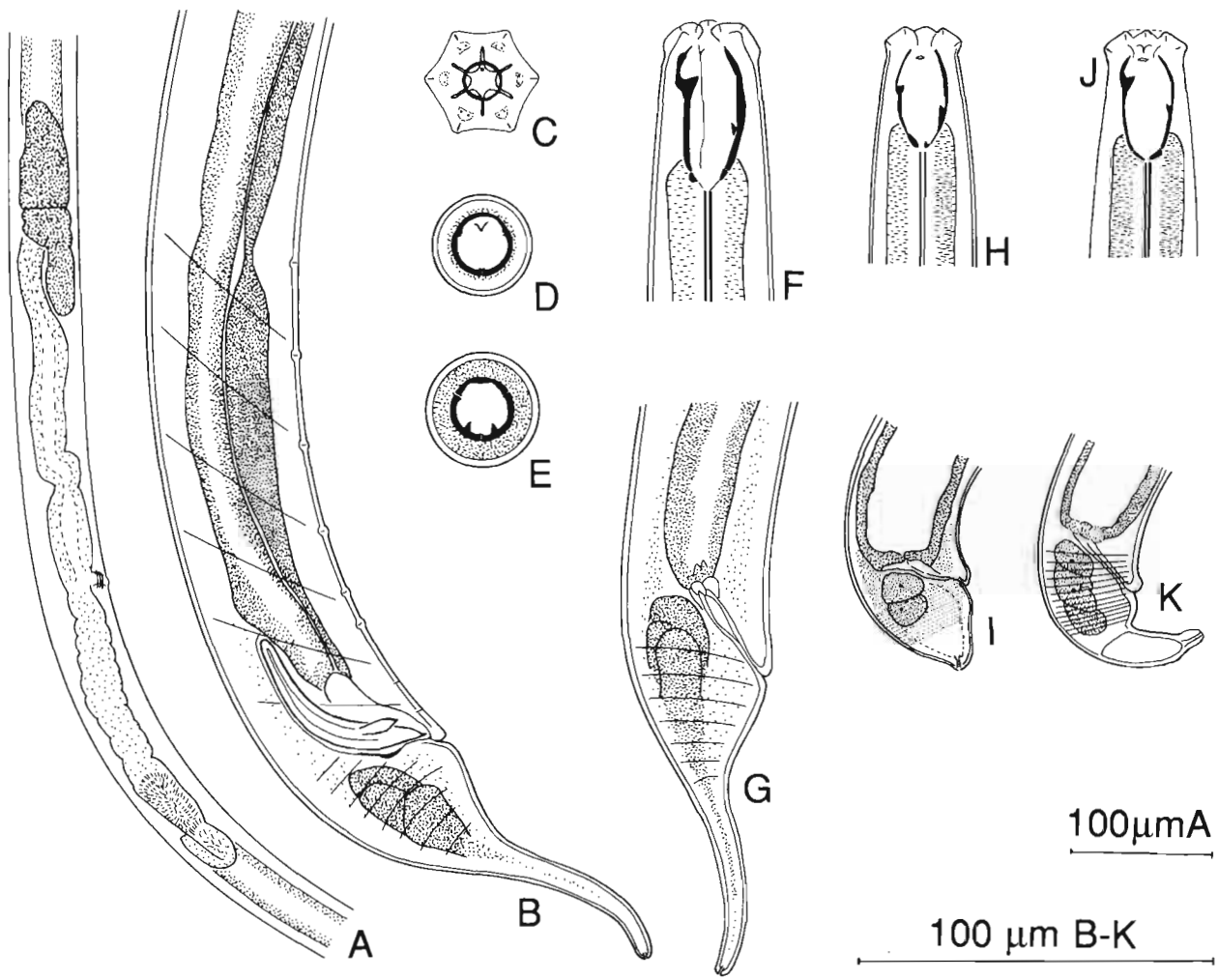

Fig. 8. — *Cobbonchus couleensis* n. sp. A : Female genital region; B : Male tail region; C-E : *En face* views; F : Stoma region of female; G : Lateral view of female tail. — *Cobbonchus altitudinarum* n. sp. H : Stoma region of female; I : Lateral view of female tail. — *Cobbonchus dzumaci* n. sp. J : Stoma region of female; K : Lateral view of female tail.

differentiation; tip generally reflexed, sometimes doubly; typically contains sperm. Vulva slightly protuberant; vagina well-developed with circular muscle served in vulval region. Cells of intestinal wall slightly pigmented; some intestinal contents deeply pigmented. Prerectum not distinct; rectum less than an anal-body-width long. Tail initially sharply conoid then with digitiform projection; distinct circular muscles in conoid portion; caudal glands well-developed; caudal gland duct opening terminal, obscure.

Male : Similar to female in general morphology. *En face* view shows six liplets surrounding oral aperture; prominent dorsal tooth in stoma and swollen plate joints anteriorly; subventral teeth and slightly swollen plate joints more posteriorly in stoma. Testes paired, opposed, outstretched; ejaculatory duct in supplement region. Spicules paired, arcuate; head without knob, pointed posteriorly; lateral guiding pieces not forked; gubernaculum simple. Ventromedian supplements 6-8, moderately developed and regularly spaced. Copulatory muscles distinct in region of supplements and prerectum. Distinct sphincter muscle around intestine and *vas deferens* at anterior of supplement range.

Juveniles : Similar to female in general morphology. All material examined (seven specimens : L = 0.79-1.74 mm) had similar pattern of teeth in stoma.

DIAGNOSIS AND RELATIONSHIPS

Length 1.9-2.3 mm. Stoma 35-40 × 19-22 µm; dorsal tooth at 67-84 % of stoma length; subventral teeth at 47-55 % of stoma length. Female prodelphic; post-vulval sac 9-15 % of body length. No vulval pores. Female tail 77-90 µm; sharply conoid then digitiform. Caudal gland duct opening terminal. Male with six to eight ventromedian supplements.

C. couleensis n. sp. is closest to *C. dianae* Coetzee, 1965, but that species is smaller (1.5-1.8 mm), has apices of teeth at 65 % and 45-50 % of stoma length, a less abruptly tapered tail, and fifteen supplements in the male.

TYPE MATERIAL

Holotype and *Allotype* : NNCNZ. *Paratypes* : NNCNZ, MNHN, RES.

LOCALITIES

Type locality : 27 c, La Coulee.

Cobbonchus altitudinarum* n. sp.
(Fig. 8 H, I, 9)

MEASUREMENTS

Females (pop. Montagne des Sources; *Nothofagus;* paratypes; n = 4) : L = 1.05 (0.98-1.08) mm (S.E. = 0.025); a = 29.5 (29-31); b = 3.40 (3.2-3.5); c = 55.2 (49-64); c′ = 0.68 (0.6-0.7); V = $^{9.2(8-11)}67.4$ $(66-68)^{11.4(10-12)}$; tail = 19 (17-22) µm; stoma = 29 (28-30) × 16 (15-16) µm; teeth at 12 (12) and 18 (17-18) µm from anterior.

Female (pop. Montagne des Sources; *Agathis;* paratype; n = 1) : L = 1.07 mm; a = 30; b = 3.5; c = 63; c′ = 0.5; V = $^{11}65^{9}$; tail = 17 µm.

Female (pop. Ouinne Valley; *Agathis;* paratype; n = 1) : L = 1.07 mm; a = 28; b = 3.3; c = 48; c′ = 0.7; V = $^{15}70^{9}$; tail = 22 µm.

Female (pop. Mt Dzumac; " forêt à mousses "; paratype; n = 1) : L = 1.26 mm; a = 31; b = 3.5; c = 57; c′ = 0.7; V = $^{10}67^{12}$; tail = 22 µm.

Female (pop. Mt Dzumac; *Nothofagus;* paratype; n = 1) : L = 1.23 mm; a = 34; b = 3.6; c = 72; c′ = 0.7; V = $^{11}67^{10}$; tail = 17 µm.

Holotype (female) : L = 1.07 mm; a = 29; b = 3.2; c = 54; c′ = 0.7; V = $^{11}68^{11}$; tail = 20 µm.

DESCRIPTION

Female : Body gently curved ventrally, particularly posterior to vulva, when relaxed by gently heat. Cuticle smooth. Lip region 23 (21-25) µm wide, slightly wider than adjacent body which narrows in region of stoma; lip region apparently typical. Amphid aperture small, located at base of lips well anterior to dorsal tooth. Stoma about twice as long as wide; dorsal tooth at about 60 % of length and a pair of smaller subventral teeth at about 40 %; a structure which may be a further tooth is sited

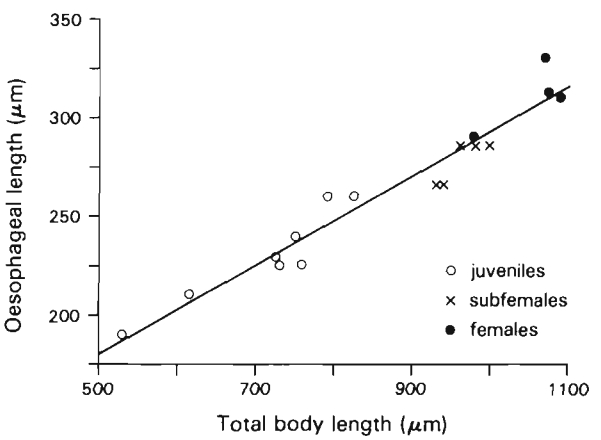

Fig. 9. Relationship between total body length and oesophageal length in female and juvenile specimens (stage 4 juveniles with well-developed genital primoridia and clear in area of future vagina are termed subfemales) of *Cobbonchus altitudinarum* n. sp. (the regression line is : $y = 0.227 x + 66.66$ $(n = 17)$ and $r = + 0.9731$***).

* The specific epithet refers to the fact all localities are more elevated, forest sites.

at the very posterior of the subventral stomal plates. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate with cardia projecting into lumen of intestine. Excretory system not observed. Gonads paired, opposed and reflexed. Vulval lips extend slightly beyond body contour. No vulval pores observed. Intestinal lumen distinct; prerectum not differentiated. Rectum very short. Tail conoid, less than an anal-body-width long; anterior half has faint transverse markings. Caudal gland duct opening is distinct and slightly dorsally directed; caudal glands apparently lie very close to rectum.

Male : Unknown.

Juveniles : Similar to female in general morphology. Size distribution is shown in Fig. 9 which shows the high overall correlation between body and oesophageal lengths. Dimensions of five stage 4 juveniles (= subfemales) from the type locality are : L = 0.96 (0.93-1.00) mm; a = 31.8 (29-37); b = 3.45 (3.4-3.5); c = 61.6 (52-71); c′ = 0.65 (0.6-0.7); tail = 16 (14-18) µm; stoma = 25 (24-25) × 12 (12-13) µm; teeth at 12 (11-12) and 15 (14-16) µm from anterior. Smallest juvenile found has L = 0.53 mm; a = 27; b = 2.8; c = 59; c′ = 0.6; tail = 9 µm; stoma = 20 × 10 µm; teeth at 9 and 13 µm.

DIAGNOSIS AND RELATIONSHIPS

Length 1.0-1.3 mm. Stoma 28-30 × 15-16 µm; dorsal tooth at 88 % of stoma length; subventral teeth at 82-83 % of stoma length. Didelphic; vulva at 65-70 %; no vulval pores. Tail conoid, less than 1/2 anal body width long. Male unknown.

The tail form of *C. altitudinarum* n. sp. is similar to that of *C. ockerti* Coetzee, 1965 but that species is prodelphic. Amongst the didelphic species of *Cobbonchus*, *C. altitudinarum* is closest to *C. indicus* Baqri, Baqri & Jairajpuri, 1978 and *C. rotundicaudatus* Coetzee, 1968 but each of these species has a depression/flexure on the ventral side of the female tail which is not present in the new species.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes :* NNCNZ, MNHN.

LOCALITIES

Type locality : 9, Montagne des Sources. Other localities : 5, Montagne des Sources; 6, Ouinne Valley; 11, 12 Mt Dzumac.

*Cobbonchus dzumaci** n. sp.
(Fig. 8 J, K, 10)

MEASUREMENTS

Females (pop. Mt Dzumac; paratypes; n = 4) : L = 1.23 (1.2-1.3) mm (S.E. ± 0.014); a = 32.7 (26-37); b = 3.09 (3.0-3.3); c = 29.7 (26-34); c′ = 1.46 (1.3-1.6); V = $^{9.9(8-13)}65.0$ $(63-67)^{8.4(7-10)}$; tail = 42 (37-45) µm; stoma = 31 (30-32) × 18 (15-20) µm; dorsal tooth at 73 (69-77) %; subventral teeth at 46 (44-59) %.

Holotype (female) : L = 1.23 mm; a = 31; b = 3.1; c = 2.9; c′ = 1.6; V = $^{9}63^{7}$; tail = 42 µm.

DESCRIPTION

Female : Body gently curved ventrally, particularly posterior to vulva, when relaxed by gentle heat. Cuticle with fine transverse striae in region of stoma. Lip region 25 (23-27) µm wide, slightly wider than adjacent body which narrows in region of stoma. Amphid aperture small, located about base of lip region. Stoma typical with large dorsal tooth and paired subventral teeth. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate. Excretory system not detected. Gonads paired, opposed, reflexed; short. No pores observed in vulva region. Intestine with distinct lumen. Prerectum not detected. Rectum about an anal-body-width long. Tail conoid with flexure on ventral surface; about one-and-a-half anal-body-widths long; transverse (?) muscle bands in anal region. Caudal glands not particularly clear; large prominent, conoid ampulla extends forward to flexure in tail; caudal gland duct opening prominent, terminal.

Juveniles : Similar to female in general morphology. Length distribution is shown in Fig. 10.

DIAGNOSIS AND RELATIONSHIPS

Length 1.2-1.3 m. Stoma 30-32 × 15-20 µm; dorsal tooth at 67-77 %; subventral teeth at 44-50 %. Didelphic; no vulval pores. Tail conoid with flexure on ventral surface; 1.5 anal body widths long. Caudal gland duct opening terminal, prominent. Male unknown.

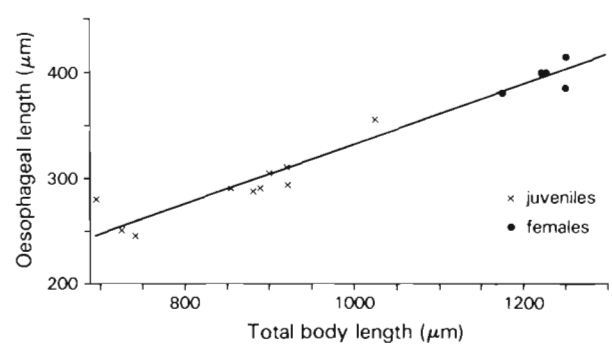

Fig. 10. Relationship between total body length and oesophageal length in juvenile and female specimens of *Cobbonchus dzumaci* n. sp. (the regression line is : $y = 0.2806\,x + 51.12$ $(n = 15)$ and $r = +0.9713^{***}$).

* The specific epithet refers to the type locality.

This species is similar to the didelphic *C. abrupticaudatus* (Altherr, 1960) Goodey, 1963 from Cameroon but differs in having a much larger caudal gland ampulla and in details of the duct. The caudal gland ampulla of *C. dzumaci* n. sp. appears similar to that in *C. collaris* Andrássy, 1985 but that species does not have a flexure on the ventral surface of the tail; the species also differ in details of the stoma.

TYPE MATERIAL

Holotype : NNCNZ. *Paratypes* : NNCNZ, MNHN.

LOCALITY

Type locality : 11, Mt Dzumac road.

REMARKS

A male (L = 1.4 mm; a = 46; b = 3.3; c = 30; c′ = 1.6; T = 45 %; spicule chord = 37 µm, supplements = 15) resembling this species was found at locality 5, Montagne des Sources.

*Cobbonchus orstomi** n. sp.
(Fig. 11 A-H)

MEASUREMENTS

Females (pop. Pic du Pin; paratypes; n = 4) : L = 1.41 (1.33-1.52) mm (S.E. ± 0.045); a = 37.6 (35-39); b = 3.11 (2.9-3.3); c = 33.6 (31-35); c′ = 1.47 (1.4-1.6); V = $^{14.4(17-20)}74.4\ (73-75)^{13.0(12-15)}$; tail = 42 µm (38-45); stoma = 31 (28-33) × 17 (16-17) µm; dorsal tooth at 67 (64-70) %; subventral teeth at 52 (46-55) %.

Female (pop. Montagne des Sources; paratype; n = 1) : L = 1.33 mm; a = 42; b = 3.1; c = 36; c′ = 1.5; V = $^{17}75^{12}$; tail = 37 µm.

Male (pop. Montagne des Sources; paratype; n = 1) : L = 1.41 mm; a = 43; b = 3.4; c = 32; c′ = 1.4; T = 46 %; spicule chord = 39 µm; supplements = 13; tail = 44 µm.

Female (pop. Champ de Bataille; paratype; n = 1) : L = 1.25 mm; a = 36; b = 3.5; c = 29; c′ = 1.3; V = $^{18}73^{10}$; tail = 43 µm.

Holotype (female) : L = 1.45 mm; a = 35; b = 3.1; c = 34; c′ = 1.5; V = $^{19}74^{13}$; tail = 42 µm.

Allotype (male) : L = 1.35 mm; a = 39; b = 3.1; c = 29; c′ = 1.7; T = 43 %; spicule chord = 37 µm; supplements = 12; tail = 47 µm.

DESCRIPTION

Female : Body gently curved ventrally, especially posterior to vulva, when relaxed by gentle heat. Cuticle smooth. Lip region 22 (21-25) µm wide, slightly wider than adjacent body which narrows in region of stoma; six prominent lips and six liplets which just overlap buccal cavity visible in *en face* view. Amphid aperture about one quarter of corresponding body width wide and located about midway between apex of dorsal tooth and front of stoma; amphidial pouch visible in *en face* view. Stoma almost twice as long as wide with tapering base, large dorsal tooth with apex at about 67 % of stoma length and a pair of subventral teeth at about half stoma length. In *en face* view plates of stoma show thickening along junctions at various depths. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate. Excretory system not detected. Anterior gonad fully developed, reflexed; oviduct contains sperm; posterior gonad represented by well-developed, sperm-filled, post-vulval sac. Vulva with cuticularised plates; flush with body; no pores observed in vulval region. Intestine with distinct, fine-grained walls; often contains almost intact prey nematodes. Prerectum not differentiated. Rectum about an anal-body-width long. Tail initially conoid, then dorsal surface strongly curved ventrally with distinct, slightly dorsally curved, digitiform projection on ventral line of body, prominent muscle bands in body of tail as far back of digitiform projection. Fine cuticular annulation apparent in tail region. Caudal glands well developed; caudal gland duct opening terminal, well-developed.

Male : Similar to female in general morphology. Testes paired, opposed outstretched. Adcloacal and twelve or thirteen ventromedian supplements. Prerectum and copulatory muscles correspond to range of supplements. Distinct sphincter muscle around intestine and *vas deferens* at anterior of supplement range. Spicules paired, similar, arcuate, without cephalic swelling; bifurcate tips of lateral accessory pieces appear bent towards posterior; gubernaculum thickened distally.

Juveniles : Similar to female in general morphology. Three specimens from the type locality had L = 0.96 (0.92-0.99) mm; a = 37; b = 2.9; c = 33; c′ = 1.3; tail = 29 µm; stoma = 23 × 13 µm with teeth at 64 % and 43 % while a smaller individual had L = 0.61 mm; a = 32; b = 2.7; c = 27; c′ = 1.4; tail = 23 µm; stoma = 19 × 10 µm with teeth at 63 % and 32 %.

DIAGNOSIS AND RELATIONSHIPS

Length 1.3-1.5 mm. Stoma 28-33 × 16-17 µm; dorsal tooth at 64-70 %; subventral teeth at 46-55 %. Female prodelphic; post-vulval sac 12-15 % of body length; no vulva pores. Female tail initially conoid then strongly curved ventrally; digitiform projection on ventral line of body curves slightly dorsally. Caudal glands and duct well developed; opening terminal. Male with twelve or thirteen ventromedian supplements.

A post-vulval sac significantly more than a body width long is also present in *C. charlesi* Coetzee, 1966, *C. chauliodus* Clark, 1960, *C. dianae* Coetzee, 1965, *C. eurystoma* Coetzee, 1965, *C. heynsi* Coetzee, 1965 and *C.*

* The specific epithet refers to ORSTOM.

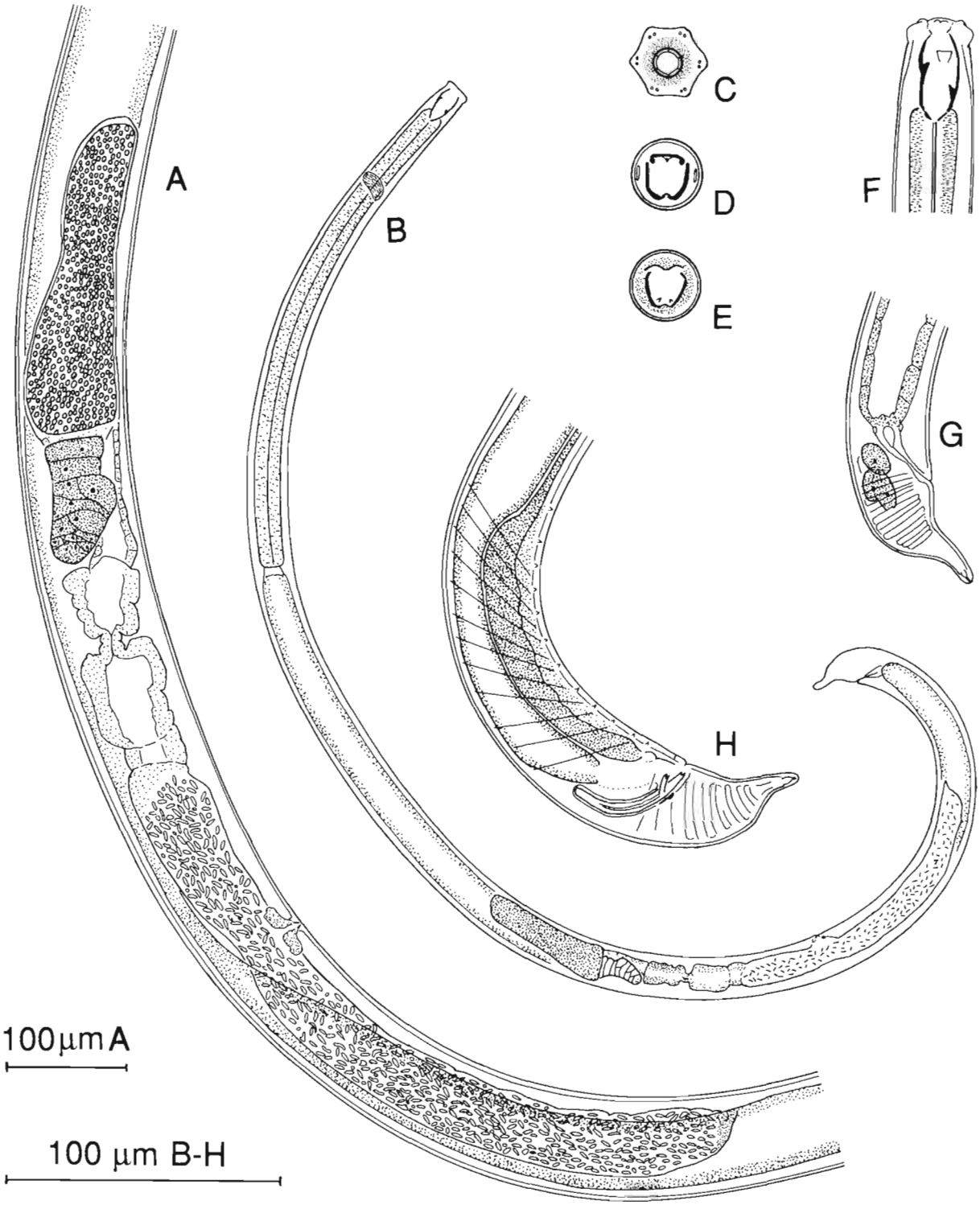

Fig. 11. *Cobbonchus orstomi* n. sp. A : Female genital region; B : Lateral view of entire female; C-E : *En face* views; F : Stoma region of female; G : Lateral view of female tail; H : Lateral view of male tail region.

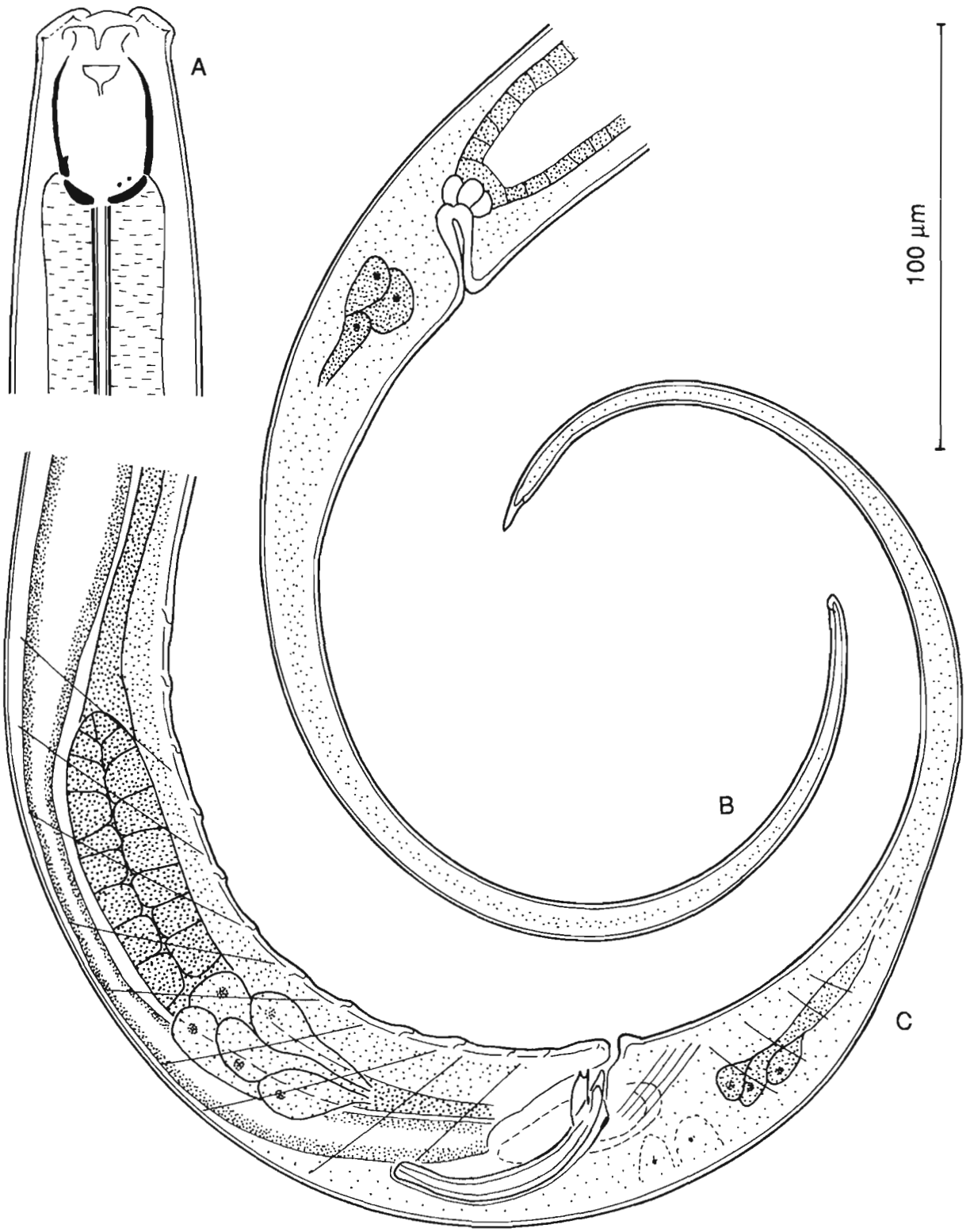

Fig. 12. *Iotonchus lacuplanarum* n. sp. A : Stoma region of female; B : Lateral view of female tail; C : Lateral view of male tail region.

megalus Coetzee, 1966. A rounded digitiform, ventral projection on the tail is present in *C. orstomi* n. sp., *C. charlesi*, *C. chauliodes* and *C. heynsi* but *C. orstomi* n. sp. is distinguished from the others by having tooth apices at 67.52 % rather than 61.50 %, 85.61 %, 79.40 % respectively.

TYPE MATERIAL

Holotype and *Allotype* : NNCNZ. *Paratypes* : NNCNZ, MNHN.

LOCALITIES

Type locality : 8, Pic du Pin. Other localities : 9, Montagne des Sources; 13, Champ de Bataille.

*Iotonchus lacuplanarum** n. sp.
(Fig. 12 A-C, 13)

MEASUREMENTS

Female (pop. Pic du Pin; paratype; n = 1) : L = 2.04 mm; a = 39; b = 4.6; c = 6.3; c′ = 10.2; V = ^{16}64; tail = 320 µm; stoma 37 × 26 µm with dorsal tooth at 76 %.

Male : L = 1.85 mm; a = 38; b = 4.2; c = 6.6; c′ = 7.4; T = 29 %; tail = 280 µm; spicule chord = 56 µm; supplements = 1 + 9; stoma 33 × 24 µm with dorsal tooth at 27 %.

Male (pop. Chutes de la Madeleine : paratype; n = 1) : L = 1.85 mm; a = 45; b = 4.9; c = 6.3; c′ = 8.9; T = 34 %; tail = 290 µm; spicule chord = 47 µm; supplements = 1 + 9; stoma = 29 × 32 µm with dorsal tooth at 28 %.

Holotype (female) : L = 1.96 mm; a = 36; b = 4.6; c = 6.1; c′ = 10.2; V = ^{15}63; tail = 320 µm; stoma = 36 × 26 µm with dorsal tooth at 25 %.

Allotype (male) : L = 2.11 mm; a = 45; b = 4.9; c = 7.2; c′ = 7.6; T = 28 %; tail = 300 µm; spicule chord = 57 µm; supplements = 1 + 12; stoma = 35 × 23 µm with dorsal tooth at 29 %.

DESCRIPTION

Female : Body generally curved ventrally, particularly in tail region, when relaxed by gentle heat. Cuticle smooth. Lip region 36 (35-37) µm wide, slightly wider than adjacent body which narrows in region of stoma; amphid aperture broad, near base of lips. Stoma broad, with flat base and small tooth at posterior of dorsal plate. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction tuberculate. Excretory system not observed. Gonad single, anterior and reflexed almost half-way to vulva. Vulva lips may protrude slightly from body line; no papillae in vulval region. Post-vulval sac less than half a body-width long. Intestinal walls distinct; intestine contains remains of nematode prey. Prerectum not distinct. Rectum about an anal-body-width long. Tail conoid then filiform and curved ventrally; finely annulate nature of subcuticle distinct; terminus rounded. Caudal glands moderately developed; caudal gland duct opening ventrally near tail terminus.

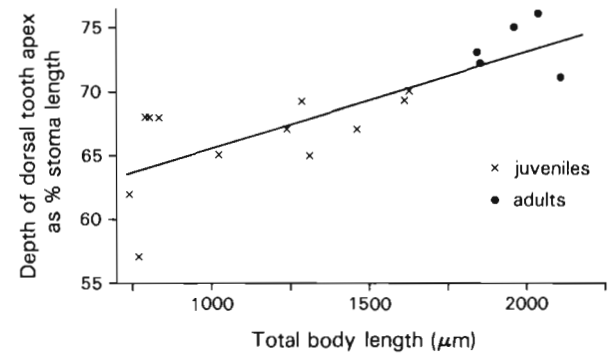

Fig. 13. Relationship between total body length and depth of dorsal tooth as percentage of stoma length in *Iotonchus lacuplanarum* n. sp. (the regression equation is : $y = 0.00747\,x + 58.12$ ($n = 17$) and $r = +0.7853$***).

Male : Similar to female in general morphology. Testes paired, opposed, outstretched. Intestine with remains of nematode prey; prerectum in supplement region distinct, without significant contents. Copulatory spicules paired, similar, arcuate; lateral guiding pieces furcate distally; gubernaculum and wings distinct. Adcloacal supplement and nine to twelve moderately developed midventral supplements; strong, diagonal muscle bands in supplement region. Anterior to supplements transverse muscle bands extend over about a body width; no distinct sphincter observed. Five (?) distinct ejaculatory glands on each side of body in midsupplement region which apparently discharge into the terminal portion of the *vas deferens*. Tail similar to that of female.

Juveniles : Similar to females in general morphology. In juveniles the dorsal tooth, although still at the same position on the plate, is relatively further forward than in adults (Fig. 13). Dimensions based on an arbitrary division are : L = 0.78 (0.74-0.83) mm (n = 5); a = 32.2 (31-35); b = 3.58 (3.4-3.7); c = 6.43 (5.6-6.8); c′ = 7.36 (6.6-9.3); tail = 123 (115-150) µm; stoma = 20 (19-21) × 12 (12-13) µm with dorsal tooth at 35 (32-43) %.

* The specific epithet indicates the distribution of known localities on Plaine des Lacs.

L = 1.36 (1.02-1.16) mm (n = 7); a = 35.1 (33-37); b = 4.07 (3.8-4.6); c = 5.33 (5.0-6.1); c′ = 9.68 (8.6-11.6); tail = 256 (200-285) µm; stoma = 30 (26-33) × 19 (14-21) µm with dorsal tooth at 33 (30-35) %.

DIAGNOSIS AND RELATIONSHIPS

Length 1.9-2.1 mm. Stoma 29-37 × 22-26 µm; dorsal tooth at posterior of dorsal plate, 24-29 % of stoma length. Prodelphic; vulva at 63-64 %; post-vulval sac less than a body width long; no vulva papillae. Tail conoid then filiform; c = 6. Caudal gland duct opens ventrally near terminus. Male with nine to twelve ventromedian supplements.

I. lacuplanarum n. sp. is closest to *I. acuticaudus* Mulvey & Jensen, 1967 but is readily distinguished from it and other prodelphic species by the ventral (*vs* dorsal) opening of the caudal gland duct, a longer tail (320 µm *vs* 200 µm for ♀♀) and lower c value (6 *vs* 10 for ♀♀), and a smaller stoma (36 × 26 µm *vs* 45 × 30 µm for ♀♀).

TYPE MATERIAL

Holotype and *Allotype* : NNCNZ. *Paratypes* : NNCN, MNHN.

LOCALITIES

Type locality : 8, Pic du Pin. Other locality : 14, Chutes de la Madeleine.

REMARKS

Coomans and Loof (1986) have given a comprehensive account of ejaculatory and rectal glands in mononchs and dorylaims.

*Iotonchus montanum** n. sp.

(Fig. 14 A-C)

MEASUREMENTS

Females (pop. Montagne des Sources; paratypes; n = 2) : L = 3.56, 3.84 mm; a = 40, 38; b = 4.8, 4.7; c = 6.4, 6.9; c′ = 9.8, 8.8; V = $^{11}58^{13}$, $^{16}60^{14}$; tail = 560, 560 µm; stoma = 65 × 43, 67 × 45 µm with dorsal tooth at 43, 43 %.

Holotype (female) : L = 3.52 mm; a = 38; b = 4.8; c = 6.4; c′ = 9.5; V = $^{17}57^{19}$; tail = 550 µm; stoma = 56 × 41 µm with dorsal tooth at 34 %.

Allotype (male) : L = 3.69 mm; a = 43; b = 4.7; c = 8.4; c′ = 6.1; T = 35 %; spicule chord = 100 µm; supplements = 1 + 12; tail = 440 µm.; stoma = 55 × 42 µm with dorsal tooth at 40 %.

DESCRIPTION

Female : When relaxed by gentle heat body fairly straight anteriorly, gently curved ventrally in region of gonads and tail. Cuticle smooth. Lip region 61 (58-64) µm wide, slightly wider than adjacent body which narrows in region of stoma. Amphid aperture and pouch obscure. Stoma about one-and-a-half times as long as wide with broad base and a single dorsal tooth set well back on dorsal plate, with its apex at about 40 % of stoma length (20 % of length of dorsal plate). Oesophagus cylindrical, surrounding base of stoma; oesophago-intestinal junction tuberculate. Excretory system not detected. Gonads paired, opposed and reflexed in both paratype females; in holotype germinal zone is most posterior portion of posterior gonad; sphincter at oviduct-uterus junction. Vagina extends one-third of way across body; prominent muscle bands radiating from vulva which is surrounded by circular muscles and " cuticularised platelets "; no body pores in vulval region. Intestinal cells moderately coloured; intestinal lumen contains both nematode prey and deeply pigmented material. Prerectum not distinct. Rectum about an anal-body-width long. Tail elongate conoid, about nine anal-body-widths long. Caudal glands moderately developed, lying in tandem; caudal gland duct opening subventral.

Male : Similar to female in general morphology. Body strongly curved ventrally in region of supplements. Testes paired, opposed, outstretched. Three of twelve supplements lie anterior to prerectum and copulatory muscles. Four large ejaculatory glands lie on each side of prerectum in mid-supplement region. Spicules paired, similar, arcuate with little cephalic development; lateral guiding pieces furcate; gubernaculum with prominent swelling. Muscle bands extend into tail which contains three moderately developed caudal glands; a prominent midventral pore less than cloaca body width posterior to cloaca.

Juveniles : Similar to female in general morphology. In the three specimens available the de Man ratios indicate differential growth : L = 1.25, 2.33, 3.10 mm; a = 33, 34, 37; b = 3.8, 4.3, 4.4; c = 5.1, 5.9, 6.9.

DIAGNOSIS AND RELATIONSHIPS

Length 3.5-3.8 mm. Stoma 55-67 × 41-45 µm; dorsal tooth at 20 % of length of dorsal plate, 34-43 % of stoma length. Female gonads paired; vulva at 57-60 %; no vulval pores. Tail elongate-conoid; about nine anal-body widths long. Caudal gland duct opening subventral. Male with twelve ventromedian supplements. Male tail with prominent mid-ventral pore.

Of the previously described didelphic *Iotonchus* species with a posteriorly located tooth and long tail *I. montanum* n. sp. is closest to *I. kherai* Mohandas & Prabhoo, 1979 which at 2.5-3.4 mm is slightly shorter than *I. montanum* but has a longer stoma (66-75 µm) in

* The specific epithet refers to the mountainous type locality.

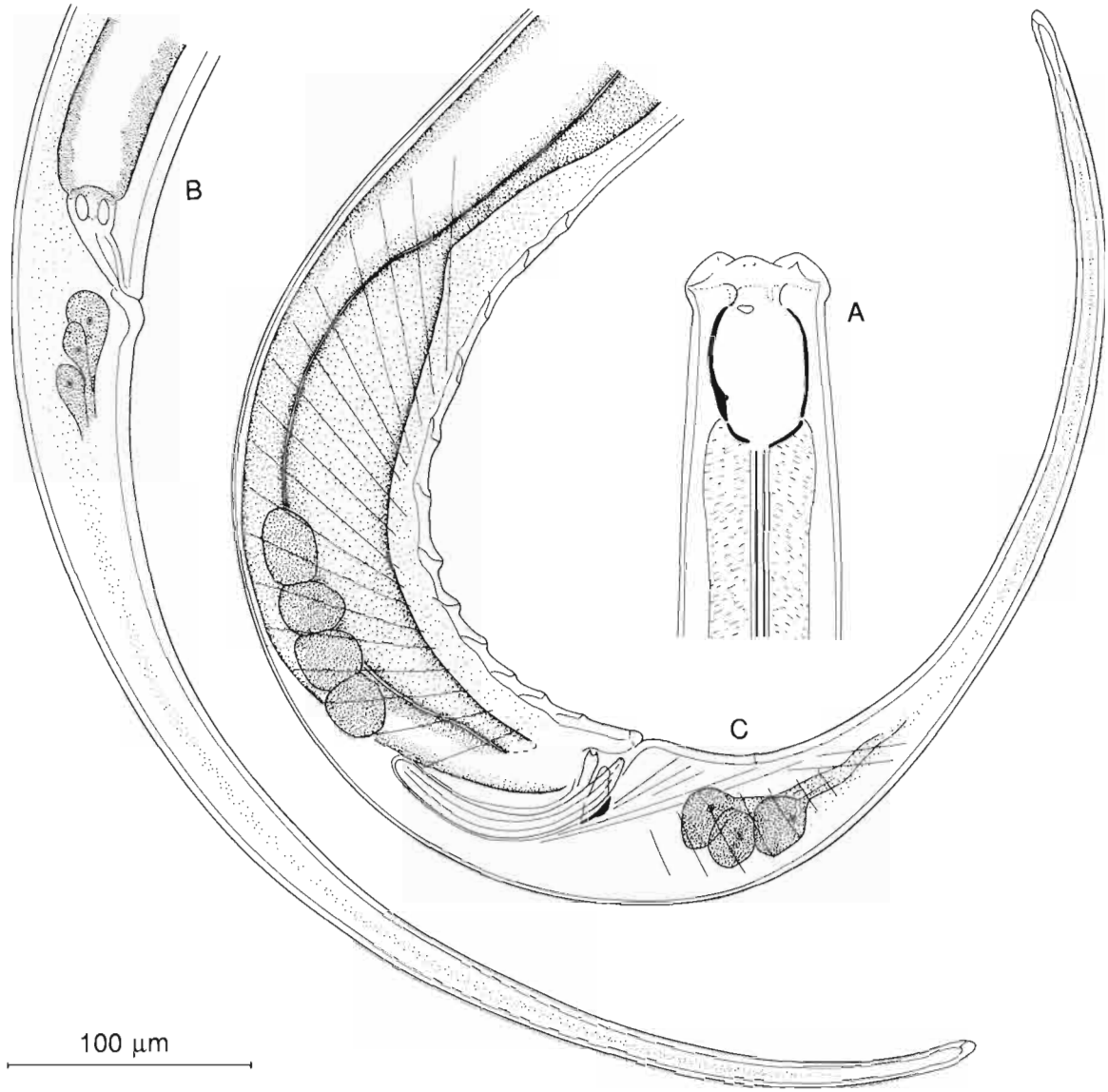

Fig. 14. *Iotonchus montanum* n. sp. A : Stoma region of male; B : Lateral view of female tail; C : Lateral view of male tail region.

females. However, no mid-ventral pore has been reported on the male tail of *I. kherai*. *I. montanum* has a single prominent ventral pore on the male tail whereas the smaller *I. candelabri* n. sp. (♀ L = 2.3-2.9 mm *vs* 3.5-3.8 mm) has two such pores.

TYPE MATERIAL

Holotype and *Allotype* : NNCNZ. *Paratypes* : NNCNZ, MNHN.

LOCALITY

Type locality : 10, Montagne des Sources.

*Iotonchus candelabri** n. sp.

(Fig. 15 A-C, 16)

MEASUREMENTS

Females (pop. Champ de Bataille; paratypes; n = 5) : L = 2.67 (2.35-2.86) mm (S.E. ± 0.092); a = 39.2 (38-42); b = 4.37 (4.2-4.6); c = 6.93 (6.4-7.5); c′ = 8.19 (7.5-9.18); V = $^{11.1(8-13)}$61.9 (61-63)$^{11.0(8-13)}$; tail =

* The specific epithet refers to the trees *(Cerberiopsis candelabrum)* at the type locality.

387 (350-450) µm; stoma = 51 (49-52) × 37 (35-41) µm with dorsal tooth at 34 (31-36 %).

Males (pop. Champ de Bataille; paratypes; n = 4) : L = 2.69 (2.58-2.80) mm (S.E. ± 0.045); a = 40.8 (38-43); b = 4.68 (4.3-4.5); c = 7.78 (7.1-8.6); c′ = 5.87 (5.2-6.6); T = 31.2 (28-38 %); spicule chord = 79 (77-83) µm; supplements = 1 + 15 (12-16); tail = 348 (310-400) µm.; stoma = 46 (43-48) × 34 (33-38) µm with dorsal tooth at 34 (32-37) %.

Holotype (female) : L = 2.86 mm; a = 40; b = 4.4; c = 7.4; c′ = 8.0; V = $^{11}63^{11}$; tail = 385 µm; stoma = 51 × 41 µm with dorsal tooth at 35 %.

Allotype (male) : L = 2.58 mm; a = 38; b = 4.5; c = 7.6; c′ = 5.7; T = 28 %; spicule chord = 79 µm; supplements = 1 + 15; tail = 340 µm; stoma = 48 × 33 µm with dorsal tooth at 35 %.

Description

Female : Body gently curved ventrally when relaxed by gentle head. Cuticle smooth. Lip region 54 (51-58) µm wide, slightly wider than adjacent body which narrows in region of stoma; lips typical; amphid opening at base of lips, near front of stoma. Stoma about one and a half times as long as wide, with broad base; a single dorsal

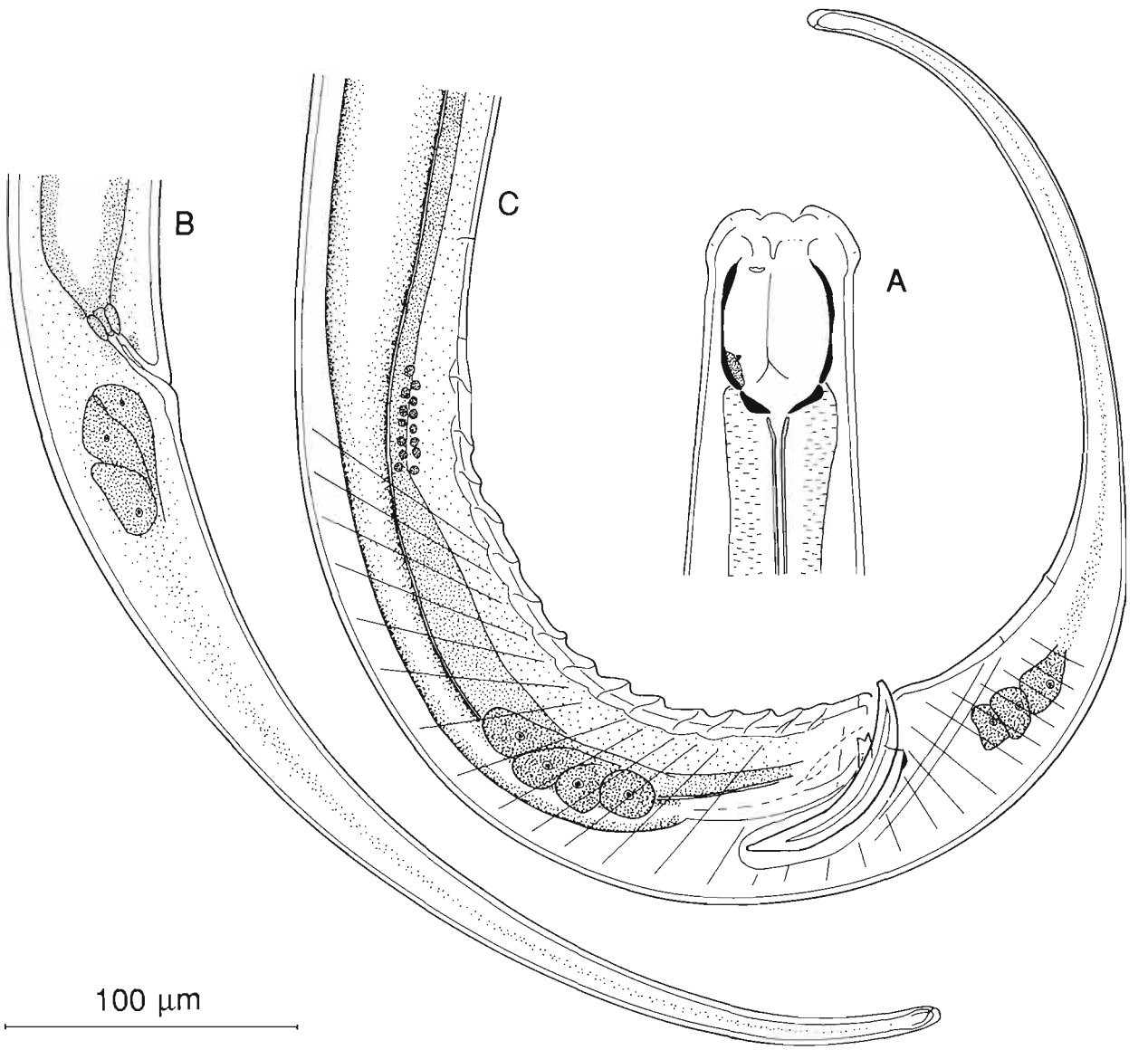

Fig. 15. *Iotonchus candelabri* n. sp. A : Stoma region of female; B : Lateral view of female tail; C : Lateral view of male tail region.

tooth whose apex is at about 20 % of the length of the plate; lateral junctions of plates of stoma visible in whole mounts. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction tuberculate. Excretory system not observed. Gonads paired, opposed, reflexed; sphincter at junction between oviduct and uterus. Vagina extends halfway across body; " cuticularised pieces " surround vulva which does not protrude from line of body. No ventral body pores in vulval region. Intestine with narrow, slightly pigmented walls; lumen with distinct remains of nematode prey. Prerectum not differentiated; rectum less than an anal-body-width long. Tail elongate conoid; three well developed caudal glands; caudal gland duct opens subterminally, ventrally; terminus rounded.

Male : Similar to female in general morphology. Testes paired, opposed, outstretched. Prerectum distinct, beginning slightly anterior to copulatory muscles.

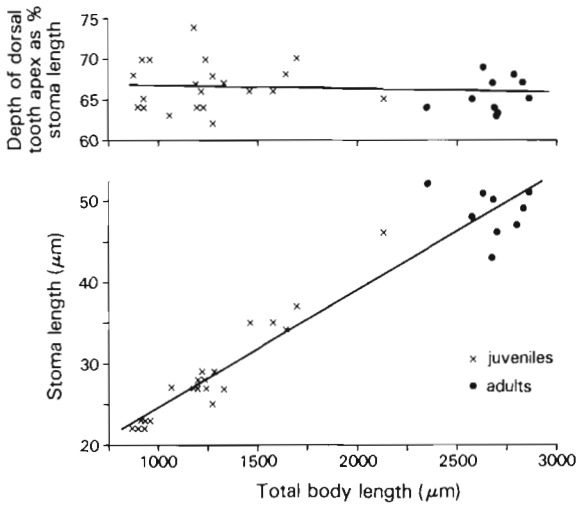

Fig. 16. Relationship between total body length and stoma length (lower) and depth of dorsal tooth as percentage of stoma length (upper) in *Iotonchus candelabri* n. sp. (the regression equations are for stoma length $y = 0.01446 x + 10.175$ ($n = 30$) and $r = + 0.9680$***; for depth of tooth $y = - 0.00050 x \times 67.27$ ($n = 30$) and $r = - 0.132$).

Midventral supplements twelve to fifteen, with a single ventral pore about a body-width anterior to first; adcloacal supplement; two distinct ventral pores an anterior, conoid portion of tail. Prominent copulatory muscles begin ventrally about fourth supplement; four prominent ejaculatory glands on each side of prerectum, about middle of range of supplements. At level of anterior supplements transverse muscle bands extend over about a body width; also three more distinct muscle bands but no distinct sphincter observed. Spicules paired, arcuate, with little cephalic expansion; lateral guiding pieces and gubernaculum well-developed. Tail conoid, with transverse muscles, then elongate conoid; three caudal glands and subterminal, ventral gland duct opening; terminus rounded.

Juveniles : Similar to female in general morphology. From length distribution in Fig. 16 the four stages appear to have the following dimensions.

St. 1 (n = 6) : L = 870-960 µm; a = 26-30; b = 3.4-3.8; c = 6.1-6.7; c′ = 5.7-6.8; tail = 135-155 µm; stoma = 22-23 × 14-16 µm with dorsal tooth at 33 (30-36) %.

St. 2 (n = 10) : L = 1060-1330 µm; a = 25-34; b = 3.8-4.1; c = 6.5-7.1; c′ = 6.0-7.0; tail = 175-190 µm; stoma = 27-29 × 16-19 µm with dorsal tooth at 36 (30-38) %.

St. 3 (n = 4) : L = 1450-1700 µm; a = 29-34; b = 3.9-4.3; c = 6.4-6.8; c′ = 6.1-7.4; tail = 210-250 µm; stoma = 34-37 × 21-26 µm with dorsal tooth at 32 (30-34) %.

St. 4 (n = 1) : L = 2140 µm; a = 34; b = 4.3; c = 7.1; c′ = 7.6; tail = 300 µm; stoma = 46 × 33 µm with dorsal tooth at 35 %.

Diagnosis and relationships

Length 2.3-2.9 mm. Stoma 43-52 × 33-41 µm; dorsal tooth at 20 % of length of dorsal plate, 31-37 % of stoma length. Female didelphic; vulva at 61-63 %; sphincter at uterus-oviduct junction; no vulval pores. Tail elongate-conoid; c = 6-8. Caudal glands well-developed; caudal gland duct opens subterminally, ventrally. Male with twelve to fifteen midventral supplements. Male tail with two prominent midventral pores.

I. candelabri n. sp. is closest to *I. kherai* Monhandas & Prabhoo, 1979 and *I. montanum* n. sp. It has a shorter stoma (43-52) µm than *I. kherai* (56-75) µm, and no ventral pores have been reported on the male tail of *I. kherai*. *I. candelabri* n. sp. is smaller than *I. montanum* n. sp. (♀ L = 2.3-2.9 mm *vs* 3.5-3.8 mm) and has two prominent ventral pores on the male tail rather than one.

Type material

Holotype and *Allotype* : NNCNZ. *Paratypes* : NNCNZ, MNHN.

Locality

Type locality : 13, Champ de Bataille.

Remarks

Stoma length in *I. candelabri* n. sp. is significantly correlated (r = + 0.968***) with body length (Fig. 16), reflecting normal development of nematodes. However, whereas in *I. lacuplanarum* n. sp. the dorsal tooth apex migrated during development (Fig. 13) (r = + 0.79***) in the present species there is no such migration (Fig. 16) (r = — 0.132); this indicates within at least the genus *Iotonchus* this character is plastic.

The mean body lengths of *I. candelabri* and *I. montanum* n. sp. differ by a factor of 1.4. This is greater than the difference between normal and large forms of *Longidorus leptocephalus* (1.26 ×) and *Ditylenchus dipsaci* (1.24 ×), and the subspecies of *Hemicycliophora chathami* (1.25 ×) but less than the difference between other species pairs which may reflect polyploidy (Yeates, 1991). Too little is known of these differences to finally assess the relative taxonomic status of the populations.

Iotonchus recessus * n. sp.
(Fig. 17 A-C)

MEASUREMENTS

Holotype (female) : L = 2.13 mm; a = 43; b = 4.6; c = 5.8; c' = 11.1; V = $^{14}63^{8}$; tail = 365 µm; stoma = 38 × 26 mm with dorsal tooth apex at 26 %.

DESCRIPTION

Female : Body gently curved ventrally when relaxed by gentle heat. Cuticle smooth. Lip region 37 µm wide, slightly wider than adjacent body. Lips typical; amphid aperture obscure. Stoma about one and a half times as long as wide, with flat base; small dorsal tooth almost at posterior of plate. Oesophagus cylindrical, surrounds base of stoma; oesophago-intestinal junction non-tuberculate. Small ventral pore about one body width posterior to front of nerve ring. Anterior gonad well developed; reflexed; presence of nematode prey in intestine obscures uterus-oviduct junction. Posterior gonad reduced to an undifferentiated sac about three and a half body widths long. Vulva extends about one third of way across body; vagina surrounded by circular muscles; " cuticular plates " adjacent to body wall. Vulva not protuberant; no ventral pores in vulval region. Prerectum not differentiated; rectum about an anal body width long. Tail elongate conoid; without distinct pores. Three moderately developed caudal glands; caudal gland duct opens subterminally, ventrally.

Male : Unknown.

Juveniles : Unknown.

DIAGNOSIS AND RELATIONSHIPS

Length 2.1 mm. Stoma 38 × 26 µm; dorsal tooth at almost posterior of plate, at 26 % of stoma length. Prodelphic with post-vulval sac 3.5 body widths long; vulva at 63 %. Tail elongate-conoid. Caudal gland duct opens ventrally, subterminally. Male unknown.

I. recessus n. sp. is clearly distinguished from all other prodelphic species of *Iotonchus* by possession of a post-vulval sac about 3.5 body widths longs.

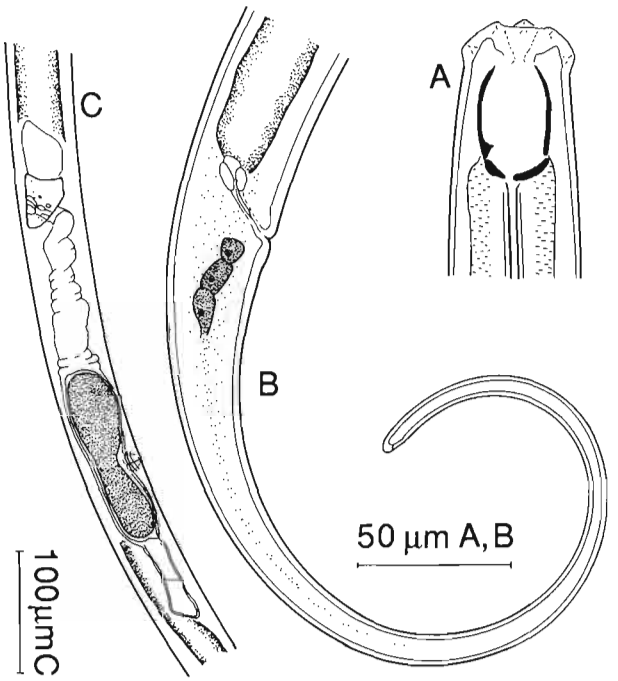

Fig. 17. *Iotonchus recessus* n. sp. A : Stoma region of female; B : Lateral view of female tail; C : Female genital region.

TYPE MATERIAL

Holotype : NNCNZ.

LOCALITY

Type locality : 10, Montagne des Sources.

Iotonchus trichurus (Cobb, 1917) Andrássy, 1958

Females (pop. Port Laguerre; *Digitaria;* n = 4) : L = 1.84 (1.61-2.21) mm (S.E. ± 0.134); a = 42.7 (40-46); b = 4.49 (4.2-4.9); c = 4.54 (4.1-5.0); c' = 14.2 (11-18); V = $^{14.6(13-16)}$62.9 (61-65); tail = 410 (330-540) µm; stoma = 32 (32-33) × 22 (20-22) µm with dorsal tooth at 29 (25-31) %.

Female (pop. Port Laguerre; *Ipomoea;* n = 1) : L = 1.47 mm; a = 28; b = 3.7; c = 3.5; c' = 14; V = $^{19}54$; tail = 425 µm; stoma = 30 × 20 µm with dorsal tooth at 28 %.

The material includes some of the largest specimens attributed to the species if the variability included by Mulvey and Jensen (1967) is accepted. Previous records include Nigeria, Brazil, Mauritius, and India. The present localities (22 a, b, g) are all at the CIRAD experimental farm, Port Laguerre.

* The specific epithet refers to the development of the post-vulval sac.

Iotonchus aff. *monhystera* (Cobb, 1917) Jairajpuri, 1970

A single female specimen from locality 27 a (La Coulee) generally conforms to the description of this species given by Jairajpuri (1970). Its measurements are :

L = 0.81 mm; a = 24; b = 3.3; c = 14; c' = 2.7; V = ^{18}75; tail = 60 µm; stoma = 22 × 12 µm with dorsal tooth at 68 %.

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