A diagnostic species compendium of the genus *Chonopeltis* Thiele, 1900 (Crustacea: Branchiura) with notes on its geographical distribution

ANNEMARIÉ AVENANT-OLDEWAGE and ELMINE KNIGHT

Avenant-Oldewage, Annemarié and Elmine Knight 1994. A diagnostic species compendium of the genus *Chonopeltis* Thiele, 1900 (Crustacea: Branchiura) with notes on its geographical distribution. *Koedoe* 37(1): 41-56. Pretoria. ISSN 0075-6458.

A tabulated and illustrated compendium of the diagnostic characters of the 13 species of *Chonopeltis* is presented. This enables any unknown species to be identified. A table and map, showing the geographical distribution of each species, is also given.

Keywords: *Chonopeltis*, Branchiura, Africa, geographical distribution.

Annemarié Avenant-Oldewage and Elmine Knight, Department of Zoology, Rand Afrikaans University, P.O. Box 524, Auckland Park, 2006 Republic of South Africa.

Introduction

The genus *Chonopeltis* was erected by Thiele (1900) to accommodate a new argulid parasite collected from a cichlid fish in eastern Africa. *Chonopeltis* differs from *Argulus* in lacking a pre-oral spine in front of the mouth opening, in the absence of the antennule (first antenna) and by the presence of a simple, four-segmented (second) antenna. The absence of scales on the ventral body surface as well as the presence of two pairs of chitinous rods on each side of the second antenna were also regarded by Thiele (1900) as possible generic traits.

Forty years after Thiele's description of *C. inermis*, Brian (1940) published a paper in which he described specimens, collected from fishes in the Congo River, as *C. inermis* var. *schoutedeni*. Dartevelle (1951) regarded the latter variety as distinguishable from *C. inermis* and Fryer (1956) recognised it as a separate species i.e. *C. schoutedeni* Brian, 1940. Later Fryer (1959) realised that Brian (1940) actually confused two separate species of *Chonopeltis*. He consequently redescribed one species as *C. schoutedeni* and the other he described as *C. congicus*. In 1960 he found a further specimen in the collection of the Musée Royal du Congo Belge labelled *C. inermis* var. *schoutedeni* and realised that it was in fact an undescribed species which he described as *C. flaccifrons*.

From 1959 until 1974 Fryer (1959, 1960b, 1961b, 1964, 1974) described five new *Chonopeltis* species from freshwater fishes collected in rivers and lakes in Central Africa. The first *Chonopeltis* species described from South Africa was *Chonopeltis australis* Boxshall, 1976. Fryer (1977) added two further species, *C. minutus* and *C. australissimus* collected from *Barbus* and *Pseudobarbus* species in rivers of the western Cape, South Africa.

Following the recent increase in interest in fish parasites in southern Africa, three more species have been described from rivers in the Transvaal province of South Africa viz. *C. fryeri*, collected from *Clarias* spp. in the Magalakwin River and in Loskop Dam in the Transvaal (Van As 1986); *C. victori*, collected from *Labeo rosae*, *L. congoro* (= syn *L. rubropunctatus*), *L. ruddi* and *Barbus marequensis* in the Olifants River, Kruger National Park (Avenant-Oldewage 1991); and *C. koki*, from *L. cylindricus* at Katima Mulilo in the Zambezi River (Van As 1992).

In his descriptions of 1960(b) and 1977 Fryer provided identification keys of the then known *Chonopeltis* species. These became outdated each time a new species was de-

scribed and Esser *et al.* (1976) pointed out some advantages of a diagnostic species compedium over a dichotomous key. It is easier to add new data to a compendium and a compendium facilitates the rapid identification of unknown species.

In addition to morphological and morphometric values Lahille (1926), Ringuelet (1948) and Avenant *et al.* (1989) used relative dimensions to distinguish between certain argulids. Following their example 70 specimens of *Chonopeltis australis* were measured as indicated in Fig. 1. Individual measurements did not show a significant deviation from the mean ($r > 0{,}450$; $p < 0{,}01$), indicating that relative measurements are reliable as a taxonomic tool.

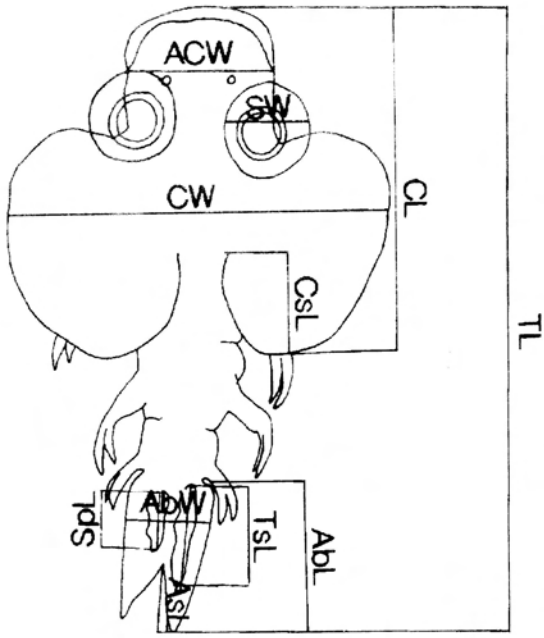

Fig. 1. *Chonopeltis australis* (schematic) to indicate the position where measurements were taken. AbL, abdomen length; AbW, abdomen width; ACW, cephalic lobe width; AsL, abdomen cleft length; CL, carapace length; CsL, carapace cleft length; CW, carapace width; SpL, spermatheca length; SW, sucker width; TsL, testis length; TL, total body length.

Since type specimens of some of the remaining 12 described *Chonopeltis* species were not available for study, the original descriptions were consulted and were used to obtain relative measurements in compiling the synoptic compendium for males (Table 2) and females (Table 1). In cases where authors did not give measurements of species in their texts, they were taken from figures accompanying the description. These measurements, based on one individual i.e. in the drawing, are underlined in the table.

In order to enhance the usefulness of this compendium notes on certain morphological structures of the genus are supplied in the text.

Notes on the morphology

Carapace

The shape of the carapace in the different *Chonopeltis* species varies from roughly triangular to trifoliate, subquadrangular or circular. The carapace is formed by three lobes, an anterior or cephalic lobe and two lateral lobes. The cephalic lobe usually contains two pairs of chitinous supporting rods, but these are absent in *C. flaccifrons* and *C. fryeri*. Furthermore, the relative size of the carapace differs in different species. This has a bearing on the length of the thorax exposed: in some instances the carapace reaches back to the bases of the first pair of legs, as in *C. inermis* and *C. australissimus*; in other cases to the

Table 1

A diagnostic compendium of females of the genus Chonopeltis. *Measurements were taken from figures accompanying species descriptions when the information was not available in the text and is indicated as such by marking the information in the table with a* †. *Abbreviations as in Fig. 1. Numbers with species correspond with numbers used in all figures and tables*

	Species	Total length	Relative measurements								References
			CL/TL	CW/CL	CsL/CL	AbL/TL	AbW/AbL	SpL/AbL	AsL/AbL	ACW/CW	SW/CW	
1	*C. inermis* Thiele, 1900	12 mm	†45% 44%	†105% †106%	†22% †22%	31-32% 31%	†36% †40%	†39% †22,7%	†60% 64%	†44% 51%	†31% †34%	Fryer (1956) Van As & Van As (1993)
2	*C. schoutedeni* Brian, 1940	15 mm	36%	†127%	†22%	42-43%	†24%	†13%	†85%	†38%	–	Fryer (1959)
3	*C. congicus* Fryer, 1959	12 mm	47%	†118%	†15%	24%	†38%	†22%	†60%	†51%	–	Fryer (1959)
4	*C. flaccifrons* Fryer, 1960b	7,4 mm	44-47%	†116%	†23%	22-23%	†50%	†36%	†56%	†55%	35-36%	Fryer (1960b)
5	*C. brevis* Fryer, 1961	8,5 mm	57%	† 111%	†29%	27%	†54%	†46%	†50%	†49%	28%	Fryer (1961a)
6	*C. meridionalis* Fryer, 1964	6,2 mm	56%	†108%	†16%	28%	†52%	†41%	†48%	†56%	29%	Fryer (1964)
7	*C. elongatus* Fryer, 1974	6,5 mm	39%	†94%	†21%	33%	†30%	†33%	†63%	†49%	†36%	Fryer (1974)
8	*C. australis* Fryer, 1977	6,8 mm	54% 54%	†110% 113%	†31% 31%	20-24% 24%	†56% 58%	†39% 39%	†46% 46%	†40% 40%	†25% 24,3%	Boxshall (1976) OUR
9	*C. minutus* Fryer, 1977	5,5 mm	59,7%	†107%	†20%	25,4%	†65%	†23%	†39%	†54%	†39%	Fryer (1977)
10	*C. australissimus* Fryer, 1977	2,8 mm	56,1%	†116%	†14%	26,7%	†58%	†42%	†27%	†62%	–	Fryer (1977)
11	*C. fryeri* Van As, 1986	8 mm	45%	113%	31%	31%	40%	†25%	52%	53%	†31%	Van As (1986)
12	*C. victori* Avenant-Oldewage, 1992	4,8 mm	58%	103%	†27%	27%	50%	30%	52%	52%	26%	Avenant-Oldewage, (1991) + OUR
13	*C. koki* Van As, 1992	6 mm	53%	†114%	†21%	31%	†40%	†47%	58%	47%	†26%	Van As (1992)

OUR = Own unpublished record

Table 2

A diagnostic compendium of males of the genus Chonopeltis. *Measurements were taken from figures accompanying species descriptions when the information was not available in the text and is indicated as such by marking the information in the table with a* †. *Abbreviations as in Fig. 1. Numbers with species correspond with numbers used in all figures and tables*

	Species	Total length	Relative measurements									References
			CL/TL	CW/CL	CsL/CL	AbL/TL	AbW/AbL	SpL/AbL	AsL/AbL	ACW/CW	SW/CW	
1	*C. inermis* Thiele, 1900	7 mm	59%	98%	28%	39%	41%	67%	65%	50%	19%	Fryer (1956)
		3.6 mm	44%	†106%	†24%	42%	†40%	†22%	53%	† 53%	†34%	Van As & Van As (1993)
2	*C. schoutedeni* Brian, 1940	8 mm	–	–	–	–	–	–	–	–	–	Fryer (1959)
3	*C. congicus* Fryer, 1959	8 mm	–	–	–	26-29%	–	–	†60%	–	–	Fryer (1959)
4	*C. flaccifrons* Fryer, 1960b	5.2 mm	52-55%	†33%	†16%	27-30%	†58%	–	†64%	†53%	–	Fryer (1960b)
5	*C. brevis* Fryer, 1961	6 mm	55%	† 111%	†26%	38%	†62%	†70%	†46%	†48%	–	Fryer (1961a)
6	*C. meridionalis* Fryer, 1964	3.63 mm	53%	†118%	†16%	37%	†38%	†56%	†49%	†51%	–	Fryer (1964)
7	*C. elongatus* Fryer, 1974	2.3 mm	44%	†100%	†18%	39.5	†30%	†61%	†49%	†53%	–	Fryer (1974)
8	*C. australis* Fryer, 1977	4.5 mm	57%	†110%	†24%	34%	57%	†66%	†34%	†39%	–	Boxshall (1976)
		6.8 mm	57%	110%	24%	34%	57%	47%	20%	57%		OUR
9	*C. minutus* Fryer, 1977	3.7 mm	58.2%	†113%	†13%	31%	–	†47%	†33%	57%	–	Fryer (1977)
10	*C. australissimus* Fryer, 1977	3.2 mm	54.8%	–	–	31.3%	†58%	58%	†25%	–	–	Fryer (1977)
11	*C. fryeri* Van As, 1986	3.1 mm	52%	120%	†14%	42%	47%	†56%	42%	55%	†31%	Van As (1986)
12	*C. victori* Avenant-Oldewage, 1992	3.1 mm	59%	101%	†25%	34%	58%	†61%	53%	54%	†30%	Avenant-Oldewage, (1991) + OUR
13	*C. koki* Van As, 1992	4 mm	51%	†115%	†25%	50%	†49%	†52%	†56%	50%	†51%	Van As (1992)

ISSN 0075-6458

Table 3

The locality, host and sites on the hosts for each of the described Chonopeltis species. Numbers with species correspond with numbers used in all figures and tables

	Species	Locality	Site	Host	Reference
1	*C. inermis* Thiele, 1900	Lake Malawi	–	"Chromis"	Thiele (1900, 1904), Fryer (1977)
		Lake Malawi	Mouth	*Clarias* spp.	Fryer (1956, 1977, 1968)
		Banga River	–	*Clarias gariepinus*	Fryer (1956)
		Luphephe River	Gill chamber	*Clarias theodorae*	Van As & Van As (1992, 1993)
2	*C. schoutedeni* Brian (1940) = *C. inermis* var *schoutedeni* Brian (1940) Dartevelle (1951)	*Zaire River	–	–	Brian (1940), Fryer (1956, 1959)
		*Zaire River tributaries	–	–	Dartevelle (1951), Fryer (1956)
		*Zaire River	–	*Gnathonemus* spp.	Monod (1928), Fryer (1956)
			–	*Marcusenius* spp.	
		Malagarasi Swamps	Under operculum	*Mormyrus* spp.	Fryer (1960b, 1968)
		Lake Mweru	Under operculum	*Hippopotamyrus dischorhynchus*	Fryer (1960b)
		Lake Mweru	Under operculum	*Gnathonemus moeruensis*	Fryer (1960b, 1965 & 1968)
		Lake Banweulu & adjoining swamps	Gill chamber	*Gnathonemus* spp.	Fryer (1959, 1960b & 1968)
		Lake Bangweulu	Gill chamber	*Mormyrus longirostris*	Fryer (1959)
		Stanley Pool-Zaire River	–	*Gnathonemus monteiri*	Fryer (1959)
3	*C. congicus* Fryer, 1959 =*C. inermis* var *schoutedeni* Brian, 1941, Dartevelle, 1951	*Zaire System	Under operculum	*Marcusenius* sp.	Brian (1940), Dartevelle (1951)
		Lake Bangweulu	Gill chamber	*Marcusenius monteiri*	Fryer (1960b & 1977)
		Lake Mweru	–	–	Fryer (1959, 1968)
		Ango ango near Matodi – Zaïre River	Flanks	*Gnathonemus monteiri*	Fryer (1968)
					Fryer (1959, 1968)
4	*C. flaccifrons* Fryer, 1960b	Lake Mweru	Under operculum	*Hippopotamyrus discorhynchus*	Fryer (1960b & 1968)
		Zaire River System	–	*Hippopotamyrus* sp.	Fryer (1960b & 1968)
		Malagarasi Swamps	Under operculum	*Hippopotamyrus* sp.	Fryer (1960b & 1968)
		Fimi River	Under operculum	*Hippopotamyrus welverthi*	Fryer (1960b)
5	*C. brevis* Fryer, 1961	Victoria Nile	Belly & pelvic fins	*Barbus altianalis radcliffi*	Fryer (1961a, 1968)
		Lake Victoria	Pelvic fins & belly	*Labeo victorianus*	Fryer (1961a, 1968)
		Tana River System	–	–	Fryer (1968)
		Mugambuzi River at Lake Tanganyika	–	*Garra* sp.	Fryer (1961b)
				Cyprinid fishes	Fryer (1961a)
		Tana River & Ragati River	Belly & fins	*Labeo cylindricus*	Fryer (1964, 1968)
		Nile & Congo River Syst.	–	Cyprinid fishes	Fryer (1968)

Table 3 (continued)

	Species	Locality	Site	Host	Reference
	larvae	Konkoure & Mamou Rivers	–	*Amphilius grandis*	Fryer (1961a)
			–	*A. rheophilus*	Fryer (1961a)
				A. grammatophorus	Fryer (1961a)
		Mugambuzi River	–	*Amphilius* sp.	Fryer (1961a)
		Regati River (Tana)	–	*A. grandis* & *Garra* sp.	Fryer (1961a, 1968)
		Lake Victoria	–	*Barbus altianalis radcliffi*	Fryer (1961a, 1961b)
6	*C. meridionalis* Fryer, 1964	Nuanetzi River (Limpopo)	–	*Labeo rosae*	Fryer (1964)
		Limpopo System	–	–	Fryer (1977, 1968)
7	*C. elongatus* Fryer, 1974	Lualaba River (Congo)	–	*Synodontis longirostris*	Fryer (1974)
8	*C. australis* Fryer, 1977	Vaal River & Boskop Dam	Externally on host	*Labeo capensis*	Boxshall (1976)
		Orange River System	–	–	Boxshall (1976)
		Doorndraai Dam (Magalakwin)	–	*Labeo rosae*	Van As & Basson (1983)
		Boskop Dam	–	*L. umbratus* & *L. capensis*	OUR
		Bloemhof, Mockes, Tierpoort, Wuras, & PMK le Roux dams (Orange River System)	–	*L. capensis* and once *L. umbratus*	Van Niekerk (1984)
	larvae	Orange River System	Inside operculum	*Barbus aeneus*	Van Niekerk & Kok (1989)
9	*C. minutus* Fryer (1977)	Tra Tra- & Twee Rivers in Olifants System (A)	Gill chamber	*Barbus calidus* & *B. erubescens*	Fryer (1977)
			Mouth	*B. calidus* & *B. erubescens*	Fryer (1977)
10	*C. australissimus* Fryer, 1977	Great Berg Rivers	Mouth	*Barbus burgi*	Fryer (1977)
11	*C. fryeri* Van As, 1986	Magalakwin River	Gill chmaber	*Clarias theodorae*	Van As (1986)
		Loskop Dam, Olifants River (B)	Gill chamber	*Clarias gariepinus*	Van As (1986)
12	*C. victori* Avenant-Oldewage, 1991	Olifants River (B), Kruger Park	Body surface	*Labeo rosae*	Avenant-Oldewage (1991)
				Labeo congoro	
				L. ruddi	
				Barbus marquensis	
				Labeo cylindricus	OUR

ISSN 0075-6458

Table 3 (continued)

	Species	Locality	Site	Host	Reference
13	*C. koki* Van As, 1992	Katima Mulilo in	Tail/fin	*Labeo cylindricus*	Van As (1992)
		Zambesi River	Tail/fin	*Labeo cylindricus*	Van As (1992)
14	*Chonopeltis* sp.	Makombe River	–	*Synodontis nigriventris*	Fryer (1964)
		*Uele' River (Zaire)	–	–	Thiele (1904)
	larvae	West Africa	–	–	Fryer (1961b, 1977)
		*Okavango River	Bases of barbels	*Synodontis melanostictus*	Barnard (1955)

* - Initially identified as *C. inermis*, rectified by Fryer (respectively 1956, 1960b, 1977)
OUR - Own unpublished record.
A - Olifants River in the Cape Province, RSA.
B - Olifants River in Transvaal Province, RSA.

bases of the second pair of legs as in *C. brevis*, *C. meridionalis* and *C. australis*. A median indentation in the anterior rim of the cephalic lobe may be present (*C. congicus*, *C. fryeri*, *C. victori* and *C. koki*) or absent (*C. australis*, *C. australissimus* and *C. brevis*) or the anterior rim of the cephalic lobe may show a slight prominence (*C. flaccifrons*). (See Figs. 2 & 3).

Suckers

The maxillules are modified into powerful suckers. The diameter of a sucker relative to that of the carapace differs among species. The suckers can be small i.e. 28-29% of carapace width, as in *C. meridionalis*, *C. fryeri* and *C. brevis* or large (35-36%), as in *C. flaccifrons* and *C. minutus*. (These percentages reflect females).

Maxilla

In some species the third podomere of the maxilla shows a distinct indentation enabling the maxilla to grasp. Such a prehensile maxilla has been described in *C. flaccifrons*, *C. schoutedeni*, *C. australis*, *C. minutus*, *C. australissimus*, *C. fryeri*, *C. victori* and *C. koki*, whereas the maxilla is not prehensile in *C. brevis* and *C. elongatus*. (See Fig. 4).

Thorax

In some species (*C. elongatus*, *C. fryeri*, *C. australis*, *C. flaccifrons* and *C. brevis*) the thorax shows distinct segmentation, whereas in all other species segmentation is indistinct. Two distinct bands of pigment spots are visible on the dorsal surface of the thorax in some species (*C. brevis*, *C. minutus*, *C. meridionalis* and *C. australis*). Fryer (1964) and Van As (1986) found that *Chonopeltis* species, which occur on the fins or the external body surface of their hosts have pigment spots, whereas such spots are absent in species that occur on the inner wall of the operculum or in the buccal cavity. In *C. australis* it was established that pigment spots were not a permanent species characteristic. On some

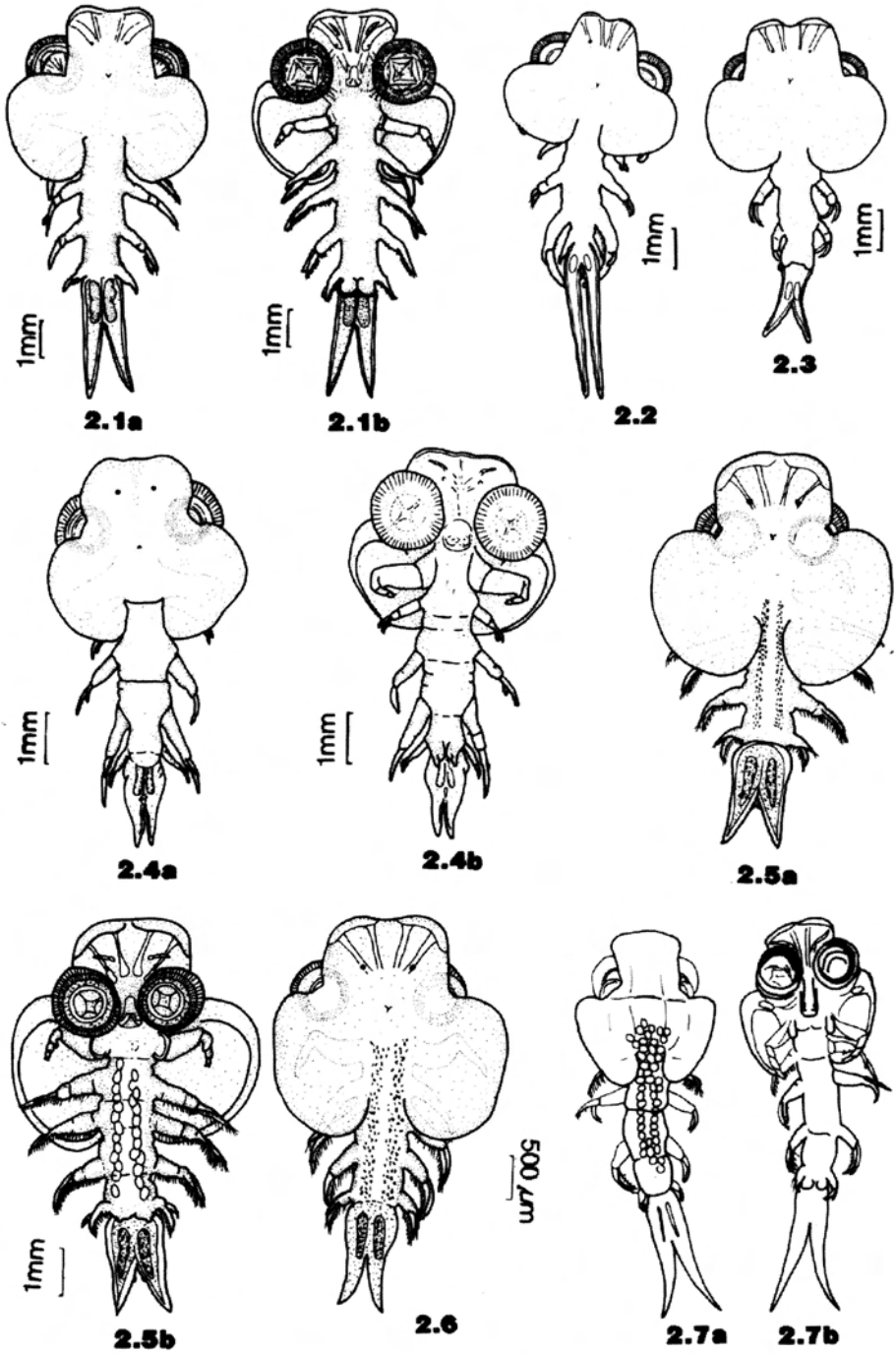

Fig. 2. *Chonopeltis* females (Second digit corresponds with species numbers used in all tables and figures)
2.1a *C. inermis*, dorsal; 2.1b *C. inermis*, ventral; 2.2 *C. shoutedeni*, dorsal; 2.3 *C. congicus*, dorsal; 2.4a *C. flaccifrons*, dorsal; 2.4b *C. flaccifrons*, ventral; 2.5a *C. brevis*, dorsal; 2.5b *C. brevis*, ventral; 2.6 *C. meridionalis*, dorsal; 2.7a *C. elongatus*, dorsal; 2.7b *C. elongatus*, ventral;

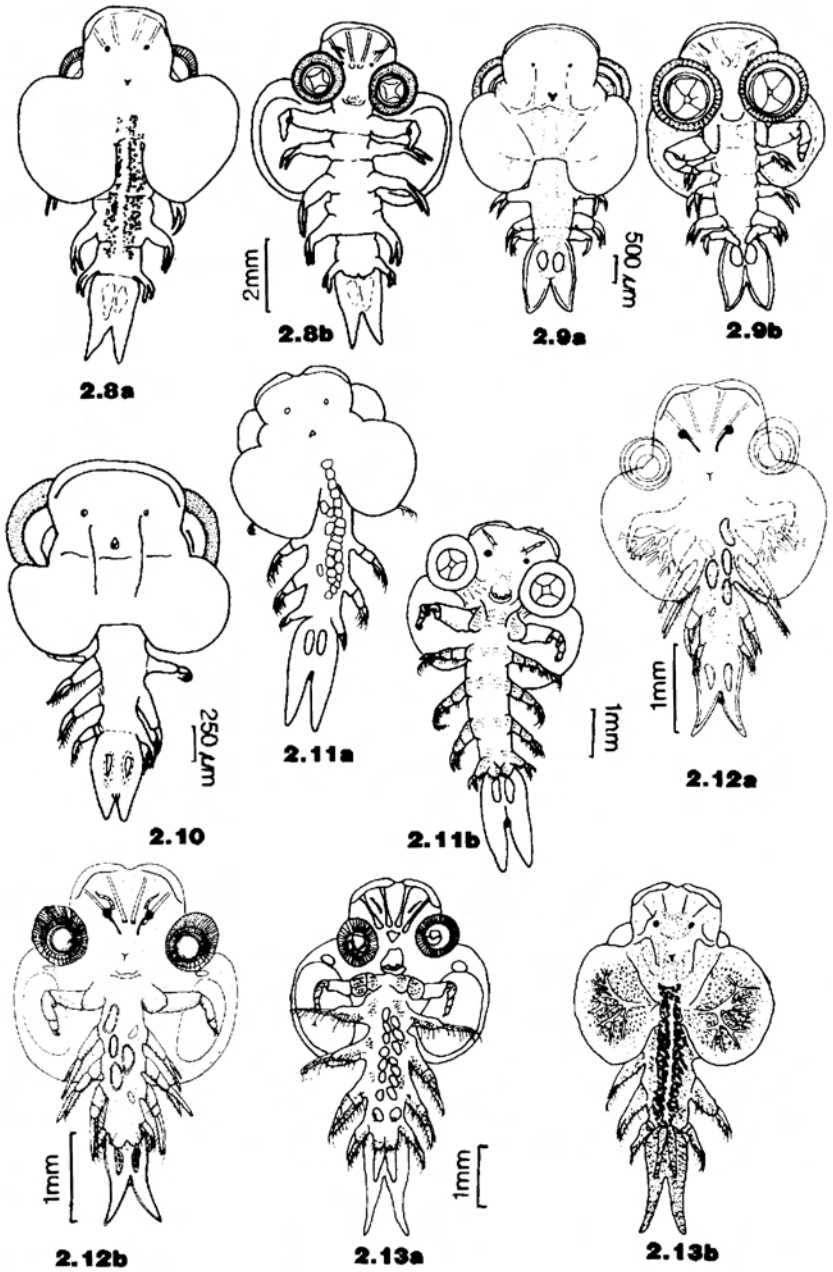

Fig. 2. (continued) *Chonopeltis* females
2.8a *C. australis* dorsal; 2.8b *C. australis*, ventral; 2.9a *C. minutus*, dorsal; 2.9b *C. minutus*, ventral; 2.10 *C. australissimus*, dorsal; 2.11a *C. fryeri*, dorsal; 2.11b *C. fryeri*, ventral; 2.12a *C. victori*, dorsal; 2.12b *C. victori*, ventral; 2.13a *C. koki*, dorsal; 2.13b *C. koki*, ventral.

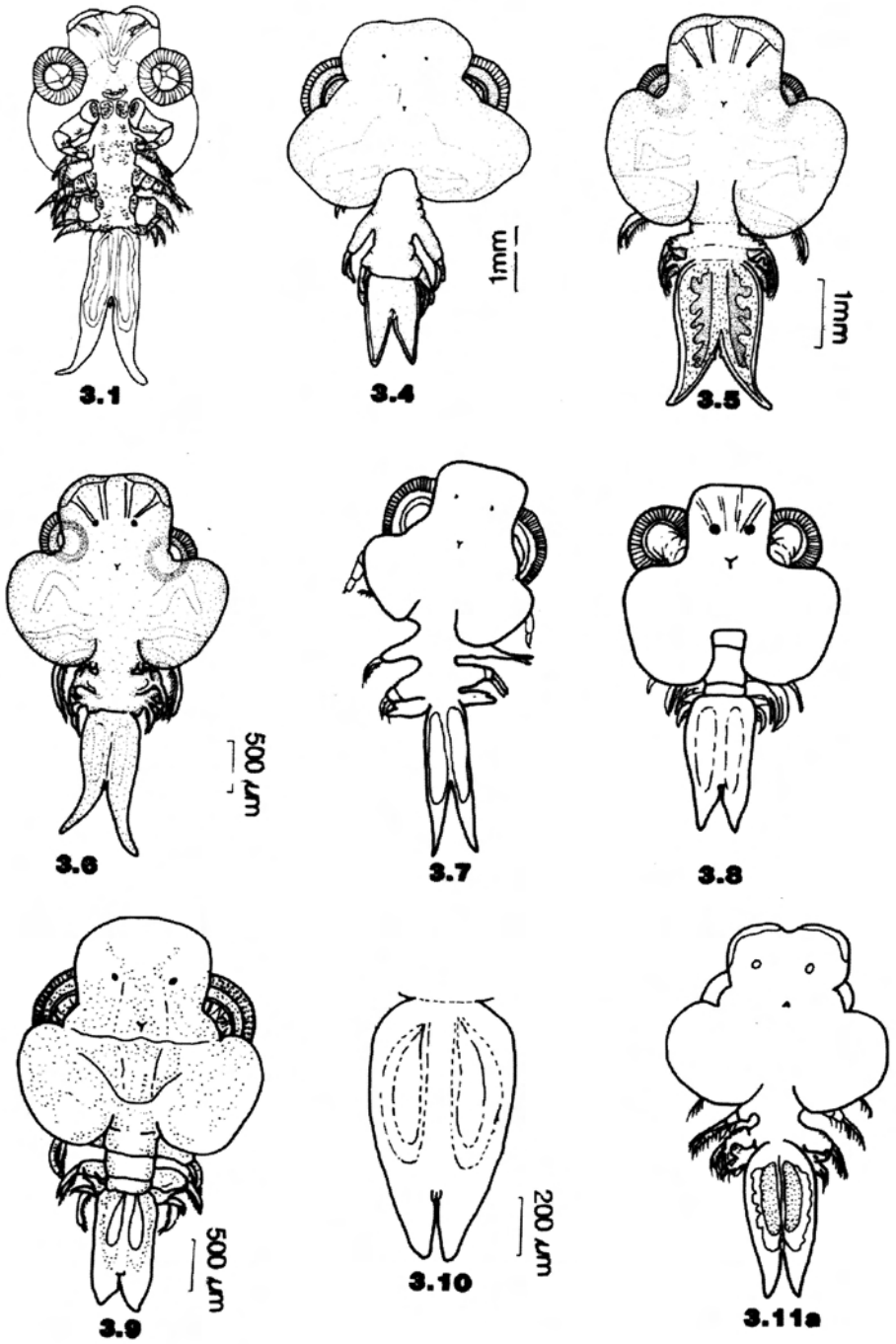

Fig. 3. *Chonopeltis* males (Second digit corresponds with species numbers used in all other tables and figures). 3.1 *C. inermis*, ventral; 3.4 *C. flaccifrons*, dorsal; 3.5 *C. brevis*, dorsal; 3.6 *C. meridionalis*, dorsal; 3.7 *C. elongatus*, dorsal; 3.8 *C. australis* dorsal; 3.9 *C. minutus*, dorsal; 3.10 *C. australissimus*, abdomen, dorsal; 3.11a *C. fryeri*, dorsal;

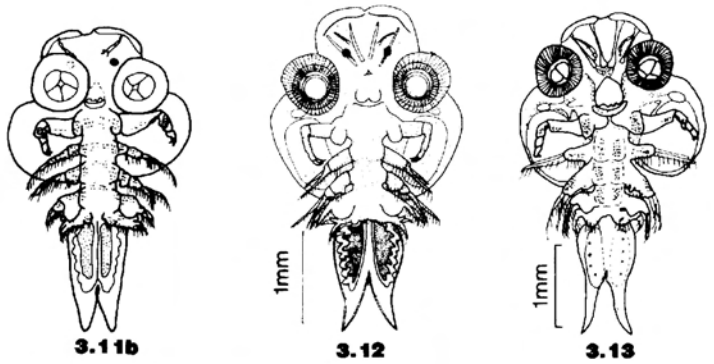

Fig. 3. (continued) *Chonopeltis* males 3.11b *C. fryeri*, ventral; 3.12 *C. victori*, ventral; 3.13 *C. koki*, ventral.

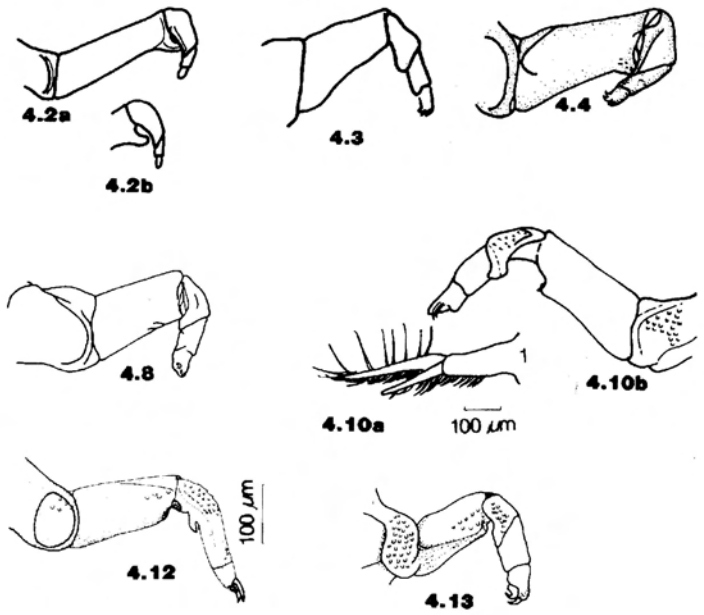

Fig. 4. *Chonopeltis* female thoracic appendages (Second digit corresponds with species numbers used in all other tables and figures). 4.2a *C. schoutedeni* maxilla, dorsal; 4.2b *C. schoutedeni* maxilla; 4.3 *C. congicus* maxilla, ventral; 4.4 *C. flaccifrons* maxilla, ventral; 4.8 *C. australis* maxilla; 4.10a *C. australissimus* first swimming leg; 4.10b *C. australissimus* maxilla; 4.12 *C. victori* maxilla; 4.13 *C. koki* maxilla.

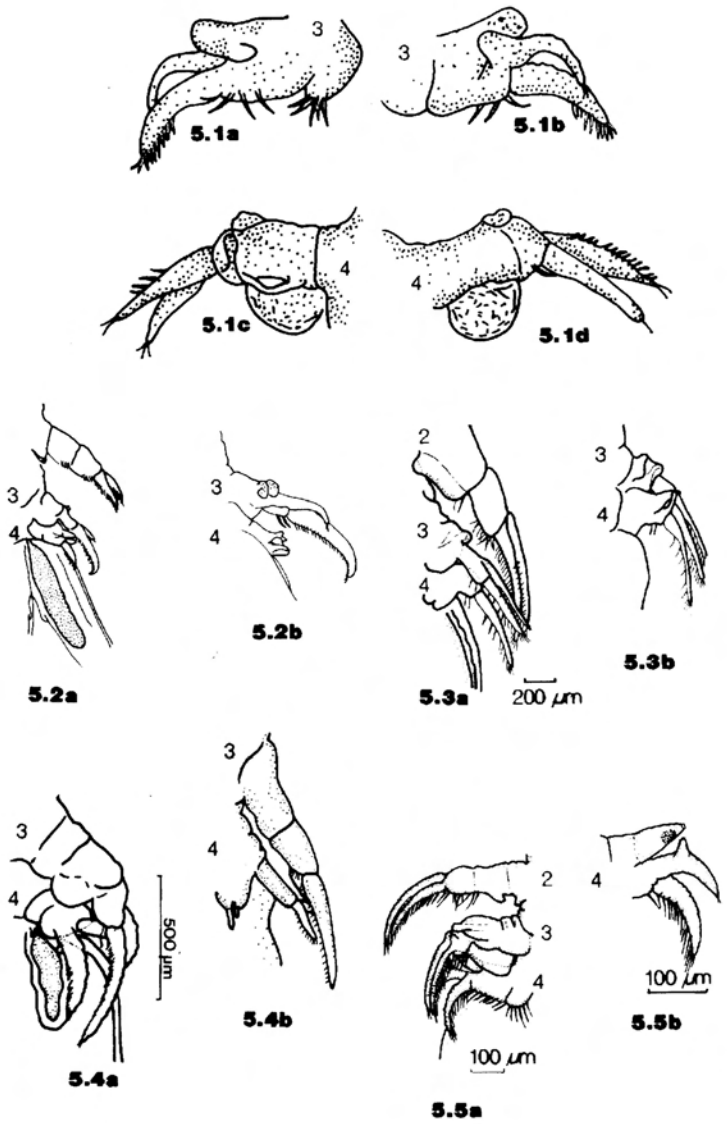

Fig. 5. *Chonopeltis* male thoracic appendages (Second digit corresponds with species numbers used in all other tables and figures).
5.1a *C. inermis* leg 3, ventral; 5.1b *C. inermis* leg 3, dorsal; 5.1c *C. inermis* leg 4, dorsal; 5.1d *C. inermis* leg 4, ventral; 5.2a *C. shoutedeni* legs 2-4, ventral; 5.2b *C. schoutedeni* legs 3-4, dorsal; 5.3a *C. congicus* legs 2-4, ventral; 5.3b *C. congicus* legs 3-4, dorsal; 5.4a *C. flaccifrons* legs 3-4, ventral; 5.4b *C. flaccifrons* legs 3-4, dorsal; 5.5a *C. brevis* legs 2-4, ventral; 5.5b *C. brevis* leg 4, dorsal.

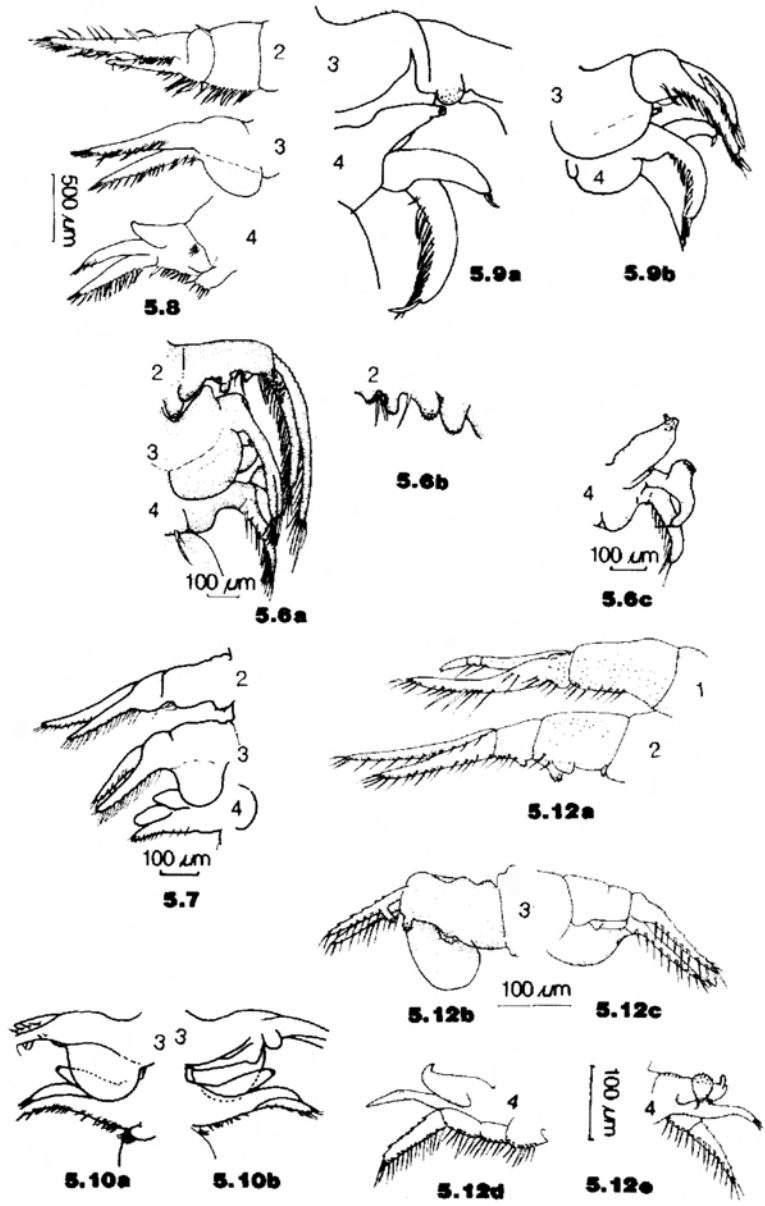

Fig. 5. (continued) *Chonopeltis* male thoracic appendages
5.6a *C. meridionalis* legs 2-4, ventral; 5.6b *C. meridionalis* leg 2, posterior face; 5.6c *C. meridionalis* leg 4, dorsal; 5.7 *C. elongatus* legs 2-4, ventral; 5.8 *C. australis* legs 2-4; 5.9a *C. minutes* legs 3-4, dorsal; 5.9b *C. minutes* legs 3-4, ventral; 5.10a *C. australissimus* legs 3-4, ventral; 5.10b *C. australissimus* legs 3- 4, dorsal; 5.12a *C. victori* legs 1-2, ventral; 5.12b *C. victori* leg 3, ventral; 5.12c *C. victori* leg 3, dorsal; 5.12d *C. victori* leg 4, ventral; 5.12e *C. victori* leg 4, dorsal.

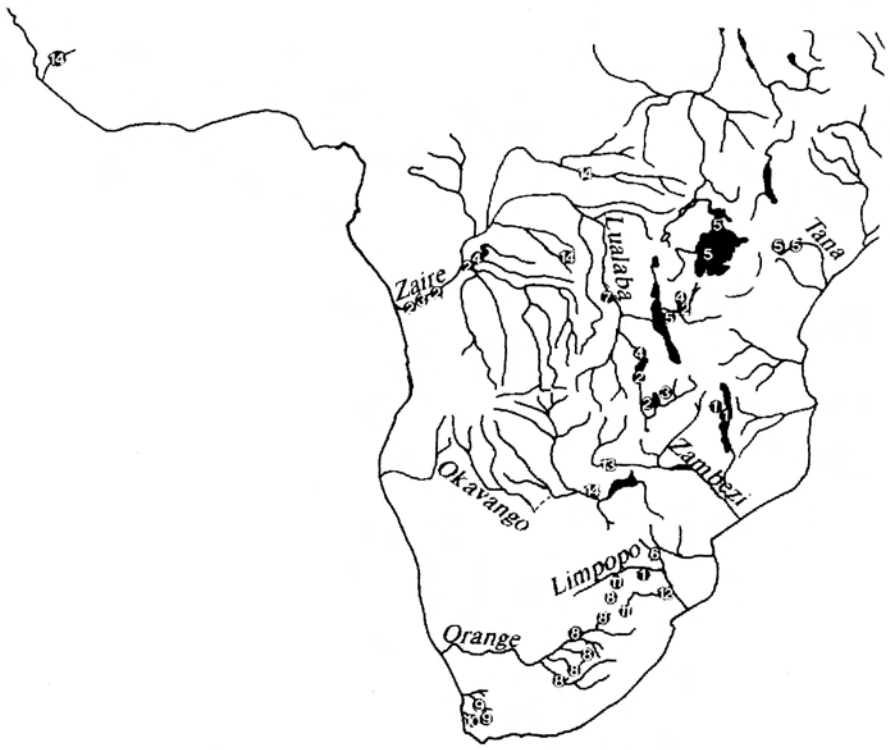

Fig. 6. The geographical distribution of *Chonopeltis* in Africa. Numbers correspond with those in Tables 1, 2 & 3 and Figs. 2 - 5.

occasions they were present, in others absent, and this was related to the coloration of the position on the host as well as to the sexual maturity of the parasite. i.e. animals with genetic products display a distinct band of pigment shielding these from sunlight as was suggested by Fryer (1964).

Thoracic appendages

The shape and size of the thoracic appendages differ considerably in the different species. In the females legs 1-4 are similar in structure, each being somewhat smaller than the preceding pair, except for *C. schoutedeni* and *C. flaccifrons* where leg 3 reaches back more than halfway along the abdomen, beyond the extremity of leg 4 and in *C. schoutedeni* where the fourth leg is remarkably shorter. In males leg 2 differs as papillated structures occur on its posterior face in *C. meridionalis*, *C. brevis*, *C. schoutedeni*, *C. fryeri*, *C. victori* and *C. koki*. Furthermore, a socket is present on leg 3 of males and a peg on leg 4. The differences in these structures are used as diagnostic criteria. (See Fig. 5).

The peg on leg 4 has been indicated as a sperm transfer instrument (Van As & Van As 1993). Serial sections of male individuals of *C. australis* and *C. victori* studied in our laboratory clearly indicate that no connection exists between the reproductive system and this structure. A second possibility, that sperm is collected by the peg from the genital opening in a manner resembling the performance of the pedipalps of spiders, can also be ruled out as the configuration of the structures on leg 4 renders it impossible for the peg to reach the genital opening. This structure serves purely for grasping the female during copulation as is certainly the case in *Dolops*

ranarum (Stuhlmann, 1891) and *D. geayi* (Bouvier, 1877) a related genus where sperm is transferred in a spermatophore (Fryer 1958, 1960a) but a clasping structure is still present although on the third leg (Avenant *et al.* 1989). In other species of *Dolops*, e.g. *D. longicauda* (Ringuelet, 1948) an elaborated peg and socket is present, but it is unfortunately not known whether spermatophores occur in this species.

The natatory lobe, situated on the fourth leg in both sexes, differs in shape and size and helps to distinguish species. It is bifid in *C. flaccifrons*, rectangular in *C. minutes*, circular in *C. brevis*, *C. australissimus* and *C. fryeri*, small in *C. elongatus* and very large in *C. australis*. These lobes differ between males and females — a fact which in our opinion indicate that these structures are more than mere swimming lobes as proposed by Van As & Van As (1993), but rather have a reproductive function. Furthermore, the natatory lobes are usually setose. In *C. minutes* the setae are minute and in *C. flaccifrons* setae are even absent.

Abdominal lobes

The abdominal lobes differ in length and in shape in different species. *C. schoutedeni* for instance, has very long abdominal lobes comprising 41% of the total body length. The length of the abdominal cleft also differs among species, being deep in *C. schoutedeni*, *C. elongatus* and *C. inermis*, but shallow in *C. minutes*, *C. australissimus* and *C. australis*. The abdominal lobes of the males generally resemble those of females, but are proportionally longer, except in *C. schoutedeni* (Tables 1 & 2). The shape of the testis is usually ellipsoid and the lateral capsular wall is smooth except in *C. brevis*, *C. fryeri*, *C. inermis*, *C. victori* and *C. koki*, where the lateral capsular wall is undulated. Although not mentioned in the species descriptions pigment spots are indicated on the abdomen of the males in the figures accompanying the descriptions of *C. brevis* and were observed in *C. australis*. These pigment spots are indicated in *C. koki* and where noted by the second author in *C. victori* although it is not mentioned in the species description.

The furcal rami are situated at the base of the abdominal cleft, except in *C. brevis* and *C. schoutedeni*, where they are situated more posteriorly on the median wall of the abdominal lobes.

The geographical distribution of *Chonopeltis*

The genus *Chonopeltis* is confined to Africa. The hosts and sites of attachment on the host are summarised in Table 3. Geographical distribution is illustrated in Fig. 6.

It is noteworthy that *C. brevis* and *C. inermis* are the only species which occur in more than one river system (see Fig. 6) with *C. brevis* in the Tana River and in Lake Victoria in the Nile river system, whereas *C. inermis* occurs in Lake Malawi as well as the Limpopo River. A wide variety of *Chonopeltis* species on the other hand occur in the Zaïre and Limpopo rivers respectively (see Fig. 6). In the Limpopo river system *C. fryeri* and *C. inermis* occurred exclusively on clariid fishes whereas *C. meridionalis*, *C. victori* and *C. australis* occur on cyprinids and all three on *Labeo rosae* although at different localities (see Fig. 6).

References

AVENANT-OLDEWAGE, A. 1991. A new species of *Chonopeltis* (Crustacea: Branchiura) from the Kruger National Park, Southern Africa. *Journal of African Zoology* 105: 313-321.

AVENANT, ANNEMARIÉ, LOOTS, G.C. AND J.G. VAN AS. 1989. A redescription of *Dolops ranarum* (Stuhlmann, 1891) (Crustacea: Branchiura). *Systematic Parasitology* 13: 141-151.

BARNARD, K.H. 1955. South African Parasitic Copepoda. Annals of the *South African Museum* 41: 223-312.

BOXSHALL, G.A. 1976. A new species of *Chonopeltis* (Crustacea: Branchiura) from Southern Africa. *Bulletin of the British Museum (Natural History) Zoology* 30: 217-221.

BRIAN, A. 1940. Sur quelques Arguilidés d'Afrique. *Revue de Zoologie et Botanique africaine* 33(2): 77-98.

DARTEVELLE, E. 1951. Crustacés parasites de poissons du Congo. *Zooleo* (Nouvelle Série) 9: 11-13.

ESSER, R.P., V.G. PERRY AND A.L. TAYLOR. 1976. A diagnostic compendium of the genus *Meloidogyne* (Nematoda: Heteroderidae). *Proceedings of the helminthological Society Washington* 43: 138-150.

FRYER, G. 1956. A report of the parasitic Copepoda and Branchiura of the fishes of Lake Nyasa. *Proceedings of the zoological Society of London* 127: 293-344.

FRYER, G. 1958. Occurrence of spermatophores in the genus *Dolops* (Crustacea: Branchiura). *Nature* 181: 1011-1012.

FRYER, G. 1959. A report on the parasitic Copepoda and Branchiura of the fishes of Lake Bangweulu (Northern Rhodesia). *Proceedings of the zoological Society of London* 132(4): 517-550.

FRYER, G. 1960a. The spermatophores of *Dolops ranarum* (Crustacea: Branchiura): their structure, formation and transfer. *Quarterly Journal of Microscopical Sciences* 101: 407-432.

FRYER, G. 1960b. Studies on some parasitic Crustaceans on African freshwater fishes, with descriptions of a new copepod of the genus *Ergasilus* and a new branchiuran of the genus *Chonopeltis*. *Proceedings of the zoological Society of London* 133: 79-102.

FRYER, G. 1961a. Larval development in the genus *Chonopeltis* (Crustacea: Branchiura). Proceedings of the zoological Society of London 137: 61-69.

FRYER, G. 1961b. The parasitic Copepoda and Branchiura of the fishes of Lake Victoria and the Victoria Nile. *Proceedings of the zoological Society of London* 137: 41-60.

FRYER, G. 1964. Further studies on the parasitic Crustacea of African freshwater fishes. *Proceedings of the zoological Society of London* 143: 79-102.

FRYER, G. 1965. Crustacean parasites of African freshwater fishes, mostly collected during the expeditions to Lake Tanganyika, and to Lakes Kivu, Edward and Albert, by the Institute Royal des Sciences Naturelles de Belgique. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique* 41(7): 1-22.

FRYER, G. 1968. The parasitic Crustacea of African freshwater fishes, their biology and distribution. *Journal of Zoology (London)* 156: 45- 95.

FRYER, G. 1974. Une nouvelle espéce de *Chonopeltis* (Crustacea: Branchiura) parasite d'un poisson congolais. *Revue de Zoologie africaine* 88: 437-440.

FRYER, G. 1977. On some species of *Chonopeltis* (Crustacea: Branchiura) from the rivers of the extreme South West Cape region of Africa. *Journal of Zoology (London)* 182: 441-455.

LAHILLE, F. 1926. Nota sobre unos parasitos de los bagres dorades y surubìes. *Revista Centro de Estudiantes de agronomia Veterinario Buenos Aires* 19: 6-16.

MONOD, T. 1928. Les Argulidés du Musée du Congo. *Revue de Zoologie et Botanique africaine* 16: 242-274.

RINGUELET, R. 1948. Argùlidos del museo de la plata. *Zoologia* 33: 281- 296.

THIELE, J. 1900. Diagnosen neuer Arguliden Arten. *Zoologischer Anzeiger* 23: 46-48.

THIELE, J. 1904. Beiträge zur Morphologie der Arguliden. *Mitteilingen aus den zoologischen Museum in Berlin* 2: 1-51.

VAN AS, J.G. 1986. A new species of *Chonopeltis* (Crustacea: Branchiura) from the Limpopo system, southern Africa. *South African Journal of Zoology* 21(4): 348-351.

VAN AS, J.G. 1992. A new species of *Chonopeltis* (Crustacea: Branchiura) from the Zambesi River System. *Systematic Parasitology* 22: 221-229.

VAN AS, L.L. AND J.G. VAN AS, 1992. First record of *Chonopeltis inermis* Thiele, 1900 in the Limpopo River System, with notes on geographical distribution. *Journal of the South African veterinary Association* 63(4): 182.

VAN AS, L.L. AND J.G. VAN AS. 1993. First record of *Chonopeltis inermis* Thiele, 1900 (Crustacea: Branchiura) in the Limpopo River System with notes on its morphology. *Systematic Parasitology* 24: 229-236.

VAN AS, J.G. AND LINDA BASSON. 1983. Checklist of freshwater fish parasites from southern Africa. *South African Journal of Wildlife Research* 14(2): 49-61.

VAN NIEKERK, J.P. 1984. *The biology of* Chonopeltis *Thiele, 1900 (Crustacea: Branchiura) in the Orange-Vaal River catchment area.* Ph.D. thesis, University of the Orange Free State, Bloemfontein.

VAN NIEKERK, J.P. AND D.J. KOK. 1989. *Chonopeltis australis* (Branchiura): Structural, developmental and functional aspects of the trophic appendages. *Crustaceana* 57: 51-56.