

## Studies on *Haliplectus* Cobb, 1913. Introduction and redescription of *H. bickneri* Chitwood, 1956 (Nematoda : Haliplectidae)

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**Summary** – Specimens of *Haliplectus bickneri* Chitwood, 1956 were collected from two localities in southern Africa : Swartvlei in the Cape Province and Cebe, Transkei. A SEM-study was conducted on the Swartvlei-population, resulting in a better understanding of the external head morphology, cephalic receptors, supplements and the midventral ridge in males. An interesting feature of these specimens is the sometimes huge, yellowish coelomocytes occurring in specific areas of the body.

**Résumé** – Étude du genre *Haliplectus* Cobb, 1913. Introduction et redescription de *H. bickneri* Chitwood, 1956 (Nematoda : Haliplectidae) – Des spécimens de *Haliplectus bickneri* Chitwood, 1956 ont été récoltés en deux localités d'Afrique du Sud, Swartvlei (Province du Cap) et Cebe (Transkei). L'étude au MEB de la population Swartvlei a permis de mieux comprendre la morphologie de la partie céphalique, des récepteurs céphaliques et de la crête médio-ventrale présente chez le mâle. Une observation intéressante faite sur ces spécimens réside en la présence de coelomocytes jaunâtres, parfois énormes, localisés en des points particuliers du corps.

**Key-words** : *Haliplectus*, SEM, taxonomy, nématodes, ultrastructure.

Recently, specimens of *Haliplectus* were collected in several places along the southern African coast, mostly in dune sands, as well as on four islands in the Seychelles group. It is intended to report on this material in a series of short publications, the last of which will include a compendium of the genus.

Cobb (1913) described the genus *Haliplectus* for the type and only species, *H. pellucidus*. In his publication he mentioned that several more (undescribed) species occurred along the coasts of the United States. When Chitwood (1956) later examined Cobb's files, he found the unpublished descriptions of three further species, which he then published under Cobb's name, viz. *Haliplectus floridanus*, *H. conicephalum* and *H. dorsalis*. Moreover, he found that the illustrations which were included with Cobb's original description of *H. pellucidus*, actually pertained to *H. floridanus*.

De Coninck (1943) proposed the genus *Aegialospirina* for his new species, *A. schulzi* and also transferred *Spirina bibulbosa* Schulz, 1934 to this genus. In his comprehensive revision of *Haliplectus*, Gerlach (1963) synonymized *Aegialospirina* with *Haliplectus*, and transferred the above-mentioned two species to *Haliplectus*.

Chitwood (1951) placed *Haliplectus* within the family Leptolaimidae Oerley, 1880, in a new subfamily Haliplectinae. De Coninck (1965) raised the subfamily to family level.

For a complete list of species up to 1973, see Gerlach

and Riemann's Checklist (1973). Species described since the publication of their checklist are : *H. brevispiculatus* Andrassy, 1973; *H. leptcephalus* Vinciguerra & Zullini, 1980; *H. tripapillaus* Blome, 1982 and *H. salicornus* Pastor de Ward, 1984.

### Materials and methods

Specimens of *H. bickneri* were collected from two localities : fifteen specimens from Swartvlei (South Africa), some of which were used for a SEM-study and three specimens from Cebe, on the Transkeian coast. They were killed in hot FAA (70 °C) and processed into dehydrated glycerine by Cobb's slow method. Measurements of curved structures were made along the median line. Distance of amphid apertures from anterior end measured from head to anterior rim of amphid aperture. For the SEM study specimens were fixed in 2.5 % buffered glutaraldehyde, post-fixed in 1 % buffered osmium tetroxide and dehydrated in an ethanol series. The specimens were critical point dried, coated with gold and viewed with an ISI SS 60 scanning electron microscope.

### *Haliplectus bickneri* Chitwood, 1956

(Figs 1-4)

#### MEASUREMENTS

*Population from Swartvlei*

*Males* (n = 6) : L = 0.83 (0.77-0.85) mm; a = 20.4 (17.7-21.3); b = 8.0 (7.7-8.4); c = 20.5 (17.7-22.5); c' = 1.52 (1.34-1.63); tail length = 41 (38-44)  $\mu$ m.

*Females* (n = 7) : L = 0.78 (0.73-0.82) mm; a = 20.2 (18.7-21.8); b = 7.6 (6.7-8.3); c = 19.5 (17.6-21.4); c' = 1.61 (1.41-1.82); V = 53.5 (50.7-56.6) %; tail length = 38.2 (35-43)  $\mu$ m.

*Juvenile a* (n = 1) : L = 0.47 mm; a = 15.7; b = 5.2; c = 14.5; c' = 1.65; tail length = 33  $\mu$ m; pharynx length = 89  $\mu$ m.

*Juvenile b* (n = 5) : L = 0.65-0.84 mm; a = 17.3-22.3; b = 7.0-8.2; c = 15.8-21.0; c' = 1.53-1.96; tail length = 33-45  $\mu$ m; pharynx length = 91-101  $\mu$ m.

#### *Population from Cebe, Transkei*

*Male 1* : L = 0.83 mm; a = 22.1; b = 8.3; c = 22.5; c' = 1.92; Tail length = 48  $\mu$ m; spicule length = 40  $\mu$ m; gubernaculum length = 11.5  $\mu$ m.

*Male 2* : L = 0.87 mm; a = 20.4; b = 8.4; c = 17.3; c' = 1.71; tail length = 44.5  $\mu$ m; spicule length = 42  $\mu$ m; gubernaculum length = 12  $\mu$ m; supplements of both males four, contiguous.

*Female* (n = 1) : L = 0.68 mm; a = 18.5; b = 8.1; c = 25; c' = 1.42; V = 55 %; tail length = 27  $\mu$ m.

*Juvenile 4* (n = 1) : L = 0.45 mm; a = 14.5; b = 6.3; c = 16.1; c' = 1.4; V = 60.2 %; tail length = 28  $\mu$ m.

## DESCRIPTION

### *Population from Swartvlei* (Fig. 1-3)

*Males* : Body small, moderately ventrally curved to almost straight when heat-relaxed, attenuated at both ends. Cuticle strongly annulated, annuli 2.5-3  $\mu$ m wide. Thickness of cuticle : 1.5-2.0  $\mu$ m in neck region; 2-2.5  $\mu$ m at midbody and about 1.3-1.5  $\mu$ m in tail region. Lateral chord 15.5-16.5  $\mu$ m wide, two rows of sublateral pores present on both sides of body. Well-developed rows of subventral and subdorsal pores observed on each side of body, the two subdorsal rows starting close to each other at the level of the amphid apertures. Lips amalgamated, head 8.5-10  $\mu$ m wide, mouth opening round, surrounded by a fringe of twelve finger-like projections (about 0.5  $\mu$ m long). Two whorls of six inner papillae and six outer setiform labial papillae present on head. Two setae and two pores (setae broken off?) were observed within the first body annule posterior of the head. Each seta is situated opposite its counterpart in either a subventral or subdorsal position. The two pores are arranged likewise (cephalic sense organs?). Amphid apertures circular, 4-4.5  $\mu$ m in diameter, unispiral, ventrally wound on inside. Amphid apertures situated 10-14  $\mu$ m from anterior end. Stoma sclerotized, with distinct cheilorhabdions and a 42-47  $\mu$ m long tube with at least one small denticle at its base. Pharynx 90-109  $\mu$ m long with small, oval-shaped anterior bulb (13.5-14  $\mu$ m  $\times$  12.5-13  $\mu$ m), tubular isthmus

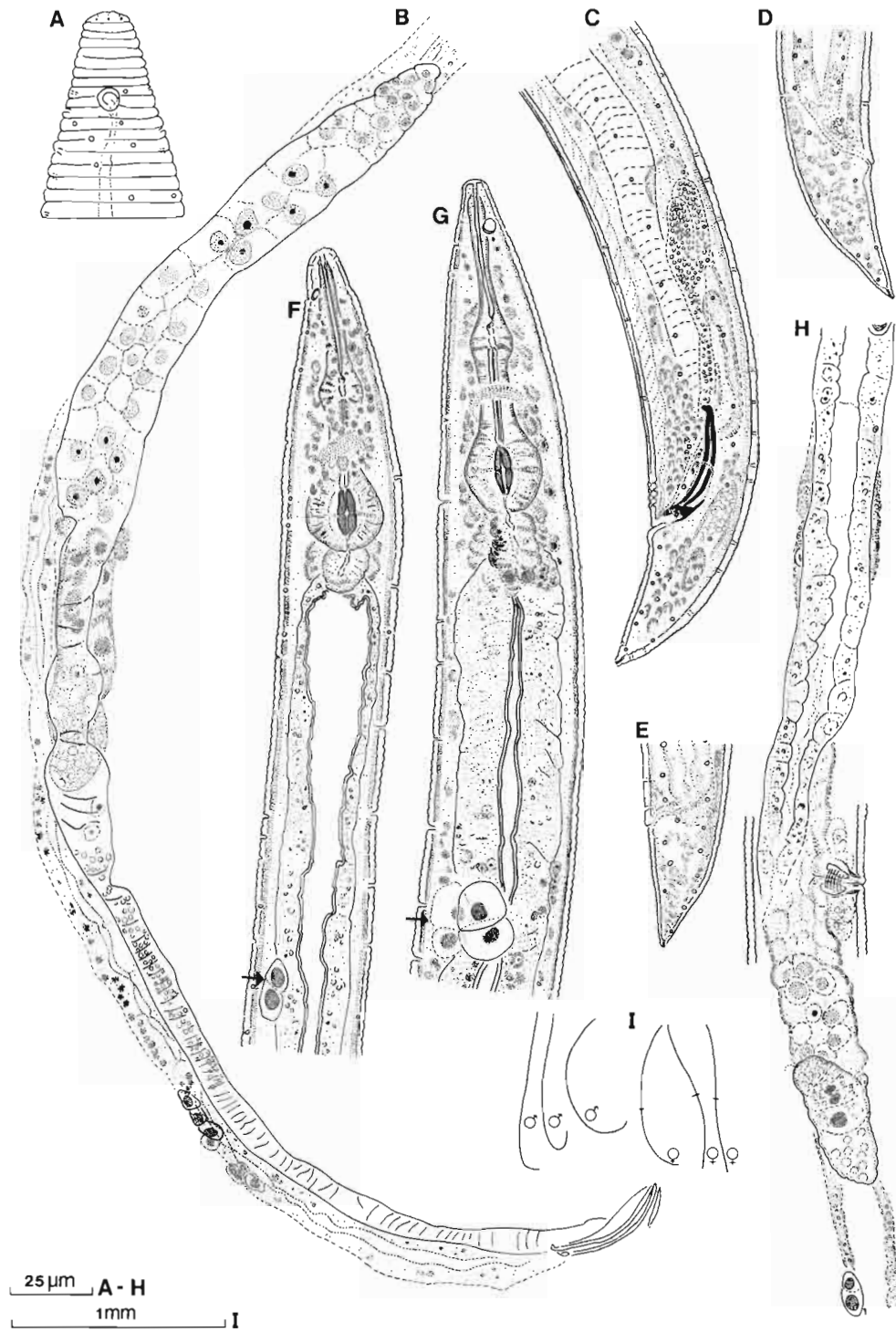
(16-19  $\mu$ m  $\times$  8.0-8.5  $\mu$ m) and a round, muscular basal bulb (22-25  $\mu$ m  $\times$  21.5-25  $\mu$ m). Lumen of both isthmus and especially of basal bulb with thickened walls. Valvular apparatus within basal bulb elongated, valve plates smooth. Two "breaks" or "joints" evident within basal bulb. Cardia distinct, multi-cellular, 13-20  $\mu$ m long. Intestine usually thick-walled. Nerve ring surrounding isthmus at 62-65  $\mu$ m from anterior end. Four coelomocytes with yellowish nuclei occur in two pairs ventrally at 115-235  $\mu$ m and 217-288  $\mu$ m from anterior end, but occasionally the four cells are in tandem. While the first pair is always well-defined, the second pair can be difficult to discern. In some specimens both pairs occur on the same level. A row of six to sixteen smaller coelomocytes occurs dorsally from about 200-280  $\mu$ m from tail tip. Male reproductive system diorchic, testes in many individuals obscure. Anterior testis outstretched, well-developed. Posterior testis small, apparently reflexed in some individuals outstretched in other. Both testes on right hand side of intestine. *Vas deferens* not muscular. Spicules two, of equal length, 39-45  $\mu$ m long, arcuate, weakly cephalated. Gubernaculum small, plate-like without apophysis, 12-14  $\mu$ m long. Supplements four, contiguous, just in front of the cloacal opening. A midventral cuticular ridge starts from the anteriormost supplement, running anteriorly to about mid-body. This ridge appears finely annulated when viewed with the light microscope and almost like a string of beads with the SEM. Seemingly associated with the midventral ridge, is a peculiar (probably cuticular) fibrous sheath which stretches internally from the anteriormost supplement to mid-body. About four ejaculatory glands can be discerned. Caudal pores on male tail numerous, five pairs situated subventrally and four pairs subdorsally; they are the continuation of a series of laterodorsal and lateroventral body pores.

*Females* : Female reproductive system didelphic, amphidelphic, anterior branch usually longer than posterior branch. Anterior ovary situated on left of intestine, posterior ovary on right hand side. Vulva a small, transverse slit. Vagina weakly muscular, surrounded by a few gland-like cells. Caudal pores on female tail arranged as follows : three pairs situated subventrally, five to six pairs subdorsally plus one pair mediolaterally in variable positions; from halfway down tail to slightly preanal. Tails of both males and females elongate-conoid but tapered in posterior one-third in females. Caudal glands and spinneret faintly visible. Many cells and nuclei observed within tail.

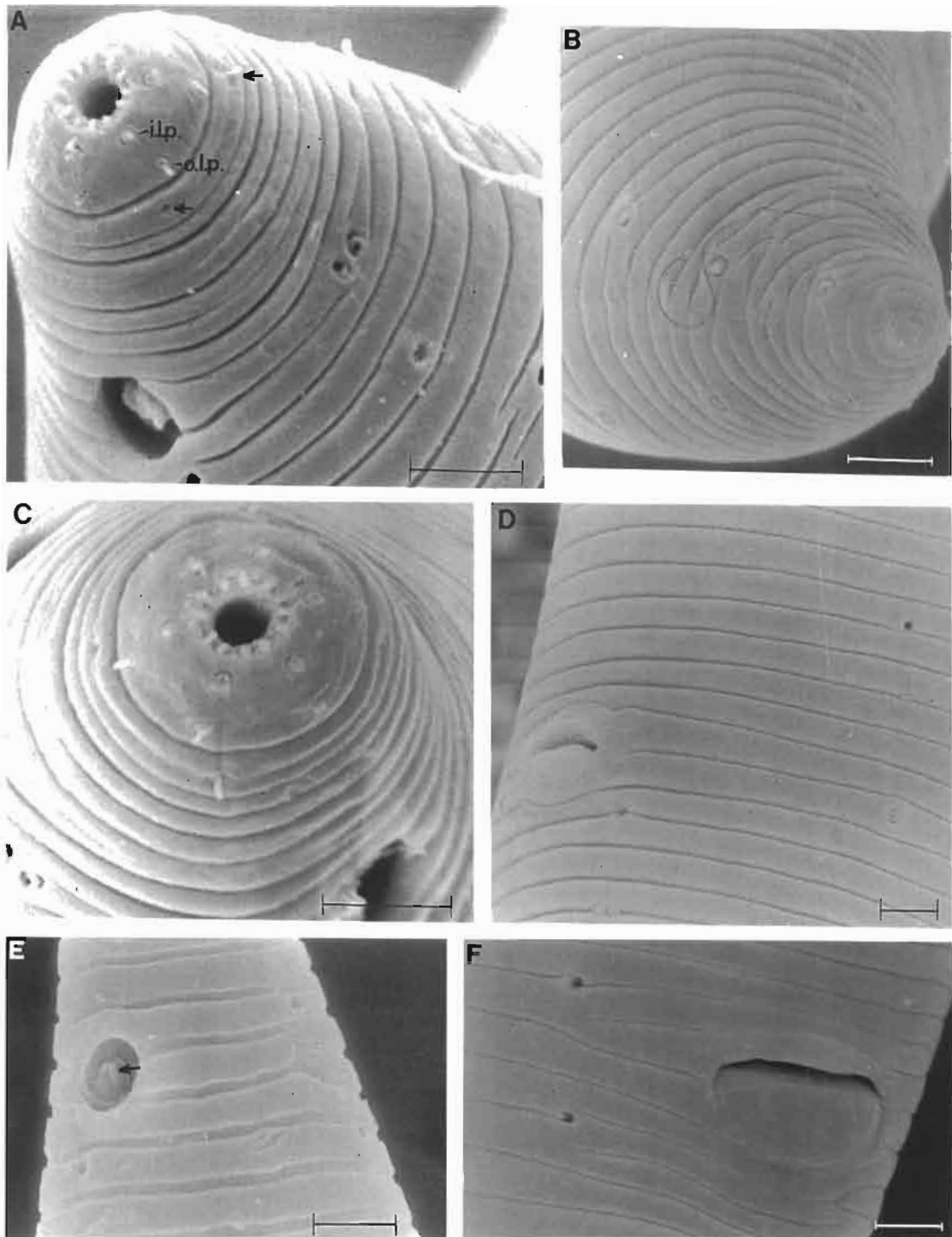
*Juveniles* : Description as for adults. No genital primordia observed. Juvenile stage not known.

### *Population from Cebe* (Fig. 4)

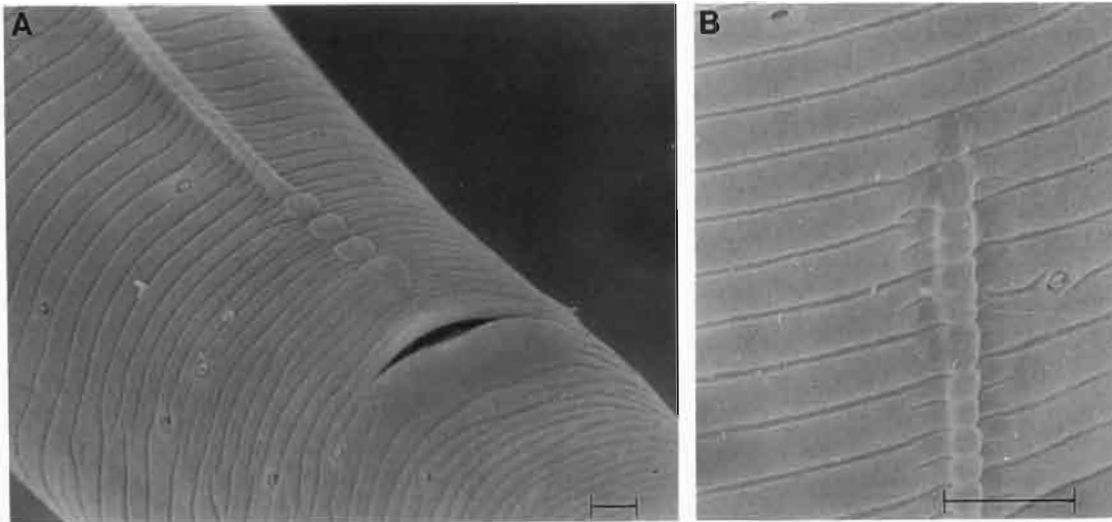
The Cebe-specimens resemble the Swartvlei-specimens in the presence of a midventral ridge in males, stretching from the first supplement to midbody. They differ in the shorter tail and shorter spinneret. The fe-



**Fig. 1.** *Haliplectus bickneri* Chitwood, 1956 (Swartvlei population). A : External morphology of anterior region of male; B : Reproductive system of male; C : Male tail showing ejaculatory glands, fibrous sheath and midventral ridge; D, E : Female tail; F : Female anterior region, showing one pair of coelomocytes (arrow); G : Male anterior region, showing two pairs of coelomocytes (arrow); H : Female reproductive system; I : Heat-relaxed body postures.



**Fig. 2.** *Haliplectus bickneri* Chitwood, 1956 (Swartvlei population). A : Female head (Arrow indicates a pore and seta occurring on first annule posterior of head; i.l.p. = inner labial papilla; o.l.p. = outer labial papilla); B : Female tail; C : En face view of female head; D : Vulva; E : Male head region (arrow indicates unispiral amphid aperture); F : Anal opening (Bar = 5  $\mu$ m).



**Fig. 3.** *Haliplectus bickneri* Chitwood, 1956 (Swartvlei population). A : Male tail showing cloacal opening, midventral ridge and four supplements; B : Midventral ridge at mid-body (Bar = 5  $\mu$ m).

male tail has four pairs of subventral and five pairs of subdorsal pores, while the male tail has five pairs subventrally and four pairs subdorsally.

The J4 in the Cebe-population compares well with the adults. The two branches of the genital tract are fully developed, the vagina is well-defined but the vulval opening not yet established.

#### LOCALITIES

At Swartvlei near Sedgefield, under indigenous grasses and shrubs in dune sand close to the beach, above high water spring tide.

At Cebe, Transkei, in clean sand under indigenous trees.

#### VOUCHER SPECIMENS

Slide numbers of Swartvlei-specimens deposited in RAU-collection : RAU 5635 and RAU 5849-RAU 5865. Collections made in September 1990 by J. Heyns.

Slide numbers of Cebe-specimens deposited in the nematode collection at the Rijksuniversiteit Gent : Transk. AC 8, Transk AC 44 and Transk AC 73. Collection made in April 1986 by A. Coomans and J. Heyns.

#### DISCUSSION

The Swartvlei-specimens agree well with the original description of *H. bickneri* Chitwood, 1956, even in the unequal lengths of the two branches of the genital system of the female. The following small differences were observed : firstly, the position of the vulva :  $V = 50.7-56.6\%$  in the Swartvlei-specimens, against  $V = 49\%$  in the type specimen. However, vulva position corre-

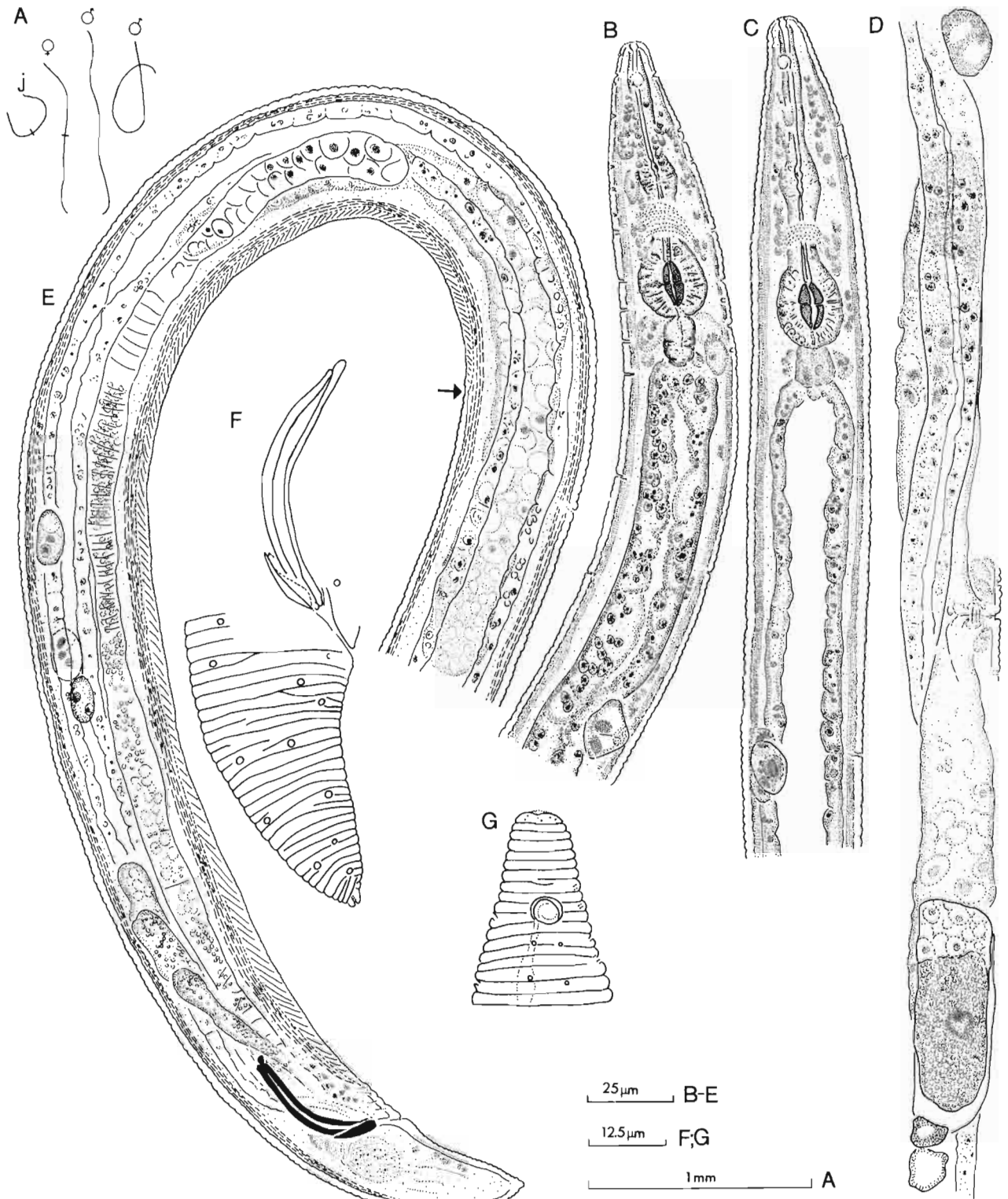
sponds with that of specimens of *H. bickneri* from Cuba (Andrássy, 1973) with a  $V$ -value of 50-54%. Secondly, the spicules are somewhat longer in the males from Swartvlei (39-45  $\mu$ m against 35-38  $\mu$ m in the types), but compare well with those of Cuban specimens (40-42  $\mu$ m) and also with those of specimens from the Red Sea (40  $\mu$ m as described by Gerlach (1967)).

The Swartvlei specimens are also near *H. dorsalis* Cobb in Chitwood, 1956 but differ from that species in the following : The  $c'$  - value is quite lower in females ( $c' = 1.41-1.82$  compared to  $c' = 2.41-3.5$ ) and the position of the vulva differs :  $V = 50.7-56.6\%$  in Swartvlei-specimens against  $V = 44-46\%$  in *H. dorsalis*. The biggest difference between the Swartvlei-population and *H. dorsalis*, is in the arrangement of male supplements. The four supplements are contiguous in the males from Swartvlei and arranged in a 1 + 1 or 1 + 3 configuration in *H. dorsalis*. The spicules of the Swartvlei-males are also longer (39-45  $\mu$ m compared to 24-32  $\mu$ m).

The morphology and morphometrical data of the Cebe-specimens agree well with that of the type specimens of *H. bickneri*, but differs in the vulva which is in a more posterior position ( $V = 55\%$  against  $V = 49\%$ ). In this character the Cebe-female is quite near those from Cuba and Swartvlei. Another difference is in the lengths of the two branches of the reproductive tract of the female, which is not as different as described for the type specimens of *H. bickneri*.

Characters described for the first time in *H. bickneri*, are the following : the two whorls of inner and outerlabial papillae on the head, the presence of twelve finger-like projections around the mouth opening and the midventral ridge observed in males. Especially the presence of the twelve projections around the oral opening could





**Fig. 4.** *Haliplectus bickneri* Chitwood, 1956 (Cebe population). A : Heat-relaxed body posture; B : Anterior region of female; C : Anterior region of male; D : Female reproductive system; E : Male tail and reproductive system (Arrow indicates anterior limit of mid-ventral ridge); F : External view of male tail; G : External morphology of male head.

be of phylogenetic importance. Indeed if these structures are homologous with the twelve vestibular folds characteristic of the Chromadorina (Filipjev, 1934; Lorenzen, 1981) then the position of the Haliplectidae should be reconsidered.

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