

## *Synonchium capense* n. sp. from South Africa (Nematoda : Cyatholaimidae)

Juan HEYNS\* and Antoinette SWART\*\*

\* Department of Zoology, Rand Afrikaans University, P.O. Box 524, Auckland Park 2006, South Africa and  
\*\* Biosystematics Division, Plant Protection Research Institute, Private Bag X134, Pretoria 0001, South Africa.

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**Summary** – *Synonchium capense* n. sp. is described from dune sands along the South African coast. It differs from *S. obtusum* Cobb, 1920, the type species, in having only three similar-sized teeth at the apex of each mandible, and in the absence of punctations on the cuticle. It is also compared with *S. depressum* Gerlach, 1954 and *S. pacificum* Yeates, 1967, and an identification key is provided for the four known species. The morphology of labial and cephalic papillae and male gonads in *Synonchium* spp. are discussed, and a large glandular organ associated with the female reproductive system is described in *S. capense* n. sp.

**Résumé** – *Synonchium capense* n. sp. provenant d'Afrique du Sud (Nematoda : Cyatholaimidae). – *Synonchium capense* n. sp. provenant de dunes sableuses des côtes d'Afrique du Sud est décrit. Il diffère de l'espèce type, *S. obtusum* Cobb, 1920, par la présence de trois dents de même taille à l'apex de chaque mandibule et par l'absence de ponctuations sur la cuticule. La nouvelle espèce est également comparée à *S. depressum* Gerlach, 1954 et *S. pacificum* Yeates, 1967, et une clé d'identification est proposée pour les quatre espèces connues. La morphologie des papilles labiales et céphaliques et l'anatomie de la gonade mâle chez les espèces du genre sont discutées. Un important organe glandulaire associé au système reproducteur femelle est décrit chez *S. capense* n. sp.

**Key-words** : Nematodes, Cyatholaimidae, *Synonchium*.

Only three nominal species are known in the genus *Synonchium* Cobb, 1920 viz. the type *S. obtusum* Cobb, 1920, *S. depressum* Gerlach, 1954 and *S. pacificum* Yeates, 1967. Information on these species is rather limited. *S. depressum* and *S. pacificum* have barely been mentioned in the literature since their original description, while *S. obtusum* has been recorded by Chitwood (1960) and on numerous occasions by Gerlach (1952, 1964, 1967), who recorded specimens from several localities, with short descriptions. The discovery of a *Synonchium* species in dune sands in four places along the South African coast offered the opportunity to study the morphology of a member of this genus in greater detail.

Standard extraction and fixation techniques were used and nematodes processed into anhydrous glycerine according to Thorne's slow method. Preparation for SEM was done as described by Swart and Heyns (1987).

### *Synonchium capense* s. sp.

(Figs. 1, 2, 3)

#### MEASUREMENTS

See Table 1.

#### DESCRIPTION

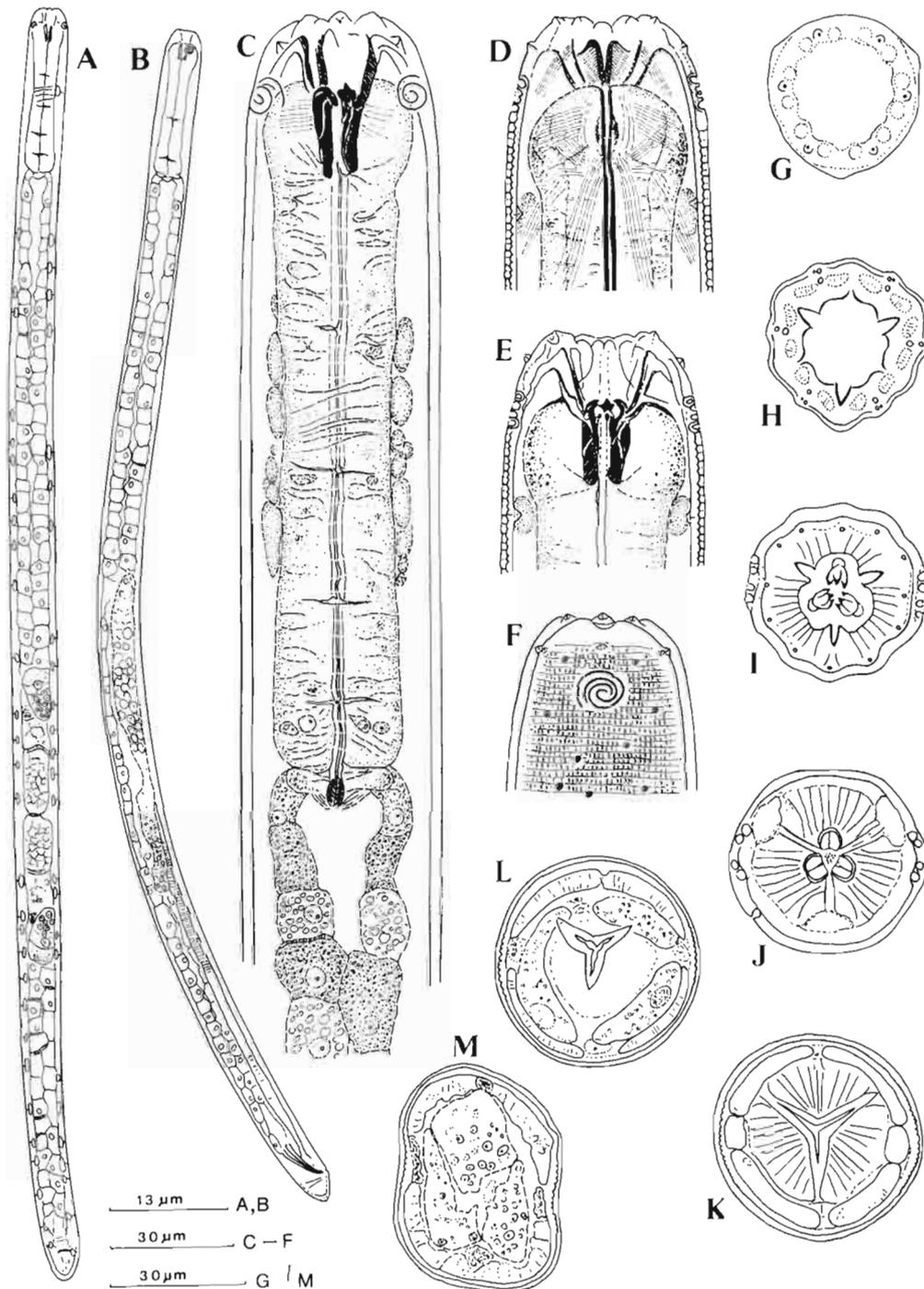
*Adult* : Body stout, cylindrical, mostly straight to nearly straight when relaxed by heat. Lip region rather truncate, not offset, but slightly narrower than adjoining

neck. Mouth opening surrounded by twelve lobes, which constitute the anterior ends of twelve sclerotized skeletal elements. Outside these lie six petal-shaped lips, each bearing a large inner labial papilla. The six outer labial papillae are somewhat smaller, and the laterodorsals and lateroventrals are closely approximated, on their lateral sides, by the four even smaller cephalic papillae. Numerous lateral pores, with the anteriormost ones in most specimens situated before the amphids; rather irregularly distributed, especially anteriorly and posteriorly, and in two irregular rows along the lateral chord over the rest of the body. Distinct transverse striae. Annules 1.6 to 2 µm wide, bearing indistinct linear markings. Amphids with one and one half spirals, somewhat oval-shaped, wider than high. Stoma in two sections, the anterior wider part with sclerotized elements which appear in lateral view as (? twelve) rib-like structures, which can hinge outward when the stoma is everted. Second part of stoma with three mandibles, each bearing three similar-sized teeth at the distal end. Posterior part of stoma surrounded by anterior swollen part of cylindroid pharynx. Lumen of pharynx triradial in cross section and interrupted in four places by breaks in the pharyngeal tissue, which may indicate the location of pharyngeal glands. Nerve ring surrounding pharynx near its middle. Cardia with a distinct boat-shaped valve, and surrounded by three flattened cells. Intestine a prominent feature, only three cells in circumference

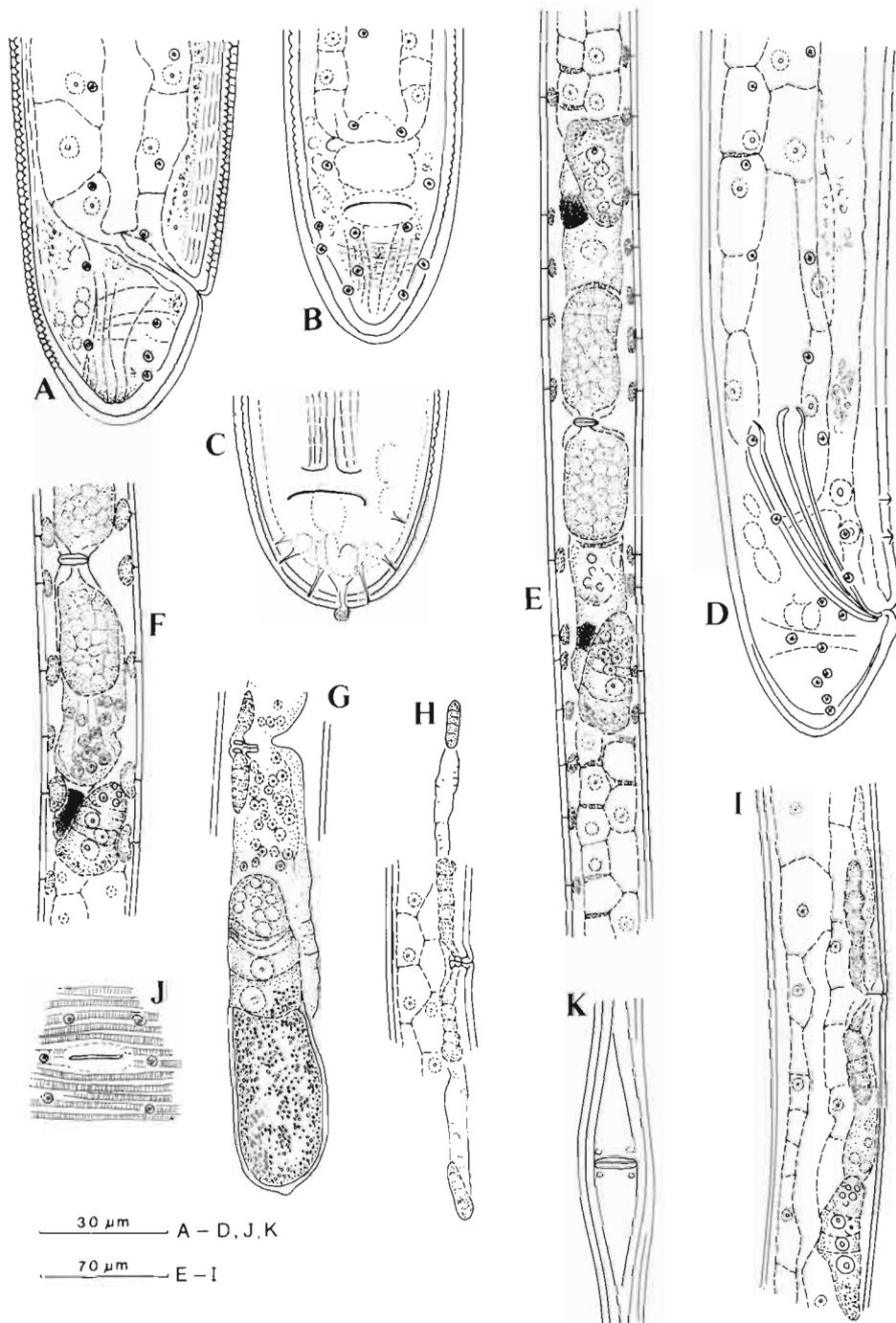
**Table 1.** Morphometric data of *Synonchium capense* n. sp. from four localities on the South African coast. (all measurements in µm, except L).

Locality	Algoa Bay			Sedgefield		Cape Agulhas	Strandfontein	
	Holotype female	Paratype females	Paratype males	Female	Male	Male	Female	Male
n	1	10	9	3	2	1	1	3
L (mm)	1.62	1.53 (1.42-1.64)	1.44 (1.32-1.61)	1.49-1.69	1.13-1.21	1.47	1.44	1.35-1.48
a	27.0	27.3 (22.6-31.9)	28.5 (26.4-30.7)	21.3-30.2	21.0-27.9	24.5	24.0	22.6-25.0
b	8.4	8.3 (7.6-9.0)	8.9 (8.5-10.1)	8.4-8.9	7.5-7.9	9.2	8.3	7.4-8.2
c	50.6	50.7 (44.2-53.3)	55.5 (48.5-63.6)	54.8-57.3	49.1-50.4	58.8	53.3	51.9-54.8
c'	0.84	0.76 (0.67-0.86)	0.68 (0.55-0.81)	0.58-0.74	0.57-0.68	0.64	0.69	0.61-0.68
V	61.4	61.9 (59.9-63.3)	–	61.5-63.6	–	–	60.4	–
Stoma length	38	37.2 (34-38)	31.9 (29-34)	34-39	29-30	30	32	25-30
Mandible length	21	20.6 (19-21)	18.0 (17-19)	19-21	18-19	17	18	16-17
Amphid : to front end	15	14.5 (12.5-15)	12.3 (10-15)	13-16	10-13	14	13	12.5-13
« height	9	8.5-10 (n = 6)	7.5-9 (n = 8)	8-10	8-8.5	8	9	8-9
« width	11	10.5-12 (n = 6)	10-11.5 (n = 8)	10.5-11.5	12	12	12	12
« % cbd*	24	25.2 (21-29)	28.5 (26-32)	23-25.3	29-31.6	29	28	24-30
Tail length	32	30.1 (28-32)	25.7 (22-30)	26-29.5	23-24	25	27	25-27
Spicule length : left	–	–	49.7 (41-64)	–	50-53	45	–	50-56
right	–	–	53.9 (42-64)	–	53	56	–	51-57
Supplement 1 to anus	–	–	13.5-17.5 (n = 7)	–	17	16	–	17-19
Supplement 2 to anus	–	–	22-26.5 (n = 5)	–	25-28	25	–	27-28

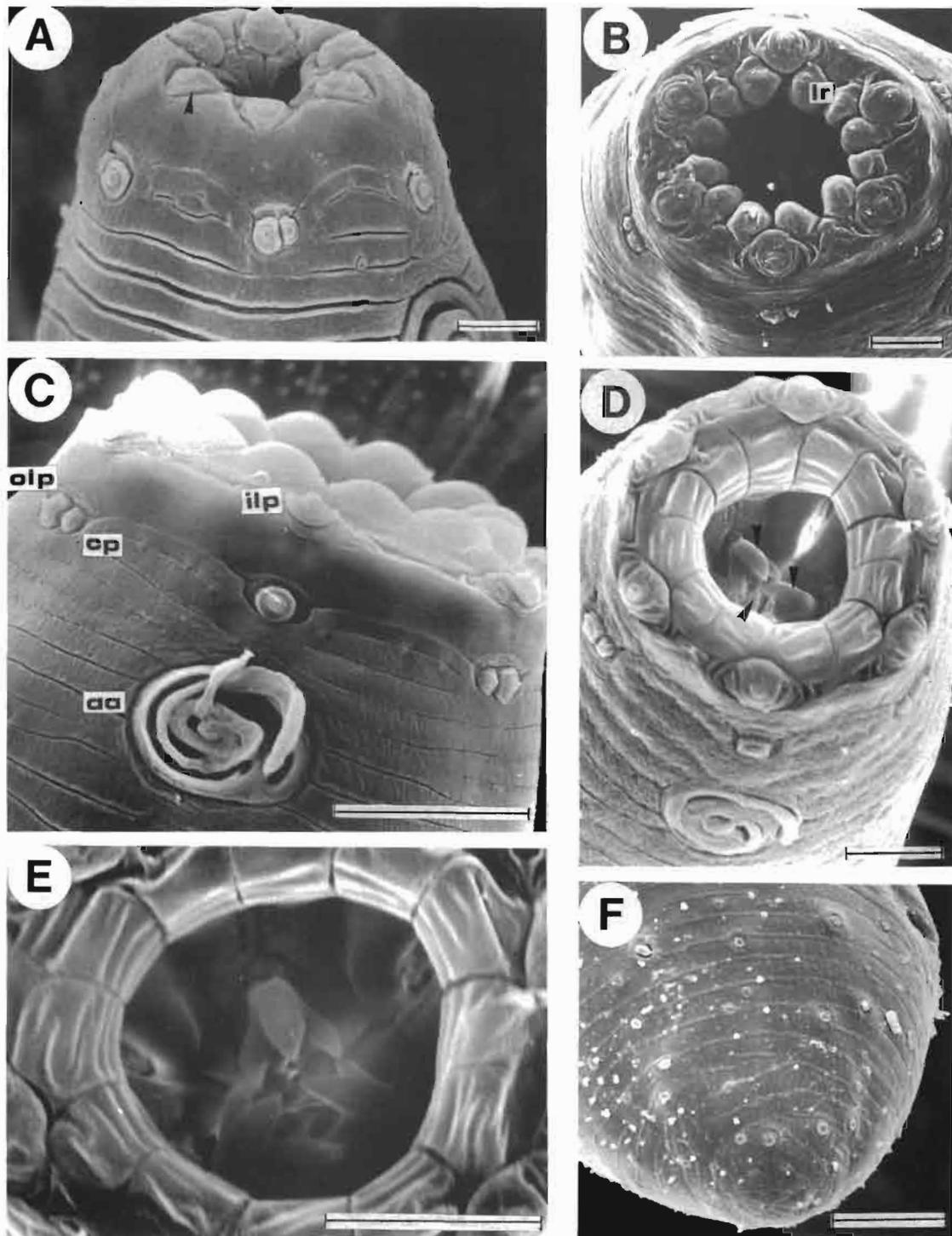
\* cbd = corresponding body diameter.



**Fig. 1.** *Synonchium capense* n. sp. A, B : Female and male, entire body; C : Pharyngeal region, sublateral view; D : Head, median view showing musculature; E : Head, median view showing mandibles and rib-like stomatal skeletal structures; F : Head, lateral, surface view; G-M : Sections at level of : inner labial papillae; stomatal skeletal structures as well as outer labial and cephalic papillae, mandibular teeth, mandibles, pharynx, cardia, and intestine, respectively.



**Fig. 2.** *Synonchium capense* n. sp. *A*: Female tail in lateral view; *B*: Female tail in ventral view, showing internal structures plus anus and body pores; *C*: Ventral view of tail of female specimen from Sedgfield showing a distinct spinneret (note secretion; also shown is the anus and narrow ventral chord flanked by somatic muscles); *D*: Male tail; *E*: Female reproductive system, ventral view (note large glandular structures on either side of vulva, and prominent lateral glands); *F*: Ventral view of posterior reproductive branch of another female; *G*: Posterior reproductive branch, sublateral view; *H*: Reproductive system of a young female; *I*: Posterior reproductive branch of another specimen; *J*: Ventral view of vulval region, surface view; *K*: Somatic muscles going round vulva/vagina.



**Fig. 3.** *Synonchium capense* n. sp. *A*: Female head in dorsolateral view, stoma in normal, retracted position; *B*: Female head in frontal view, stoma partially everted; *C*: Female head in lateral view, stoma partially everted; *D*: Male head in frontal view, stoma partially everted; *E*: Frontal view of head, showing teeth; *F*: Female tail (ilp = inner labial papilla; olp = outer labial papilla; cp = cephalic papilla; aa = amphid aperture; lr = anterior end of skeletal element). (Bar equals 10  $\mu$ m).

and the lumen with irregular and variable appearance. Intestine with two distinct cell types, one type with numerous small granules, the other (? secretory) cells, which are more numerous in the ventricular area, with larger globules and prominent nuclei. Rectum shorter than anal body diameter, without special features. Anus a crescent-shaped, transverse opening. Tail bluntly conoid. Development of spinneret highly variable, apparently absent in most specimens, rudimentary in others, but fairly well-developed in occasional specimens.

*Female* : Didelphic, with opposed, reflexed ovaries. Vulva a small 12-14  $\mu\text{m}$  long transverse slit. Vagina short and not very muscular. Uterus broad, not distinctly separated from oviduct, the latter with a dark, optically dense yellowish area. On each side of the vagina, and lying between the uterus and the body wall, on the ventral side, there is a flattened, multicellular structure, its 26 to 28 cells forming a solid, one-layered rectangular mass. This structure, which is probably of glandular nature, is already well-developed in young females with a weakly developed reproductive system.

*Male* : General morphology similar to female. Two opposed, outstretched testes, the anterior one better developed than the posterior. Spicules slightly ventrally curved, slender, proximally weakly cephalated, distally rather sharply bent ventrad. In many specimens the righthand spicule is somewhat longer than the lefthand one. Gubernaculum absent. There are usually two, sometimes only one, inconspicuous ventromedian preanal supplements; when only one visible, it is always the posteriormost one. Supplements very difficult to observe when not in a perfectly lateral view. Sperm cells *in situ* in male are ovoid to nearly round, and vary in size from 6-10  $\times$  8-12  $\mu\text{m}$ . When observed in the uteri of impregnated females, sperm cells appear more roundish and measure 5-8  $\times$  5-9  $\mu\text{m}$ .

#### DIAGNOSIS AND RELATIONSHIPS

*Synonchium capense* n. sp. is characterized by three similar-sized teeth on the mandibles, absence of distinct punctations on the cuticle, bluntly rounded tail, two (rarely one) ventromedian supplements in male, and absence of gubernaculum.

*S. capense* n. sp. differs from the type species *S. obtusum*, as described by Cobb (1920) and Chitwood (1960), in the following : only three teeth on each mandible, absence of circular punctations on the cuticle, undifferentiated lateral field, smaller lateral organs and smaller body pores. It corresponds with *S. depressum* in having three similar-sized teeth on each mandible, but differs in tail shape (bluntly rounded *vs* conoid), shape of amphid (almost circular *vs* three times as wide as high), ornamentation on cuticle (longitudinal markings *vs* circular punctations) and length of spicules (41-64 *vs* 78  $\mu\text{m}$ ). The new species differs from *S. pacificum* in having only three teeth on each mandible *vs* five, only

two (or one) ventromedian supplements *vs* seven to nine, and absence of a gubernaculum.

#### TYPE LOCALITY AND HABITAT

Dune slacks with vegetation hummocks in the Alexandria dune field, east of Sundays River mouth in Algoa Bay, near Port Elizabeth, South Africa. Eleven females and eleven males collected during 1987 by A. McLachlan. This is the same as the type locality of *Haliplectus algoensis* Swart, Heyns & Furstenberg, 1992, and more information about the nature of the dune slacks can be found in Swart *et al.* (1992).

#### OTHER LOCALITIES

Three females, two males and several juveniles from dune sands at Swartvlei, near Sedgefield, March and November 1990 (RAU samples - KP 134 and 138). A single male specimen in dune sands at Cape Agulhas, the southernmost tip of the African continent, 15 October 1988 (RAU sample KP 111). One female, three males and four juveniles from dune sands at Strandfontein, August 1987 (RAU sample KP 76).

#### TYPE SLIDES

Holotype female on slide RAU type 290, paratypes on slides RAU type 291-300 (from type locality in Alexandria dune field), and RAU slides 5634, 5638, 5845-5848 (Sedgefield); 4284 (Cape Agulhas); and 3452-3455 (Strandfontein). One female and one male deposited in each of the following institutions : Laboratorium voor Morfologie and Systematiek der Dieren, University of Ghent, Belgium, and Laboratoire de Biologie Parasitaire, Protistologie, Helminthologie, Muséum National d'Histoire Naturelle, Paris, France.

#### DISCUSSION

Study of the head region of *S. capense* n. sp. with LM and especially with SEM showed that this species has the usual complement of six inner labial papillae, six outer labial papillae and four cephalic papillae. It is inconceivable that this will not be the same in all *Synonchium* species, therefore there can be little doubt that the papillae which Cobb (1920) labelled as six cephalic papillae in his illustration of *S. obtusum* on page 291 are in fact the outer labial papillae, and that he overlooked the four cephalic papillae, which in all probability are as small and closely approximated to the outer labials as in *S. capense* n. sp. In fact, in Chitwood's (1960) description of *S. obtusum* he does show the "double" papillae in his Fig. 1C, although he does not mention labial or cephalic papillae in his brief description (his Fig. 1E is less accurate). However, in his description of *S. pacificum*, Yeates (1967) mentions "two rings, each of six papillae, visible in *en face* view", without indicating whether he regarded these as labial, or labial and cephalic, and clearly indicating that he also overlooked the four cephalic papillae. His Fig. 2A shows only two circlets (= labial papillae), but not the four cephalic papillae.

Gerlach (1954) in his description of *S. depressum* mentions, and illustrates in his Fig. 3A, six labial and six cephalic papillae « de même grandeur », indicating that same as Cobb, he overlooked the cephalic papillae and regarded the outer labials as six cephalic papillae. In Gerlach's (1952) description of *S. obtusum* he does not illustrate the papillae accurately, but here he explicitly states "zwei Kränze von Papillen, sechs Lippenpapillen und sechs Kopfpapillen". Interestingly, in his 1964 description of *S. obtusum* he accurately portrays (in his Fig. 14 a) the six inner labial, six outer labial and four cephalic papillae, and yet he talks of ten cephalic papillae. He repeats this mistake in his 1967 description: "Es sind zehn flache Kopfpapillen vorhanden".

Regarding the large glandular structures associated with the female reproductive system described above, it is not sure whether this is a structure unique to *S. capense*, n. sp., or whether it is also present, but perhaps less well-developed, in other *Synonchium* species. It may well have been overlooked, since no previous author gave a detailed description or illustration of the reproductive system.

Cobb (1920) did not mention whether *S. obtusum* had one or two testes, but apparently Chitwood (1960) regards it as a single outstretched testis. Gerlach (1952, 1964, 1967) does not mention the male gonad in any of his three descriptions of *S. obtusum*, neither in his description of *S. depressum*. However, in *S. pacificum* and *S. capense* n. sp. there are two opposed, outstretched testes, and we can safely assume that this will be the case in all *Synonchium* species.

#### Key to species of *Synonchium*

- 1 – Tail conoid; amphids three times as broad as high; mandibles with three teeth each ..... *S. depressum* Gerlach, 1954
  - Tail bluntly rounded; amphids circular or slightly broader than high; mandibles with three or five teeth each .... 2
- 2 – Mandibles with three teeth each; spinneret mostly indistinct or absent; cuticle without punctations ..... *S. capense* n. sp.
  - Mandibles with five teeth each; spinneret distinct; cuticle with punctations ..... 3
- 3 – Mandibles with three large and two smaller teeth; male with two inconspicuous ventromedian supplements; gubernaculum absent ..... *S. obtusum* Cobb, 1920
  - Mandibles with one large tooth flanked by two smaller teeth on each side; male with seven to nine ventromedian supplements; gubernaculum present ..... *S. pacificum* Yeates, 1967

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