

## COSMOCERCOID NEMATODE PARASITES FROM FROGS OF SOUTHERN AFRICA

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*Abstract* — A survey of cosmocercoid nematode parasites of frogs in southern Africa revealed the presence of five species: *Aplectana degraaffi* n. sp. from *Breviceps sylvestris* of Transvaal, *A. capensis* n. sp. from *Breviceps rosei* and *B. montanus* of the southern Cape, *A. macintoshii* (Stewart, 1914), *A. chamaeleonis* (Baylis, 1929), *Cosmocerca ornata* (Dujardin, 1845) from various frog species throughout the region. *Aplectana degraaffi* n. sp. differs from all other congeneric species in the possession of a characteristic projection on the distal part of the spicule shaft. *Aplectana capensis* n. sp. differs from the closely related species *A. macintoshii* in the morphology and distribution of the caudal papillae in males and the shape of the capitulum of the spicules. *Aplectana degraaffi* and *A. capensis* are probably restricted in distribution and evolved respectively as vicariants of the pan-African species *A. chamaeleonis* and *A. macintoshii*.

### *Introduction*

There is little information on the nematode parasites of amphibians from southern Africa. The present study concerns the Cosmocercinae (Cosmocercoida), a widely distributed group of about 95 species occurring mainly in frogs. These parasites have not previously been reported in frogs from southern Africa. Five species are reported herein, including two new species.

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## Material and Methods

Collections of parasites were made in two ways. Some frogs were captured by hand and dissected within 12 h of capture in the Kruger National Park, Republic of South Africa, in three provincial reserves of Natal (Giant's Castle Nature Reserve, Loteni Nature Reserve, Coleford Nature Reserve), and in the vicinity of Pretoria. In addition frogs from various localities in southern Africa which are preserved in alcohol in the herpetological collection of the Transvaal Museum, Pretoria, were examined for parasites. Nematodes were collected from these frogs by removing and dissecting the digestive tract.

Nematodes collected from frogs which were captured live were fixed in hot 70% ethyl alcohol and preserved in 70% alcohol at room temperature. Specimens from the Transvaal Museum were also preserved in 70% alcohol.

## Results

### *Aplectana degraaffi* n. sp.

Type Material: ♂ holotype, ♀ allotype, 24 ♂♂, 23 ♀♀ paratypes, Museum national d'Histoire naturelle, Paris, MNHN 99KB.

Host: *Breviceps sylvestris sylvestris* FitzSimons, 1930 (Microhylidae)

Locality: Woodbush, near Pietersburg, Transvaal.

Location: Large intestine.

### Description (Fig. 1)

Cosmocercoidea, Cosmocercidae, Cosmocercinae. Lateral alae narrow, extending from anterior end to just before anus in both species. Small somatic papillae present on body surface. Oral opening large, three lips present. Each lip with thin cuticular flange directed anteriorly. Cephalic extremity with six minute inner labial papillae and six outer papillae of which the submedian pair is markedly small. Amphidial pores large. Anterior extremity of oesophagus with three tooth-like projections covered by thick ring of cuticle. Excretory pore prominent.

*Male* (holotype): Total length 3,6 mm. Length of oesophagus 796 µm (pharyngeal portion of corpus 53 µm, posterior portion of corpus 512 µm, isthmus 37 µm, and bulb 194 µm). Nerve ring 284 µm and excretory pore 512 µm from anterior extremity. Tail 138 µm long, thick in anterior half and tapering rapidly to sharp point in posterior half. Anterior half of tail and preanal region with prominent dorso-ventrally directed muscles. Posterior half of tail with three pairs of small caudal papillae; one ventral, one lateral and one dorsal. Anterior half of tail with one pair of lateral caudal papillae located close to two pairs of adjacent sublateral papillae. Anus opening large, anterior lip with three small pairs and one large unpaired caudal papillae. Preanal region with four-five pairs of subventral caudal papillae. Spicules equal, 173 µm long, shaft curved ventrally and with narrow projection about 15 µm long originating about 35 µm from distal extremity. Gubernaculum prominent, 60 µm long.

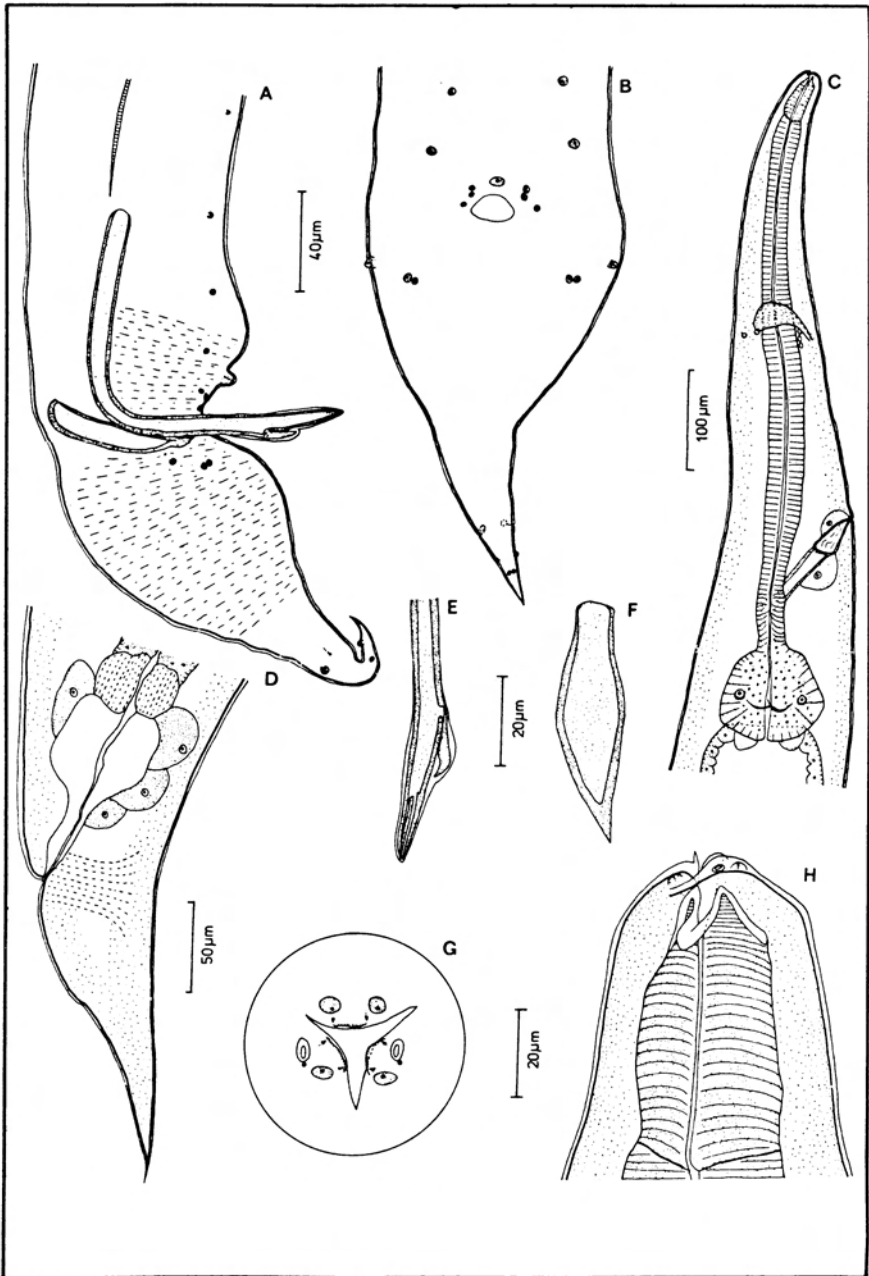


Fig. 1. *Aplectana degraaffi* n. sp. A, Caudal end of male, lateral view. B, *idem*, ventral view. C, Anterior end of female, lateral view. D, Tail of female, lateral view. E, Distal end of spicule, lateral view. F, Gubernaculum, dorsal view. G, Cephalic extremity of female, apical view. H, *idem*, lateral view.

*Female* (allotype): Total length 4,1 mm. Length of oesophagus 662  $\mu\text{m}$  (pharyngeal portion of corpus 34  $\mu\text{m}$ , posterior portion of corpus 475  $\mu\text{m}$ , isthmus 47  $\mu\text{m}$ , bulb 106  $\mu\text{m}$ ). Nerve ring 212  $\mu\text{m}$ , excretory pore 400  $\mu\text{m}$ , and vulva 2,5 mm from anterior extremity. Both ovaries located anterior to vulva. Eggs in uteri numerous, thin-shelled, 116-122  $\mu\text{m}$  long and 66-69  $\mu\text{m}$  wide, containing fully developed larvae. Tail 200  $\mu\text{m}$  long, conical and sharply pointed.

*Paratypes*: Dimensions of five males and five females are as follows. *Males* — 3,6-4,6 mm long; oesophagus 760-768  $\mu\text{m}$  long; nerve ring 293-318  $\mu\text{m}$  and excretory pore 587-606  $\mu\text{m}$  from anterior extremity; spicules 191-213  $\mu\text{m}$ ; gubernaculum 72-78  $\mu\text{m}$  and tail 150-203  $\mu\text{m}$  long. *Females* — 3,8-5,1 mm long; oesophagus 768-780  $\mu\text{m}$  long; nerve ring 240-250  $\mu\text{m}$ , excretory pore 450-487  $\mu\text{m}$  and vulva 2,5-3,3 mm from anterior extremity; tail 150-243  $\mu\text{m}$  long.

#### Comments

*Aplectana degraaffi* n. sp. most closely resembles *A. chamaeleonis* (Baylis, 1929) Travassos, 1931 from amphibians and reptiles (also rarely in fish) of Africa in the number and distribution of the caudal papillae in males and in the cephalic structures (Baker 1981). However, it is easily distinguished from this species by the morphology of the distal end of the spicules. In *A. chamaeleonis* spicules have a smooth shaft with a long transparent sheath extending well beyond the distal extremity of the shaft, whereas in *A. degraaffi* the spicular sheath on the distal end is inconspicuous and the shaft has a characteristic elongate projection near its distal end.

The anal region of all the male type specimens of *A. degraaffi* is depressed slightly into the body. This is probably a fixation artifact which is often observed in other *Aplectana* species with a similar robust caudal musculature (Baker 1981).

*Aplectana degraaffi* n. sp. is named in honour of Dr. G. de Graaff, National Parks Board of Trustees, Pretoria.

#### *Aplectana capensis* n. sp.

Type Material:  $\delta$  holotype,  $\text{f}$  allotype, 1  $\delta$ , 6  $\text{f}$   $\text{f}$  paratypes, MNHN 242KB.

Host: *Breviceps rosei* Power, 1926 (Microhylidae)

Locality: near Cape Town, Cape Province.

Other Material: 1  $\delta$ , 9  $\text{f}$   $\text{f}$ , MNHN 243KB. From *Breviceps montanus* Power, 1926, near Cape Town, Cape Province.

Location: Large intestine.

#### Description (Fig. 2)

Cosmoceroidea, Cosmocercidae, Cosmocercinae. Lateral alae wide, extending from just behind cephalic extremity to anterior third of tail in both sexes. Numerous small somatic papillae present on body surface. Oral opening large, three lips present. Each lip with thin cuticular flange directed anteriorly. Cephalic extremity with six small inner labial papillae and six outer papillae of which the submedian pair is markedly small. Amphidial pores large. Anterior extremity of oesophagus

with three short projections covered with thick cuticle. Anterior extremity in some specimens retracted slightly into body behind pharyngeal portion of oesophagus. Four large muscle trunks extending from anterior end at level of pharyngeal portion of oesophagus to hypodermis at level of oesophageal isthmus.

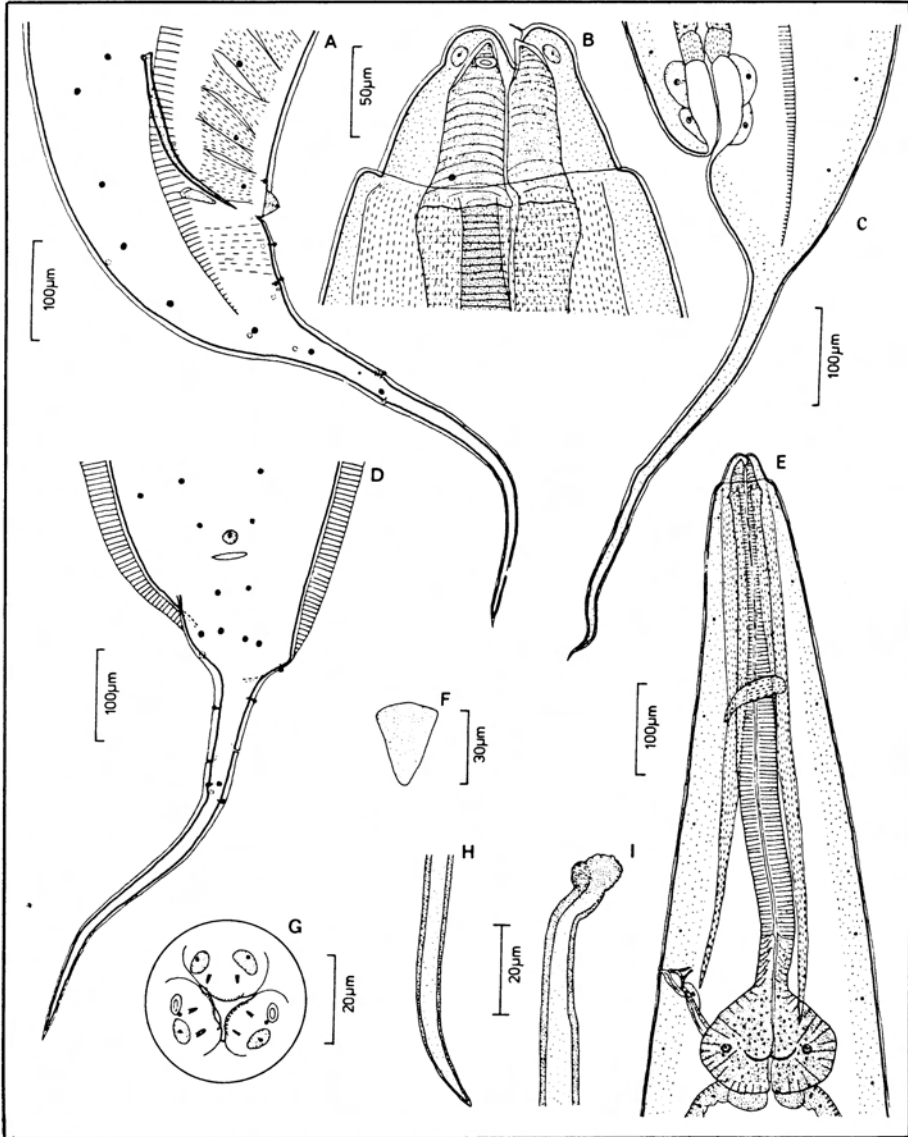


Fig. 2. *Aplectana capensis* n. sp. A, Caudal end of male, lateral view. B, Cephalic extremity of female, lateral view. C, Tail of female, lateral view. D, Caudal end of male, ventral view. E, Anterior end of female, lateral view. F, gubernaculum, dorsal view. G, Cephalic extremity of female, apical view. H, Distal end of spicule, lateral view. I, Proximal end of spicule, lateral view.

*Male* (holotype): Total length 2,7 mm. Length of oesophagus 493  $\mu\text{m}$  (pharyngeal portion of corpus 28  $\mu\text{m}$ , posterior portion of corpus 340  $\mu\text{m}$ , isthmus 37  $\mu\text{m}$ , bulb 87  $\mu\text{m}$ ). Nerve ring 206  $\mu\text{m}$  and excretory pore 381  $\mu\text{m}$  from anterior extremity. Tail 556  $\mu\text{m}$  long, thick in anterior quarter, rapidly tapering and markedly slender in posterior half. Posterior half of tail without papillae. About 28 papillae present on anterior half of tail. Preanal region with numerous papillae variable in position and extending to anterior end. Somatic papillae and caudal papillae are indistinguishable by size or morphology except for one markedly large unpaired papilla on anterior lip of anus. Spicules equal, 203  $\mu\text{m}$  long, shaft smooth and sharply pointed distally, capitulum with prominent sclerotized thickening. Gubernaculum about 35  $\mu\text{m}$  long, weakly sclerotized.

*Female* (allotype): Total length 6,4 mm. Length of oesophagus 694  $\mu\text{m}$  (pharyngeal portion of corpus 37  $\mu\text{m}$ , posterior portion of corpus 487  $\mu\text{m}$ , isthmus 53  $\mu\text{m}$ , bulb 117  $\mu\text{m}$ ). Nerve ring 257  $\mu\text{m}$ , excretory pore 577  $\mu\text{m}$  and vulva 3,2 mm from anterior extremity. Both ovaries located anterior to vulva. Eggs in uteri numerous, thin-shelled, 243-256  $\mu\text{m}$  long and 143-156  $\mu\text{m}$  wide, containing fully developed larva. Tail 610  $\mu\text{m}$  long, thick in anterior quarter, posterior three-quarters markedly slender.

*Paratypes*: Dimensions of one male and five females are as follows. *Male* — 2,7 mm long; oesophagus 600  $\mu\text{m}$  long; nerve ring 219  $\mu\text{m}$  and excretory pore 438  $\mu\text{m}$  from anterior extremity; spicules 231  $\mu\text{m}$ , gubernaculum 40  $\mu\text{m}$  and tail 600  $\mu\text{m}$  long. *Females* — 6,9-9,6 mm long; oesophagus 718-744  $\mu\text{m}$  long; nerve ring 281-287  $\mu\text{m}$ , excretory pore 600-612  $\mu\text{m}$  and vulva, 3,5-5,2 mm from anterior extremity; tail 575-637  $\mu\text{m}$  long.

*Other Specimens*: Dimensions of one male and five females from *Breviceps montanus* (MNH 243KB) are as follows. *Male* — 4,1 mm long; oesophagus 506  $\mu\text{m}$  long; nerve ring 181  $\mu\text{m}$  and excretory pore 418  $\mu\text{m}$  from anterior extremity; spicules 212  $\mu\text{m}$ , gubernaculum 40  $\mu\text{m}$  and tail 644  $\mu\text{m}$  long. *Females* — 2,5-5,8 mm long; oesophagus 518-694  $\mu\text{m}$  long; nerve ring 200-243  $\mu\text{m}$ , excretory pore 381-562  $\mu\text{m}$  and vulva 1,2-2,9 mm from anterior extremity; tail 618-837  $\mu\text{m}$  long.

### Comments

*Aplectana capensis* n. sp. most closely resembles *A. macintoshii* (Stewart, 1914) Travassos, 1931, which occurs widely in various frogs in Africa (see redescription in Baker 1981). However, these species may be distinguished from each other by three morphological characters. (1) The posterior half of the male tail in *A. capensis* lacks papillae whereas papillae occur on the anterior three-quarters of the tail in *A. macintoshii*. (2) The single unpaired papilla on the anterior lip of the anus in males of both species is the same size as the other caudal and somatic papillae in *A. macintoshii*, whereas in *A. capensis* it is markedly larger than the other papillae. (3) The capitulum of the spicules in *A. capensis* is in the form of a bulbous sclerotized cap which is not present in *A. macintoshii*.

### Other species

Three other cosmocercoids in addition to the two new species described above were found occurring in frogs from various localities in southern Africa (see Fig. 3).

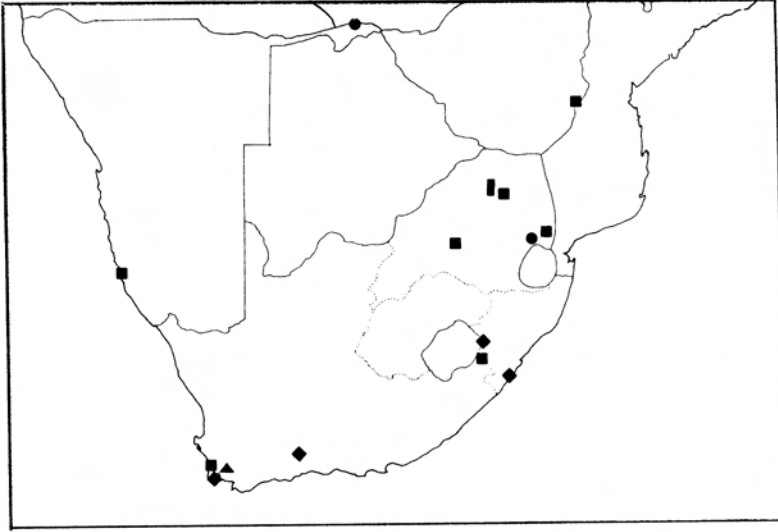


Fig. 3. Localities in southern Africa where cosmocercoids were collected from frogs. ▲ = *Aplectana capensis* n. sp.; ■ = *Aplectana degraaffi* n. sp.; ● = *Aplectana macintoshii* (Stewart, 1914); ◆ = *Aplectana chamaeleonis* (Baylis, 1929); ■ = *Cosmocerca ornata* (Dujardin, 1845).

#### 1) *Aplectana chamaeleonis* (Baylis, 1929)

This species was found in five species of frogs: *Bufo rangeri* Hewitt, Umzinto, Natal (MNHN 132-133KB); *Bufo angusticeps* Smith, Groot Swartberge, Cape Province (100KB); *Rana angolensis* Bocage, Giant's Castle Nature Reserve, Natal (143KB); *Ptychadena oxyrhynchus* (Smith), Umzinto, Natal (104KB); *Cacosternum capense* Hewitt, Cape Town, Cape Province (106-107KB).

#### 2) *Aplectana macintoshii* (Stewart, 1914)

This species was found in five species of frogs: *Bufo carens* Smith, White River, Natal (1-4KB); *Bufo gutturalis* Power, Skukuza, Kruger National Park, Transvaal (39,40,42KB); *Bufo maculatus* Hallowell, Skukuza, Kruger National Park, Transvaal (52KB); *Bufo garmani* Meek, Skukuza, Kruger National Park, Transvaal (59KB); *Phrynomerus bifasciatus* (Smith), Caprivi Strip, Namibia (98KB); *Breviceps adpersus* Peters, Skukuza, Kruger National Park, Transvaal (69KB).

#### 3) *Cosmocerca ornata* (Dujardin, 1845)

This species was found in ten species of frogs: *Bufo rosei* Hewitt, Cape Town, Cape Province (235KB); *Bufo rangeri* Hewitt, Coleford Nature Reserve, Natal

(183KB); *Bufo gutturalis* Power, Skukuza, Kruger National Park, Transvaal, (6KB), and Pretoria, Transvaal (116KB); *Bufo maculatus* Hallowell, Skukuza, Kruger National Park, Transvaal (43,46,50KB); *Bufo garmani* Meek, Skukuza, Kruger National Park, Transvaal (56KB); *Bufo anotis*, Mount Selinda, Zimbabwe (101KB); *Ptychadena anchietae* (Bocage), Skukuza, Kruger National Park, Transvaal (17KB); *Ptychadena porosissima* (Steindachner), Haenertsburg, Transvaal (105KB); *Kassina senegalensis* (Duméril and Bibron), Loteni Nature Reserve, Natal (174KB); *Cacosternum namaquense* Werner, Luderitz, Namibia (108KB).

### Discussion

The frog fauna of southern Africa is a mixture of endemic species (especially in the Cape region) and forms distributed more widely in Africa. The same is observed for their cosmocercoid parasites. Thus *A. chamaeleonis*, *A. macintoshii* and *C. ornata* are all pan-African in distribution and each occurs in many frogs from different families. *Aplectana degraaffi* n. sp. and *A. capensis* n. sp., however, are apparently more restricted in host range and geographic distribution. The one known host species for *A. degraaffi* is restricted in distribution to two small forested areas in northern Transvaal, and the two known hosts for *A. capensis* occur only in the southern Cape (Passmore & Carruthers 1979). Both these *Aplectana* species occur in *Breviceps* spp. The Brevicipitinae (Microhylidae), which are endemic to southern Africa, differ ecologically from other types of frogs of the region by being fossorial in habits. These observations suggest that *A. degraaffi* and *A. capensis* evolved under conditions of geographic and ecological isolation. Both species are probably vicariants, *A. capensis* being morphologically close to *A. macintoshii* and *A. degraaffi* close to *A. chamaeleonis*.

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## REFERENCES

- BAKER, M. R. 1981. Revision of Old World species of the genus *Aplectana* Railliet & Henry, 1916 (Nematoda, Cosmocercidae). *Bull. Mus. natn. Hist. nat.*, Paris, 4e sér., sect. A, 2: 955-998.
- PASSMORE, N. I. and V. C. CARRUTHERS. 1979. *South African frogs*. Johannesburg: Witwatersrand University.