

Spirocamallanus rebecca sp. n. (Nematoda: Camallanidae) from freshwater fishes in south-eastern Mexico

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Abstract. *Spirocamallanus rebecca* sp. n. is described from freshwater cichlids in some lakes of Southeast Mexico. It has 14 spiral bands in the buccal capsule, similar unequal spicules 503–544 and 281–297 long, 3 precloacal and 6 postcloacal pairs of papillae, vulva situated in the middle part of the body. An updated list of the species of the genus is presented.

During several surveys of the helminth fauna of native cichlids in the south-eastern region of Mexico (Pineda-López et al. 1985), a camallanid nematode was frequently found in the intestine of several *Cichlasoma* species. This paper describes this nematode as a new species.

MATERIALS AND METHODS

The material consisted of 8 males and 17 females collected from the intestine of *Cichlasoma pasonis* Rivas, 1928 and *C. helleri* Steindachner, 1903 from El Vapor Lagoon, Campeche and Las Ilusiones Lake, Tabasco. Additional specimens (5 males and 15 females) were obtained from *C. synspilum* Hubbs, 1935 from Centenario Lagoon in Campeche.

Living specimens were fixed in hot ethanol and stored in 70% ethanol. They were cleared in glycerine or lactophenol for examination. The following description is based on the best specimens available, 6 males and 12 females recovered from *C. helleri* and 2 males and 2 females from *C. synspilum*. Measurements are in micrometers unless otherwise stated and represent the range followed by the mean $\pm$ standard deviation. The figures were drawn with the aid of a drawing tube.

For SEM studies, 2 males and 2 females from *C. helleri* from El Vapor Lagoon and 2 males and 2 females from *C. synspilum* from Centenario Lagoon were used. The fixed nematodes were dehydrated to 100% ethanol and then transferred to 100% acetone (two changes). They were critical point dried, sputter coated with gold and observed in a Philips ISI 60-A scanning electron microscope.

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RESULTS

Fam. **Camallanidae** Railliet et Henry, 1915

Spirocamallanus rebecca sp. n.

Figs. 1–4

Description: Reddish nematodes; cuticle with fine transverse striations. Body with region of maximum width in middle or slightly posterior. Lips absent; cephalic papillae elongate, in 3 concentric rings of 4 oriented 450 from dorso-ventral axis; amphids lateral (Fig. 3A). Deirids present, lateral. Mouth slightly dorso-ventrally elongate. Buccal capsule barrel-shaped. Buccal cavity much deeper than broad; anterior fifth smooth, remainder lined with 12–14 (mode 14) spiral ridges when counted diagonally. Excretory pore situated short distance anterior to junction of muscular and glandular portions of oesophagus. Tail long, tapering gradually towards tip and terminating in 3 spine-like projections, one dorsal and 2 subventral.

Male (4 specimens, measurements of holotype in parentheses. Figs. 1, 2B): Body 12.1–13.7 mm, 13.2 $\pm$ 0.6 (13.7) long by 256–363, 325 $\pm$ 41 (363) maximum width. Buccal capsule 98–103, 100 $\pm$ 2 (100) long by 58–64, 61 $\pm$ 2 (64) wide. Muscular portion of oesophagus claviform, 356–456, 419 $\pm$ 43 (425) long, glandular portion 681–850, 787 $\pm$ 73 (800), ratio 1:1.8–1.9, 1.88 $\pm$ 21 (1.8). Nerve ring 250–294, 270 $\pm$ 18 (256) from anterior end. Excretory pore 431–519, 478 $\pm$ 34 (463) from anterior end. Spicules unequal, similar in shape, gradually tapering distally to point; right spicule blade-like, 503–544, 522 $\pm$ 17 (519) long; left 281–297, 291 $\pm$ 7 (296) long; spicule ratio 1:1.75–1.83, 1.8 $\pm$ 0.031

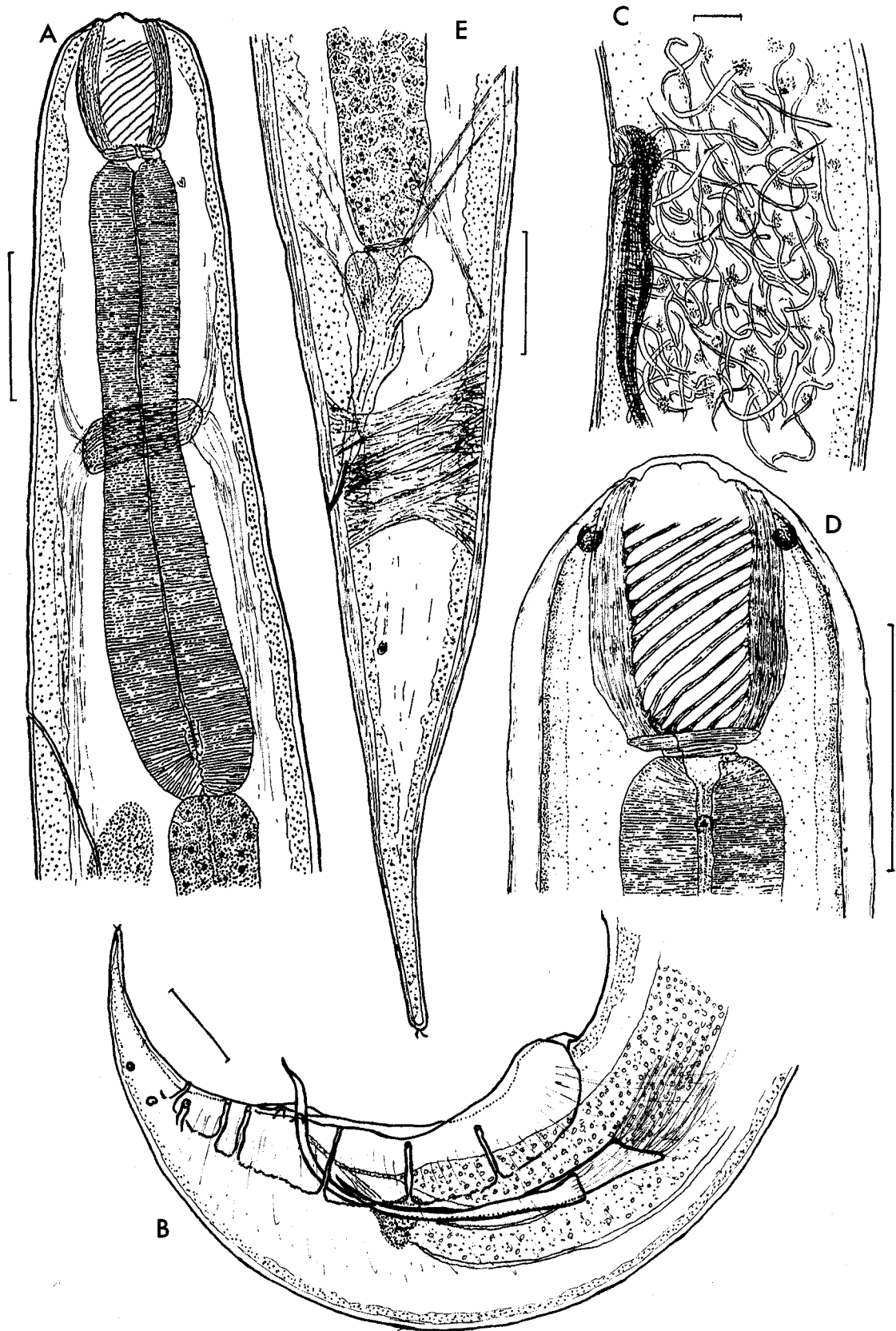


Fig. 1. *Spirocamallanus rebecae* sp. n. – male. **A** – anterior region of holotype, lateral view; **B** – tail region of holotype, lateral view. Female. **C** – vulval region, lateral view. **D** – cephalic end of female paratype, lateral view. **E** – tail of allotype, lateral view. Scale bar 100 μ m.

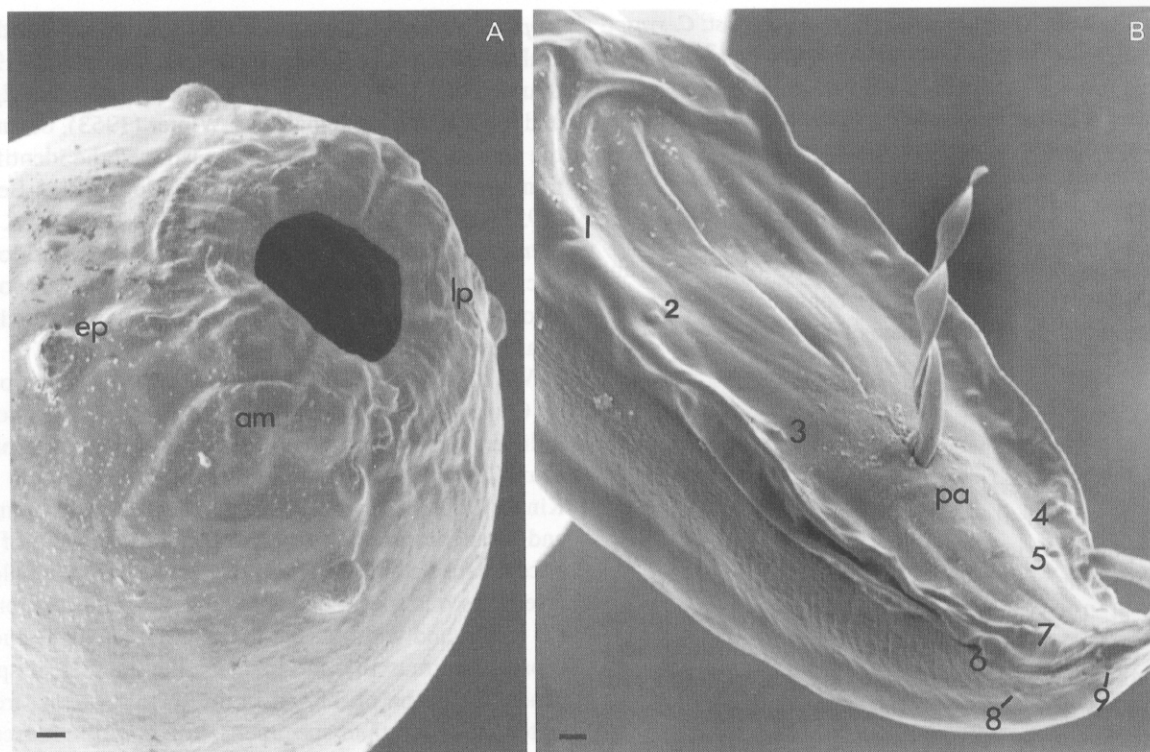


Fig. 2. *Spirocamallanus rebecca* sp. n. **A** – SEM micrograph of the anterior end of a female showing labial papillae (lp), external circle of partly fused double papillae (ep) and amphid (am). **B** – SEM micrograph of the posterior end of adult male. Precloacal papillae (1–3); postcloacal papillae (4–7); ventrolateral papillae (8–9); paraoccal papillae (pa). Scale bar 10 μ m.

(1.75). Gubernaculum absent. Caudal alae supported by 7 symmetrical pedunculate pairs of papillae; 3 precloacal pairs of equal length; 4 postcloacal pairs with 3rd pair wider than others and slightly more ventrolateral; 2 pairs of sessile paraoccal papilla-like structures present, transversally elongate, one pair on either side of cloacal opening, other pair slightly posterior (Fig. 2B). Two smaller papillae with very short peduncles present laterally; one at level of last papillae supporting caudal alae, other slightly further posterior; latter were not evident in ventral view. Phasmids associated with the first of latter pairs of small papillae. Tail flexed ventrally, tapering to fine point with 3 spine-like projections.

Female (10 gravid specimens, measurements of allotype in parentheses; Fig. 1): Body 12.1–21.9 mm, 16.9 $\pm$ 2.8 (18.5) long by 281–619, 469 $\pm$ 11 (588) maximum width. Buccal capsule 98–117, 105 $\pm$ 6 (108) long by 67–80, 74 $\pm$ 4 (70) wide. Muscular portion of oesophagus 456–531, 498 $\pm$ 20 (494) long; glandular portion 638–1025, 836 $\pm$ 117 (944) long, ratio 1:1.4–2.0, 1.7 $\pm$ 0.2 (1.9). Nerve ring 278–313, 300 $\pm$ 10 (300) from cephalic end. Excretory pore 488–597, 545 $\pm$ 30 (538) from anterior end. Vulva situated 6.5–11.8 mm, 9.2 $\pm$ 1.5 (9.7) or 52.2–62.0%, 54.6 $\pm$ 2.7 (52.2) of body length from anterior end. Vagina muscular straight, extending posteriorly from vulva. Tail tapering gradually to fine point with 3 associated spine-like projections. Rectum surrounded by 3 rectal glands, 2 situated

dorsolaterally, one ventrally. Phasmids ventrolateral, slightly posterior to anus. Larvae inside uterus 207–274 (239.8 $\pm$ 28) long by 13–17 (14.5 $\pm$ 1) wide.

The measurements of two immature females are as follows: length 6.9, 10.6 mm; maximum width 138, 231; length of muscular oesophagus 319, 438; glandular portion 388, 575; distance from cephalic end to nerve ring 125, 262; to excretory pore 356, 531; vulva situated at 54.2, 53.2% of body length; length of buccal capsule 62, 101; width 44, 70; 14 spiral thickenings; tail 193, 294.

Type host: *Cichlasoma helleri*, local name “mojarra cortín” (Cichlidae).

Site of infection: Intestine.

Type locality: Laguna El Vapor, Campeche, Mexico; 3/5/88.

Type material:

Holotype: 1 male from *C. helleri* (No. NE-001-010)

Allotype: 1 female from *C. helleri* (No. NE-001-010)

Paratypes: 4 males, 11 females and 1 larval paratypes (No. NE-001-011) from *C. helleri*;

2 males and 1 female (No. NE-001-034); host: *Cichlasoma pasionis*; locality: Laguna Las Ilusiones, Tabasco, Mexico; 30/8/86;

1 female (No. NE-001-020); host: *Cichlasoma helleri*; locality: Laguna Las Ilusiones, Tabasco; 10/2/86;

1 male and 2 females (No. NE-001-019); same host, locality and date of collection as above;

5 males and 15 females (No. NE-001-040); host: *C. synspilum*; locality: Laguna Centenario, Campeche; 17/9/90.

Type material deposited in the Parasitological Collection, Universidad Juarez Autonoma de Tabasco, Mexico. Voucher specimens (paratypes) are deposited in the Institute of Parasitology, Academy of Sciences of the Czech Republic, České Budějovice. (Coll. No. N-633).

The species is named after the wife of the first author, Mrs. Rebeca Rios, for her continued support and interest in our work on the parasites of fish.

DISCUSSION

There are several partial inventories of the genus, which have considered only the species from certain geographical regions (Brazil) (Pinto et al. 1974, 1975, 1976, Vicente et al. 1985, Rodriguez et al. 1991, Moravec et al. 1993) but the most recent catalogues of the entire genus have been produced by Petter (1979), who listed 48 species of *Spirocamallanus*, and by Gupta and Garg (1985, 1986 a,b), who listed 35 species.

While studying the new species, we found necessary to update the records of the species of this genus. Table 1 presents an alphabetical list of all the nominal species of which we are aware grouped according to geographical zones. The list was cross-referenced with the Host-Parasite Database of the Parasitic Worms Division at The Natural History Museum, London. It also indicates some synonyms which have been proposed so far. Accepting these synonyms, there are 85 species of this genus up to date from various fish hosts.

Amongst the criteria used to separate the species, those of Gupta and Garg (1985) seemed appropriate to differentiate the new species. They proposed four groups, separating the species of this genus on the basis of the presence or absence, number and size of the spicules. Group "A": spicules absent; group "B": one spicule; group "C": two equal spicules and group "D": two unequal spicules. We have modified the designation of group C to additionally accommodate those species in which the spicules are subequal. The group to which each species belongs is also indicated in Table 1.

The present species, having two unequal spicules, falls into group D, which holds the majority of species. Table 2 summarises the differences between some of the American species with two unequal spicules and three precloacal papillae and *S. rebecae* n. sp.

Five species of this genus have been reported from Mexico and North America: *S. spiralis* (Baylis, 1923) Olsen, 1952 from Veracruz, Mexico, *S. pereirai* (Annereaux, 1946) Olsen, 1952 from California, Gulf of Mexico and the State of Tabasco, Mexico, *S. neocaballeroi* Caballero-Deloya, 1977 from Veracruz, Mexico, and *S. cricotus* Fusco et Overstreet, 1978 and *S. hali-*

trophus Fusco et Overstreet, 1978 from the northern Gulf of Mexico. However, Fusco and Overstreet (1978) doubted that *S. spiralis*, originally described from Egypt and identified from females by Winter (1953), occurs in the Gulf of Mexico. They also questioned the identification of *S. pereirai* reported by Sogandares-Bernal (1955) and Joy (1971, 1974), designating them as *S. cricotus*, and considered *S. pereirai* to be restricted to the Pacific Ocean. However, *S. pereirai* has been reported also from Brazil (Pinto et al. 1984) and Pakistan (Rasheed 1970).

We question the identification of *S. pereirai* reported by Osorio-Sarabia et al. (1987) for Tabasco, Mexico, as it differs widely from the original description of Annereaux (1946) and from the redescription of Noble and King (1960) in several characteristics such as number and arrangement of the caudal papillae, the size of the buccal capsule and the shape of the tail in the female. It resembles our specimens with regard to the relation of the length and width of the body, the size of the buccal capsule and muscular oesophagus, the number of spiral bands, the shape of the tail in the female and its freshwater habitat. In their specimens, however, the muscular oesophagus and the right spicule are smaller, they have 5 pre- and 3 postcloacal papillae, one pair of paracloacal papillae and the position of the vulva is in the first third of the body.

Spirocamallanus neocaballeroi can easily be distinguished from *S. rebecae* sp. n. as it has two small and equal spicules. Our specimens are similar to *S. pereirai* in the size and shape of the tail but can be distinguished from it because *S. pereirai* has smaller spicules, 6 postcloacal pedunculated papillae associated with the caudal alae and a smaller muscular: glandular oesophagus ratio. *Spirocamallanus rebecae* sp. n. also resembles *S. cricotus* but in the latter the left spicule and the buccal capsule are smaller, it has 5 postcloacal papillae, fewer spiral bands, 8 rectal glands and the shape of the tail is also different. *Spirocamallanus hali-trophus* is larger than *S. rebecae* sp. n., the right spicule is smaller, it has six pairs of postcloacal papillae supporting the caudal alae, it has 12 spiral bands and the shape of the tail is also different. There are other camallanid species from the Caribbean and South America that are also related to *S. rebecae* sp. n. but they can easily be distinguished by certain features. The five species described by Bashirullah and Williams (1980) from marine fishes off Puerto Rico (*S. papillicaudatus*, *S. partitus*, *S. spinicaudatus*, *S. garnotus*) and Venezuela (*S. plumierus*) differ in the number and arrangement of caudal papillae, body measurements and the shape of the tail. *Spirocamallanus johnsoni* Guerrero, 1971 from a marine fish off Venezuela differs from *S. rebecae* sp. n. by the presence of large postanal lateral papillae in the female, and the greater size of spicules, greater number of postcloacal

Table 1. List of species of the genus *Spirocamallanus* (alphabetically by geographical zones).**INDO-PAKISTAN**

- M D *S. alii* Kalyankar, 1971. India, Bangladesh, Malaysia.
- M B *S. argyrops* Gupta et Masoodi, 1988. India.
- F D* *S. aspiculus* (Khera, 1955) (nec *S. aspiculus* sensu Majumdar, 1961). Considered in synonymy with *S. bagarii* (Karve et Naik, 1951) by Campana-Rouget (1961) and by Petter (1979).
- F C *S. bagarii* (Karve et Naik, 1951). Transferred to the genus *Onchocamallanus* by Petter (1979). Redescribed by Gupta and Masoodi (1988) and as *Procamallanus* (*Spirocamallanus*) *bagarii* by Moravec and Sey (1988). India.
- F D* *S. bengalensis* Akram, 1975 (= *S. intestinicolus* Bashirullah, 1973)¹
- M A *S. berdii* Kahn et Yaseen, 1969. Pakistan.
- M C *S. bheemunipatnamensis* Lakshmi, Rao et Shyamasundari, 1990. India.
- M B *S. chabaudi* Gupta et Garg, 1985. India.
- F B* *S. chauhani* Sahay, 1966; considered in synonymy with *S. gubernaculus* by Sood (1968) and with *S. mysti* by De et al. (1986). India.
- M B *S. crossorhombi* Zaidi et Khan, 1975. Pakistan.
- M B *S. ditchelli* Gupta et Garg, 1977. India.
- M ? *S. dussumieri* Bilquees, Khanum et Jehan, 1971². Pakistan
- F B* *S. fasciatus* (Sood, 1967); considered in synonymy with *S. gubernaculus* by Akram (1975) and with *S. mysti* by De et al. (1986). India.
- M C *S. fotedari* Gupta et Garg, 1986. India.
- F D *S. globonchus* (Ali, 1960). Transferred to the genus *Onchocamallanus* by Petter (1979). India.
- F B* *S. gontii* (Sood, 1967); considered in synonymy with *S. gubernaculus* by Akram (1975) and with *S. mysti* by De et al. (1986). India.
- F B* *S. gubernaculus* (Khera, 1955); considered in synonymy with *S. mysti* by De et al. (1986). India.
- F D* *S. hyderabadensis* (Ali, 1956); considered in synonymy with *S. singhi* by Agarwal (1966) and with *S. mysti* by De et al. (1986). India.
- F C *S. indicus* Gupta et Garg, 1986. India.
- F D* *S. inglisi* Bashirullah et Hafizuddin, 1973; considered in synonymy with *S. mysti* by De et al. (1986). Bangladesh.
- F D* *S. intestinicolus* Bashirullah, 1973 (= *S. olseni* sensu Bashirullah, 1973, nec sensu Campana-Rouget and Razarihelisoa 1965); considered in synonymy with *S. singhi* by Akram (1975) and with *S. mysti* by De et al. (1986). Bangladesh.
- F ? *S. kalrai* (Rehana et Bilquees, 1979)³. Pakistan.
- M B *S. lali* Gupta et Garg, 1985. India.
- M D *S. lamellari* Gupta et Garg, 1986. India.
- F B *S. machidai* Gupta et Masoodi, 1988. India
- M D* *S. mazabukae* Khan et Yaseen, 1969. (= *S. alii* (Kalyankar, 1971) after Petter 1978, 1979)
- F B *S. machidai* Gupta et Masoodi, 1988. India.
- F B *S. meszarosi* Arya, 1984. India.
- S. murius* Bashirullah et Hafizuddin, 1973 in Basirullah, 1973c – *nomen nudum*⁴.
- F D *S. mysti* Karve, 1952. Redescribed by De et al. (1986). India.
- F B *S. nanitalensis* Arya, 1978. India.
- M ? *S. neobuccalaris* (Bilquees, Fatima et Rehana, 1977)³. Pakistan.
- F D* *S. notopteri* Bashirullah et Hafizuddin, 1973 (nec *S. notopteri* sensu Siddiqi et Khattak, 1984). Considered in synonymy with *S. mysti* by De et al. (1986). Bangladesh.
- * *S. nuzvidensis* Rajyalakshmi, Hanumantha Rao et Shyamasundari, 1990. India. In the original paper there is no indication of spiral thickenings in the buccal capsule in the description or the figures. Therefore, a new combination, *Procamallanus nuzvidensis* n. comb. is proposed.
- F B* *S. ompoci* Majumdar et Dutta, 1972; considered in synonymy with *S. gubernaculus* by Akram (1975) and with *S. mysti* by De et al. (1986). India.
- F D* *S. ophicephalus* (Ali, 1960). Transferred to the genus *Onchocamallanus* by Petter (1979). Considered in synonymy with *S. globonchus* (Ali, 1960) by Agarwal (1966). India.
- M D *S. otolithi* Gupta et Garg, 1986. India.
- M D *S. pereirai* (Annereaux, 1946) has been reported from this zone (Pakistan) by Rasheed (1970).
- F C *S. planoratus* (Kulkarni, 1935). India.
- F D *S. ritai* Misra, 1985. India.
- F D *S. siluri* Osmanov, 1964 has been reported from this zone by Moravec and Amin (1978). Afghanistan.
- M D *S. siddiqi* (Siddiqi et Khattak, 1984). Originally described as *S. notopteri* and renamed by Gupta and Masoodi (1988) since the specific name was preoccupied by *S. notopteri* Bashirullah et Hafizuddin, 1973.
- M D *S. sihamai* Khan et Begum, 1971. Pakistan.

Table 1. List of species of the genus *Spirocamallanus*. (continued)

- F D* *S. singhi* (Ali, 1956); redescribed by Sood (1967); considered in synonymy with *S. mysti* by De et al. (1986). India.
M D *S. soodi* Gupta et Masoodi, 1988. India.
M D *S. sparus* (Akram, 1975). Pakistan.
M D *S. spiralis* (Baylis, 1923) has been reported from this zone (Pakistan) by Khan and Begum (1971) and Bilquees et al. (1977).
F D* *S. timmi* Bashirullah, 1973; considered in synonymy with *S. singhi* by Akram (1975) and with *S. mysti* by De et al. (1986). Bangladesh.
F D *S. vachai* Sinha et Sahai, 1965. India.
F D* *S. vittatusi* (Sood, 1967); considered in synonymy with *S. mysti* by De et al. (1986). India.
F D* *S. viviparus* (Ali, 1956); considered in synonymy with *S. singhi* by Agarwal (1966) and with *S. mysti* by De et al. (1986). India.

AFRICA

- F D *S. daleneae* Boomker, 1993. Gabon.
F D *S. spiralis* (Baylis, 1923); female described by Baylis (1923b). Egypt.
F D *S. mazabukae* Yeh, 1957 (nec *S. mazabukae* sensu Khan et Yaseen, 1969, after Petter 1978). Rhodesia.
M D *S. tornquisti* Campana-Rouget, 1961 (= *S. spiralis* sensu Törnquist, 1931, nec *Spirocamallanus spiralis* (Baylis, 1923) after Petter 1979); redescribed by Grabda (1974). Red Sea.
F D *S. xenopodis* (Baylis, 1929) (parasite of Amphibia). Tanganyica.
M D *S. olseni* Campana-Rouget et Razarihelissoa, 1965 has been reported from this zone (Red Sea) by Fusco and Overstreet (1979).

MADAGASCAR

- M D *S. olseni* Campana-Rouget et Razarihelissoa, 1965.

CENTRAL ASIA

- F D *S. siluri* Osmanov, 1964. This species is validated afterwards by Osmanov (1986). Ousbekistan.

EAST ASIA

- F C *S. bagarii* (Karve et Naik, 1951) has been reported for this zone (Vietnam) by Moravec and Sey (1988).
F D *S. fulvidraconis* (Li, 1935) (considered in synonymy with *S. siluri* Osmanov, 1964 after Skryabina 1971). Redescribed by Moravec and Sey (1988). Soviet Far East, China and Vietnam.
M D *S. guttatusi* n. nov. for *S. philippinensis* Machida et Taki, 1985 nec Velasquez, 1980.
M D *S. istiblenni* Noble, 1966 has been reported from this zone (Okinawa) by Hasegawa et al. (1991).
F D *S. kerri* (Pearse, 1933)⁵. India
F B *S. parasiluri* (Fujita, 1927). Redescribed by Yamaguti, 1935. Japan.
M D *S. philippinensis* Velasquez, 1980 (nec *S. philippinensis* sensu Machida et Taki, 1985). Philippines.

AUSTRALIA

- F D *S. murrayensis* (Johnston et Mawson, 1940).
M C *S. platycephali* Hooper, 1983.

PACIFIC OCEAN

- M D *S. monotaxis* Olsen, 1952. Hawaii.
M D *S. istiblenni* Noble, 1966. Hawaii.

NORTH AMERICA AND MEXICO

- M D *S. cricotus* Fusco et Overstreet, 1978 (= *S. pereirai* sensu Sogandares-Bernal 1955, and Joy 1971, 1974 after Fusco and Overstreet 1978). Northern Gulf of Mexico.
M D *S. halithropus* Fusco et Overstreet, 1978. Gulf of Mexico.
F C *S. neocaballeroi* Caballero-Deloya, 1977
M D *S. pereirai* (Annereaux, 1946) (nec *S. pereirai* sensu Sogandares-Bernal 1955, and Joy 1971, 1974 after Fusco and Overstreet 1978; nec *S. pereirai* sensu Osorio et al. 1987). Redescribed by Noble and King (1960). California.

WEST INDIES

- M D *S. papillicaudatus* Bashirullah et Williams, 1980. Puerto Rico.

Table 1. List of species of the genus *Spirocamallanus*. (continued)

M	D	<i>S. partitus</i> Bashirullah et Williams, 1980. Puerto Rico.
M	D	<i>S. spinicaudatus</i> Bashirullah et Williams, 1980. Puerto Rico.
M	D	<i>S. garnotus</i> Bashirullah et Williams, 1980. Puerto Rico.
F	D	<i>S. dessetae</i> Petter, Golvan et Tcheprakoff, 1977. Guadeloupe.

SOUTH AMERICA

F	D	<i>S. amarali</i> (Vaz et Pereira, 1934); redescribed by Pinto et al. (1975). Brazil.
F	C	<i>S. barroslimai</i> (Pereira, 1935) ⁶ (probably junior synonym of <i>S. inopinatus</i> after Pinto and Noronha 1976). Brazil.
M	D	<i>S. caballeroi</i> Bashirullah, 1977. Venezuela.
F	C*	<i>S. cearensis</i> (Pereira, Dias et Azevedo, 1936) (= <i>S. hilarii</i> (Vaz et Pereira, 1934) after Kohn and Fernandez 1988). Brazil.
F	D	<i>S. cervicalatus</i> Petter, 1990. Paraguay.
F	D	<i>S. chimusensis</i> Freitas et Ibanez, 1968. Brazil.
F	D	<i>S. cruzi</i> (Guimaraes, Cristofaro et Rodriguez, 1976). Brazil.
M	D	<i>S. cumanensis</i> Bashirullah, 1977. Venezuela.
F	C*	<i>S. fariasi</i> (Pereira, 1935) (= <i>S. inopinatus</i> (Travassos, Artigas et Pereira, 1928) after Pinto and Noronha 1972). Brazil.
F	D	<i>S. freitasi</i> Moreira, Oliveira et Costa, 1991. Brazil.
F	C	<i>S. hilarii</i> (Vaz et Pereira, 1934) ⁶ . Brazil.
F	D	<i>S. iheringhi</i> (Travassos, Artigas et Pereira, 1928); redescribed by Pinto and Noronha (1972) and Pinto et al. (1975). Brazil.
F	C*	<i>S. incariocai</i> Freitas et Ibanez, 1970 (junior synonym of <i>S. hilarii</i> (Vaz et Pereira, 1934) after Rodrigues et al. 1991). Peru.
F	C	<i>S. inopinatus</i> (Travassos, Artigas et Pereira, 1928); redescribed by Kloss (1966), Pinto and Noronha (1972), Pinto et al. (1975) and Santos et al. (1979). Brazil.
F	D	<i>S. intermedius</i> (Pinto, Fabio, Noronha et Rolas, 1974). Brazil.
M	D	<i>S. johnsoni</i> Guerrero, 1971. Venezuela.
F	C	<i>S. krameri</i> Petter, 1974. ⁶ French Guyana.
M	D	<i>S. macaensis</i> (Vicente et Santos, 1972). Brazil.
F	C	<i>S. paraensis</i> (Pinto, Fabio, Noronha et Rolas, 1976). Brazil.
F	D	<i>S. paraguayensis</i> Petter, 1990. Paraguay.
F	D	<i>S. penneri</i> Fusco et Brooks, 1978. Colombia.
M	D	<i>S. pereirai</i> (Annereaux, 1946) is reported for this zone (Brazil) by Pinto et al. (1984).
F	C	<i>S. pexatus</i> (Pinto, Fabio, Noronha et Rolas, 1976).
F	D	<i>S. pimelodus</i> (Pinto, Fabio, Noronha et Rolas, 1974). Brazil.
F	C	<i>S. pinto</i> (Kohn et Fernandes, 1988). Brazil.
M	D	<i>S. plumierus</i> Bashirullah et Williams, 1980. Venezuela.
F	C*	<i>S. probus</i> (Pinto et Fernandes, 1972) (= <i>S. inopinatus</i> (Travassos, Artigas et Pereira, 1928) after Pinto et al. 1976). Brazil.
F	D	<i>S. rarus</i> (Travassos, Artigas et Pereira, 1928); redescribed by Pinto and Noronha (1972) and Pinto et al. (1975). Brazil.
F	D	<i>S. solani</i> (Pinto, Fabio, Noronha et Rolas, 1975). Brazil.
F	C*	<i>S. wrighti</i> (Pereira, 1935); junior synonym of <i>S. hilarii</i> (Vaz et Pereira, 1934) after Kloss (1966). Brazil.

*: Species which are no longer recognized.

F: Freshwater.

M: Marine.

A, B, C, D: Groups of Gupta and Garg (1985). See text for details.

¹ Akram (1975) renamed *S. olseni* sensu Bashirullah (1973a) (which was preoccupied by *S. olseni* Campana-Rouget et Razarihelisoa, 1965) as *S. bengalensis* unaware, unfortunately, to the fact that Bashirullah (1973b) had already renamed it as *S. intestinicolus*.² This species (not considered by Gupta and Garg 1985) cannot be classified in any group because, as noted by Petter (1979), a male is described but the figure looks like the posterior end of a female.³ These species cannot be classified in any group because only females are known.⁴ Hafizuddin (pers. com.).⁵ Petter (1979) did not classify it because only the females were known. In the brief description in Gupta and Garg (1985) there is no mention of the spicules, yet he assigned it to this group.⁶ Originally in group D of Gupta and Garg (1985). We place it in group C along with species with equal or subequal spicules.

Table 2. Comparison of selected morphological characters for *S. rebecae* sp. n. and certain American species of *Spirocamallanus*.

	<i>S. rebecae</i> sp. n.	<i>S. dessetae</i> Petter, Golvan et Tchepprakoff, 1977	<i>S. macaensis</i> Vicente et Santos, 1972	<i>S. pereirai</i> Osorio et al. (1987)	<i>S. pereirai</i> (Annereaux, 1946) Noble et King, 1960	<i>S. cricotus</i> Fusco et Overstreet, 1978	<i>S. halitropus</i> Fusco et Overstreet, 1978
Host, habitat and locality	<i>C. helleri</i> (Cichlidae) Freshwater Lag. El Vapor Campeche, Mexico	<i>Agnostomus</i> <i>monticola</i> (Mugilidae) Freshwater, I. Guadalupe, Caribe	<i>Menticirrus</i> <i>americanus</i> (Sciaenidae) Marine, Brasil	<i>C. meeki</i> , <i>C. pastonis</i> , <i>Petenia splendida</i> (Cichlidae) Freshwater, Chiribital, Tab. Mexico	<i>Atherinopsis</i> <i>californiensis</i> Marine, California	<i>Micropogonias</i> <i>undulatus</i> (Sciaenidae) Marine, N Gulf of Mexico	<i>Syacium</i> <i>papillosum</i> (Bothidae) Marine, N Gulf of Mexico
Length (mm)	♂♂ ♀♀ 12.03–13.74 12.06–21.91	13.5–19.0 22.0–38.0	18.9–20.2 54.2	12.87–16.83 17.30–21.45	6.8–17.7 8.7–26.5	10.0–20.1 17.3–32.0	13.3–26.9 22.5–44.5
Muscular oesophagus	♂♂ ♀♀ 356–456 456–531	500 700	530–580 690	260–310 400–600	280–500 350–525	382–465 420–593	390–465 454–609
Glandular oesophagus	♂♂ ♀♀ 681–850 638–1025	860 1000	790–840 930	680–780 540–830	400–775 510–897	400–694 538–834	517–928 693–963
Ratio muscular: glandular oesophagus	♂♂ ♀♀ 1:1.8–1.9 1:1.4–2.0	1:1.72	1:1.34	n/a	n/a	n/a	n/a
Anterior end to nerve ring	♂♂ ♀♀ 250–294 278–313	360 400	300 410	n/a	n/a	209–276 192–398	247–316 293–348
Anterior end to excretory pore	♂♂ ♀♀ 431–519 488–597	800 750	750 730	360–398	400	345–552 383–648	431–603
Buccal capsule	♂♂ ♀♀ 98–103 × 58–64 98–117 × 67–80	80 × 80 80 × 90	70–81 × 66–78 93 × 93	90–97	52–79 × 48–76 58–86 × 52–80	54–75 × 49–64 72–83 × 53–77	86–98 × 63–81 96–121 × 84–96
No. spirals	12–14	9–12	14	12–16	14	10–15	10–14
Spicule	Right Left 503–544 281–297	670–850 280	610–620 250–270	430–520 180–350	430 200	429–552 224–257	257–459 183–324
Precloacal papillae	3	3	3	5	3	3	3
Peduncular postcloacal papillae	4	5	4	3	6	5	6
Vulva %	52.2–62.0	40–52	34.7	n/a	n/a	48–55	47–54
Rectal glands	3	n/a	n/a	3	n/a	8	4
Female tail	conic	conic	rounded	conic	rounded	rounded	rounded

papillae and the shape of the tail in the male. *Spirocamallanus macaensis* Vicente et Santos, 1972 from Brazil is much larger, the buccal capsule is smaller in length but wider, the position of the vulva is on the anterior half of the body and the shape of the spicules and the tail is different. *Spirocamallanus dessetae* Petter, Golvan et Tchepprakoff, 1977 from Guadeloupe is also larger than *S. rebecae* sp. n., with a longer right spicule and five pairs of postcloacal papillae supporting the caudal alae.

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Note: The references for the authorities of taxa have also been included to make them readily available.

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