
18 Family Catenotaeniidae Spasskii, 1950

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Introduction

Hypothesis of the phylogeny of cestodes of the family Catenotaeniidae

According to Freeman (1973) the Catenotaeniidae have common ancestors with the Proteocephalidae and with the more recently derived Taeniidae.

A comparative analysis of the genital apparatus, uterine structures and geographical distribution of the hosts suggests that the most primitive catenotaeniids are cestodes of the genus *Hemicatenotaenia* Tenora, 1977, the type-species of which is *H. geosciuri*, a parasite of an African sciurid. This genus is fundamentally a parasite of sciuromorphic rodents which appeared in Holarctic, Asiatic and African Regions during the Oligocene and it was also at this period a parasite of the old rodent families Geomyidae and Heteromyidae. It is characterized by a long uterus with numerous lateral branches (30-60 pairs) and a great number of testes.

Secondarily, a new line appeared during the Miocene: the genus *Catenotaenia* Janicki, 1904, the type-species of which is *C. pusilla*, a parasite of mice. This genus is a parasite of North African Xerini, which appeared in the Miocene (Thenius, 1979), and diversified also in the Cricetidae, Muridae and Microtidae in the Holarctic Region. Also at this time, the genus *Catenotaenia* parasitized the old families Geomyidae and Heteromyidae. Consequently, these cestodes have fewer testes and fewer main lateral uterine branches. Penetration of the Catenotaeniinae into the Neotropical Region occurred only recently.

Quentinotaenia mesovitellinica (Rego, 1967) Tenora, Mas-Coma, Murai & Feliu, 1980, a parasite of Caviidae in Brazil, originated probably through capture from Nearctic Sciuridae or Cricetidae to Caviidae, these sciurid and cricetid rodents being introduced into South America only in the Quaternary (Thenius, 1972). This cestode has few testes and a horseshoe-shaped ovary.

The second phase of the evolutionary line of the Catenotaeniidae began in

the Palaearctic Region with the genus *Pseudocatenotaenia* Tenora, Mas-Coma, Murai & Feliu, 1980, a parasite of murid rodents of the genus *Apodemus*. *Pseudocatenotaenia* still belongs to the subfamily Catenotaeniinae because of its primitive anatomical characters: an osmoregulatory system with two pairs of longitudinal canals, and testes situated in the posterior part of the proglottid behind the ovary. This genus is also linked with the evolutionary line of the subfamily Skrjabinotaeniinae in so far as the gross morphology of *Pseudocatenotaenia* already resembles some *Skrjabinotaenia* species (e.g. *S. lobata*), with wide mature proglottids and with the testes and the ovary overlapping the lateral osmoregulatory canals.

The subfamily Skrjabinotaeniinae is, according to Tenora *et al.* (1980), of recent appearance. Its origin will undoubtedly be found in the Palaearctic or the Asiatic Region, probably in myomorphic rodents of the Muroidea group. The hosts and geographical distribution of the Skrjabinotaeniinae suggest that they arose in the Late Tertiary in connection with the migration of rodents of the families Muridae and Gerbillidae to Africa. The ancestral form of the Skrjabinotaeniinae is represented by *S. rhombomydis*, a species parasitic in Gerbillidae from the Caspian Coast. This species is morphologically similar to *Skrjabinotaenia psammomi*, parasitic in Gerbillidae of the genus *Psammomys* in Egypt. This new evolutionary line of the Skrjabinotaeniinae differs from the Catenotaeniinae in having a network of numerous osmoregulatory canals and by testes surrounding the ovary in different ways.

According to Quentin (1971) and Tenora *et al.* (1980), two main evolutionary lines can be detected in the Skrjabinotaeniinae. One line (genus *Skrjabinotaenia*) includes the historically oldest forms, in all of which the last gravid proglottid of the strobila is always longer than wide and never has a posterior longitudinal fissure. In this group, it is possible to observe a gradual shortening in the length of the strobila and a decrease in the number of proglottids through the different species. *S. lobata*, the longest species and the only species distributed in both Europe and Africa, represents one of the most primitive forms. All other species of the genus are exclusively Ethiopian. The extreme case in this evolutionary line is *S. pauciproglottis*, the shortest and youngest living form with a strobila constituted of only two or three proglottids. The differentiation of *Skrjabinotaenia* occurred in Africa, mainly in Muridae. These cestodes exhibit stenoxenous specificity and are found also in Gerbillidae, Dendromuridae and Malagasy Cricetidae. The presence of Skrjabinotaeniinae in Madagascar is probably the result of a fortuitous and recent introduction of these helminths from the African continent into Madagascar with the genus *Rattus*.

Further differentiation within the subfamily Skrjabinotaeniinae occurred in the Ethiopian Region. Another line, the genus *Meggittina* Lynsdale, 1953, arose from *Skrjabinotaenia* parasitic in North African Gerbillidae, and in this line it is possible to detect in the last gravid proglottid some signs of a longitudinal fissure. *Meggittina* is fundamentally parasitic in Gerbillidae and expanded recently to the rest of the African continent and to Madagascar, adapting secondarily to other families of rodents, the Muridae and Cricetidae.

These hypotheses on the phylogeny of cestodes of the family Catenotaeniidae preserve the systematics and taxonomy of the Catenotaeniidae given by Tenora *et al.* (1980). The family Catenotaeniidae is divided into two subfamilies: Cateno-

taeniinae and Skrjabinotaeniinae, with the six genera *Hemicatenotaenia*, *Catenotaenia*, *Quentinotaenia*, *Pseudocatenotaenia*, *Skrjabinotaenia* and *Meggittina*.

However, my concept of the evolutionary line of the Catenotaeniidae is slightly different:

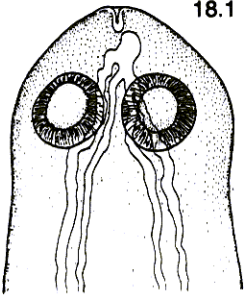
1. The genus *Hemicatenotaenia* with the type-species *H. geosciuri* (Ortlepp, 1938) is regarded as the more primitive.
2. The genus *Catenotaenia* with the type-species *C. pusilla* (Goeze, 1782) is derived from *Hemicatenotaenia*.
3. In the phylogeny of the Catenotaeniidae, the genus *Pseudocatenotaenia* is placed between Catenotaeniinae and *Skrjabinotaenia* and not between *Hemicatenotaenia* and *Catenotaenia*.
4. The species *Atriotaeia* (*Ersbovia*) *baltazardi* Quentin, 1967 is placed in synonymy with *Quentinotaenia mesovitellinica* (Rego, 1967).
5. The genus *Neoskrjabinotaenia* Bilqees, 1982 is placed in synonymy with the genus *Catenotaenia*. The number of uterine branches, the asymmetrical ovary, the number and the position of the testes correspond to the characters of *Catenotaenia*.

Family Catenotaeniidae Spasskii, 1950

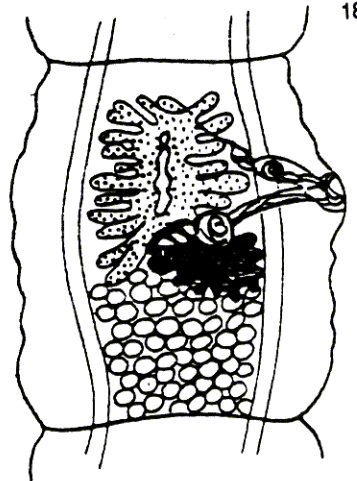
Diagnosis: Scolex rounded or semi-oval, provided with four suckers and sometimes with small apical sucker. Osmoregulatory system composed of two main pairs of longitudinal canals or network of numerous canals. Mature and gravid proglottids elongated either transversely or longitudinally. Genital apparatus single. Testes in posterior part of proglottid or around ovary in various ways. Ovary asymmetrical (except *Quentinotaenia*). Genital atrium in anterior third of proglottid, irregularly alternating. Uterus of taenioid type with central stem and lateral branches subdivided into secondary branches. Larval stage of merocercoid type developing in tyroglyphid acarions. Larva has apical sucker. Oncosphere possesses oval membrane or membrane with processes. Adults parasitic in rodents. Type-genus *Catenotaenia* Janicki, 1904.

Key to subfamilies

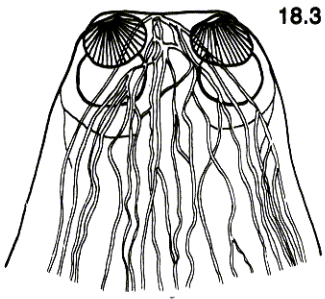
- 1a. Two pairs of osmoregulatory longitudinal canals (Fig. 18.1); testes always posterior to the ovary in the posterior part of the proglottid (Fig. 18.2) *Catenotaeniinae* Spasskii, 1949.
Diagnosis: Catenotaeniidae. Testes confined to postovarian field between lateral osmoregulatory canals or overlapping them. Lateral uterine branches at right angles to median stem. Gravid proglottids longer than wide. Type-genus *Catenotaenia* Janicki, 1904.
- 1b. Osmoregulatory system with numerous canals (Fig. 18.3); testes surrounding ovary in various ways but never confined to the posterior part of the proglottid (Fig. 18.4) *Skrjabinotaeniinae* Genov & Tenora, 1979.



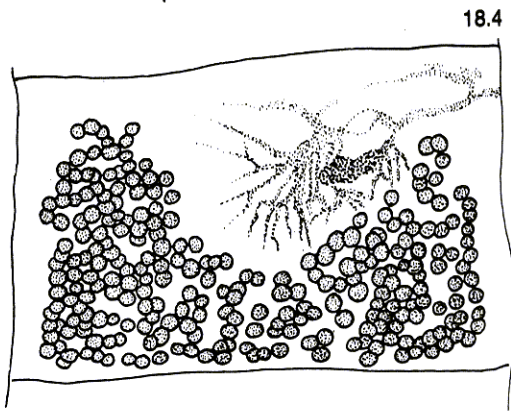
18.1



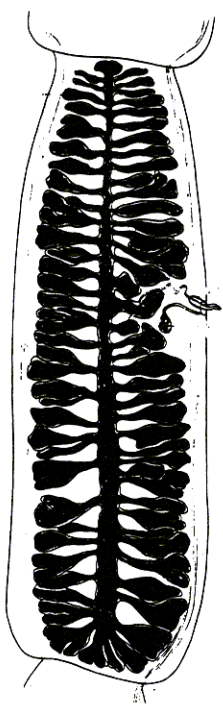
18.2



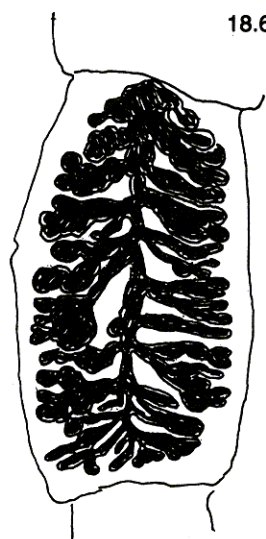
18.3



18.4



18.5



18.6

Diagnosis: Catenotaeniidae. Osmoregulatory system a network of numerous longitudinal and transverse canals. Testes surrounding ovary in various ways, including as two separate lateral groups. Lateral uterine branches at various angles to the median stem. Gravid proglottids of various sizes. Type-genus *Skrjabino- taenia* Akhumyan, 1946.

Key to genera of the subfamily Catenotaeniinae Spasskii, 1949

1a. More than 30 pairs of lateral uterine branches in gravid proglottid (30–60 pairs) (Fig. 18.5); parasites of Sciuridae (fundamental hosts) and Microtidae *Hemicatenotaenia* Tenora, 1977.

Diagnosis: Catenotaeniinae. Ovary asymmetrical. 150–300 testes situated posteriorly to female organs, do not cross the longitudinal osmoregulatory canals. Parasites of Holarctic, Ethiopian and Asiatic Sciuridae (fundamental hosts) and Microtidae. Type-species *H. geosciuri* (Ortlepp, 1938) Tenora, 1977.

1b. Fewer than 30 pairs of lateral uterine branches in gravid proglottid (Fig. 18.6) 2.

2a. Testes not overlapping osmoregulatory canals bilaterally (Fig. 18.8), less than 150 3.

2b. Testes overlapping lateral osmoregulatory canals bilaterally; mean number of testes greater than 150 (Fig. 18.9); parasites of murid rodents of genus *Apodemus* *Pseudocatenotaenia* Tenora, Mas-Coma, Murai & Feliu, 1980.

Diagnosis: Catenotaeniinae. Strobila acraspedote. Mature proglottids wider than long. Ovary asymmetrical, highly lobate, extensive, in anterior half of proglottid. Lobes of ovary reach lateral osmoregulatory canals or overlap them. Vitelline gland in poral part of proglottid. 140–180 testes in posterior half of proglottid. Uterus with lateral branches overlapping excretory canals bilaterally. Eggs oval with two processes. Parasites of Palaearctic Muridae of the genus *Apodemus*. Type-species *P. matovi* (Genov, 1971) Tenora, Mas-Coma, Murai & Feliu, 1980.

3a. 70 to 150 testes (Fig. 18.7); parasites of Muroidea (fundamental hosts) and also Holarctic Heteromyidae and Sciuridae *Catenotaenia* Janicki, 1904.

(Syns *Cattotaenia* Shipley, 1908, *lapsus*; *Neoskrjabinotaenia* Bilqees, 1982.)

Diagnosis: Catenotaeniinae. Ovary asymmetrical. Fewer than 150 testes situated

Fig. 18.1 Scolex of *Pseudocatenotaenia matovi* (Genov, 1971). After Tenora *et al.* (1980).

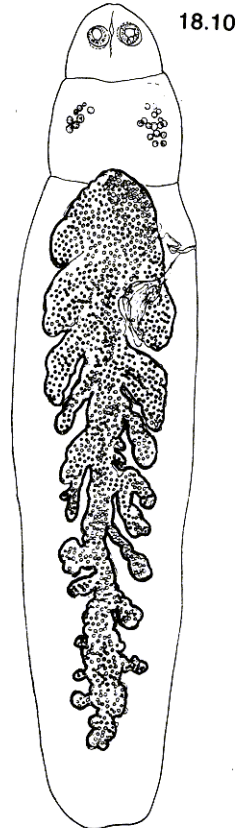
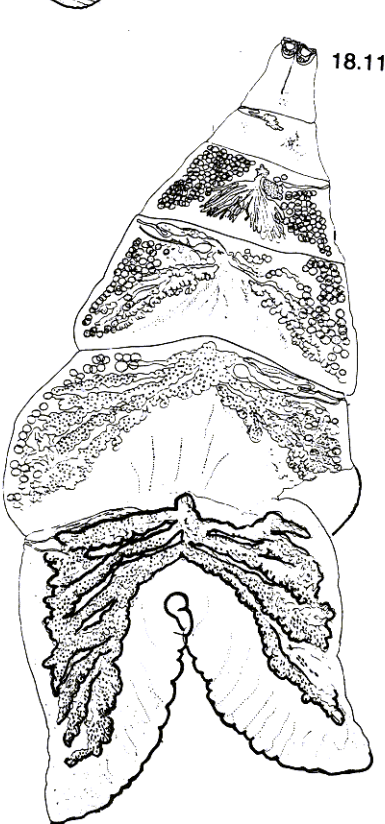
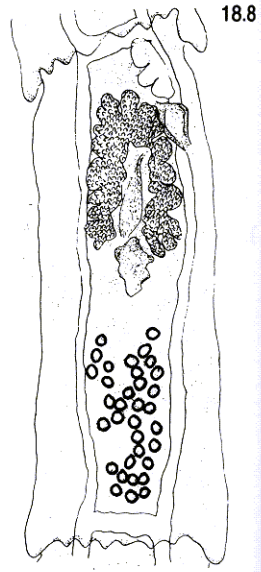
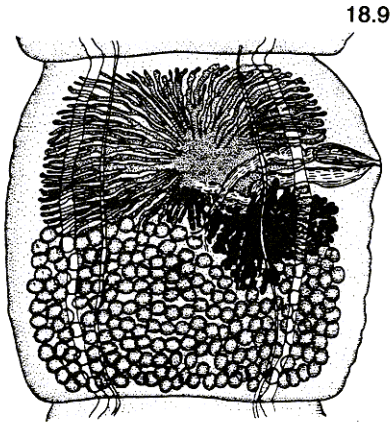
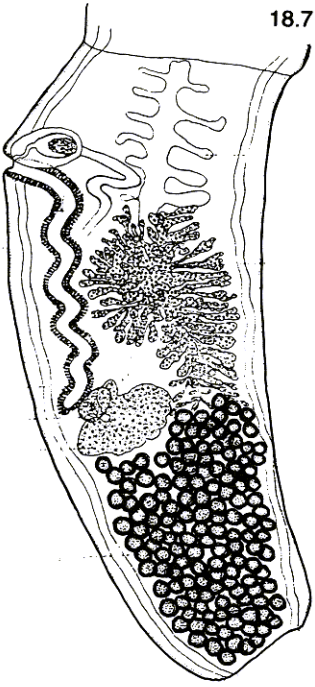
Fig. 18.2 Mature proglottid of *Catenotaenia pusilla* (Goeze, 1782). After Meszaros & Murai (1979).

Fig. 18.3 Scolex of *Skrjabinotaenia lobata* (Baer, 1925). After Quentin (1971).

Fig. 18.4 Proglottid of *Skrjabinotaenia lobata* (Baer, 1925). After Quentin (1971).

Fig. 18.5 Gravid proglottid of *Hemicatenotaenia ris* (Yamaguti, 1942). After Yamaguti (1942).

Fig. 18.6 Gravid proglottid of *Catenotaenia pusilla* (Goeze, 1782). Original.



posteriorly to female organs, do not cross longitudinal osmoregulatory canals. Uterus with fewer than 30 pairs of lateral uterine branches. Parasites of Holarctic and Asiatic Scuridae, Cricetidae, Muridae, Microtidae, Heteromyidae, Geomyidae and ? Erinaceidae. Type-species *C. pusilla* (Goeze, 1782) Janicki, 1904.

3b. 30 to 40 testes (Fig. 18.8); parasites of Neotropical Caviidae
 *Quentinotaenia* Tenora, Mas-Coma, Murai & Feliu, 1980.
 (Syn. *Quentinia* Spasskii, 1969.)

Diagnosis: Catenotaeniinae. Ovary in anterior half of proglottid, almost symmetrical, horseshoe-shaped. Vitelline gland compact, enclosed by ovarian lobes or postovarian. Testes few, posterior to vitelline gland between lateral osmoregulatory canals. Uterus with 15–20 compact lateral branches. Parasites of Brazilian Caviidae. Type-species *Q. mesovitellinica* (Rego, 1967) Tenora, Mas-Coma, Murai & Feliu, 1980.

Key to genera of the subfamily Skrjabinotaeniinae Genov & Tenora, 1979

1a. Gravid proglottid undivided, longer than wide (Fig. 18.10); parasites of Palaearctic and Ethiopian Muridae (fundamental hosts) and also Palaearctic and Ethiopian Gerbillidae, Ethiopian and Malagasy Cricetidae and Dendromuridae *Skrjabinotaenia* Akhumyan, 1946.

Diagnosis: Skrjabinotaeniinae. Strobila acraspedote with three to sixty proglottids. Mature proglottids longer than wide. Ovary asymmetrical, highly lobate, extensive. Testes numerous, distribution relative to ovary variable (posterior, lateral, sometimes surrounding ovary or in two lateral groups). Uterus taenioid with median stem and numerous lateral branches shorter than median stem. Parasites of Palaearctic and Ethiopian Muridae (fundamental hosts) and also Palaearctic and Ethiopian Gerbillidae, Ethiopian and Malagasy Cricetidae and Dendromuridae. Type-species *S. oranensis* (Joyeux & Foley, 1930) Akhumyan, 1946.

1b. Gravid proglottid deeply cut posteriorly by a longitudinal fissure and transversely elongated (Fig. 18.11); parasites of Ethiopian Gerbillidae (fundamental hosts) and also of Ethiopian and Malagasy Muridae and Cricetidae *Meggittina* Lynsdale, 1953.
 (Syn. *Rajotaenia* Wertheim, 1954.)

Diagnosis: Skrjabinotaeniinae. Strobila acraspedote, strongly reduced, consisting of small scolex, wide neck and only few proglottids. Gravid proglottid widening to form two lateral wings. Ovary and vitelline gland poral. Testes numerous,

Fig. 18.7 Mature proglottid of *Catenotaenia chabaudi* Dollfus, 1953. After Dollfus (1953).

Fig. 18.8 Proglottid of *Quentinotaenia mesovitellinica* (Rego, 1967). After Rego (1967b).

Fig. 18.9 Mature proglottid of *Pseudocatenotaenia matovi* (Genov, 1971). After Tenora *et al.* (1980).

Fig. 18.10 *Skrjabinotaenia pauciproglottis* Quentin, 1965. After Quentin (1971).

Fig. 18.11 *Meggittina gerbilli* (Wertheim, 1954). After Quentin (1971).

in two lateral groups or in two groups anterior to female organs. Median longitudinal stem of uterus very short, lateral uterine branches each with secondary branches from their inner sides. Parasites of African and Malagasy Gerbillidae (fundamental hosts), Muridae and Cricetidae. Type-species *M. baeri* Lynsdale, 1953.

Note added in proof

The genus *Quentinia* Spasskii, 1969 proposed for the species *Q. baltazardi* (Quentin, 1967) predates *Quentinotaenia* Tenora, Mas Coma, Murai & Feliu, 1980. Consequently, *Quentinotaenia* falls into synonymy with *Quentinia*. The correct name of the type-species of *Quentinia* is *Q. baltazardi* (Quentin, 1967), syn. of *Q. mesovitellinica* (Rego, 1967).