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DELIBERATIONS ON THE PROBLEMS OF MAMMOMONOGAMUS SPECIES (NEMATODA, SYNGAMIDAE) IN RUMINANTS

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Dedicated to Academician B. Ryšavý on the occasion of his 60th birthday

Abstract. The taxonomy of mammomonogamids parasitic in ruminants is discussed with regard to their different rates of variability in Cuba and Mexico. Since their variability is large and the existence of biological species is not based on their morphology but on the reproduction isolation of populations, the authors came to the conclusion that the specific analysis of mammomonogamids will be convincing only in case that it is carried out using taxonomic experiments of special orientation.

Members of the genus *Mammomonogamus* belong to common parasites of domestic ruminants in the substropical and tropical regions. Due to the fact that they occur also in man, the interest in these parasites has lately increased. Particularly the questions of their specific appurtenance have been discussed. The life cycles of these nematodes are still unknown and therefore the problems of the systematics and taxonomy are very difficult to solve.

For the time being, the only basis for objective studies is the variability of *Mammomonogamus* species. However, in the last years some authors correctly stated that even the helminth variability may lead to erroneous taxonomic conclusions if it is not verified experimentally. The reason is that older morphological criterion of the species (based on the degree of difference) is not always in correlation with the reproductive isolation which is now considered to be a specific criterion in biparentally reproducing organisms. If the goal is the determination of real species in nature, the experiment becomes decisive for the verification whether certain forms of helminths belong to the same or to different species. In most cases the decision without experiments is debatable and little convincing. For these reasons, the taxonomic studies of the helminths the ontogenesis of which is unknown are little attractive. Among these species are also the mammomonogamids. However, from the sanitary and economic viewpoints it is important to study these helminths, in spite of the fact that the present opinions may be disproved in the future.

Since we had the possibility to study 1,794 mammomonogamids from cattle in Cuba (Flores et al. 1979), we are giving here some deliberations on their taxonomy as it appears from the viewpoint of the theory of reproductive isolation of species and their morphological variability.

In 1899 Railliet described *Syngamus laryngeus* from cattle in Indochina and Linstow (in the same year but later) *Syngamus nasicola* from *Cervus rufus* in Brazil and from *Capra hircus* in Cameroon (Africa). Since that time, these species have been dealt with in many papers. Some authors regard them as synonyms (Vaz 1935, Ryzhikov 1949 and others), others state that they can be differentiated morphologically (Buckley 1934, Graber et al. 1971, 1972, Mejia 1978). In our opinion, the reason of all these

inconsistences is the stability or variability of the morphological characters applied for specific diagnosis of mammomonogamids. They are dealt with in detail in the paper by Ryzhikov (1949).

Our studies of mammomonogamids from cattle in Cuba (Flores et al. 1979) revealed that two basic forms of these nematodes exist in the province Granma. The nematodes of the first group (67.8 % of the examined specimens) possess mostly long ribs in the mouth capsule and the female tail is relatively short, measuring up to 0.200 mm (Fig. 1). The nematodes of the other group (13.2 %) possess mostly short ribs in the mouth capsule, whereas the female tail is relatively long, more than 0.260 mm (Fig. 2). The remaining 19 % of mammomonogamids are transitive forms with 0.200—0.260 mm long tail and other intermediary characters in the mouth capsule. They were mentioned in the paper by Flores et al. (1. c.).

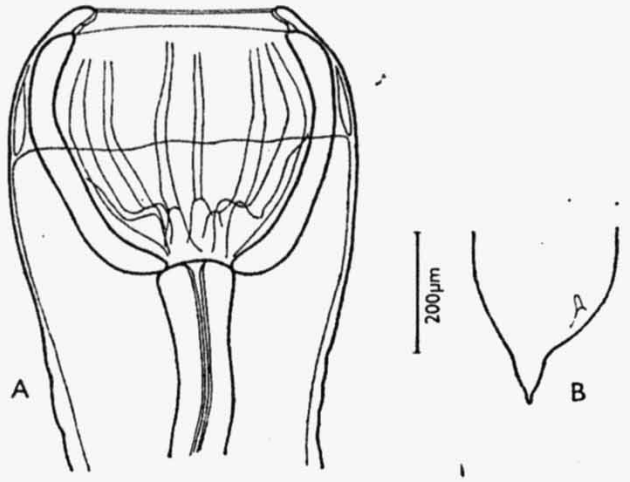

Fig. 1. *Mammomonogamus laryngeus* (Railliet, 1899) — the form with mostly long ribs in the mouth capsule and relatively short female tail (up to 0.200 mm). a) head end of female; b) 0.168 mm long tail (Cuban material).

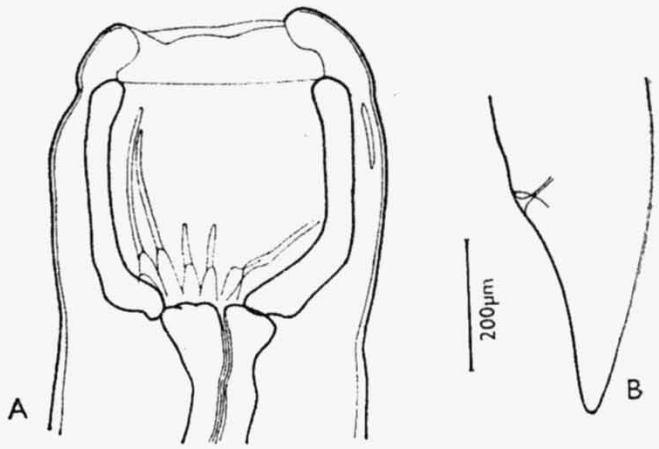

Fig. 2. *Mammomonogamus laryngeus* (Railliet, 1899) — the form with mostly short ribs in the mouth capsule and relatively long tail (more than 0.260 mm). a) head end of female; b) 0.327 mm long tail (Cuban material).

Graber et al. (1971, 1972) and Mejia (1978) regard the first two types as species. The form with mostly long ribs in the mouth capsule, short female tail (0.176 ± 0.009 mm) and other characters is regarded by Mejia (1978) as *M. laryngeus* and that with mostly short ribs in the mouth capsule, long female tail (0.288 ± 0.007 mm) and other characters is named *M. nasicola*.

A relatively large correlation of the above characters was observed only recently when an extensive material of mammomonogamids was examined. This is evidenced by an older material deposited in the museums which was named independently of the above correlation. For example, we used for a comparison a pair of mammomonogamids from the original Railliet's collection which was described by the author as *Syngamus laryngeus* from the host *Bos taurus* (loc. Nhatrong-Annam). Of the eight ribs in its mouth capsule, six reach the anterior margin (Figs. 3A, B) and the female tail is relatively long, measuring 0.272 mm (Fig. 3C). The data on its morphology are given in Tables 1 and 2.

Three pairs of *Syngamus nasicola* Linst. were obtained from Dr. Hartwich of the Zoological Museum in Berlin. Two pairs (No. 1052) are syntypes from the host *Cervus rufus* from Rio Grande do Sul (Figs. 3D, 4, 5). The third pair (No. 6083) is from the host *Ovis aries* from Trinidad. All pairs (particularly the two pairs No. 1052) were very strongly pigmented, so that the structure of the mouth capsule was poorly visible. The teeth appeared like indistinct shadows and their number could not be determined.

Table 1. Morphological and metrical data on males of *Mammomonogamus nasicola* (Linstow, 1899) and *M. laryngeus* (Railliet, 1899) (in mm)

	Syngamus nasicola Linstow, 1899 (syntypes) No. 1052		*Syngamus nasicola* Linstow, 1899 No. 6083	*Syngamus laryngeus* Railliet, 1899
Host	*Cervus rufus*		*Ovis aries*	*Bos taurus*
Locality	Rio Grande do Sul		Trinidad	Nhatrong (Annam)
Male length	4.421	5.288	5.664	2.880
Maximum male width	0.536 in mouth capsule region		0.476	0.288
Maximum head part width	0.536	0.651	0.484	
Mouth capsule	0.374 × 0.453	0.325 × 0.352	0.301 × 0.413	0.352 (width)
Thickness of capsule walls	0.114 × 0.132	0.061 × 0.132	0.096 on the average	0.035
Capsule granulation	poorly visible	distinct	distinct	distinct
Capsule cordons	very poorly visible	present	not visible	not visible
Teeth in capsule	indistinct, number cannot be determined	not visible	not visible	8 in number, measuring centrally 0.044—0.061 × 0.026—0.035
Ribs in capsule	not visible	not visible	not visible	8 in number, 6 reaching anterior margin of capsule
Oesophagus	0.900 × 0.306	0.936 × 0.290	0.936 × 0.308	0.774 × 0.144
Cervical papillae		0.846 and 0.864 from anterior extremity		0.576 and 0.630 from anterior extremity
Excretory pore	0.9 from anterior extremity	0.936 from anterior extremity	0.910	
Nerve ring			0.624 from anterior body end	
Spicules	not examined	not examined		0.023—0.026
Deposit	Zoological Museum, Berlin	Zoological Museum Berlin	Zoological Museum Berlin	Dr. Z. Zavadil, Brno

Table 2. Morphological and metrical data on females of *Mammomonogamus nasicola* (Linstow, 1899) and *M. laryngeus* (Railliet, 1899) (in mm)

	Syngamus nasicola Linstow, 1899 (syntypes) No. 1052		*Syngamus nasicola* Linstow, 1899 No. 6083	*Syngamus laryngeus* Railliet, 1899
Host	*Cervus rufus*		*Ovis aries*	*Bos taurus*
Locality	Rio Grande do Sul		Trinidad	Nhatrong (Annam)
Female length	23.360	22.137	16.981	12.629
Max. width of head part	0.448	0.642	0.607	
Maximum body width	0.751 behind vulva	0.693 behind vulva	0.780 behind vulva	0.578 behind vulva
Mouth capsule	0.484 × 0.536	0.492 × 0.545	0.413 × 0.576	0.468 (width)
Thickness of capsule walls	0.074—0.114	0.114	0.105—0.127	
Capsule granulation	distinct		distinct	distinct
Capsule cordons	transverse, poorly visible		poorly visible	not visible
Teeth in capsule	indistinct		very indistinct	
Ribs in capsule	indistinct		indistinct	
Oesophagus	0.116 × 0.396	1.069	1.224 × 0.400	0.882 × 0.299
Middle of nerve ring			0.972 from anterior extremity	
Cervical papillae			0.900 and 0.945 from anterior extremity	0.378
Excretory pore		1.026		
Vulva from anterior extremity	4.566	4.739	4.161	2.832
Anus from posterior extremity		0.396	0.176	0.272
Tail				transversely striated
Eggs	0.047—0.049 × 0.089—0.091	0.047—0.049 × 0.087	0.049—0.053 × 0.095	
Deposit	Zoological Museum Berlin	Zoological Museum Berlin	Zoological Museum Berlin	Dr. Z. Zavadil, Brno

The ribs in the mouth capsule were quite indistinct. All specimens from Berlin possessed a markedly thick-walled mouth capsule (Figs. 4, 5), which may be due to a deformation (?) caused by the alcohol in which the specimens were kept. The tail in the female No. 1052 (syntype) was long and measured 0.396 mm (Fig. 3D), whereas the tail in *S. nasicola* female No. 6083 was short, measuring 0.176 mm. Tables 1 and 2 include only the data which could be obtained without damaging the nematode specimens.

A comparison of the variability of mammomonogamids observed in the representative material by Mejia (1978) and Flores et al. (1979) reveals that both basic forms (cfr. Figs. 1, 2) "appear" in Mexico as different taxons. It does not follow from the paper by Mejia (1978) that any transitive types were found. In Cuba, however, there do occur specimens transitive between the two forms which indicates that no reproductive isolation exists between them and that they appear as a single species.

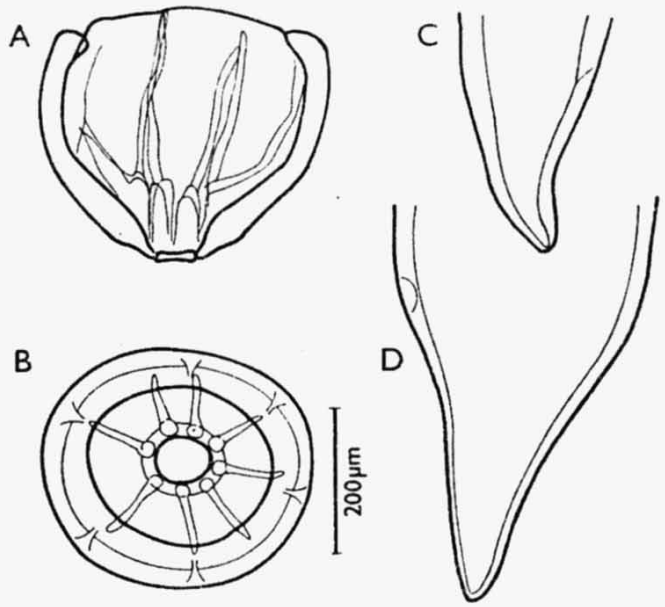

Fig. 3. *Syngamus laryngeus* Railliet, 1899 from Railliet's collection (Deposit of Dr. Zavadil, Brno) A, B — Mouth capsule of male, C — female tail (0.272 mm long). *Syngamus nasicola* Linstow, 1899 — syntype (Deposit of Zoological Museum, Berlin, No. 1052), D — Head part of female.

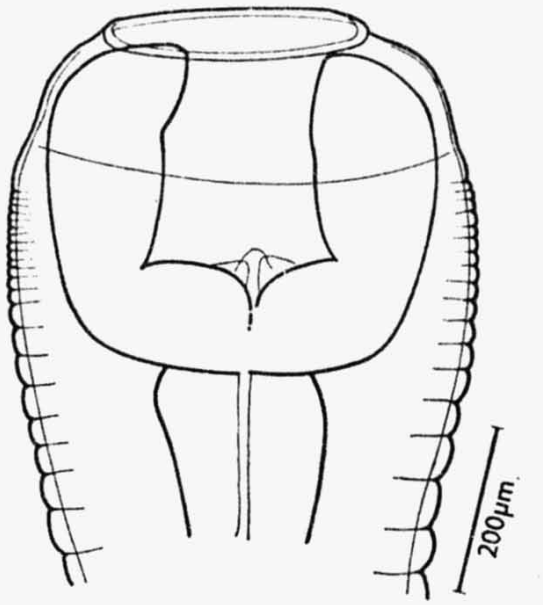

Fig. 4. Head part of male of *Syngamus nasicola* Linstow, 1889 — syntype. (Deposit of Zoological Museum, Berlin, No. 1052).

Since no "specific" character which would not be variable in a certain geographical region was found in mammomonogamids, it may be supposed from the taxonomical view that

1) the two basic forms (Figs. 1, 2) belong to a single variable species; in some region they may form independent races (subspecies), whereas in others they form only intrapopulation morphs with many transitive specimens;

2) the two basic forms represent two different species. This assumption is associated with another one, i.e., that there exists a reproductive isolation between them, though their variability may partly coincide in some regions.

The assumption that there is a difference between the basic forms from Cuba and those from Mexico is supported by the fact that all male specimens from Cuba possessed spicules, whereas in males obtained from Mejia and originating from Mexico the spicules (measuring 0.028—0.030 mm) were found only in the species named *M. laryngeus*, but they were lacking in *M. nasicola*. (The comparative material from Mexico consisted of three pairs of *M. nasicola* and two pairs of *M. laryngeus*).

The spicules were examined using a new modified method described by Flores et al. (1979). It could not be detected whether an abnormity, polymorphism or character of taxonomic importance was involved and further studies of spicules in mammomonogamids from Mexico are necessary to elucidate this problem.

However, if it is proved experimentally that the above forms of mammomonogamids belong to two different biological species, it will mean that in some regions these nematodes cannot be morphologically differentiated due to the fact that the variability of characters of taxonomic importance is partly coinciding. (The question of the existence of spicules in *M. nasicola* is not considered.)

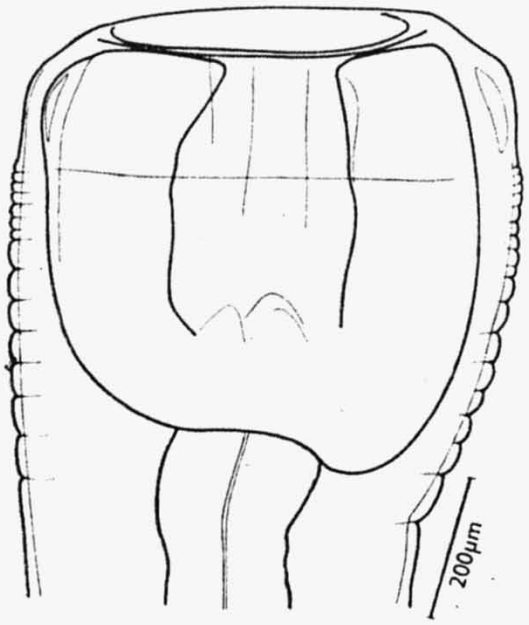

Fig. 5. Head part of female of *Syngamus nasicola* Linstow, 1889 — syntype. (Deposit of Zoological Museum, Berlin, No. 1052).

The taxonomic evaluation of Cuban mammomonogamids was based on the fact that there exist transitive specimens between the basic forms (Figs. 1, 2) in all localities and that they belong to a single "taxonomic species". Since a majority of the examined parasites belonged to the groups with mostly long ribs in the mouth capsule and a relatively short tail in females, all mammomonogamids from Cuba were placed in the species *M. laryngeus* (Railliet, 1899). This decision does not exclude the possible existence of *M. nasicola* (Linst. 1899) in nature, though this species could not be exactly differentiated in Cuba. Any hypothesis is little convincing without experimental proof, in spite of the great work necessary for its substantiation. We have therefore come to the conclusion that other aspects are necessary in the studies of mammomonogamids from further regions, though their morphology and variability are of great importance from the view of their specific appurtenance. Of primary importance is the knowledge of their life cycles and the special taxonomic experiments should follow. Particularly the variability of each form under study should be verified using the principle of related communities (Macko 1971). This method can be applied while studying separately the variability of progeny originating from eggs of a "typical" female of a certain group and the progeny of the female of the other group (Macko and Birová 1976, Birová and Macko 1976). The experiments based on the studies of the reproductive isolation of these groups will be the most convincing.

Acknowledgement. Our thanks are due to Dr. Mejia from Mexico, Dr. Graber from France, Dr. Hartwich from Berlin and Dr. Zavadil from Brno for kindly providing us with the comparative material of mammomonogamids and the relevant information.

РАССУЖДЕНИЕ О ПРОБЛЕМАХ ВИДОВ РОДА *MAMMOMONOGAMUS* (NEMATODA, SYNGAMIDAE) У ЖВАЧНЫХ ЖИВОТНЫХ

Й. К. Мацко, В. Бирова и Р. Флорес

Резюме. Обсуждается таксономия маммомоногамид, паразитирующих у жвачных животных, учитывая их различную изменчивость на Кубе и в Мексике. Так как изменчивость этих нематод велика и существование биологичеслих видов основано не на их морфологии,

а изоляции размножения популяций, авторы выводят, что специфический анализ маммомоногамид убедителен только в том случае, что он сделан на основе таксономических опытов специального направления.

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D. W. T. Crompton, S. M. Joyner: Parasitic Worms.

Wykeham Publications (London) Ltd., London 1980, 207 pp., 204 Figs. Price £ 5.00.

This book appeared as the 57th volume of The Wykeham Science Series. According to the authors it is an introduction into helminthology for students who have no or partial knowledge of parasitology. It presents a brief survey of the available information on the complicated relationships between parasitic worms and their living environment. Various aspects of helminth biology and some general characters of parasitism are described and discussed using many examples. A zoological approach is used in elucidation of these complicated problems. The book is written in a brief and clear manner and the mode of compilation suggests that the authors applied here their rich scientific and pedagogic experience. Numerous figures and schemes (mostly taken from the literature) contribute to better understanding of the text, similarly as the glossary at the end of the book explaining some biological terms which were not defined in the text.

The book is divided into ten major chapters which are further subdivided according to the questions discussed. In the first, introductory chapter the concept of parasitism is explained and is characterized as a dynamic relationship between living organisms where all necessary energy and nutrition of both partners are supplied by the host. Also the classification of parasitic worms (helminths) and their position within the animal kingdom are dealt with. This group of parasites includes three animal phylla — Platyhelminthes (classes Trematoda and Cestoda), Acanthocephala and Aschhelminthes (class Nematoda). For each phyllum are given its characteristics, main groups of representatives, morphology, adaptation to parasitic way of living, living conditions and hosts. In the