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A compendium of the family Axonolaimidae, (Nematoda)[1]

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Abstract : Diagnostic characters of genera included in the Axonolaimidae (Filipjev, 1918) were determined by scrutiny of original and subsequent descriptions and figures, and by studying specimens of *Apodontium* Cobb, 1920 and *Margonema* Cobb, 1920. The study of *Apodontium* showed the genus to have a unique stoma ; and not to be congeneric with *Synodontoides* as previously proposed. The validity of *Parascolaimus* Weiser, 1959 is questioned but the genus is retained pending future studies. Family affiliation includes a variety of amphidial shapes (excluding circular), shape of the stoma, number of the post-labial setae, and body size. Genera may also vary as to stomatal armature, number of gonads, inclination of the stomatal walls, length of body and shape of tail. Based on these characteristics, membership in the family is concluded to be : *Apodontium* Cobb, 1920 ; *Ascolaimus* Ditlevsen, 1919 ; *Axonolaimus* De Man, 1889 ; *Margonema* Cobb, 1920 ; *Nicascolaimus* Riemann, 1986 ; *Odontophora* Bütschli, 1874 ; *Odontophoroides* Boucher and Helléouët, 1977 ; *Parodontophora* Timm, 1963 ; *Pseudolella* Cobb, 1920 ; *Synodontium* Cobb, 1920 and *Synodontoides* Hopper, 1963. *Odontophoroides hopperi* Lambshead, 1982 is regarded a junior synonym of *O. monhystera* (Gerlach, 1953).

Résumé : Le diagnose des genres de la famille des Axonolaimidae (Filipjev, 1918) a été déterminée d'après l'examen des descriptions et des figures originales et postérieures et d'après l'étude des spécimens d'*Apodontium* Cobb, 1920 et *Margonema* Cobb, 1920. L'étude d'*Apodontium* a montré que le genre a un stoma unique, et non pas congénère de *Synodontoides* comme proposé précédemment. La validité de *Parascolaimus* Weiser, 1959 est remise en question mais le genre est maintenu en attendant des études plus approfondies. L'affiliation au niveau de la famille inclut une variété de formes amphidiales (circulaire exclue), forme du stoma, nombre de soies post-labiales, et, taille du corps. Les genres peuvent aussi varier dans l'armature stomacale, le nombre des gonades, l'inclinaison des parois stomacales, la longueur du corps et la forme de la queue. Les représentants de la famille basées sur ces caractéristiques sont les suivants : *Apondontium* Cobb, 1920 ; *Ascolaimus* Ditlevsen, 1919 ; *Axonolaimus* De Man, 1889 ; *Margonema* Cobb, 1920 ; *Nicascolaimus* Riemann, 1986 ; *Odontophora* Bütschli, 1874 ; *Odontophoroides* Boucher et Helléouët, 1977 ; *Parodontophora* Timm, 1963 ; *Pseudolella* Cobb, 1920 ; *Synodontium* Cobb, 1920 ; et *Syndontoides* Hopper, 1963. *Odontophoroides hopperi* Lambshead, 1982 est considéré comme un synonyme junior de *O. monhystera* (Gerlach, 1953).

INTRODUCTION

The subfamily Axonolaiminae (Axonolaimini) was established by Filipjev (1918) within the family Monhysteridae. The basis for this classification was the structure of the amphid described as "lateral organs spiral with very few turns, sometimes less than one, or in a form of complex tube". At that time the subfamily contained four genera : *Axonolaimus* De Man, 1889 ; *Araeolaimoides* De Man, 1893 ; *Conolaimus* Filipjev, 1918 and *Sphaerocephalum* Filipjev, 1918. In 1930, Filipjev transferred nematodes with a pyramidal stoma and subspiral amphid to the Axonolaiminae, establishing the membership as : *Margonema* Cobb, 1920 ; *Axonolaimus, Synodontium* Cobb, 1920 ; *Ascolaimus* Ditlevsen, 1919 ; *Apodontium* Cobb, 1920

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and *Odontophora* Bütschli, 1874. In 1934, Filipjev placed the subfamily in the Linhomoeidae, included 19 genera within the Axonolaiminae and synonymized his genus *Conolaimus* with *Odontophora*.

De Coninck and Stekhoven (1933) raised the subfamily to family level (eliminating use of the subfamily category), included 9 genera, and placed the family in the new "order" "Araeolaimoidea". Stekhoven (1935) reduced family membership to only five genera (*Ascolaimus, Odontophora, Axonolaimus, Araeolaimus* and *Araeolaimoides*). Allgén (1935) included the genus *Filipjeviella* within the subfamily. Chitwood (1951) proposed a key for five genera in the Axonolaiminae (similar to that proposed by Filipjev (1930) but omitted the genus *Ascolaimus*. Timm (1963) described a new genus *Parodontophora* to be included in the subfamily and De Coninck (1965) added the genus *Cynura* Cobb (1920). Hope and Murphy (1972) omitted *Cynura* and *Margonema* from their classification but added *Parascolaimus* Wieser, 1959 and *Synodontoides* Hopper, 1963 to the subfamily. The genus *Pseudolella* Cobb, 1920 was included in the subfamily by Filipjev (1934), Timm (1963), and also by Gerlach and Riemann (1973-1974). Belogurov and Kartavtseva (1975) and Belogurov and Koroljeva (1975) redescribed nine genera in this subfamily: *Axonolaimus, Apodontium, Ascolaimus, Margonema, Odontophora, Parascolaimus, Parodontophora, Synodontium, Synodontoides*; they omitted the genus *Pseudolella*.

Lorenzen (1981) included 10 genera within this subfamily. He synonymized *Synodontoides* with *Apodontium* and included *Odontophoroides* Boucher and Helléouët, 1977 in his list of genera in this subfamily. This is the most recent classification of the subfamily Axonolaiminae and includes: *Apodontium, Ascolaimus, Axonolaimus, Margonema, Odontophora* (syn. *Trigonolaimus* Ditlevsen, 1919), *Odontophoroides, Parascolaimus, Parodontophora, Pseudolella* (syn. *Pseudolelloides* Timm, 1957), and *Synodontium*. We concur with Lorenzen's classification except for his synonymization of *Synodontoides* with *Apodontium*.

Family Axonolaimidae (Filipjev, 1918) De Coninck and Stekhoven, 1933

The original description by Filipjev (1918) was "These are nematodes of medium size, rarely small. The cuticle is smooth or very finely annulated. The cephalic bristles are in one or two rows. *The lateral organs are in the form of a spiral, incomplete or with one small turn,* frequently very large, oval. The esophagus is most often without a bulb. The ovaries are straight. The spicules, where known, are short, the gubernaculum is frequently with 2 dorsal processes."

Family Description: Body rarely small, cuticle smooth or very finely annulated; head with 4 large, long cephalic setae followed by smaller setae; amphid usually large, oval, horse-shoe shaped, or shepherd crook-shaped, with variations thereof; stoma either in a form of two pyramids joined at their base to form a fusiform cavity, funnel-shaped or with parallel walls. Anterior part of stoma sometimes with teeth or tooth-like structures; esophagus usually slightly enlarged posteriorly; females monodelphic or didelphic; males monorchic or diorchic; spicules

curved, gubernaculum with apophyses, usually dorsally directed; tail conoid to clavate, caudal glands and spinneret present.

Apodontium Cobb, 1920 (Fig. 1-3).

This genus was first described by Cobb (1920) from two male specimens, (as determined from inspection of photocopies of Cobb's original drawings). Although Cobb's description of the taxon did not emphasize principal diagnostic characteristics, keys leading to the genus described the pharynx to be armed with teeth having an outward throw (eversible), the amphids elliptical, the body with 4 setae, the accessory (gubernaculum) bent away from the spicule, and without apophyses. In addition, the male has only one testis.

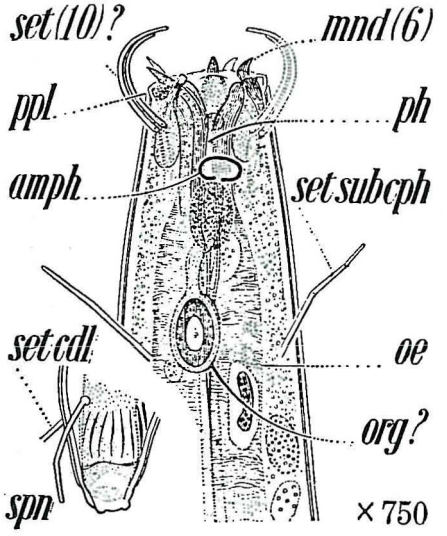

Fig. 1 - *Apodontium pacificum* Cobb, 1920. Male anterior end and tail terminus (after Cobb, 1920).

Filipjev (1930) placed this genus in the subfamily Axonolaiminae stating that it probably resembled *Monhystera elongata* Bütschli, 1874 (= *Ascolaimus elongatus* (Bütschli, 1874) De Coninck and Stekhoven, 1932) because of the circular amphids. Chitwood (1951) also accepted placement of *Apodontium* in the Axonolaiminae. Wieser (1956) concurred with Filipjev's opinion that *Apodontium* is most probably a synonym of *Ascolaimus*. Belogurov and Kartavtseva (1975) synonymized *Apondontium* with *Ascolaimus*. This synonymization is implausible because *Apodontium* has an elliptical to circular amphid, a funnel-shaped stoma, and only one testis while *Ascolaimus* has an amphid appearing like a U-shaped sausage, a cone-shaped stoma, and 2 testes.

Type material of this species, including Cobb's original drawings and notes, were loaned to us for study. The material consisted of nematodes processed "sublimate to balsam" from Mollendo, Peru (5 slides) and Salaverry, Peru (19 slides). The

nematodes studied were mostly in pieces and did not present sufficient detail for critical study. Cephalic setae were not observed, nor were the teeth in the vestibule sufficiently distinct. Fig. 2 and 3 illustrate the anatomical and morphological features observed. It should be noted that the key to males in Cobb (1920) states that *Apodontium* has a gubernaculum without an apophysis ("apophysis to the accessory none"). The male studied in slide N-6 from Mollendo showed a faint but clear apophysis. (Fig. 3A)

Diagnosis : Body long (2.3 mm) ; head with 4 strong setae, amphids elliptical ; 6 eversible teeth situated anteriorly in funnel-shaped stoma; esophagus cylindrical without a bulb ; testis one ; spicules 2, equal, more or less arcuate, about twice or three times as long as anal body width ; gubernaculum 1/4 the length of the spicule ; male tail conoid or subconoid, no supplement, caudal glands and spinneret present.

Type and only species : Apodontium pacificum Cobb, 1920.

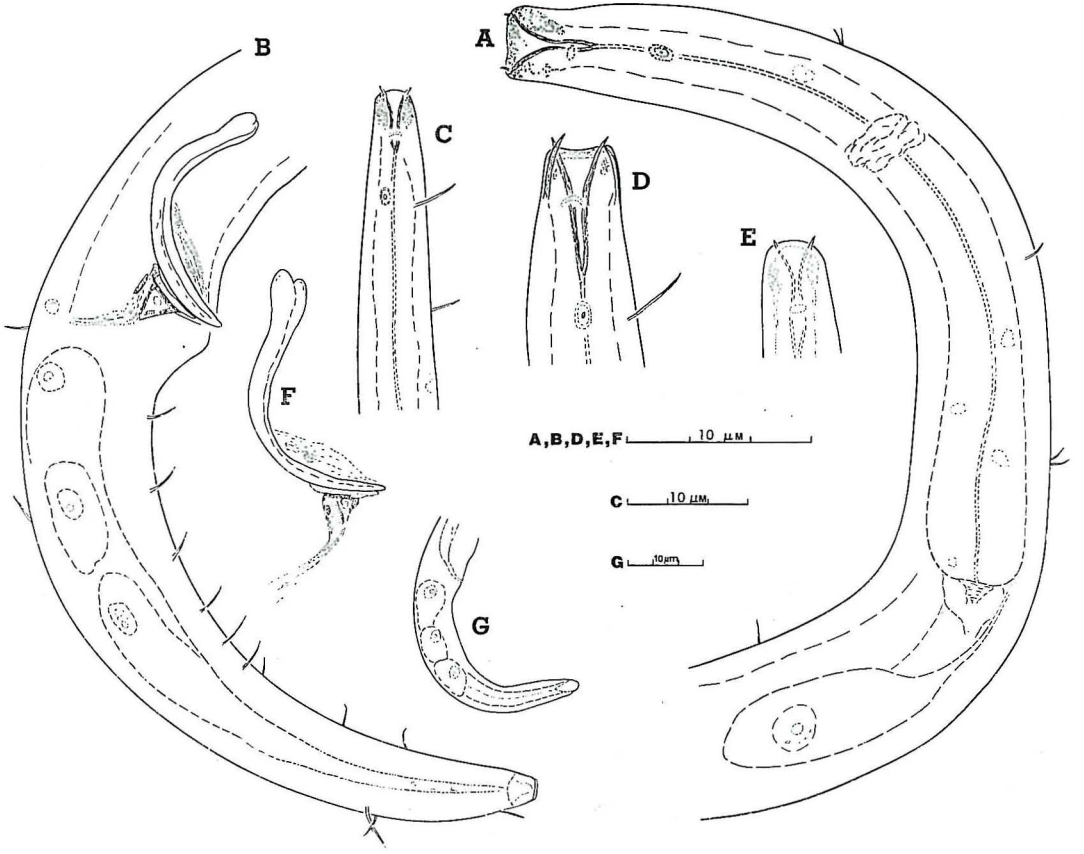

Fig. 2 - *Apodontium pacificum* Cobb, 1920. A, C, D and E. Anterior ends of males ; B. Male tail ; F. Spicule ; G. Juvenile tail. Fig. A, B, C, D and F drawn from specimens on slide 1, Mollendo ; Fig. E and G from slide 3, Mollendo.

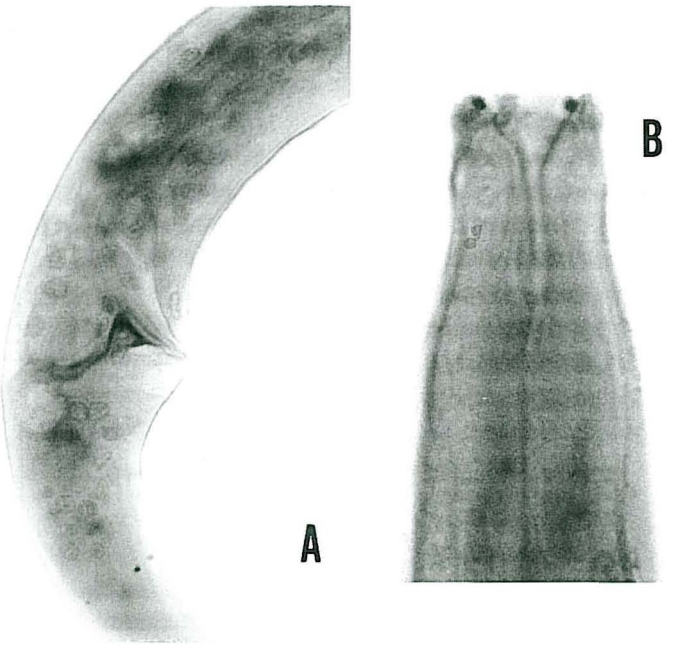

Fig. 3 - *Apodontium pacificum* Cobb, 1920.
A. Syntype male from Mollendo, Peru showing spicules and gubernacular apophysis.
B. Young male syntype showing characteristic shape of stoma. The two black dots are teeth.

Ascolaimus Ditlevsen, 1919 (Fig. 4).

This genus was established by Ditlevsen (1919) based on the species *Bathylaimus filiformis* Ditlevsen, 1918 and subsequently renamed *Ascolaimus filiformis* because the former genus was preoccupied (Fig. 4A). Skwarra (1921) described the species *A. elongatus* to be accommodated in the new genus.

Allgén (1929) redescribed the genus and placed it in the subfamily Axonolaiminae. Filipjev (1929 & 1930) further added to the knowledge of the genus and redescribed the species *A. elongatus* Skwarra (1921). Stekhoven and De Coninck (1932), De Coninck and Stekhoven (1933), and Stekhoven (1935) synonymized several other species under *Ascolaimus elongatus* (*Anticoma longisetosa* Kreis, 1924; *Ascolaimus filiformis* Ditlevsen, 1919; *Axonolaimus tenuis* Schulz, 1932 *Axonolaimus serpentulus* De Man, 1922 and *Monhystera elongata* Bütschli, 1874) and considered this species as monotypic within the genus. Stekhoven and De Coninck, 1932 established *Monhystera elongata* Bütschli, 1874 (Fig. 4B: = *Ascolaimus elongatus*) as the senior synonym to *A. filiformis* (Ditlevsen, 1918) and type of the genus. The taxon *A. mediterraneus* Brunetti, 1949 was considered identical with *A. elongatus* by Gerlach (1953). Gerlach and Riemann (1973-1974) renamed *Ascolaimus elongatus*

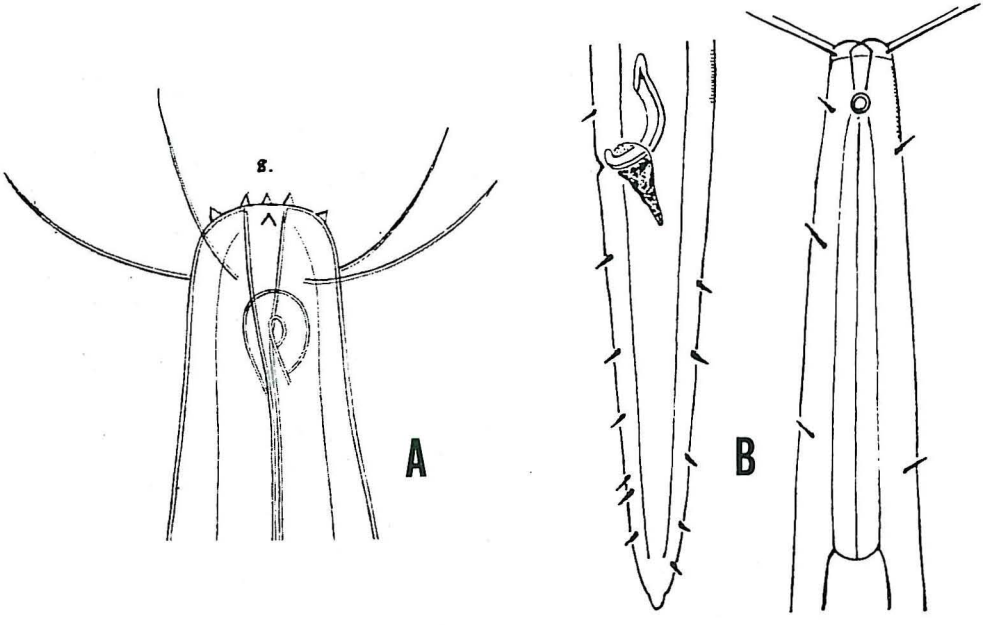

Fig. 4 - *A. Ascolaimus filiformis* (Ditlevsen, 1918) Ditlevsen, 1919. Anterior part of female. (after Ditlevsen, 1918); B. *Monhystera elongata* Bütschli, 1874. (= *Ascolaimus elongatus*) Lateral views of anterior part of body and male tail (tracing from the original figure by Bütschli, 1874).

Skwarra, 1921 as *A. elongatulus* nom. nov. A paper dealing with this genus was written by Belogurov and Koroljeva (1975) in which they gave their diagnosis of the genus and considered *Ascolaimus filiformis* as genotype.

Description: Body long and thin (a = 64-75), cuticle punctate in the thickest part, finely cross-striped; head with 4 large setae; amphids in a form of circular loop, located behind setae and at the region of the posterior part of stoma; stoma funnel-shaped, deep (Filipjev 1930 described it as composed of 2 parts: the anterior part in the form of an incomplete pyramid, and the posterior part probably in the form of a buccal capsule), no teeth; esophagus cylindrical, slightly swollen posteriorly; excretory pore situated anteriorly; ovaries 2, symmetrical; spicules strongly curved, usually with a hook at the end; gubernaculum with 2 posterior extensions; tail conical.

Type species: *Ascolaimus filiformis* (Ditlevsen, 1918), a subjective junior synonym of *A.elongatus* (Bütschli, 1874).

Axonolaimus De Man, 1889 (Fig. 5).

This genus was proposed by De Man (1889) partly based on the description of *Anoplostoma spinosum* (Fig. 5A) by Bütschli (1874), and included a new species, *A. filiformis* De Man, 1889. *Axonolaimus* differs considerably from *Anoplostoma* (am-

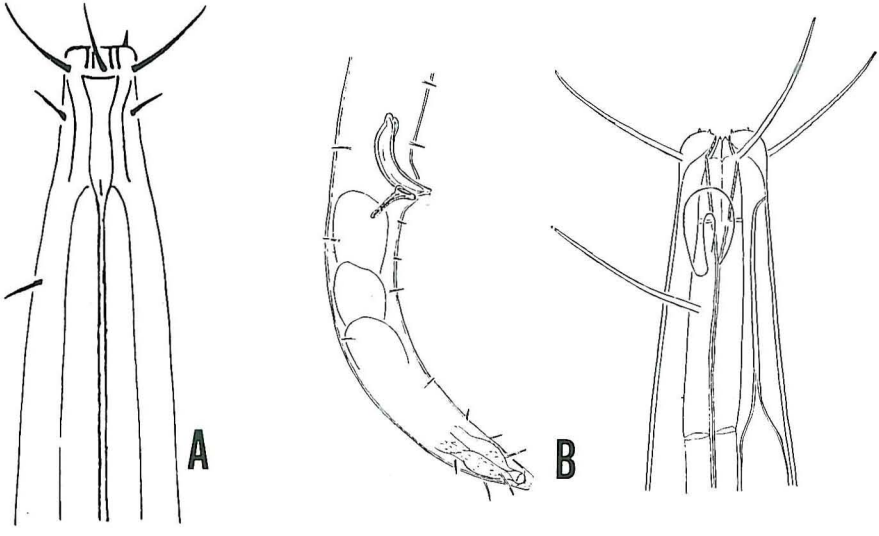

Fig. 5 - *A. Anoplostoma spinosa* Bütschli, 1874 (= *Axonolaimus spinosus* (Bütschli, 1874) De Man, 1889 (in part)). Lateral view anterior end (tracing from the original figures by Bütschli, 1874); B. *Axonolaimus hexapilus* Wieser and Hopper, 1967. Anterior and posterior ends of male (after Wieser & Hopper, 1967).

phid large, and head with four setae in *Axonolaimus* (Fig. 5B) as compared to amphid small or inconspicuous, head with 6 setae in *Anoplostoma*). Filipjev (1918) redescribed the genus more completely, included two new species, and erected the subfamily Axonolaimini. Cobb (1930) further added to the generic description and included two more new species. In 1959, Wieser prepared a key to 17 species of *Axonolaimus* while Hopper (1963) constructed a key for 20 species of the genus. Gerlach and Riemann (1973-1974) list 41 species in the genus.

Description Body tapering toward both ends; cuticle with very fine transverse striae, most easily seen near the tail; head with four large submedial cephalic setae; amphid large, an elongated hook-shaped tube, situated over buccal cavity region and often extending below it; buccal cavity in the form of 2 pyramids joined at their bases, the anterior pyramid (pointed anteriorly) is much shorter than the posterior and is without armature; female with 2 gonads, not reflexed; male with 2 testes, spicules arcuate, gubernaculum with 2 posterior processes; tail similar in both sexes, clavate, long, with caudal glands and spinneret. Male tail with many setae on ventral side.

Type species : *Axonolaimus spinosus* (Bütschli, 1874) De Man, 1889.

Margonema Cobb, 1920 (Fig. 6-7).

This genus was described by Cobb (1920) based on specimens collected from Mollendo and Salaverry, Peru. Filipjev (1930 & 1934), and Chitwood (1951) placed this genus in the Axonolaiminae. Fortunately, we were allowed access to Cobb's

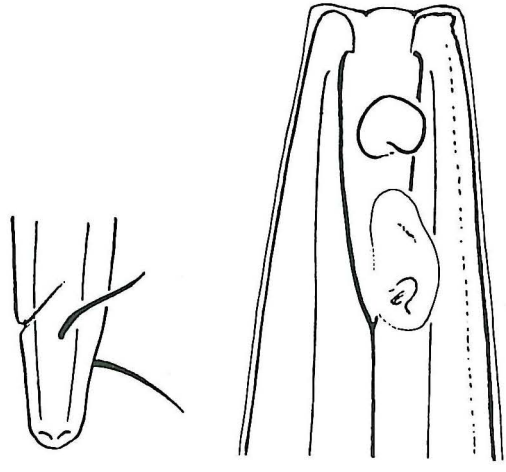

Fig. 6 - *Margonema ringens* Cobb, 1920. Anterior end and tail terminus. (tracing from original figure by Cobb, 1920).

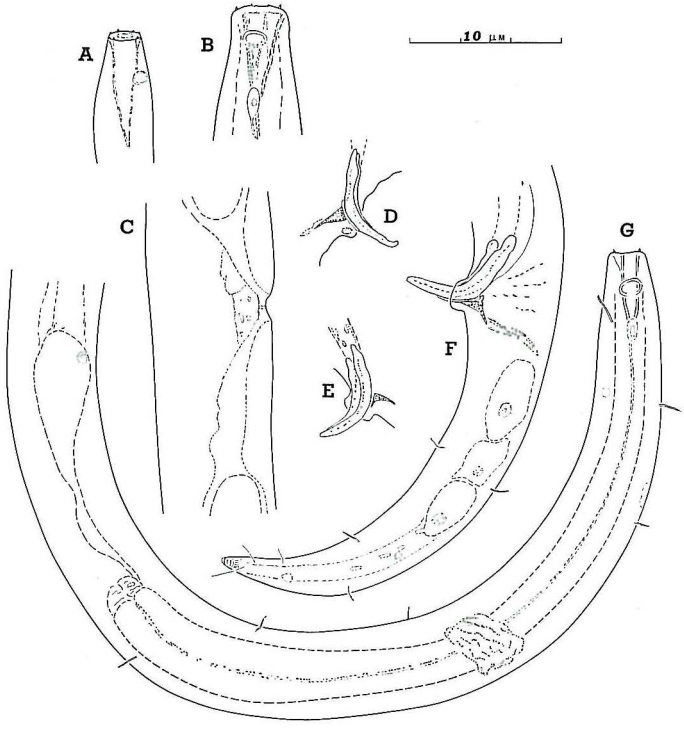

Fig. 7 - *Margonema ringens* Cobb, 1920. A, B. Anterior ends of females; C. Vulva region; D, E. Spicules and gubernacula; F. Male tail; G. Anterior end of male. Fig. A, B and F drawn from specimens on slides 4, 5 and 2 respectively, Mollendo, Peru. Fig. C, D, E and G from slides 3, 2, 2, and 1 respectively, Salaverry, Peru.

type material in the USDA Collection at Beltsville, Maryland, USA which had been passed through corrosive sublimate and was mounted on balsam. Although the nematodes mainly were fragmented, we nonetheless were able to observe certain morphological and anatomical details that are shown in Fig. 7. We were able to confirm Cobb's description of the nematode with the exception of his statement "cuticle apparently naked" and the existence of "thirty to forty low, about equidistant supplementary organs". We can not deny the existence of supplementary organs; simply put, they were not observed, which may be due to the age of the preparations.

Description (emended): Cuticle smooth, with few setae; amphid circular to elliptical, faint; stoma with weak walls, without teeth; esophagus without a bulb; female amphidelphic, gonads outstretched; testis single, outstretched; spicules paired, equal, more or less arcuate; end of spicules curved at the very tip; gubernaculum present, with adjoining apophysis; tail conoid, setose, tapering posteriorly.

Type species: *Margonema ringens* Cobb, 1920.

Nicascolaimus Riemann, 1986 (Fig. 8).

This novel genus thus far has been found only in New South Wales, Australia. The type and only species is *N. punctatus* Riemann, 1986. It is claimed to possess the generic characters of the Axonolaimidae in the shape of the stoma, loop-shaped amphids, and arrangement of the testes. It also bears affinities to the Comesomatidae in its cuticular ornamentation and in the position of the esophageal marginal tubes.

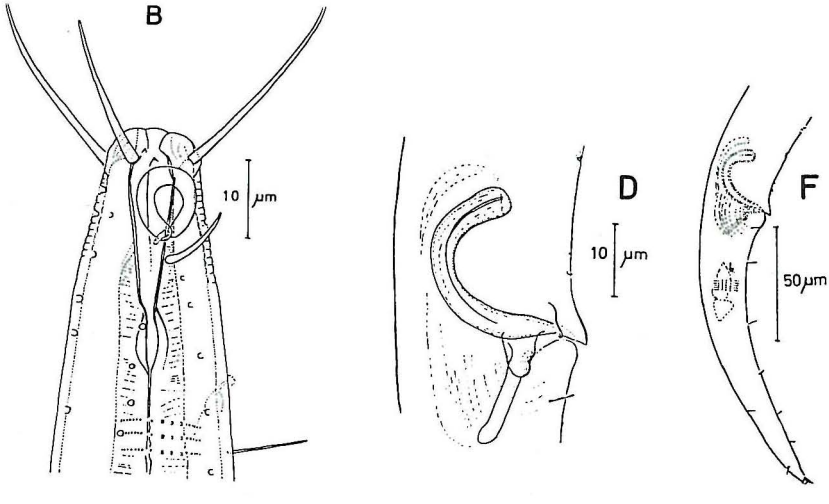

Fig. 8 - *Nicascolaimus punctatus* Riemann, 1986. B. Male anterior region; D. spicular apparatus; F. Tail. (after Riemann, 1986).

Description : Cuticle annulated, each ring with distinct row of punctations, 4-5 rows of punctations conspicuous in cervical and adanal regions ; large, ring-shaped cuticular pores occur irregularly in cervical region ; setae limited to cervical and caudal region, head with 4 robust setae ; amphids loop-shaped ; stoma conical with 2 or 3 very small teeth at posterior end of lips ; esophageal marginal tubes located immediately behind stoma ; 2 dissimilar testes occurring in tandem arrangement ; female gonads amphidelphic outstretched.

Type species : *Nicascolaimus punctatus* Riemann, 1986.

Odontophora Bütschli, 1874 (Fig. 9).

This genus was established by Bütschli (1874) with very simple description and drawing (Fig. 9A). The genus is characterized by the presence of teeth in the buccal cavity (Fig. 9B & 9C). Filipjev (1918 & 1930) placed this genus in the subfamily Axonolaiminae. Two genera, *Conolaimus* Filipjev, 1918 and *Trigonolaimus* Ditlevsen, 1919, were synonymized with *Odontophora* by Allgén (1929). Wieser (1956) devised a key for identification of species belonging to this genus based on amphid shape and length of the setae around the head. He later amended the key (Wieser, 1959). Lorenzen (1972) described 3 new species based on the distribution of subcephalic setae in one or two circles.

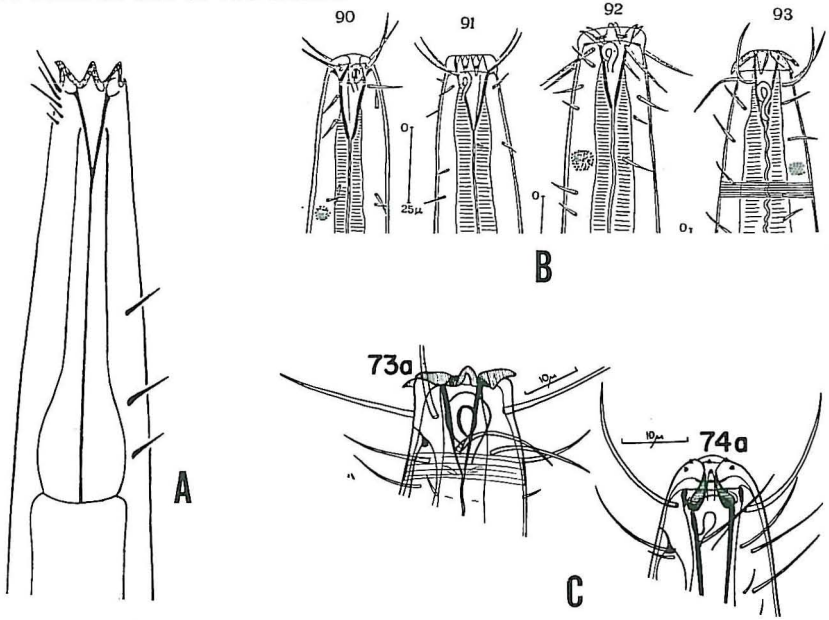

Fig. 9 - *A. Odontophora marina* Bütschli, 1874. Lateral view, anterior end. (tracing from original figure by Bütschli, 1874) ;
B. *Odontophora armata* (Ditlevsen, 1918). 90. Juvenile head with teeth fully retracted ; 91. Male head, showing opened mouth ; 92. Female head, showing teeth slightly extended ; 93. Male head showing teeth totally extruded. (after De Coninck & Stekhoven, 1933) ;
C. 73a. *Odontophora lituifera* Wieser, 1959. Anterior end of male showing teeth fully exerted. 74a. *Odontophora peritricha* Wieser, 1956. Anterior end of male showing teeth fully retracted. (after Wieser, 1959).

Boucher (1974) considered evolution of this genus based on the disposition and number of subcephalic and cervical setae. He provided a key to species in which he divided member species into 4 groups : 1) species with 4 subcephalic setae or less ; 2) species with 4 paramphidial setae ; 3) species with 2 sublateral and 4 submedian subcephalic setae ; 4) species with 4 sublateral and 4 submedian subcephalic setae. In addition, group 4 was divided into 2 smaller groups : a) without complementary setae between cephalic and subcephalic setae, b) with complementary setae more or less close to the cephalic setae.

Description : Body attenuated at both ends, mainly posteriorly ; cuticle smooth or annulated internally ; head rounded, cephalic setae long, sometimes followed by other setae ; amphid loop-shaped, oval in general outline ; stoma funnel-shaped *with tooth-like formation in anterior part* ; esophagus gradually enlarged posteriorly but without a bulb ; female amphidelphic, gonads outstretched ; spicules extremely curved ; testes 2 ; gubernaculum with 2 posterior processes ; caudal glands and spinneret present.

Type species : *Odontophora marina* Bütschli, 1874.

Odontophoroides Boucher and Helléouët, 1977 (Fig. 10).

This genus was based upon the distinctive features shown by *Synodontium monhystera* Gerlach, 1953, in particular the strong teeth in the buccal cavity and the adjacent amphid. These structures were not originally described as the characters of *Synodontium.* Lambshead (1982) described the new species *O. paramonhystera* and discussed the status of the genus with regard to the presence or

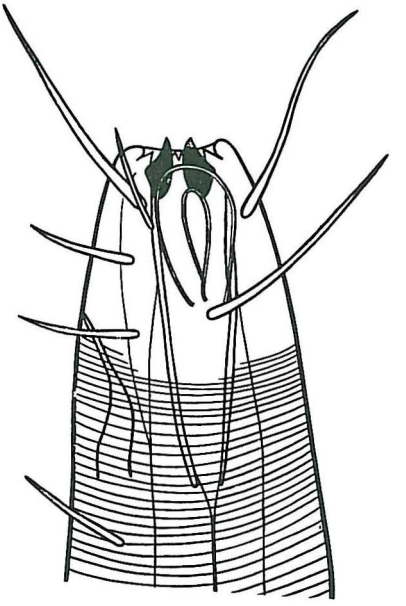

Fig. 10 - *Odontophoroides monhystera* (Gerlach, 1958) Boucher and Helléouët, 1977. Lateral view. Anterior end of female (after Boucher & Helléouët, 1977).

absence of subcephalic setae as stated in the descriptions by Hopper (1968), Lorenzen (1981), and Boucher and Helléouët (1977). Accordingly, Lambshead suggested the name *Odontophoroides hopperi* for *Synodontium monhystera* sensu Hopper (1968) with the diagnostic characters : lack of lateral subcephalic setae at the base of the amphid, and absence of fine subcephalic setae associated with the subventral (R_3) cephalic setae.

After studying the description and illustrations of Hopper (1968), Lambshead stated "The text refers to two lateral subcephalic setae, but notes them as position "8 µm and 23 µm respectively from anterior extremity" which would not seem to place them in their typical situation, i.e. at the base of the amphids." This interpretation does not appear to be valid because 8 µm is the position of the circle of the *cephalic* setae, and 23 µm is the position of the lateral *subcephalic* setae.

The description of Hopper (1968) definitely establishes the presence of lateral subcephalic setae which are 15 µm long and positioned 23 µm from the anterior end. It becomes obvious that these subcephalic setae are not shown in Hopper's illustration. Accordingly, the first characteristic stated by Lambshead as diagnostic for *Odontophoroides hopperi* is invalid.

The second diagnostic character proposed by Lambshead, "...the absence of fine subcephalic setae associated with the subventral R_3 subcephalic setae" is questionable because Hopper stated "Between the cephalic setae and subcephalic setae there occur several shorter (7 µm) setae..."

On the basis of the above arguments, we consider Hopper's specimen to be conspecific with the type species *Odontophoroides monhystera* (Gerlach, 1953) Boucher and Helléouët, 1977 (synonym : *O. hopperi* Lambshead, 1982 n. syn.).

Description : This genus is very close to *Synodontium* Cobb, 1920 but characterized by clearly visible shepherd crook-shaped amphids and prominent teeth in the buccal cavity.

Type species : *Odontophoroides monhystera* Boucher and Helléouët, 1977.

Parascolaimus Wieser, 1959 (Fig. 11).

This genus is characterized by 6 labial claw-like structures and the peculiar structure of gubernaculum. Belogurov and Kartavtseva (1975) described 2 new taxa which made a total of 4 species in the genus (*P. tau* Wieser, 1959 ; *P. ungulatus* Wieser, 1959 ; *P. proprius* Belogurov and Kartavtseva, 1975 ; and *P. amphidoporus* Belogurov and Kartavtseva, 1975.

There is some doubt in our minds as to the validity of this genus. Wieser's species show claw-like structures which could be vestibular rather than labial in nature. Belogurov and Kartavtseva offered the explanation that these structures are labial papillae which are modified into special nail-like formations, capable of projecting forward. Yet, the drawings of their two species fail to show such claw-like projections. The second distinguishing feature of the genus is the distinctive nature of the gubernaculum which is purported to be constructed of a dorsal section bearing an apophysis and a ventral part which is paired, tubular and at the

distal end of the spicula. The two species depicted by Belogurov and Kartavtseva do not show the same type of gubernaculum shown by Wieser's species. Nonetheless, it appears more prudent, at this time, to include all four species in *Parascolaimus*.

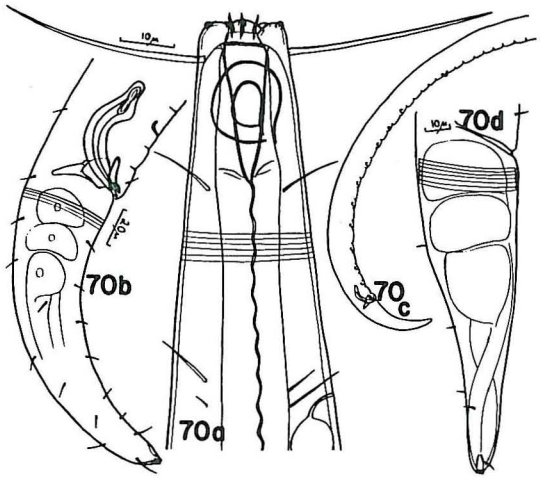

Fig. 11 - *Parascolaimus tau* Wieser, 1959. 70a. Anterior end of male ; 70b. Male tail ; 70c. Posterior end of male ; 70d. Female tail. (after Wieser, 1959).

Description : Body slim, cuticle annulated sometimes indistinct ; cervical setae in 2 longitudinal sublateral rows on both sides of the body, somatic setae present ; amphid monospiral, circular or oval ; stoma axonolaimoid, *with 6 labial "claws"*, probably representing modified labial papillae ; female gonads paired, opposite and not reflexed ; testis paired, reflexed ; spicules moderately curved ; gubernaculum of a *peculiar structure*, composed of a dorsal part carrying a caudal-dorsal apophysis and a ventral part that is paired, tubular and situated laterally to the distal end of the spicula ; supplements present or absent.

Type species : *Parascolaimus tau* Wieser, 1959.

Parodontophora Timm, 1963 (Fig. 12).

This genus was proposed by Timm (1963) for *Odontophora* species with parallel walls of the stoma. He chose *P. paragranulifera* (Timm, 1952) as the type species and included in the genus a number of species of *Odontophora* and *Pseudolella*.

Boucher (1974) speculated on the evolution of the genus, for which he felt the important diagnostic characters are length of ventral branch of amphid, position of the excretory pore from the anterior end, and length of the excretory gland. He used these characters to construct a key to species of this genus in which a new species, *P. xenotricha*, was accommodated. Belogurov and Kartavtseva (1975), and Pavluk and Belogurov (1979) also have described new species of this genus.

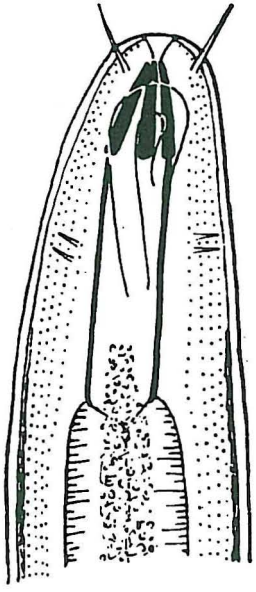

Fig. 12 - *Parodontophora pacifica* (Allgén, 1947) Timm, 1963. Female anterior portion. (after Timm, 1963).

Description : Cuticle smooth or with internal annulation ; amphid in a form of complex tube, sometimes with very long ventral branch ; stoma with parallel walls and with 6 tooth-like structures ; gonads 2, opposite, not reflexed ; other characters like that of *Odontophora*.

Type species : *P. paragranulifera* Timm, 1963.

Pseudolella Cobb, 1920 (Fig. 13).

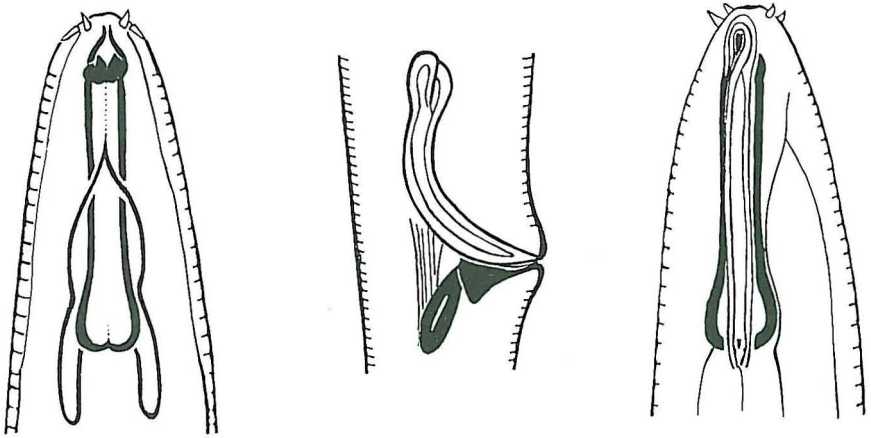

Fig. 13 - *Pseudolella granulifera* Cobb, 1920. Anterior ends and spicular region. (tracing from original figure by Cobb, 1920).

This genus was first described by Cobb (1920) and characterized by parallel stomal walls and an amphid shaped like a shepherd's crook. He described 2 species, *P. cephalata* and *P. granulifera*. Other species later were described by Allgén (1947), Timm (1952), and Gerlach (1955, 1957 & 1962). Some of those species eventually were synonymized with the genus *Parodontophora*. In 1957, Timm described a new genus *Pseudolelloides* which was very similar to *Pseudolella*. Gerlach (1962) proposed that the two genera should be synonymized and Timm (1963) made *Pseudolelloides* a junior synonym of *Pseudolella.*

Description : Cuticle smooth ; head tapering, rounded ; cephalic setae 4, length about 1/4 of head diameter at level of setae ; amphid shape a shepherd's crook, usually very long ; stoma with thin parallel walls, sclerotized, flaring out then arching in sharply at base; teeth present in anterior part of stoma ; esophagus with swollen posterior part ; female gonads 2, amphidelphic, outstretched ; testes 2 ; spicules curved, gubernaculum with posterior process ; caudal glands and spinneret present.

Type species: *Pseudolella granulifera* Cobb, 1920.

Synodontium Cobb, 1920 (Fig. 14).

This genus, established by Cobb (1920) is characterized by one posterior gonad in the female and a stoma with obscure teeth and an indistinct amphid. Filipjev (1930), in a classification of the family Axonolaimidae, stated that this genus probably is a synonym of *Axonolaimus*. Chitwood (1951) and Hopper (1963) confirmed the validity of this genus by virtue of the single female gonad which differs completely from other members of the Axonolaimidae. Hopper (1962 & 1963) proposed two new species and explained the structure of the amphid more completely.

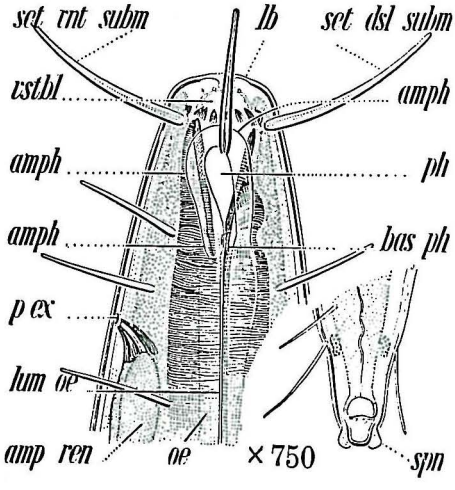

Fig. 14 - *Synodontium fecundum* Cobb, 1920. Anterior end and tail terminus. (after Cobb, 1920).

The amphid consists of a large internal pouch with a duct at the anterior extremity leading forward and outward to the surface of the body and from which long strands of an unknown material may arise. The amphid aperture consists of nothing more than the small, circular orifice of the amphidial duct. Gerlach (1953) described a new species, *S. monhystera*, which has strong teeth and an axonolaimoid amphid, such as in *Odontophora*. Since these characters had not been seen in other species of *Synodontium*, Boucher and Helléouët (1977) established the new genus *Odontophoroides* to accommodate this species.

Description : Cuticle striated, somatic setae present ; head with 4 cephalic setae and 2 lateral subcephalic setae ; amphid obscure ; stoma axonolaimoid, *with 6 double-tooth structures* ; esophagus enlarged posteriorly with a light basal swelling ; female gonad single, opisthodelphic and outstretched, vulva pre-equatorial ; spicules slightly curved ; gubernaculum with 2 apophyses ; testes paired, opposite and straight ; supplements present ; tail conoid ; caudal glands and spinneret present.

Type species : *Synodontium fecundum* Cobb, 1920.

Synodontoides Hopper, 1963 (Fig. 15).

This genus was proposed by Hopper (1963), based on *Axonolaimus procerus* Gerlach, 1957. Hopper established the genus as being intermediate between *Axonolaimus* and *Synodontium*.

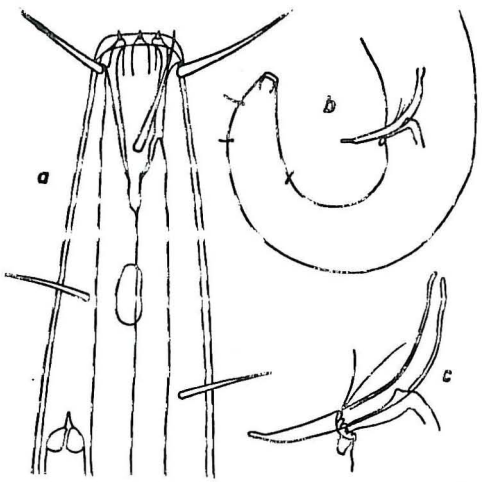

Fig. 15 - *Synodontoides procerus* (Gerlach, 1957) Hopper, 1963. a. Anterior region ; b. Tail ; c. Spicular apparatus. (after Gerlach, 1957).

Generic characteristics are : spicules slender, moderately arcuate and weakly cephalated (spicules robust, strongly arcuate and strongly cephalated in *Axonolaimus* and *Synodontium*). Lorenzen (1981), when observing *Synodontoides procerus*, stated that the genus is completely identical with *Apodontium* and he considered

Synodontoides as a junior synonym of *Apodontium*. We do not agree with this synonymization. *Apodontium* has only one testis while *Synodontoides* has two testes. *Apodontium* has teeth in buccal cavity, but *Synodontoides* does not.

Description : Body thin ; head with 4 cephalic setae ; 2 subcephalic setae situated laterally at posterior portion of stoma ; amphid obscure ; buccal cavity without teeth ; female gonads 2.

Type species : *Synodontoides procerus* (Gerlach, 1957) Hopper, 1963.

KEY TO GENERA IN THE FAMILY AXONOLAIMIDAE

1. Stoma with teeth 2
   Stoma without teeth 9
2. (1) Amphid elliptical, male with one testis ..... *Apodontium* Cobb, 1920
   Amphid not elliptical, male with 2 testes 3
3. (2) Female with one gonad 4
   Female with 2 gonads 5
4. (3) Stoma anteriorly with 4 distinct teeth and plate-like lateral teeth, amphids distinct ..... *Odontophoroides* Boucher & Helléouët, 1977
   Stoma anteriorly with circlet of 12 minutes, closely-packed odontia, amphids indistinct ..... *Synodontium* Cobb, 1920
5. (3) Stomatal walls parallel 6
   Stomatal walls not parallel 7
6. (5) Stomatal walls curve outwards at base ..... *Pseudolella* Cobb, 1920
   Stomatal walls straight ..... *Parodontophora* Timm, 1963
7. (5) Cuticle punctuate, with ring pores ..... *Nicascolaimus* Riemann, 1986
   Cuticle non-punctate and without ring pores 8
8. (7) Stoma with large eversible teeth located behind labium ..... *Odontophora* Bütschli, 1874
   Labium with small "claws" ..... *Parascolaimus* Wieser, 1959
9. (1) Male with one testis ..... *Margonema* Cobb, 1920
   Male with 2 testes 10
10. (9) Lateral subcephalic setae located opposite posterior portion of stoma ..... *Synodontoides* Hopper, 1963

No lateral subcephalic setae present 11
11. (10) Body elongate (a = 64 to 75), tail conical ..... *Ascolaimus* Ditlevsen, 1919
Body not as long (a = *ca* 35), tail somewhat clavate ..... *Axonolaimus* De Man, 1889

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