

A SYNOPSIS OF THE
FAMILIES AND GENERA
OF NEMATODA

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OF NEMATODA

20 APR 1926
PRESENTED

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LONDON :

PRINTED BY ORDER OF THE TRUSTEES OF THE
BRITISH MUSEUM

SOLD AT

THE BRITISH MUSEUM (NATURAL HISTORY), CROMWELL ROAD, S.W. 7

AND BY

B. QUARITCH, LTD.; DULAU & CO., LTD.; THE OXFORD UNIVERSITY
PRESS; AND WHELDON & WESLEY, LTD., LONDON; ALSO BY
OLIVER & BOYD, EDINBURGH

1926

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Issued 27 March, 1926]

PRINTED IN GREAT BRITAIN BY
RICHARD CLAY & SONS, LIMITED,
BUNGAY, SUFFOLK.

PREFACE

THE vast literature of the Nematoda is extremely scattered and is contained in periodicals dealing with very varied subjects. Owing to the economic importance of the group there are many students of it; these must have felt the need of a comprehensive work on the Nematoda, and the present volume is the result of an attempt by Dr. Baylis and Captain Daubney to remedy this deficiency. The Synopsis is not merely a compilation, for the authors have made some important proposals in regard to classification, and have themselves examined material representing a large proportion of the parasitic genera.

The authors wish to thank Mr. B. P. Uvarov, whose kind assistance has enabled them to give diagnoses of a number of genera described in the Russian language. The authors also wish to thank those helminthologists who have sent separate copies of their papers; these have greatly facilitated the preparation of this volume.

C. TATE REGAN,
Keeper of Zoology.

*British Museum (Natural History),
March, 1926.*

INTRODUCTION

No monograph exists embracing the Nematoda as a whole, and containing diagnoses either of genera, of families or of higher groups, to which a worker who is not a specialist can turn for assistance in the determination of specimens. It is chiefly with the object of relieving this situation to some slight extent that the present work has been undertaken. In the labour of compiling it we have been very greatly assisted by Stiles and Hassall's valuable Index-Catalogue of Medical and Veterinary Zoology. Indeed, it is only the recent publication (1920) of the subject-volume dealing with Roundworms that has made it possible to gather together a collection of generic diagnoses in any degree approaching completeness. Incidentally, the attempt to collect these diagnoses has demonstrated that a large proportion of those to be found in the literature are totally inadequate, and in many instances it is doubtful whether the genera concerned can ever again be recognized. This statement, so far as the more modern literature is concerned, refers particularly to the free-living forms.

When the present work had already been in preparation for some months, it came to our knowledge that Professor Warrington Yorke and Dr. P. A. Maplestone, of the Liverpool School of Tropical Medicine, were preparing a book on somewhat similar lines,* and that it was in a considerably more advanced state than our own. We learnt, however, that it was the authors' intention to deal only with the Nematodes parasitic in Vertebrates. Professor Yorke, with the greatest kindness and generosity, sent us the proofs of the book before its publication, and allowed us to make use of them in completing our work. It was, however, unfortunately too late for us to make full references to the book throughout the text, and we have only done so where we have been particularly indebted to it for fresh information.

Our original plan was to confine our attention to genera published before the end of the year 1923, and we have adhered fairly strictly to this principle. It was found impossible to obtain and consult all the literature necessary to keep pace with the constant output of new genera since that date, and so render the catalogue complete up to the moment of publica-

* *The Nematode Parasites of Vertebrates*, London (1926).

tion. Accordingly, although we have frequently made reference to literature published since 1923, where it has been important for our purpose, we have not included the new genera proposed, unless they appeared to be synonyms of earlier genera, or were merely new names proposed to replace older ones which were preoccupied.

We consider that the prevailing custom of separating the Nematodes into free-living and parasitic groups leads to an entirely unnatural scheme of classification. All degrees of parasitism, permanent and temporary, are found among the Nematodes, and any such arbitrary division must be made in total disregard of obvious morphological similarities. All the Nematodes resemble each other, in general appearance and structure, far more closely than do, for example, Insects of different orders. Yet within a given order of Insects it is well known that there may be both free-living and parasitic forms, and a preliminary division of the Insects as a whole into free-living and parasitic groups would not be regarded seriously by any modern entomologist. In the Nematodes the custom referred to was doubtless adopted by specialists for their own convenience, since it was almost impossible for one worker to be conversant with the literature of the whole group.

The evidence available points, in our view, to the derivation of all parasitic Nematodes from free-living ancestors, and there are indications that the habit of parasitism has been developed not once only, but at various times in the evolutionary history of the group. It is accordingly impossible to point to any one group of free-living forms as the origin of all the parasitic forms. Certain parasitic forms, not closely related to each other, still retain evident traces of primitive structure, and their affinities to free-living genera are clear. For example, a close connection appears to exist between the semi-parasitic Mermithidae and the Anguilluliniidae, and between the parasitic Oxyuridae and Atractidae and the mainly free-living Rhabditidae.

We have, therefore, attempted to unite the whole of the Nematoda in a common system of classification. It is not suggested that the proposed system is in any way perfect or permanent. It may, however, point the way to a more natural classification in the future, especially if our knowledge of the imperfectly-diagnosed forms becomes more complete. It seems to us convenient, and not in any way unscientific or illogical, to regard the Nematoda as a self-contained Class of the animal kingdom. We do not feel called upon, in a work of this character, to enter into a discussion of the relationships of this Class to other groups. The Nematoda have been generally treated as forming part of a Phylum Nemathelminthes, which is taken to include also the Nematomorpha or

Gordiacea, the Acanthocephala, and possibly some other small groups of very uncertain affinities. Without entering into the vexed question of the "naturalness" of this arrangement, we propose here to deal only with the Nematoda proper, to the exclusion of all the other groups.

The primary divisions of the Class Nematoda are treated as Orders, corresponding broadly to some of the "Superfamilies" originated by Railliet and others, and now accepted by the majority of helminthologists. The classification we have adopted starts with the assumption, which seems to us to be well-founded, that the forms with three lips, or obvious modifications of three lips, are to be regarded as primitive. The majority of these have been grouped together in one large Order, Ascaroidea.*

The other Orders are regarded as collateral branches that have originated independently of each other from the original stock now represented by the Ascaroidea. Thus the Strongyloidea still retain evidences of the three-lipped arrangement, although they have become considerably modified in other directions; they have a true bursa in the male, and a definite system of bursal rays which is not paralleled among the Ascaroidea. There is a striking resemblance between the free-living larval stages of Strongyloidea generally, and particularly of the forms with a buccal capsule, and the adults of many of the free-living terricolous forms here included in the Ascaroidea. A similar resemblance exists between the larvæ of the Mermithidae and the adults of the Anguillulidae.

The Filarioidea have departed much more widely from the primitive type, having lost all traces of the triradial symmetry of the lips, except in retaining the usual number (six) of cephalic papillæ. This divergence may possibly be connected with the introduction of a complex life-cycle involving an intermediate host. The two remaining Orders (Dioctophymoidea and Trichinelloidea) are small, very highly-specialized groups whose relationships cannot easily be determined.

A survey of the whole of the Nematoda shows that there has been too great a tendency on the part of workers with comparatively restricted interests to raise the rank of the small groups with which they were dealing. For instance, Cobb, in a recent publication, divides the free-living Nematodes alone into two subphyla with classes, subclasses and orders. One of his subphyla, the Alaimia, corresponds to the family

* The use of the name Ascaroidea for this group should not be taken to imply that the Ascaridae are regarded as its most primitive members. These are undoubtedly to be found among the free-living genera, and the Ascaridae, apart from the primitive arrangement of the lips, are very highly specialized in accordance with their strictly parasitic mode of life.

Alaimidae of other workers. The bursate parasitic Nematodes, similarly, have, in the course of a few years, risen from the rank of a family, Strongylidae, to that of a suborder, Strongylata. We have been compelled to reduce the rank of many groups, owing to the false position which the Nematoda must assume in relation to the animal kingdom as a whole if this practice of elevating small groups were continued. Further, the subdivision of groups tends to keep pace with their elevation in rank, and it becomes impossible to find characters of sufficient weight to justify the subdivisions made. Individual instances of this difficulty will be remarked upon in the appropriate places in the text.

The generic diagnoses given are not simply extracts from those given by the original authors. We have endeavoured to make use of any subsequent literature which has modified the original diagnosis, and have often taken characters directly from the genotype. We have also tried to define groups in terms which are mutually exclusive, wherever this is possible. It will be seen that the better-known groups usually need only short diagnoses to separate them from each other, whereas the separation of less well-known forms frequently necessitates the use of much longer descriptions, embracing characters of less importance, and, it is to be feared, often of doubtful reliability.

The quotation of an author's name in conjunction with the name of a subfamily or higher group implies no more than that that author was the originator of the name.

REFERENCES TO LITERATURE

At the end of each diagnosis the genotype is specified, and references are given to the more important sources of our information regarding the genus and its genotype. No attempt is made to give a complete bibliography. The abbreviations used to indicate the titles of publications are, in general, those employed in the *Zoological Record*.

SYNONYMS

In giving the synonymy of generic names we have endeavoured to include all total synonyms, but have not considered it necessary or desirable to mention all the partial synonyms or obvious misspellings. For example, the family Ascaridae, as here understood, is roughly co-extensive with the genus *Ascaris* in its original, wide sense, and if all partial synonyms were to be given, it would have been necessary to include *Ascaris* in the synonymy of almost every genus in the family. It is doubtful whether this would have served any useful purpose. We have, however, given in square brackets

the generic name originally given to the genotype of each genus, wherever this has subsequently been changed.

DEFINITIONS

In descriptions of Nematodes, the same term is not infrequently used by different authors to denote quite different structures; it is therefore necessary to define the more important descriptive terms used in this work.

Accessory piece.—A more or less strongly-chitinized structure (frequently serving as a guide for the copulatory spicules), developed in connection with the dorsal wall of the cloaca of the male. (By many authors this structure is called the *gubernaculum*).

Buccal capsule.—A cavity into which the mouth leads and which opens behind into the oesophagus, and having a chitinous wall which is not surrounded externally by muscular tissue. In some families the duct of a dorsal oesophageal gland is visible in the wall of the capsule, and is referred to as the *dorsal gutter*.

Buccal cavity.—This term is sometimes used where it is difficult to determine whether the structure referred to is a buccal capsule or a pharynx.

Buccal valves.—The shell-shaped, chitinous, lateral halves of the buccal capsule wall, when it is not a continuous structure.

Bursa.—A cuticular expansion of the caudal end of the male in the Strongyloidea, supported by a definite system of "rays." (Cuticular expansions of the caudal end not supported by this definite system of rays are referred to as *caudal alae*).

The following nomenclature is adopted for the rays of the bursa :—

Ventral rays { ventro-ventral,
latero-ventral.

Lateral rays { antero-lateral,
medio-lateral,
postero-lateral.

Externo-dorsal rays.

Dorsal ray.

Caudal glands.—Unicellular glands in the caudal region, commonly present in free-living forms, and producing a cement-like secretion which may serve for fixation to solid objects. For the specialized terminal portion of the common duct of these glands Cobb's term *spinneret* is employed. (This corresponds to the "*caudal sucker*" of Bastian).

Cordons.—Grooves, tubular channels or festoon-like ornaments in or on the cuticle of the cervical region.

Dentigerous ridges.—Rows of denticles situated on the inner surface of the lips.

Genital cone.—A terminal or subterminal, postanal, ventral process in male Strongyloidea, which may have on its ventral surface a granular and thickened cuticle, referred to by some authors as a *dermal collar*.

Head.—Although there is no real head in Nematodes, the anterior portion of the animal, carrying the mouth, lips and cephalic papillae or other specialized sensory organs, is frequently referred to as the "head." When this region is marked off from the portion of the body following it by a constriction, or by being itself of greater diameter, it is described as *distinct*.

Lateral organs.—Paired lateral subcuticular organs near the anterior end of the body, presumably sensory in function, occurring in many free-living forms and apparently homologous with the lateral cephalic papillae of more highly-specialized parasitic forms. (The "*anphids*" of Cobb).

Lips.—Clearly-differentiated structures surrounding the mouth and bearing sensory papillae on their external surfaces.

Mouth-collar.—A ring-like cuticular swelling sometimes surrounding the anterior extremity, immediately behind the mouth-opening, in the Strongyloidea.

Ocelli.—Masses of pigment within the body-cavity, usually closely connected with the oesophagus, and sometimes provided with hyaline lenses. (Referred to by some authors as *eyes* or *eye-spots*).

Oesophageal funnel.—A funnel-shaped expansion of the lumen of the oesophagus at its anterior end, immediately behind its junction with the buccal capsule or pharynx. The funnel is frequently lined with thickened cuticle.

Ovejectors.—Specialized muscular portions of the female genital tubes, near their junction with the vagina, serving to control the deposition of ova.

Oviparous.—Producing eggs which hatch some time after deposition.

Ovoviviparous.—Producing eggs which may or may not have shells, and which hatch immediately after deposition.

Pharynx.—Resembles a buccal capsule, but has an external muscular coat.

Sucker.—A depression supplied with muscles and with a thickened cuticular border. In the absence of a thickened cuticular border, such structures are usually referred to as *sucker-like organs*.

Supplementary organs.—Modified preanal or postanal papillae on the ventral surface of the male in many free-living genera, having frequently a more or less complex chitinous framework. (The "*sucker-tubes*" of Bastian, and the "*Haftorgane*" of some German authors).

Tail.—The portion of the body between the anus or cloacal opening and the posterior extremity.

Teeth.—This term is reserved for comparatively simple structures on the lips or within the mouth, buccal capsule pharynx or oesophagus. Complex serrate or denticulate structures (e.g., such as occur in *Crossocephalus*) are termed *jaws*.

Telamon.—A more or less strongly-chitinized supporting structure, of varying shape, developed in connection with the ventral wall of the cloaca of the male.

Viviparous.—Producing eggs which hatch while still contained in the uterus.



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NEMATODA

ORDER I. ASCAROIDEA Railliet & Henry, 1915.

Free-living or parasitic forms having normally three lips, of which one is dorsal and two subventral. In certain cases the lips may be much reduced or absent.

Fam. 1. ASCARIDAE Cobbold, 1864.

Parasitic forms. Polymyarian. Lips well developed, bearing papillae and sometimes alternating with three interlabia. Buccal cavity absent. Reproductive organs highly developed. Male with two spicules. An accessory piece present or absent. Uterine branches parallel. Oviparous. Eggs very numerous, with unsegmented contents when laid.

Subfam. 1. ASCARINAE Travassos, 1913.

Oesophagus without well-marked ventriculus, sometimes with a muscular bulb. Spicules equal or subequal. Accessory piece absent. Vagina and uterus run posteriorly from the vulva.

1. *Ascaris* L., 1758.

Syn. *Stomachida* Pereboom, 1780; *Fusaria* Zeder, 1800; *Lombricoidea* Mérat, 1821.

Cervical alae absent. Lips with dentigerous ridges. Interlabia, if present, extremely reduced. No interlabial grooves at bases of lips. Male with five or six pairs of postanal papillae, the anterior pair or anterior pairs having double terminations. Numerous irregularly-arranged preanal papillae. Spicules non-alate, tubular, relatively short and stout. Vulva near middle of body or anterior to it. Uterine branches two.

Hab. Small intestine of Mammals.

Genotype: *A. lumbricoidea* L., 1758.

Linnaeus, 1758, *Systema Naturae*, i, 644, 648.

2. *Ophidascaris* Baylis, 1921.

Cervical alae absent. Lips almost square. Dorsal lip slightly smaller than ventro-lateral lips. Dentigerous ridges

present. Interlabia usually well developed. Deep transverse interlabial grooves run from the interlabia partially round the bases of the lips. Oesophagus without bulb or ventriculus. Male with four to six pairs of postanal papillae, the most anterior pair frequently having double terminations. Preanal papillae numerous. Spicules subequal, alate. Vulva usually in posterior half of body. Genital organs in both sexes usually confined to posterior region of body, which often shows a fusiform thickening. Uterine branches two.

Hab. Alimentary canal of Reptiles.

Genotype : *O. [Ascaris] filaria* (Dujardin, 1845).

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 177, 653; Baylis, 1921, *Parasitol.*, xii, 412.

3. *Polydelphis* Dujardin, 1845.

Syn. *Hexametra* Travassos, 1920.

Cervical alae absent. Lips more or less hexagonal, frequently longer than broad, usually broader at the base than at the free edge. Dorsal lip usually smaller than ventrolateral lips. Pulp of ventro-lateral lips asymmetrical. Interlabia absent. No interlabial grooves at bases of lips. Oesophagus without bulb or ventriculus. A rudimentary intestinal caecum occasionally present. Spicules subequal. Caudal papillae of male as in *Ophidascaris*. Vulva usually in anterior region of body, rarely behind the middle. Uterine branches four or six.

Hab. Alimentary canal of Reptiles.

Genotype : *P. [Ascaris] anoura*. Dujardin, 1845.

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 221 (as subgenus); Baylis, 1921, *Parasitol.*, xii, 418; Baylis & Daubney, 1923, *Rec. Ind. Mus.*, xxv, 554.

4. *Toxocara* Stiles, 1905.

Syn. *Belascaris* Leiper, 1907.

Cervical alae present, coarsely striated. Body bent ventrally anteriorly. Lips with pulp forming two distinct lateral lobes and an unpaired internal lobe. Interlabia absent. Oesophagus with distinct muscular bulb posteriorly. Tail of male with marked terminal digitiform appendage. Caudal alae more or less well developed. On each side a group of five postanal papillae on the terminal appendage (two subdorsal, one lateral, two subventral), one double subventral papilla between cloaca and base of appendage, and about twenty preanal papillae. Spicules subequal, alate. Vulva towards anterior fourth of body. Coils of female genital tubes extend throughout almost whole length of body. Common trunk of

uterus relatively long. Eggs globular or subglobular, with a thin shell, the surface of which is pitted.

Hab. Small intestine of carnivorous Mammals.

Genotype : *T. [Lumbricus] canis* (Werner, 1782).

Werner, 1782, *Vermium intestinalium brevis expositionis continuatio*, Leipzig, 11; Stiles, in Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, 150; Leiper, 1907, *Brit. Med. Journ.*, June 1, 1297; Railliet & Henry, 1911, *Compt. rend. Soc. Biol.*, Paris, lxx, 12; Stiles & Brown, 1924, *Journ. Parasitol.*, xi, 92.

According to Stiles and Brown (1924), Werner's *Lumbricus canis* is a recognizable species, because Rudolphi recognized it and renamed it *Ascaris marginata*. If this reasoning is sound, *L. canis* can be taken, as it was taken by Stiles (1905), as the type of the genus to which *Belascaris mystax* (Zeder, 1800) also belongs. *Belascaris* thus becomes a synonym of *Toxocara*.

5. *Toxascaris* Leiper, 1907.

Cervical alae present, finely striated. Body bent dorsally anteriorly. Lips as in *Belascaris*, but with anterior lobules marked off from lobes by a deep groove, broad and bilobed at their extremities. Interlabia absent. Oesophagus without bulb. Tail of male conical, without digitiform appendage. Caudal alae absent. On each side a group of five postanal papillae near tip of tail (two subdorsal, one lateral, two subventral). A double subventral papilla between these and the cloaca, and a row of at least twenty-five papillae, commencing with a papilla behind the cloaca, the second of this series being at the level of the cloacal opening. Spicules subequal, non-alate. Vulva towards anterior third of body. Coils of female genital tubes lie between vulva and posterior end of body. Common trunk of uterus relatively short. Eggs subglobular, with thick, smooth shell.

Hab. Small intestine of carnivorous Mammals.

Genotype : *T. [Ascaris] leonina* (v. Linstow, 1902).

v. Linstow, 1902, *Arch. f. mikr. Anat.*, lx, 217; Leiper, 1907, *Brit. Med. Journ.*, June 1, 1297; Railliet & Henry, 1911, *Compt. rend. Soc. Biol.*, Paris, lxx, 12.

6. *Lagochilascaris* Leiper, 1909.

Lateral alae present throughout the whole length of the body. Lips separated by a groove from the body. Free edge of each lip deeply indented in the middle. Well-developed interlabia present. Oesophagus simple. Tail of male bluntly conical, slightly curved ventrally. Five pairs of postanal papillae, those of the most anterior pair being large and having

double terminations. At least twenty-four pairs of preanal papillae. Spicules subequal, non-alate. Vulva in front of middle of body. Vagina runs anteriorly for a short distance, then turns posteriorly. Eggs globular, with thick, pitted shells.

Hab. Alimentary canal (?) of carnivorous Mammals.

Genotype: *L. minor* Leiper, 1909.

Leiper, 1909, *Abstr. Proc. Zool. Soc. Lond.*, No. 74, 35; 1909, *Proc. Zool. Soc. Lond.*, 742; 1913, *Trans. Soc. Trop. Med. Hyg.*, vi, 265; Fantham, Stephens & Theobald, 1916, *Animal Parasites of Man*, London, 467.

7. *Orneoascaris* Skrjabin, 1916.

Cervical alae apparently absent. Lips large, with denticerous ridges. Interlabia absent. Oesophagus simple. Tail of male with wide alae and longitudinally and transversely furrowed on its ventral surface. Postanal papillae four pairs, sessile. Preanal papillae pedunculate, not numerous. Spicules equal, transparent. Vulva in anterior half of body. Eggs large and oval.

Hab. Alimentary canal of Amphibia.

Genotype: *O. chrysanthemoides* Skrjabin, 1916.

Skrjabin, 1916, *Sci. Res. Zool. Exp. Brit. E. Africa* (Dogiel & Sokolow), 1914, Petrograd, i (4), 50, 124.

8. *Trispiculascaris* Skrjabin, 1916.

Lips large, with auricular outgrowths at the sides. Denticerous ridges and interlabia present. No ventriculus or oesophageal or intestinal caeca. Tail of male curved, with wide alae and very few preanal and postanal papillae, arranged in single lateral rows. Spicules equal, slender. An accessory piece present. Tail of female straight, conically pointed. Vulva in anterior half of body.

Hab. Alimentary canal of Reptiles.

Genotype: *T. trispiculascaris* Travassos, 1920 (= *T. helicina* (Molin, 1860) of Skrjabin, 1916).

Skrjabin, 1916, *Sci. Res. Zool. Exp. Brit. E. Africa* (Dogiel & Sokolow), 1914, Petrograd, i (4), 48, 123; Travassos, 1920, *Arch. Esc. Sup. Agric. e Med. Vet.*, Nietheroy, iv, 15.

Subfam. 2. **ANISAKINAE** Railliet & Henry, 1912, *emend.* Baylis, 1920.

Oesophagus may or may not be divided into an anterior muscular portion and a posterior ventriculus of different histological structure, or a muscular bulb. When a ventri-

culus is absent, and frequently when it is present, there is an anterior caecum springing from the intestine and lying alongside of the oesophagus. A posterior glandular caecum, or occasionally several such caeca, some of which may be directed anteriorly, may also be developed in connection with the ventriculus. Parasitic in the alimentary canal of Vertebrates, the hosts being generally aquatic or fish-eating animals.

The subfamilies Crossophorinae and Goeziinae were proposed by Baylis (1920, *Parasitol.*, xii, 263) for the genera *Crossophorus* and *Goezia* respectively, while the subfamily Heterocheilinae Railliet & Henry, 1912, was restricted to the genera *Heterocheilus* (*Lobocephalus*) and *Typhlophoros*. It appears doubtful whether sufficient characters exist to warrant the separation of these subfamilies from the Anisakinae. The genera concerned are therefore now referred to the latter subfamily. For the two subfamilies Anisakinae and Heterocheilinae of Railliet & Henry (1912), which we regard as forming a single group, we have preferred to retain the name Anisakinae, with a well-known genus as its type. In any case the name Heterocheilinae falls into synonymy together with that of its type-genus.

1. *Anisakis* Dujardin, 1845.

Syn. *Peritrachelius* Diesing, 1851; *Conocephalus* Diesing, 1861.

Lips with dentigerous ridges. Interlabia absent. Oesophagus with an oblong or sigmoid ventriculus. No oesophageal or intestinal caeca. Spicules sometimes unequal.

Hab. Stomach and intestine of marine Mammals.

Genotype: *A.* [*Ascaris*] *dussumieri* (van Beneden, 1870).

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 151 (as subgenus); Stiles & Hassall, 1899, *Rep. Fur Seal Invest.*, Washington, Part III; Baylis, 1920, *Parasitol.*, xii, 260.

2. *Raphidascaris* Railliet & Henry, 1915.

Syn. *Hysterothylacium* Ward & Magath, 1916.

Lips without dentigerous ridges. Interlabia present. Oesophagus with small ventriculus, from which springs a small posterior caecum. No intestinal caecum.

Hab. Stomach and intestine of Fishes.

Genotype: *R.* [*Ascaris*] *acus* (Bloch, 1779).

Bloch, 1779, *Beschäft. Berl. Ges. Naturf. Fr.*, iv, 544; Railliet & Henry, 1915, *Bull. Soc. Path. exot.*, Paris, viii, 271; Ward & Magath, 1916, *Journ. Parasitol.*, iii, 63; Baylis, 1920, *Parasitol.*, xii, 261.

3. *Porrocaecum* Railliet & Henry, 1912.

Syn. *Terranova* Leiper & Atkinson, 1914.

Lips with dentigerous ridges. Interlabia usually present. Oesophagus with oblong ventriculus, which is short in the genotype but in other species often long and bent at an angle, so as to open into the intestine laterally. An intestinal caecum present. No oesophageal caecum. An accessory piece is rarely present.

Hab. Intestine of Birds, marine Mammals and Fishes.

Genotype : *P. [Ascaris] crassum* (Desl., 1824).

Deslongchamps, 1824, *Encycl. Méthodique*, Paris, ii, 89; Railliet & Henry, 1912, *Bull. Soc. Path. exot.*, Paris, v, 256; Baylis, 1920, *Parasitol.*, xii, 261.

4. *Contraecum* Railliet & Henry, 1912.

Syn. *Kathleena* Leiper & Atkinson, 1914.

Lips without dentigerous ridges. Interlabia present, usually very well developed. Oesophagus with reduced ventriculus, giving off a posterior caecum. An intestinal caecum present.

Hab. Intestine of fish-eating Mammals and Birds, and of Fishes.

Genotype : *C. [Ascaris] spiculigerum* (Rud., 1809).

Rudolphi, 1809, *Entozoorum Historia Naturalis*, ii, 168; Railliet & Henry, 1912, *Bull. Soc. Path. exot.*, Paris, v, 256; Baylis, 1920, *Parasitol.*, xii, 261.

5. *Cloeoascaris* Baylis, 1923.

Each lip with a pair of large conical teeth on its inner surface. Interlabia absent. A collar-like fold of cuticle surrounding the neck, and between this and the bases of the lips an area covered with small spines. Oesophagus with a reduced ventriculus giving off a posterior caecum. An intestinal caecum present. Vulva in anterior half of body.

Hab. Alimentary canal of semi-aquatic carnivorous Mammals (one species known).

Genotype : *C. spinicollis* Baylis, 1923.

Baylis, 1923, *Ann. Mag. Nat. Hist.*, (9) xi, 459, 463.

6. *Galeiceps* Railliet, 1916.

Head apparently with three lips, of which the dorsal is bilobed, and each bears one or two teeth on its inner surface. Behind the lips a collar-like cuticular fold. Interlabia absent. Structure of alimentary canal not described.

Hab. Intestine of a semi-aquatic Mammal (one species known).

Genotype : *G.* [*Ancyracanthus*] *cucullus* (v. Linstow, 1899).

v. Linstow, 1899, *Mitt. Zool. Mus.*, Berlin, i, 19; Railliet, 1916, *Journ. Parasitol.*, ii, 103.

Ancyracanthus cucullus v. Linstow, 1899, for which Railliet proposed the genus *Galeiceps*, referred by him to the family *Thelaziidae*, appears to be very closely related to *Cloeoascaris*. The two dorsal buccal swellings described by v. Linstow appear to be two lobes of a single dorsal lip. No mention is made of spines between the bases of the lips and the cuticular collar. Possibly the re-examination of v. Linstow's species may show that *Cloeoascaris* is synonymous with *Galeiceps*.

7. *Paranisakis* Baylis, 1923.

Lips with dentigerous ridges. Interlabia present. Oesophagus with a ventriculus, but no oesophageal or intestinal caeca.

Hab. Intestine of Fishes.

Genotype : *P. squatinae* Baylis, 1923.

Baylis, 1923, *Parasitol.*, xv, 8.

The genus *Paranisakis* resembles *Anisakis* in having an oesophageal ventriculus, but no caeca. It differs, however, in the presence of interlabia and dentigerous ridges. The characters of the head indicate its very close relationship to *Contracaecum*.

8. *Dujardinia* Gedoelst, 1916.

Lips without dentigerous ridges, but with the cuticle of their internal surfaces produced into large tooth-like structures, apparently capable of being interlocked. These structures are carried by three main cuticular lobes on the anterior border of each lip. Interlabia present. Well-marked interlabial grooves run from them to the bases of the lips. Oesophagus with a small spherical bulb. No oesophageal caecum. An intestinal caecum present. Vagina long and slender. Eggs subglobular, with very thin membranous shell.

Hab. Alimentary canal of aquatic Vertebrates (Crocodiles, Fishes, Dugong).

Genotype : *D.* [*Ascaris*] *helicina* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xl, 337; v. Drasche, 1883, *Verh. k. k. Zool.-bot. Ges.*, Wien, xxxii, 130; Gedoelst, 1916, *Rev. Zool. Afric.*, Brussels, v (1), 18, 21; Baylis, 1920, *Parasitol.*, xv, 223.

9. *Multicaecum* Baylis, 1923.

Lips with dentigerous ridges. Small interlabia present. Well-marked interlabial grooves run from them to the bases

of the lips. Oesophagus with a small ventriculus, from which spring two anterior and three posterior caeca. An intestinal caecum present. An accessory piece present.

Hab. Alimentary canal of Crocodiles (one species known).

Genotype : *M.* [*Ascaris*] *agile* (Wedl, 1862).

Wedl, 1862, *Sitz. k. Akad. Wiss.*, Wien, xliv, 467; Baylis, 1923, *Parasitol.*, xv, 230.

10. *Angusticaecum* Baylis, 1920.

Lips with dentigerous ridges. Interlabia absent. Oesophagus without ventriculus or distinct bulb. No oesophageal caecum. A long slender intestinal caecum present.

Hab. Intestine of land Tortoises and (?) Batrachians.

Genotype : *A.* [*Ascaris*] *holopterum* Rud., 1819.

Rudolphi, 1819, *Entozoorum Synopsis*, 53, 295; Baylis, 1920, *Parasitol.*, xii, 262.

Baylis (1920) referred *Porrocaecum numidicum* Seurat, 1917, from *Rana*, to this genus. In spite, however, of the stated absence of interlabia it seems more probable that it is referable to *Amplicaecum*. We have seen specimens belonging apparently to the latter genus from a frog and from a crocodile. Those from the frog were similar to, though probably not identical with, Seurat's species.

11. *Amplicaecum* Baylis, 1920.

Lips with dentigerous ridges. Small interlabia present. Oesophagus without ventriculus or distinct bulb. No oesophageal caecum. A wide intestinal caecum present.

Hab. Alimentary canal of carnivorous Birds and Reptiles.

Genotype : *A.* [*Ascaris*] *colurum* (Baylis, 1919).

Baylis, 1919, *Ann. Mag. Nat. Hist.*, (9) iii, 457; 1920, *Parasitol.*, xii, 262.

12. *Crossophorus* Ehrbg., in Hemp. & Ehrbg., 1828.

Lips separated from neck by a distinct constriction, which is occupied by a collar consisting apparently of a double row of fimbriae. In reality these fimbriae form a single endless chain, which doubles on itself at the centre of the base of each lip externally and passes across the inner surface of the lip. In addition to these each lip also has an interrupted dentigerous ridge. No interlabia. Oesophagus with "gizzard" anteriorly, containing a chitinous masticatory apparatus, and with a posterior muscular bulb. Two long intestinal caeca present. No oesophageal caecum. Tail of male very blunt. Postanal papillae in two parallel rows on either side. Preanal papillae

immediately in front of cloaca also in two parallel rows, and more anteriorly a single row on each side. Spicules equal, alate, transversely striated. An accessory piece present. Tail of female conically pointed. Vulva in the middle third of the body. Uterine branches opposed. Eggs oval, with moderately thick, smooth shells.

Hab. Alimentary canal of Hyrax.

Genotype : *C. collaris* Ehrbg., in Hemp. & Ehrbg., 1828.

Ehrenberg, in Hemprich & Ehrenberg, 1828, *Symbolae physicae, Pars Zoologica, decas prima* (Mammalia); Baylis, 1919, *Ann. Mag. Nat. Hist.*, (9) iv, 343; Neveu-Lemaire, 1921, *Bull. Soc. Path. exot.*, Paris, xiv, 390.

13. *Goezia* Zeder, 1800.

Syn. *Cochlus* Zeder, 1803; *Prionoderma* Rud., 1810; *Lecanocephalus* Diesing, 1839.

Lips flattened from in front and expanded outwards, separated from body by a constriction. Cuticle with a series of transverse rings bearing backwardly-directed spines on their posterior edges. Oesophagus slightly constricted in the middle and swollen into a bulb behind, giving off posteriorly a long caecum. A short intestinal caecum present. Tail rounded and in both sexes prolonged into an appendage. Spicules subequal. Vulva a little in front of the middle of the body. Eggs globular.

Hab. Alimentary canal of Fishes.

Genotype : *G. [Cucullanus] ascaroides* (Goeze, 1782).

Goeze, 1782, *Naturgeschichte der Eingeweidewürmer*, Blankenburg, 40, 134; Zeder, 1800, *Erster Nachtrag zur Naturgeschichte der Eingeweidewürmer*, Leipzig, 6, 96; Railliet & Henry, 1915 *Bull. Soc. Path. exot.*, Paris, xiii, 270.

14. *Acanthocheilus* Molin, 1858.

Lips somewhat retractile, each with two pointed processes anteriorly and with two pairs of sharp teeth on its inner surface. Oesophagus with a spherical posterior bulb and a fusiform prebulbar swelling. An intestinal caecum present. Tail in both sexes conical. Male with preanal papillae in two rows on each side. Spicules short, with terminal knobs. Vulva in anterior region of body.

Hab. Intestine or stomach of Sharks and Dogfish.

Genotype : *A. quadridentatus* Molin, 1858.

Molin, 1858, *Sitz. k. Akad. Wiss.*, Wien, xxx, 154; 1861, *Denkschr. k. Akad. Wiss.*, Wien, xix, 313; Örley, 1885, *Termes. Füz.*, Budapest, ix, 102, 217; Linton, 1900, *Bull. U.S. Fish. Comm.*, xix, 303.

15. Lobocephalus Diesing, 1838.

Syn. *Heterocheilus* Diesing, 1839.

Lips bilobed, two of them truncate in front, the third broader and somewhat longer. Behind the lips a cuticular collar composed of nine longitudinal folds. Three of these folds large, alternating with pairs of smaller folds. Oesophagus with a small distinct bulb. An intestinal caecum present. Tail of male pointed. Spicules alate. Tail of female tapering. Vulva apparently posterior. Eggs oval.

Hab. Stomach and small intestine of Manatee (one species known).

Genotype: *L. heterobus* Dies., 1838 (= *Heterocheilus truncatus* Dies., 1839).

Diesing, 1839, *Ber. u. d. Versamml. deutsch. Naturf. u. Aerzte in Prag*, 189; 1839, *Ann. Wien. Mus. Naturg.*, ii, 229; Stiles & Hassall, 1899, *Rep. Fur Seal Invest.*, Washington, Part III, 107.

16. Typhlophoros v. Linstow, 1906.

Lateral alae present. Lips triangular, narrowed at base, with pulp widened in front. Behind the lips a cuticular collar of sixteen transversely striated longitudinal folds. An intestinal caecum present. Tail of male with four pairs of preanal papillae. Spicules equal. Tail of female with two rounded preanal projections. Vulva somewhat in front of middle of body. Eggs thick-shelled.

Hab. Stomach of Gharial (one species known).

Genotype: *T. lamellaris* v. Linstow, 1906.

v. Linstow, 1906, *Journ. and Proc. Asiat. Soc. Bengal*, ii, 270.

17. Heligmus Dujardin, 1845.

Lips rounded, not very distinct. Oesophagus club-shaped, with a ventriculus. Tail of male recurved, with a double row of twelve to thirteen ventral papillae. A single, very long, tubular, flexible, transversely striated and broadly alate spicule. Vulva towards anterior third of body.

Hab. Intestine of Fishes (one species known).

Genotype: *H. longicirrus* Dujardin, 1845.

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 136, 145.

From Dujardin's description it appears possible that this genus may be a member of the subfamily Anisakinae, but the characters given are insufficient to establish definitely its position.

Fam. 2. HETERAKIDAE Railliet & Henry, 1914.

Parasitic forms. Polymyarian. Lips may be well defined, or so reduced as to appear absent. A buccal capsule may be present or absent. In the absence of a buccal capsule, the anterior portion of the oesophagus is usually differentiated as a pharynx. Except in *Ascaridia*, a posterior oesophageal bulb is present. There is a more or less well-developed preanal sucker in the male, with or without a chitinous border. Reproductive organs highly developed. Spicules usually two (occasionally one or both may be imperfectly chitinized, or absent). Vulva typically near the middle of the body, occasionally posterior.

Subfam. 1. HETERAKINAE Railliet & Henry, 1912.

Lips well defined. Buccal capsule absent. Oesophagus with a pharynx and a posterior bulb, except in *Ascaridia*. Preanal sucker nearly circular, with chitinous border. Vulva in the middle of the body or slightly anterior to it. Eggs usually unsegmented when laid.

1. *Heterakis* Dujardin, 1845.

Syn. *Ganguleterakis* Lane, 1914; *Gireterakis* Lane, 1917.

Lips without "cordons." Oesophagus with a short pharynx and a distinct subglobular bulb. Caudal alae of male extremely well developed, and supported by pedunculate papillae. Spicules unequal or subequal. No accessory piece. Branches of uterus either actually or apparently opposed. Eggs with thick shell and unsegmented contents.

Hab. Alimentary canal of Birds and Mammals.

Genotype: *H. [Ascaris] papillosa* (Bloch, 1782).

Bloch, 1782, *Abhandlung von der Erzeugung der Eingeweidewürmer*, Berlin, 32; Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 136, 222; Travassos, 1913, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, v, 274; Lane, 1914, *Ind. Journ. Med. Res.*, ii, 656, 660, and 1917, iv, 754, 758, 764.

2. *Pseudaspidoera* Baylis & Daubney, 1922.

Lips with "cordons," opening in pairs at the interlabial spaces, diverging and recurrent, ending blindly on outer surface of lips. Oesophagus as in *Heterakis*, with a very short pharynx and a well-developed posterior pyriform bulb. Caudal alae of male well developed, and supported by pedunculate papillae. Spicules unequal and dissimilar, the right long and slender, the left short, stout and alate, with a barbed tip. No accessory piece. Uterine branches opposed. Eggs thin-shelled, with a slight internal thickening at one pole.

Hab. Alimentary canal of Pea-fowl (one species known).
Genotype : *P. pavonis* Baylis & Daubney, 1922.

Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 297.

3. *Ascaridia* Dujardin, 1845.

Lips well developed, without "cordons." Oesophagus club-shaped, without posterior bulb. Male with slight caudal alae and relatively large caudal papillae. Spicules equal or subequal. No accessory piece. Uterine branches opposed. Eggs with an internal thickening of the shell at one pole.

Hab. Small intestine of Birds and Reptiles.

Genotype : *A. [Ascaris] hermaphrodita* (Frölich, 1789).

Frölich, 1789, *Naturforscher*, Halle, xxiv, 151; Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 151, 214; Travassos, 1913, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, v, 288; Lane, 1914, *Ind. Journ. Med. Res.*, ii, 662, and 1917, iv, 756.

On the ground of the absence of an oesophageal bulb Travassos (1920 (?), *Rev. Vet. e Zootech.*, Rio de Janeiro, 64) places this genus in a subfamily Ascaridiinae of the family Ascaridae. In our view the presence of a typical caudal sucker with a chitinoid border in the male necessitates its inclusion among the Heterakidae, as was originally proposed by Railliet & Henry (1914, *Proc. Internat. Zool. Congr.*, 677).

4. *Aspidodera* Railliet & Henry, 1912.

Syn. *Aspidocephalus* Diesing, 1851, *nec* Motasch, 1839.

Lips with "cordons" opening in pairs at the interlabial spaces, diverging and recurrent, the recurrent branches anastomosing on the outer surfaces of the lips. Oesophagus, as in *Heterakis* and *Pseudaspododera*, with a pharynx and a well-developed posterior pyriform bulb. Male without caudal alae. Spicules equal. An accessory piece present. Uterine branches opposed. Eggs thin-shelled.

Hab. Alimentary canal of Edentates and Marsupials.

Genotype : *A. [Aspidocephalus] scoleciformis* (Diesing, 1851).

Diesing, 1851, *Systema Helminthum*, ii, 208; Railliet & Henry, 1912, *Bull. Soc. Path. exot.*, Paris, v, 257; 1913, *Bull. Mus. Hist. Nat.*, Paris, 93.

5. *Paraspidodera* Travassos, 1914.

Lips large and well developed, resembling those of *Ascaris*, without "cordons." Oesophagus with a pharynx and a

posterior bulb. Male without caudal alae. Spicules subequal. An accessory piece present.

Hab. Colon and caecum of Rodents.

Genotype : *P. [Ascaris] uncinata* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 661; Travassos, 1914, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, vi, 137; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 44, 49.

6. *Strongyluris* Müller, 1894.

Lateral fields conspicuous, composed of a single row of large cells. Lips well developed, without "cordons," but expanded in front and at the sides into a cuticular flange. Oesophagus with relatively long pharynx, the lumen of which forms a ventral "kink" at its posterior end, and with a well-developed posterior bulb. Tail of male obliquely truncate ventrally, and with a short terminal spike. Well-developed alae supported by stout pedunculate papillae, giving the appearance of a bursa. Spicules relatively long, equal. No accessory piece. Uterine branches parallel. Segmentation may begin before oviposition.

Hab. Alimentary canal of Lizards and Chameleons.

Genotype : *S. brevicaudata* Müller, 1894.

Müller, 1894, *Arch. f. Naturg.*, lx, 113, 116.

7. *Spinicauda* Travassos, 1920.

Syn. *Sonsinia* Baylis & Daubney, 1922.

Lateral fields conspicuous, composed of single row of large cells. Lips subtriangular, expanded anteriorly and laterally as in *Strongyluris*, without "cordons." Oesophagus with a short pharynx and a posterior bulb. Tail of male long, straight and tapering, without alae. Papillae small and sessile. Spicules short, subequal. An accessory piece present. Uterine branches parallel.

Hab. Alimentary canal of Lizards and Chameleons.

Genotype : *S. [Ascaris] spinicauda* (Olfers, in Rudolphi, 1819).

Olfers, in Rudolphi, 1819, *Entozoorum Synopsis*, 40, 272; Travassos, 1920 (?), *Rev. Vet. e Zootech.*, Rio de Janeiro, 64; 1920, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, xii, 44; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 297; Baylis, 1923, *Parasitol.*, xv, 12.

Spinicauda icosiensis Seurat, 1917, appears to occupy a position intermediate between this genus and *Strongyluris*, because the tail of the male is obliquely truncate ventrally but has an elongate terminal cone.

8. *Africana* Travassos, 1920.

Lips well developed, subglobular, without "cordons," expanded anteriorly and laterally into cuticular flanges. Oesophagus with a pharynx and a bulb. Tail of male straight and conical. Caudal alae somewhat reduced, barely extending beyond the cloaca. Papillae sessile and mostly small. Spicules long and slender, equal or unequal. No accessory piece. Uterine branches apparently opposed. Eggs with thick shell.

Hab. Alimentary canal of Lizards and Chameleons.

Genotype: *A. [Heterakis] africana* (Gendré, 1909).

Gendré, 1909, *Proc. Verb. Soc. Linn.*, Bordeaux, lxiii, 33; Travassos, 1920, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, xii, 48.

Subfam. 2. **SUBULURINAE** Travassos, 1914.

Lips much reduced or absent. A cylindrical buccal capsule present, except in *Cissophyllus*, in which the lips are well developed. Oesophagus without pharyngeal portion (except in *Cissophyllus*) and with a posterior bulb. Preanal sucker antero-posteriorly elongated, fusiform or elliptical. Vulva usually about the middle of the body, occasionally posterior. Eggs usually containing embryos when laid.

The genus *Cissophyllus* is exceptional in so many particulars that it appears to occupy a position intermediate between this subfamily and the Heterakinae. *Maupasina* is exceptional in that the preanal sucker appears to have been replaced by a vesicular swelling, and in the position of the vulva.

1. *Subulura* Molin, 1860.

Syn. *Allodapa* Diesing, 1861.

Lips rarely apparent. Mouth usually oval or hexagonal, with its long axis dorso-ventral. Buccal capsule with three teeth at its base. Lateral cervical alae frequently present. Tail of male with more or less well-developed alae. Caudal papillae sessile, eleven pairs or fewer. Spicules two, equal, slender, alate. An accessory piece present. Preanal sucker fusiform. Eggs subglobular, usually containing embryos when laid.

Hab. Alimentary canal of Birds, Mammals and (?) Fishes.

Genotype: *S. acutissima* Molin, 1860.

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xl, 332; Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 614, 644; Seurat, 1914, *Bull. Soc. Hist. Nat. Afrique Nord*, Alger, vi, 195; Barreto, 1919, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, xi, 12.

2. *Oxynema* v. Linstow, 1899.

Lips not apparent. Mouth circular. Buccal capsule with three teeth at its base. Tail of male with slight alae. Caudal

papillae sessile, ten or eleven pairs. A single spicule and an accessory piece present. Preanal sucker fusiform. Eggs subglobular, containing embryos when laid.

Hab. Intestine and caecum of Carnivores and Rodents.

Genotype: *O. [Heterakis] crassispiculum* (Sonsino, 1889) (= *O. rectum* v. Linstow, 1899).

Sonsino, 1889, *Atti. Soc. Tosc. Sci. Nat.*, Pisa, x, 227; v. Linstow, 1899, *Mitt. Zool. Mus.*, Berlin, i, 19.

Barreto (1919, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, xi, 51) has revived the genus *Oxyinema*, which had been regarded by some authors as a synonym of *Allodapa*, to include the two species *crassispiculum* and *boueti* (Gendre, 1911), in which only a single spicule is present.

3. *Heteroxynema* Hall, 1916.

Lips apparent. Teeth feebly, if at all, developed at the base of the buccal capsule. Cervical alae present. Male without spicules or accessory piece. Caudal papillae eleven pairs, mostly near the cloaca. Preanal sucker fusiform, bordered, at the sides only, by a delicate cuticular membrane ornamented with transverse rows of trabeculae. Eggs bluntly pointed, rather like those of Oxyuridae.

Hab. Caecum and large intestine of a Rodent (one species known).

Genotype: *H. cucullatum* Hall, 1916.

Hall, 1916, *Proc. U. S. Nat. Mus.*, 1, 56.

4. *Numidica* Barreto, 1919.

Lips indistinct. Buccal capsule with thick walls, divided into an anterior and a posterior chamber, the latter containing three teeth at its base. Lateral alae absent. Male with unequal spicules, the right larger and well-chitinized, the left very slightly so. An accessory piece present. Caudal papillae pedunculate, ten pairs (four preanal, six postanal). Preanal sucker elliptical, bordered by a rim covered with small cuticular trabeculae. Eggs rounded, containing embryos when laid.

Hab. Intestine of Carnivores (one species known).

Genotype: *N. [Allodapa] numidica* (Seurat, 1915).

Seurat, 1915, *Compt. rend. Soc. Biol.*, Paris, lxxviii, 122; Barreto, 1919, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, xi, 57.

According to Seurat, there are two indistinct lateral lips, each bearing three papillae.

5. *Maupasina* Seurat, 1913.

Syn. *Maupasiella* Seurat, 1913.

Lips not distinct. Mouth surrounded by three pairs of

prominent setiform papillae. Buccal capsule divided into an anterior and a posterior chamber, the latter occupied by three tricuspid teeth. Tail of male obliquely truncate, with broad caudal alae. Caudal papillae pedunculate, ten pairs. Spicules two, equal. An accessory piece present. No pre-anal sucker, but a vesicular swelling present in front of cloaca. Vulva immediately in front of anus, preceded by a sudden constriction of the body. Uterine branches parallel. Eggs containing embryos when laid.

Hab. Alimentary canal of an insectivorous Mammal (one species known).

Genotype: *M. [Maupasiella] weissi* (Seurat, 1913).

Seurat, 1913, *Bull. Soc. Hist. Nat. Afrique Nord*, Alger, iv, 127; 1913, *Compt. rend. Soc. Biol.*, Paris, lxxv, 326.

Seurat (1917, *Compt. rend. Soc. Biol.*, Paris, lxxx, 350) states that there are two indistinct lateral lips, each bearing laterally a pair of papillae and anteriorly a papilliform projection.

Fam. 3. KATHLANIIDAE Travassos, 1918, *emend.*

Parasitic forms. Meromyarian. Three well-developed lips, entire or subdivided. Oesophagus preceded either by a chitinous buccal capsule or by a muscular pharynx with a cuticular lining, unarmed or containing tooth-like structures. Oesophagus with a prebulbar swelling and a large posterior muscular bulb, separated from the former by a rather narrow neck, the two swellings and the neck together giving the appearance of a single dumbbell-shaped or flask-shaped bulb. Tail of male without alae. The ventral muscles in the preanal region of the male frequently aggregated to form one or more fusiform sucker-like organs without a chitinous border. Reproductive organs moderately highly-developed. Spicules two, equal or subequal, usually falciform and broadly alate. An accessory piece usually present. Vulva at about the middle of the body or somewhat behind it. Uterine branches opposed. Oviparous or viviparous.

According to Travassos, the musculature of *Cruzia* is "incompletely polymyarian."

1. *Kathlania* Lane, 1914.

Syn. *Pseudoheterakis* Travassos, 1917; *Oxysoma* Schneider, 1866, *e. p.*

Head separated from body by a slight constriction. Lateral alae present. Each lip subdivided into a large main lobe and four smaller accessory lobes, two on each side of the main lobe. In the mid-ventral position there is an additional

unpaired lobe or interlabium. The two lateral and four submedian cephalic papillae are situated on certain of the accessory lobes, while each main lobe has a pair of very small papillae on its inner surface. A buccal capsule present, triangular in section and with three tooth-like structures at its entrance. Tail of male ending in a long spike. A muscular preanal sucker-like organ present. Caudal papillae sessile, twenty-three in number (six pairs and one unpaired papilla preanal, five pairs postanal). Spicules relatively short, subequal, broadly alate. A large Y-shaped accessory piece present. Vulva behind the middle of the body. The anterior uterine branch turns to run posteriorly parallel with the other. Eggs with thin, finely striated shell, containing embryos when laid.

Hab. Alimentary canal of marine Turtle (one species known).

Genotype: *K. [Ascaris] leptura* (Rudolphi, 1819) (= *K. kathlena* Lane, 1914).

Rudolphi, 1819, *Entozoorum Synopsis*, 48; Lane, 1914, *Ind. Journ. Med. Res.*, Calcutta, ii, 664; Travassos, 1917, *Brazil. Med.*, Rio de Janeiro, No. 12; 1918, *Rev. Soc. Brazil. Sci.*, ii, 84.

2. *Tonaudia* Travassos, 1918.

Head separated from body by a well-marked constriction, the posterior margin of the head forming a sharp angle. Lateral alae present. Lips and buccal capsule as in *Kathlania*. Tail of male ends in a long spike, which is directed dorsally. A muscular preanal sucker-like organ present. Eight pairs of caudal papillae and an unpaired preanal papilla present. Spicules extremely long and slender, reaching anteriorly to the middle of the oesophagus when not extruded, and with narrow alae. A Y-shaped accessory piece present, not strongly chitinized. Vulva slightly behind the middle of the body. Vagina very long and coiled. Female organs in other respects as in *Kathlania*.

Hab. Alimentary canal of marine Turtle (one species known).

Genotype: *T. [Kathlania] tonaudia* (Lane, 1914).

Lane, 1914, *Ind. Journ. Med. Res.*, Calcutta, ii, 668; Travassos, 1919, *Rev. Soc. Brazil. Sci.*, 84.

3. *Spironoura* Leidy, 1856.

Syn. *Spirura* Diesing, 1861, *nec* Blanchard, 1849; *Falcaustra* Lane, 1915; *Florencioia* Travassos, 1919.

Head frequently wider than neck, occasionally not distinct. Lateral fields wide. Lateral alae absent. Lips entire, each bearing two outer and two inner papillae. Oral cavity supported by a continuous cuticular ring. Pharynx muscular,

with narrow lumen. Tail in both sexes tapering and pointed. Male with ten or more pairs of caudal papillae (of which three pairs are preanal) and an unpaired preanal papilla. Preanal caudal muscles of male sometimes aggregated into one or several fan-shaped sucker-like organs. Spicules equal, relatively short, sickle-shaped, usually broadly alate. An accessory piece usually present, sometimes imperfectly chitinized or absent. Vulva towards the posterior third of the body. Eggs usually large, thick-shelled, oval, laid at various stages of development, according to species.

Hab. Intestine of Tortoises, Batrachians and fresh-water Fishes.

Genotype : *S. gracile* Leidy, 1856.

Leidy, 1856, *Proc. Acad. Nat. Sci.*, Philadelphia, viii, 52; Lane, 1915, *Ind. Journ. Med. Res.*, Calcutta, iii, 109; Baylis, 1920, *Ann. Mag. Nat. Hist.*, London, vi, 414; Travassos, 1920, *Arch. Esc. Sup. Agric. e Med. Vet.*, Nictheroy, iv, 21; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, Calcutta, vii, 309; Boulenger, 1923, *Parasitol.*, xv, 53; Chapin, 1924, *Journ. Parasitol.*, x, 212.

4. *Zanclophorus* Baylis & Daubney, 1922.

Head somewhat narrower than neck, surrounded by a slight cuticular collar at its base. Lips large, entire, anteriorly flattened, each carrying a pair of rather prominent papillae and bordered internally by cuticular fringes. Oral cavity with three separate double horseshoe-shaped chitinoid supports at its angles. Pharynx with wide lumen, lined with thickened cuticle. A single, well-developed, muscular, preanal sucker present in the male. Spicules as in *Spironoura*, but relatively much longer. A large, but incompletely chitinized, accessory piece present. Female organs as in *Spironoura*.

Hab. Stomach and intestine of land Tortoises.

Genotype : *Z. annandalei* Baylis & Daubney, 1922.

Baylis & Daubney, 1922, *Mem. Ind. Mus.*, Calcutta, vii, 310.

5. *Cruzia* Travassos, 1917.

Syn. *Oxysoma* Schneider, 1866, *e. p.*

Head not distinct. Lateral fields broad. Lips well developed, subtriangular. Pharynx three-sided, with narrow lumen, strongly chitinized, and containing three longitudinal series of anteriorly-directed teeth. At its base there are also three large, blunt, tooth-like structures. Intestine with an anterior caecum. Tail of male conical. Nine pairs of caudal papillae present (four preanal, five postanal). Ventral surface of preanal region rugose. Caudal muscles well developed but not aggregated into a sucker-like [organ].

Spicules subequal, alate. A large subtriangular accessory piece present. Tail of female tapering. Vulva slightly in front of the middle of the body, not prominent. Eggs relatively large, with thick, rugose shell, containing embryos when laid.

Hab. Caecum and large intestine of Opossums (one species known).

Genotype: *C. [Ascaris] tentaculata* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 658; Travassos, 1917, *Brazil. Med.*, Rio de Janeiro, xxxi, N. 12; 1922, *Mem. Inst. Osw. Cruz*, Rio de Janeiro, xiv, N. 1.

This genus appears to fall naturally into the family Kathlaniidae, the characters in which it differs from the preceding genera being so slight that, in our view, they do not justify the erection of a distinct family Cruzidac, as is proposed by Travassos. Nor can we follow Ortlepp (1924, *Journ. Helminthol.*, ii, 17), who proposes to erect for *Cruzia* a new subfamily, Cruzinac, of the family Heterakidae.

6. *Cissophyllus* Railliet & Henry, 1912.

Lips complex; the dorsal lip trident-shaped, the ventro-lateral lips furnished with groups of lancet-like teeth. Buccal capsule apparently absent. Oesophagus with a pharynx and a posterior bulb. Tail of male without alae. Caudal papillae small, sessile. Spicules subequal. An accessory piece present. Preanal sucker fusiform. Vulva in posterior third of body. Uterine branches parallel. Eggs segmenting when laid.

Hab. Intestine of Chelonia.

Genotype: *C. laverani* Railliet & Henry, 1912.

Railliet & Henry, 1912, *Bull. Soc. Path. exot.*, Paris, v, 253.

7. *Probstmayria* Ransom, 1907.

Head truncate. Lips bilobed, the dorsal lip having two papillae with long peduncles, the ventro-lateral lips each one such papilla. Pharynx tubular, composed of a small anterior portion without muscles and a longer, muscular, posterior portion. Caudal end of male without sucker-like organ. Several pairs of small postanal papillae present. Spicules short, subequal. Tail in both sexes long and tapering. Vulva about the middle of the body. Viviparous (eggs few and large, hatching in uterus).

Hab. Colon of Equidae (one species known).

Genotype: *P. [Oxyuris] vivipara* (Probstmayr, 1865).

Probstmayr, 1865, *Wochenschr. f. Thierh. u. Viehz.*, Augsburg, ix, 178; Ransom, 1907, *Trans. Amer. Microsc. Soc.*, xxvii, 33; Baylis, 1923, *Parasitol.*, xv, 36.

8. *Amblyonema* v. Linstow, 1898.

Three low conical lips present. Slight lateral alae, rounded posteriorly. At the base of the oral cavity three trilobed teeth present. Oesophagus long, slender, with a small prebulbar swelling and a large posterior bulb. Tail rounded, with a short terminal spike. Male with three pairs of preanal and one pair of postanal papillae, the latter dorsally directed. Two equal, alate spicules and an accessory piece present. Vulva in the posterior half of the body. Eggs large, thick-shelled.

Hab. Intestine of Australian Lung-fish (*Ceratodus*) (one species known).

Genotype : *A. terdentatum* v. Linstow, 1898.

v. Linstow, 1898, *Denkschr. Med. Nat. Ges.*, Jena, viii, 470.

According to Travassos (1920 (?)) this genus falls into the subfamily Oxysomatinae of the family Oxyuridae, and is placed by him near *Probstmayria*, which in our view belongs to the Kathlaniidae. The characters mentioned by v. Linstow for *Amblyonema* seem to us to indicate closer relationship with the latter family than with the Oxyuridae.

9. *Spectatus* Travassos, 1923.

Head somewhat wider than neck. Lips well developed, bilobed. Prebulbar swelling of oesophagus much reduced. Tail of male short and conical. A muscular preanal sucker-like organ present. Caudal papillae sessile, twenty-two in number (five pairs preanal). Spicules short, falciform, equal and alate. Accessory piece V-shaped. Tail of female very short. Vulva in the middle of the body. Vagina long.

Hab. Intestine of a Fish (one species known).

Genotype : *S. spectatus* Travassos, 1923.

Travassos, 1923, *Folh. Med.*, Rio de Janeiro, vi (15 Feb.), 29.

Fam. 4. OXYASCARIDAE Travassos, 1920.

Parasitic forms. Meromyarian. Males very much smaller than females. Lips greatly reduced. No buccal capsule. Oesophagus with a pyriform ventriculus. Intestine ends in a voluminous pyriform rectum which is highly chitinized. Spicules equal, small, poorly chitinized. Accessory piece apparently absent. Caudal alae absent. Caudal papillae few. Vulva in anterior half of body. Uteri opposed. Eggs containing embryos when laid.

1. *Oxyascaris* Travassos, 1920.

With the characters of the family.

Hab. Intestine of Reptiles and Batrachians.

Genotype : *O. oxyascaris* Travassos, 1920.

Fam. 5. OXYURIDAE Cobbold, 1864.

Parasitic forms. Meromyarian. Mouth with simple, usually inconspicuous lips. No buccal capsule. Oesophagus usually with a pharynx and always with a distinct posterior bulb, containing three valves. Reproductive organs simple. Oviparous. Ovaries short, producing relatively few large eggs. Excretory pore at about the level of the oesophageal bulb or even behind it. Caudal end of mature female always elongated and subulate. Male without a preanal sucker, except in *Hoplodontophorus*.

This family appears to form a fairly homogeneous group, and we have not felt justified in retaining the families Pharyngodonidae and Isakidae of Travassos (1920 (?)). The contents of the former appear to fall naturally into the subfamily Oxyurinae, while *Isakis*, the sole representative of the Isakidae, may be included among the Cosmocercinae. The subfamily Syphaciinae Railliet (1916, *Réc. Méd. Vét.*, 521) is discarded, since its genera also appear to fall into the Oxyurinae.

Subfam. 1. OXYURINAE Hall, 1916.

Mouth with three or six lips. Male with a single spicule, which may be vestigial (rarely without a spicule), and usually without an accessory piece. The caudal papillae of the male mainly in the vicinity of the cloaca.

1. *Oxyuris* Rudolphi, 1803.

Syn. *Lepturis* Schlotthauber, 1860.

Lips not apparent. Cuticle of head not inflated. Mouth hexagonal. One pair of lateral and two pairs of large submedian cephalic papillae present. Oesophagus relatively short, hourglass-shaped, with a short pharynx, containing numerous cuticular bristles in both sexes and three prominent teeth in the female. Its narrow middle portion passes gradually into the posterior pyriform bulb. Tail of male truncate, with alar expansions in front of and behind the cloaca, each supported by a pair of pedunculate papillae. Two pairs of smaller caudal papillae present. A single spicule, without an accessory piece. Tail of female extremely long. Vulva towards the anterior end of the body, but postoesophageal. The common trunk of the uterus extremely long, extending almost to the posterior end, and there dividing into two short branches which run parallel to each other in the anterior direction. Eggs elongated, flattened on one side, unsegmented when laid, with thick shell, having an opening at one pole filled by a plug which is outwardly concave.

Hab. Large intestine of Equidae (one species known).

Genotype : *O. [Ascaris] equi* (Schrank, 1788).

Schrank, 1788, *Verzeichniss der . . . Eingeweidewürmer*, München, 7; Rudolphi, 1803, *Arch. f. Zool. u. Zoot.*, Brunswick, iii, 6; Yorke & Macfie, 1922, *Trans. R. Soc. Trop. Med. Hyg.*, London, xv, 148.

2. *Dermatoxys* Schneider, 1866.

Lips well developed, each with a tooth projecting from its inner surface. Oesophagus hourglass-shaped, with a long, slender middle portion and a posterior bulb. Cervical alae present. Posterior end of the male with very long well-developed alae, and provided on its ventral surface in the preanal region with a curving longitudinal row of comb-like crests. Caudal papillae mainly grouped around the cloaca. A single spicule, very small. Accessory piece absent. Vulva in the anterior half of the body. The common trunk of the uterus extends posteriorly to a point beyond the anus, the branches passing forward parallel to each other. Eggs with a thick shell, stippled externally, slightly flattened on one side and with an aperture near one pole, apparently closed by a plug.

Hab. Alimentary canal of Rodents.

Genotype : *D. [Ascaris] veligera* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 656; Schneider, 1866, *Monographie der Nematoden*, Berlin, 123; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 99.

3. *Hoplodontophorus* Turner, 1921.

Mouth with three lips, not very apparent, situated in a shallow depression having twelve papillae round its edge. Oesophagus hourglass-shaped, the anterior portion representing the oesophagus proper and the posterior portion the bulb. A pharynx present. Tail of male with wide alae supported by three pairs of papillae, one large and preanal, the remaining two near the posterior end. One pair of ventral papillae at the level of the cloaca. A muscular sucker on the ventral surface in the preanal region, with an opening in its posterior border. A single spicule and an accessory piece. Tail of female long and slender, with rounded tip and small terminal spike. Vulva in the anterior third of the body, with prominent lips. Common trunk of uterus runs posteriorly almost as far as the anus. Uterine branches parallel, running anteriorly. Eggs large, elongated, flattened on one side.

Hab. Alimentary canal of Hyrax (one species known).

Genotype : *H. [Oxyuris] flagellum* (Ehrenb., in Hempr. & Ehrenb., 1828).

Hemprich & Ehrenberg, 1828, *Symbolae physicae, Pars Zoologica, decas prima* (Mammalia); Turner, 1921, *Trans. R. Soc. Trop. Med. Hyg.*, London, xv, 187; Monnig, 1924, 9th and 10th *Rep. Dir. Vet. Ed. and Res.*, Pretoria, 442.

4. *Enterobius* Leach, in Baird, 1853.

Syn. *Oxyurias* Stiles, 1905; *Fusarella* Seurat, 1916; *Trypanoxyuris* Vevers, 1923.

Cuticle of anterior end inflated. Lips fairly distinct. Mouth triradiate. Narrow lateral alae present. Oesophagus with a prebulbar swelling and a distinct bulb. Tail of male truncate, with alae supported in front by a pair of pedunculate preanal papillae, and behind by a pair at the extremity of the tail. Two or three pairs of sessile postanal papillae also present. A single spicule, relatively long. No accessory piece.* Vulva in the anterior half of the body. Common trunk of the uterus short. Uterine branches parallel.

Hab. Large intestine of Primates.

Genotype: *E. [Ascaris] vermicularis* (L., 1758).

Leach, in Baird, 1853, *Cat. Entozoa Brit. Mus.*, 108; Seurat, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxviii, 67 (*Fusarella*); Yorke & Macfie, 1922, *Trans. R. Soc. Trop. Med. Hyg.*, London, xv, 148.

5. *Protozoophaga* Travassos, 1923.

Lips not apparent. Oesophagus cylindrical. A well-developed posterior bulb present. Tail of male alate, with two pairs of large lateral papillae and a conical terminal process. A single spicule, feebly chitinized. Accessory piece absent. Tail of female conical in the young, long and tapering, up to half the total length, in the adult. Vulva in anterior region of body. Uterine branches parallel, running anteriorly.

Hab. Alimentary canal of a Rodent (one species known).

Genotype: *P. [Oxyuris] obesa* (Diesing, 1851).

Diesing, 1851, *Systema Helminthum*, ii, 141; Travassos, 1923, *Folh. Med.*, Rio de Janeiro, iv, 36.

* In *Trypanoxyuris trypanuris* Vevers (1923, *Journ. Helminthol.*, i, 39) there is said to be an annular gubernaculum. It seems possible that this statement is founded upon a misinterpretation. An annular gubernaculum of the type shown in Vevers' figure 2, B, would apparently prevent the extrusion of the spicule. The only other character to distinguish *Trypanoxyuris* from *Enterobius* is the presence of a short tail-spike in the male, and this appears too small a character upon which to found a new genus.

The validity of this genus appears extremely doubtful. Up to the present the genotype is not characterized sufficiently to enable its affinities with other genera to be determined.

6. *Thelandros* Wedl, 1862.

Lips bilobed. Buccal capsule absent. Oesophagus with a very short pharynx and a posterior bulb. Lateral fields each formed of a single row of very large cells with stellate nuclei. Lateral alae present in male in some species, sometimes extending posteriorly as far as the cloaca. Tail of male ends in a dorsal process. Caudal alae absent. Three pairs of caudal papillae present, one of which is situated on the ventral surface of the caudal process. A single spicule, sharply pointed. Accessory piece absent. Tail of female suddenly constricted behind the anus to form a terminal spike. Vulva usually a little behind the middle of the body. Uterine branches parallel. Eggs oval, not containing embryos when laid.

Hab. Alimentary canal of Lizards and Tortoises.

Genotype: *T. alatus* Wedl, 1862.

Wedl, 1862, *Sitz. k. Akad. Wiss.*, Wien, xlv, 470; Seurat, 1917, *Arch. Zool. exp. et gén.*, Paris, lvi, 412.

7. *Ozolaimus* Dujardin, 1845.

Head with "two lateral lobes," diverging distally. Mouth elongated dorso-ventrally. Oesophagus long, composed of two distinct portions; the anterior short and stout, with a fusiform swelling behind; the posterior slender, ending in a distinct bulb behind. Tail of male short, finger-shaped, bluntly rounded. A single long, stout spicule present. Tail of female tapering. Vulva prominent, at about the posterior fourth of the body. Female genital organs anterior. Eggs large.

Hab. Intestine of Iguana.

Genotype: *O. [Ascaris] megatyphlon* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 47, 285; Dujardin, 1845, *Histoire nat. des Helminthes*, 145; Schneider, 1866, *Monographie der Nematoden*, 120; v. Linstow, 1906, *Arch. f. Naturg.*, lxxii, i, 254 (*Oxyuris cirrata*).

8. *Macracis* Gedoelst, 1916.

Mouth a vertical slit with lateral raised borders. Lateral and submedian papillae present. Oesophagus very long and slender, with three anteriorly directed valve-like cuticular folds at its entrance, and with a large posterior bulb. Tail in both sexes short and conical. Tail of male apparently without alae, truncate ventrally, and with a short, dorso-ventrally flattened, dorsal appendage, bearing a pair of

papillae near its tip. Two pairs of preanal and one pair of postanal papillae also present on the lips of the cloaca, and a truncate median postanal process. A single long, alate spicule present. Vulva at about the posterior third of the body. Female organs confined to about the middle third of the body. Vagina long, running anteriorly, then posteriorly. Common trunk of uterus short, its branches turning forward near their origin and parallel. Ovaries reflexed.

Hab. Alimentary canal of an Iguana (one species known).

Genotype: *M. [Oxyuris] monhystera* (v. Linstow, 1902).

v. Linstow, 1902, *Centralbl. f. Bakt.*, xxxi, 30; Gedoelst, 1916, *Rev. Zool. Afric.*, 77; Rauther, 1918, *Zool. Jahrb., Anat.*, xl, 441.

Gedoelst (1916) originally referred this genus to the Atracinae on the ground of v. Linstow's statement that the female organs were unpaired. Following, however, Rauther's re-description of *O. monhystera*, this view was abandoned.

9. Pharyngodon Diesing, 1861.

Cuticle rather thick, with relatively well-marked transverse striations. Lips not apparent. No buccal cavity. Oesophagus with a posterior bulb. In the male a single pair of lateral alae present. In the female two parallel alae extend along each lateral field. Lateral fields composed of a single row of large cells with rounded nuclei. Tail of male suddenly constricted at the level of the cloaca, and continued as a long, dorsally-directed, conical process, the anterior portion of which bears short and broad lateral alae. One pair of sessile preanal papillae and two pairs of pedunculate postanal papillae present. Of the latter, the posterior pair is near the posterior limit of the alae. A single spicule, sharply pointed. Accessory piece absent. Tail of female rather suddenly constricted behind the anus to form a terminal spike, sometimes bearing spines. Vulva postoesophageal. Uterine branches narrow and parallel. Eggs very long and narrow, with an operculum at each end.

Hab. Rectum of Lizards.

Genotype: *P. [Oxyuris] spinicauda* (Dujardin, 1845).

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 143; Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 642; Seurat, 1917, *Arch. Zool. exp. et gén.*, Paris, lvi, 404.

10. Tachygonetria Wedl, 1862.

Syn. *Paracis* Railliet & Henry, 1916; *Mehdiella* Seurat, 1918.

Lips not apparent. Oesophagus usually long, and with a posterior bulb. Lateral alae absent. Lateral fields dark-

coloured, broad, consisting of a single row of large cells. Tail of male suddenly constricted at the level of the cloaca and continued as a dorsally-directed conical process, with or without a terminal spike. Five pairs of caudal papillae present, of which three pairs are grouped about the cloaca (one pair preanal, one at the level of the cloaca, one postanal), the remaining two pairs being lateral, one at the posterior end of the alae and the other midway between these and the cloaca. Posterior lip of cloaca swollen into a conical process. A single spicule, short, with a straight or barbed point. An accessory piece present, shaped like a very open V. Vulva usually behind the middle of the body. Common trunk of uterus short. Uterine branches parallel. Eggs large, few in number, segmenting when laid, occasionally containing embryos.

Hab. Caecum of herbivorous Reptiles (Tortoises and *Uromastix*).

Genotype : *T. vivipara* Wedl, 1862.

Wedl, 1862, *Sitz. k. Akad. Wiss.*, Wien, xlii, 471, 482; Seurat, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 223; 1918, *Arch. Inst. Past. Tunis*, x, 247.

According to Seurat (1912, 1913, 1917), *T. vivipara* has two types of female, one of which is oviparous and the other viviparous. In the latter the larvae reach the encysted or infective stage within the uterus. Seurat has proposed the genus *Mehdiella*, with *microstoma* (Drasche) as its genotype. The differences mentioned, however, do not appear to be sufficient to warrant a generic distinction between *Mehdiella* and *Tachygonetria*.

11. *Aorurus* Leidy, 1849.

Syn. *Streptostoma* Leidy, 1849.

Cuticle coarsely striated. Mouth large, circular, without apparent lips. Head followed by a slightly projecting cuticular collar. Oesophagus with a large pyriform prebulbar swelling and a distinct posterior muscular bulb joined to it by a slender neck. The prebulbar swelling is almost equal in size to the muscular bulb. Tail of male obliquely truncate ventrally, and with a subulate terminal process dorsally, bearing a pair of papillae near its base. Two pairs of preanal papillae and a median postanal conical process also present. A single spicule present. Apparently no accessory piece. Tail of female extremely long and subulate. Vulva in anterior half of body, behind oesophageal bulb. Uterine branches and ovaries parallel. Eggs flattened on one side.

Hab. Intestine of Myriopoda (*Julus*) and Orthoptera (*Blatta*).

Genotype : *A. [Streptostoma] agilis* (Leidy, 1849).

Leidy, 1849, *Proc. Acad. Nat. Sci.*, Philadelphia, iv, 230 and 1850, v, 100; 1853, *Smithsonian Contr. Knowl.*, Washington, v, 45; Hammerschmidt, 1838, *Isis* (Oken), Leipzig, 354 (*Oxyuris diesingi*); 1847, *Naturw. Abhandl.*, Wien, i, 284 (*Oxyuris blattae-orientalis*, e. p.); Galeb, 1878, *Arch. Zool. exp. et gén.*, Paris, vii, 293 (*Oxyuris diesingi*, not *O. blattae*).

Aorurus, as originally described by Leidy, consisted of the two subgenera *Streptostoma* and *Thelastoma*. These he raised later, no doubt rightly, to the rank of genera. In these circumstances, *Streptostoma* becomes a synonym of *Aorurus*.

12. *Thelastoma* Leidy, 1849.

Cuticle coarsely striated. Lateral alae present. Mouth small, without apparent lips. A short pharynx apparently present. Oesophagus proper club-shaped, followed by a distinct pyriform bulb. Intestine may be provided near its origin with a posteriorly-directed caecum. Male unknown.* Tail of female long, subulate. Vulva in the posterior half of the body. Uterine branches and ovaries apparently opposed. Eggs flattened on one side.

Hab. Intestine of Myriopoda, Coleoptera and Orthoptera.
Genotype: *T. attenuatum* Leidy, 1849.

Hammerschmidt, 1847, *Naturw. Abhandl.*, Wien, i, 284 (*Oxyuris blattae-orientalis*, e. p.); Leidy, 1849, *Proc. Acad. Nat. Sci.*, Philadelphia, iv, 231; 1853, *Smithsonian Contr. Knowl.*, Washington, v, 46; Galeb, 1878, *Arch. Zool. exp. et gén.*, Paris, vi, 292 (*Oxyuris blattae*).

Although the characters given by Leidy and others are sufficient to distinguish *Thelastoma* from *Aorurus*, they cannot be said to furnish a satisfactory diagnosis, in the absence of a fuller description of the genotype.

13. *Pseudonymus* Diesing, 1857.

Syn. *Ptychocephalus* Diesing, 1861; *Helicothrix* Galeb, 1878.

Cuticle of neck with a series of annular swellings of different sizes. Mouth with six lips. Oesophagus club-shaped, containing six longitudinal chitinoid rodlets, and with a distinct pyriform posterior bulb. Tail of male rounded, with a truncate appendage bearing a ventrally-curved terminal spike. One pair of postanal and two pairs and one median preanal

* Leidy (1853), in his definition of the genus, states that there is a single spicule in the male. No males appear to have been described for any of the species assigned to this genus, although Galeb (1878) states that in *Oxyuris blattae* (= *T. appendiculatum* Leidy) the male is without the intestinal caecum possessed by the female. It seems likely that the form in question belonged to a different species.

papillae present. Spicule single. Tail of female very long. Vulva at about posterior third of body. Female genital tubes paired, opposed. Eggs regularly oval, containing embryos when laid and with spiral filaments wound round the shells.

Hab. Intestine of aquatic Beetles.

Genotype : *P. [Oxyuris] spirotheca* (v. Györy, 1856).

v. Györy, 1856, *Sitz. k. Akad. Wiss.*, Wien, xxi, 327; Diesing, 1857, *Denkschr. k. Akad. Wiss.*, Wien, xiii, 10; 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 614, 637; Railliet & Henry, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 114.

14. *Passalurus* Dujardin, 1845.

Lips not apparent. Pharynx contains three denticles. Oesophagus with a prebulbar swelling and a distinct bulb. Tail of male ends in a long spike. Caudal alae extend posteriorly to the origin of the spike, and are supported at this level by a pair of pedunculate papillae. In addition to these there is a pair of small sessile papillae behind the cloaca, and three pairs of large sessile papillae at the level of the cloaca. A single relatively short spicule. No accessory piece. Tail of female marked externally in its distal portion with prominent annular thickenings. Vulva anterior, postoesophageal, sometimes on a short vaginal outgrowth. Common trunk of uterus long. Uterine branches parallel. There is in the female a long filament lying freely in the body-cavity, extending from in front of the vulva to the region of the anus.

Hab. Caecum and large intestine of Hares and Rabbits (one species known).

Genotype : *P. [Oxyuris] ambiguus* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 19, 229; Dujardin, 1845, *Histoire nat. des Helminthes*, Paris, 230, 231; Seurat, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxviii, 67; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 68.

15. *Welleomia* Sambon, 1907.

Lips large and broad. Interlabia present, directed inwardly. Oesophagus with a prebulbar swelling and a distinct posterior bulb. Cervical alae may be present or absent. Intestine shows at least one anterior and one posterior dilatation, but the characters of these are not constant. Tail of male slightly alate, with one pair of large postanal papillae, and a pair at the level of the cloaca. A single spicule and an accessory piece present. Behind the postanal papillae the tail diminishes to a slender filament. Tail of female conical and marked externally with a spiral thickening. Vulva in anterior half of body, at the end of a long tubular vaginal outgrowth.

Hab. Alimentary canal of Rodents.

Genotype : *W. mitchelli* Sambon, 1907.

Sambon, 1907, *Abstr. Proc. Zool. Soc.*, London, March 26, 15; 1907, *Proc. Zool. Soc.*, London, 282; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 70; Baylis, 1922, *Ann. Mag. Nat. Hist.*, (9) ix, 494.

16. *Syphacia* Seurat, 1916.

Lips distinct. Buccal capsule absent. Oesophagus with a short pharynx, a prebulbar swelling and a distinct posterior bulb. Tail of male ends in a long spike. Caudal alae terminate posteriorly at the origin of the tail-spike. Two pairs of sessile preanal papillae present, one of which is situated on the lip of the cloaca. The caudal alae are supported behind by a pair of large pedunculate postanal papillae, and contain a smaller pair at about the middle. A single relatively long spicule and an accessory piece present. Vulva in anterior region, but postoesophageal. Common trunk of uterus relatively long. Uterine branches parallel, not extending posteriorly as far as the anus.

Hab. Caecum and large intestine of Rodents.

Genotype: *S. [Ascaris] obvelata* (Rudolphi, 1802.)

Rudolphi, 1802, *Arch. f. Zool. u. Zoot.*, Brunswick, ii, 18; Seurat, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxviii, 64; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 81.

17. *Haplacis* Railliet & Henry, 1916.

Head rounded, with three lips and one pair of papillae. Oesophagus proper short and stout, somewhat hourglass-shaped, followed by a distinct spherical bulb. Tail of male tapering, apparently without alae. Three pairs of preanal papillae present. A single large, stout, pointed spicule present. Accessory piece absent. Tail of female tapering. Vulva towards the middle of the body, or somewhat behind it. Vagina very short. Uterine branches opposed. Eggs large, oval, segmenting when laid.

Hab. Intestine of Myriopoda.

Genotype: *H. [Isacis] silvestrii* (Parona, 1896).

Parona, 1896, *Atti Soc. Ligust. Sci. Nat.*, Genova, vii, 111; Railliet & Henry, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 114.

Beyond the fact that this genus is placed by Railliet & Henry among forms with a single spicule and without an accessory piece, and in which the vulva is situated towards the middle or in the posterior half of the body, no characterization of it exists. We are unable to extract from the specific description of the genotype any well-marked characters differentiating it from other Oxyurinae.

Subfam. 2. **COSMOCERCINAE** Railliet, 1916.

Lips apparent or obscure. Male with two equal or subequal spicules and usually an accessory piece (absent in *Isakis* and *Odontogeton*).

1. **Cosmocerca** Diesing, 1861.

Syn. *Nematoxys* Schneider, 1866, *e. p.*; *Ananconus* Railliet & Henry, 1916.

Lips not apparent. Oesophagus with a small pharynx, a very slight prebulbar swelling and a posterior bulb. Well-developed lateral alae present, extending posteriorly a little behind the anus in the female. Tail of male with fine terminal spike. Numerous small preanal and postanal papillae present, with slender peduncles. On the ventral surface of the preanal region in the male there are two longitudinal rows of comb-like crests. Spicules short, equal. A strongly-chitinized accessory piece present, sometimes larger than the spicules. Vulva at about the middle of the body. Uterine branches apparently opposed.

Hab. Intestine and lungs (?) of Batrachians.

Genotype: *C. trispinosa* Railliet & Henry, 1916 (= *Oxyuris ornata* of Walter, 1856, *nec* Duj., 1845).

Walter, 1856, *Zeitschr. f. wiss. Zool.*, Leipzig, viii, 163; Railliet & Henry, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 247.

2. **Aplectana** Railliet & Henry, 1916.

Syn. *Nematoxys* Schneider, 1866, *e. p.*; *Aplecta* Railliet & Henry, 1916.

Lips fairly distinct. Buccal capsule absent. Oesophagus with a very short pharynx and a posterior bulb, separated from it by a constriction. Lateral alae present, extending from near the anterior end to a little behind the anus. Tail of male pointed, with numerous sessile postanal papillae. Spicules equal, short and slender. A large oblong accessory piece present. Vulva slightly in front of the middle of the body. Uterine branches apparently opposed. Embryos hatch *in utero*.

Hab. Alimentary canal of Amphibians.

Genotype: *A. [Ascaris] acuminata* (Schrank, 1788) (= *Nematoxys commutatus* of Schneider, 1866, *nec* *Cosmocerca commutata* Diesing, 1861).

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 227; Schneider, 1866, *Monographie der Nematoden*, Berlin, 113; v. Linstow, 1909, in Brauer, *Süsswasserfauna Deutschlands*, Heft 15, 58; Railliet & Henry, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 248; 1916, *Réc. Méd. Vét.*, Paris, 426.

The absence of "combs" on the ventral surface of the male, as is indicated by Railliet & Henry, is the only salient character to distinguish this genus from *Cosmocerca*.

3. *Oxysomatium* Railliet & Henry, 1913.

Syn. *Oxysoma* Schneider, 1866, *e. p.*

Lips small, sometimes not apparent. Oesophagus with a posterior bulb. Tail of male pointed, with from three to twelve pairs of preanal and up to six pairs of postanal papillae. Spicules equal, relatively long. A small, canoe-shaped accessory piece present. Vulva in posterior half of body. Eggs containing embryos when laid.

Hab. Alimentary canal of Amphibians and Reptiles.

Genotype: *O. longespiculum* Railliet & Henry, 1916 (= *Oxysoma brevicaudatum* of Schneider, 1866, *nec Fusaria brevicaudata* Zeder, 1803).

Railliet & Henry, 1916, *Compt. rend. Soc. Biol., Paris*, lxxix, 113, 247; Skrjabin, 1916, *Sci. Res. Zool. Exp. Brit. E. Africa* (Dogiel & Sokolow), 1914, i (4), 140.

4. *Syphaciella* Monnig, 1923.

Cuticle of head inflated. Cervical alae present. Lips distinct. Buccal capsule absent. Oesophagus with a prebulbar swelling and a distinct posterior bulb. Tail of male ends in a spike. Wide caudal alae extend posteriorly as far as the origin of the tail-spike. Two pairs of preanal papillae; two pairs and one unpaired postanal papillae present. All the papillae are in the cloacal region. Spicules subequal. An accessory piece present. Vulva anterior, postoesophageal, surrounded by a prominent cuticular swelling. Common trunk of uterus extends posteriorly almost to the level of the anus. Uterine branches parallel.

Hab. Alimentary canal of Birds.

Genotype: *S. capensis* Monnig, 1923.

Monnig, 1923, *Trans. R. Soc. S. Africa*, xi, 108.

5. *Carnoia* Gilson, 1898.

Lips distinct, semicircular. Cuticle annulated, the anterior twelve to fifteen rings of the female each armed with fourteen spines. Male with one or two circlets of small spines on the eleventh and twelfth rings. Pharynx long, with wider anterior chamber containing three sharp teeth. Oesophagus slender, cylindrical, with a large oval muscular bulb anteriorly, containing six paired rods, and a pyriform posterior bulb containing three striated valves. Spicules apparently partly fused. An accessory piece present. Vulva in front of middle

of body, between twenty-fifth and twenty-ninth rings. Common trunk of uterus rather short, running posteriorly. Uterine branches parallel, running anteriorly. Oviparous. Eggs oval, with rather thin shell.

Hab. Intestine of a Myriopod (one species known).

Genotype : *C. vitiensis* Gilson, 1898.

Gilson, 1898, *La Cellule*, xiv, 360.

6. *Isakis* Lespès, 1856.

Syn. *Rhigonema* Cobb, 1898.

Mouth with three low lips, having denticulate inner edges. Oesophagus short, with a prebulbar swelling and a spherical posterior bulb. Tail conically pointed. Male without caudal alae. Several pairs of preanal and postanal papillae present. Spicules equal. No accessory piece. Vulva near middle of body. Female genital tube apparently single. Ovary reflexed. Oviparous.

Hab. Intestine of Insects, Myriopods and (?) Molluses.

In the genotype the young are parasitic in Termites, the adults free-living.

Genotype : *I. migrans* Lespès, 1856.

Lespès, *Ann. Sci. nat.*, Paris, Zool., v, 335; Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 311; Railliet & Henry, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 114.

7. *Odontogeton* Allgén, 1921.

Mouth opening in a slight depression. Head with a cuticular eap which "partly forms the teeth of the mouth and partly an outer ring of strongly-developed and backwardly-directed hooks." Oesophagus with a posterior muscular bulb. Tail of male with three pairs of postanal and one pair of preanal papillae. Spicules equal. Vulva a little behind the middle of the body. Uterine branches opposed. Ovaries reflexed.

Hab. Mouth of Wart-hog (one species known).

Genotype : *O. phacochoeri* Allgén, 1921.

Allgén, 1921, *Zool. Anz.*, liii, 84.

Fam. 6. ATRACTIDAE Travassos, 1920 (?).

Parasitic forms. Lips three or six, sometimes not apparent. Pharynx usually absent. The three-lipped forms may possess eversible jaws or fringes of bristles. Oesophagus club-shaped, muscular, relatively short, followed by a pyriform glandular bulb, with a long anterior portion or neck, which is sometimes narrower than the oesophagus proper. No cervical alae.

Tail of male tapering, without alae. Reproductive organs simple. Spicules two. Vulva close to anus, exceptionally with a common opening. Female genital tube single. Eggs few, very large. Viviparous.

Hab. Alimentary canal of Vertebrates.

1. Atractis Dujardin, 1845.

Lips not distinct, apparently six. Neck of oesophageal bulb narrower than the oesophagus proper. Tail of male constricted behind the anus to form a conical process. Nine pairs of caudal papillae present, of which six pairs are postanal. Spicules unequal and markedly dissimilar. In addition to these there is a tubular chitinous accessory organ. Tail of female conical.

Hab. Alimentary canal of Tortoises and Iguanas.

Genotype: *A. [Ascaris] dactyluris* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 40, 272; Schneider, 1866, *Monographie der Nematoden*, Berlin, 124; Drasche, 1884, *Verhandl. k. k. Zool.-bot. Ges.*, Wien, xxxiii; 328, Parona, 1887, *Ann. Mus. Civ. Stor. Nat.*, Genova, xxiv, 344; v. Linstow, 1883, *Arch. f. Naturg.*, xlix, 296; Gedoelst, 1919, *Compt. rend. Soc. Biol.*, Paris, lxxxii, 910.

2. Labiduris Schneider, 1866.

Three large and distinct lips, the dorsal lip smaller than the two ventro-lateral and trilobed anteriorly, each ventro-lateral lip with a conical process in front and a fringe of knobbed bristles behind. Tail of male sharply constricted behind the cloaca to form a long, slender terminal process. Ten to twelve pairs of caudal papillae present, of which four or five sessile pairs are preanal. The two most anterior pairs of postanal papillae very large and prominent, the most posterior pair supporting the posterior angles of small square alae. Spicules equal. Accessory piece absent. Tail of female long and pointed.

Hab. Large intestine of Tortoises.

Genotype: *L. [Ascaris] gulosa* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 40, 271; Schneider, 1866, *Monographie der Nematoden*, Berlin, 122; v. Linstow, 1899, *Mitt. Zool. Mus.*, Berlin, i, 13; Gedoelst, 1919, *Compt. rend. Soc. Biol.*, Abt. A, Paris, lxxxii, 912.

3. Crossocephalus Railliet, 1909.

Syn. *Pterocephalus* v. Linstow, 1899, *nec* Schneider, 1887.

Three distinct lips, each bearing two chitinous jaws with a terminal tooth and a row of bristles externally. The jaws

are eversible, and when inverted are lodged in the anterior part of the lumen of the oesophagus. Behind the lips a cuticular collar bearing a pair of prominent horn-like lateral papillae. Tail of male bluntly conical. Up to ten pairs of rather small caudal papillae present. Spicules unequal. No accessory piece. Tail of female narrows suddenly behind the anus and tapers to a fine point.

Hab. Alimentary canal of Perissodactyle mammals.

Genotype : *C. [Pterocephalus] viviparus* (v. Linstow, 1899).

v. Linstow, 1899, *Mitt. Zool. Mus.*, Berlin, i, 12; Railliet, 1909, *Réc. Méd. Vét.*, Paris, lxxxvi, 336; Gedoelst, 1916, *Rev. Zool. Afric.*, v, 1; Baylis, 1919, *Ann. Mag. Nat. Hist.* (9) iv, 94; Yorke & Southwell, 1920, *Ann. Trop. Med.*, Liverpool, xiv, 127.

4. *Rondonia* Travassos, 1920 (?).

Spicules subequal. A cloaca present in both sexes.

Hab. Alimentary canal of freshwater fishes (one species known).

Genotype : *R. rondoni* Travassos, 1920 (?).

Travassos, 1920 (?), *Rev. Vet. e Zotech.*, Rio de Janeiro, 62.

5. *Cobboldia* Leiper, 1911.

Syn. *Cobboldia* Leiper, 1910.

Lips not apparent. Mouth surrounded by a cuticular collar with median dorsal and ventral prolongations. The collar is supported by four finger-like papillae, the lateral pair longer than the median. Length of the posterior oesophageal bulb and its "neck" almost twice that of the oesophagus proper. Tail of male long and tapering. Nine pairs of sessile caudal papillae present, of which four are postanal. Spicules unequal. No accessory piece.

Hab. Stomach of Hippopotamus (one species known).

Genotype : *C. [Cobboldia] vivipara* (Leiper, 1910).

Leiper, 1910, *Proc. Zool. Soc.*, London, 235; 1911, *Proc. Zool. Soc.*, London, 555; Gedoelst, 1919, *Compt. rend. Soc. Biol.*, Paris, lxxxii, 912.

6. *Cyrtosomum* Gedoelst, 1919.

Mouth hexagonal, with six lips. No buccal capsule. Tail of male conical. Six pairs of caudal papillae present, of which three are preanal and three postanal, near the tip of the tail. Spicules equal, sharply pointed. Accessory piece absent.

Hab. Alimentary canal of a Lizard (one species known).

Genotype : *C. scelopori* Gedoelst, 1919.

Gedoelst, 1919, *Compt. rend. Soc. Biol.*, Paris, lxxxii, 910.

7. *Monhysterides* Baylis & Daubney, 1922.

Lips apparently six, small. Oesophagus with short, muscular anterior portion and longer, partly glandular, posterior "bulb." Caudal end of male tapering, with five pairs of postanal and four pairs of preanal papillae, the latter being very close together, subventral and prominent. Spicules unequal, tubular, the longer blunt, the shorter pointed. No accessory piece.

Hab. [Alimentary canal of] a Fish.

Genotype: *M. piscicola* Baylis & Daubney, 1922.

Baylis and Daubney, 1922, *Mem. Ind. Mus.*, vii, 342.

8. *Leiperenia* Khalil, 1922.

Lips "more than six." Oesophagus proper very short; the posterior bulb, with its "neck," about three times as long. Tail of male tapering. Four small postanal papillae at about the middle of the tail. Spicules unequal. An accessory piece present. Tail of female long and slender.

Hab. Alimentary canal of Elephants.

Genotype: *L. leiperi* Khalil, 1922.

Khalil, 1922, *Ann. Mag. Nat. Hist.*, (9) ix, 215; 1922, *Proc. Zool. Soc. London*, 206.

Fam. 7. RHABDITIDAE Micoletzky, 1922.

Small forms, free-living or parasitic, or with both free-living and parasitic phases, with a three-sided, prismatic or tubular buccal cavity, usually without teeth. Oesophagus usually with a posterior bulb containing valves, and frequently also with a prebulbar swelling. Cuticle without bristles, or with very few. Reproductive organs simple. Oviparous or viviparous, not infrequently parthenogenetic or hermaphrodite.

This family is divided by Micoletzky (1922, *Arch. f. Naturg.*, lxxxvii) into four subfamilies (Cylindrolaiminae, Plectinae, Rhabditinae and Bunoneminae). We have been unable to find sufficient characters to separate the Plectinae from the Cylindrolaiminae, and have therefore merged these two groups into a single one. The subfamily Bunoneminae consists of two genera which possess very well-marked and obvious characters. The distinctions between the Rhabditinae and Cylindrolaiminae are not felt to be very satisfactory, but these two groups are, for the present, retained.

Subfam. 1. RHABDITINAE Micoletzky, 1922.

Buccal cavity elongate, typically a three-sided tube without tooth-like structures. Lateral organs and caudal glands

generally absent. Excretory system typically in the form of lateral canals. Testis usually single.

We have included in this subfamily several partially parasitic genera which have previously been referred to other groups. The structure of the free-living forms of *Rhabdias* and *Strongyloides* indicates their close relationship to *Rhabditis*. We have therefore suppressed the family *Rhabdiasidae* (Railliet, 1915) (= *Angiostomidae* Braun, 1895). There appears to be no reason why the genera *Lepidonema*, *Hystrignathus* and *Heth* should not also be included in the Rhabditinae, and we have adopted this classification, the family Lepidonemidae (Travassos, 1920 (?)), with its subfamilies Lepidoneminae and Hystrignathinae, being therefore discarded.

The family Mermithidae (Braun, 1883) is considered as having relationships on the one hand with the Rhabditidae, and on the other hand with the Anguillulidae. It is possible that a more comprehensive study of this highly-specialized group would lead to its inclusion in one of these families. We have accordingly compromised by retaining the family Mermithidae.

The superfamily Rhabdiasoidea (Railliet & Henry, 1916) (= Angiostomoidea Hall, 1916) included, according to Travassos (1920 (?)), the families Rhabdiasidae, Mermiidae [sc. Mermithidae], Lepidonemidae, Isakidae and Atractidae. *Isakis*, the sole representative of the Isakidae, has been transferred to the Oxyuridae, and the family Atractidae is also regarded as part of the order Ascaroidea. This disposes of all the contents of the superfamily Rhabdiasoidea, which accordingly disappears.

1. *Rhabditis* Dujardin, 1845.

Syn. *Tribactis* Dujardin, 1845; *Angiostoma* Dujardin, 1845, *e. p.*; *Ascaroides* Barthélemy, 1858; *Pelodytes* Schneider, 1859; *Pelodera* Schneider, 1866.

Cuticle smooth or striated. Lateral alae usually absent. Head usually distinct, without lips or with either three or six lips, bearing papillae or bristles. Buccal capsule a cylindrical or three-sided chitinoid tube, usually interrupted by a non-chitinized portion near its posterior end. Oesophagus usually with two swellings, of which the posterior is a muscular bulb. Tail of male with bursa-like alae supported by five to ten pairs of pedunculate papillae. Spicules two, equal, rarely fused. An accessory piece usually present. Testis single, reflexed. Tail of female more or less pointed. Vulva commonly in the middle of the body, with opposed genital tubes and reflexed ovaries; more rarely posterior, with a single anterior genital tube. Oviparous, sometimes viviparous.

Hab. Decaying material, damp soil or water (fresh or marine). Some species parasitic, chiefly in insects.

Genotype : *R. terricola* Dujardin, 1845.

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 239; de Man, 1884, *Die frei . . . lebenden Nematoden der Niederl. Fauna*, Leiden, 118; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 245.

2. *Rhabdias* Stiles & Hassall, 1905.

Syn. *Angiostoma* Dujardin, 1845, *e. p.* (*Angiostoma* and *Angiostomum* auctt.); *Rhabdonema* Leuckart, 1879, et auctt., *e. p.*

Free-living generation. Microscopic forms. Sexes separate. Body fairly stout. Mouth without lips. A short buccal capsule present. Oesophagus with a fusiform prebulbar swelling and a pyriform posterior bulb. Tail of male conical, with a short terminal spike and narrow lateral alae. Four pairs of preanal and three pairs of postanal papillae present, all lateral in position. Spicules equal, short and stout. Apparently no accessory piece. Tail of female conical. Vulva somewhat behind middle of body. Uterine branches opposed. Eggs very few and large. Embryos hatch within the uterus, and are retained until the death of the female.

Parasitic generation. Much larger than the free-living generation, and consisting of "female" forms only (protandrous hermaphrodites). Slender forms, without lips. A short, cup-shaped buccal capsule present. Oesophagus cylindrical, with a slight constriction about the middle, and without a posterior bulb. Tail conical. Vulva near the middle of the body, opening directly into the uterine branches, which are opposed. Ovaries reflexed. Eggs segmenting when laid.

Hab. Lungs of Amphibians and Reptiles. (Free-living stages in faeces of these animals or in the soil).

Genotype : *R. [Ascaris] bufonis* (Schrank, 1788).

Schrank, 1788, *Verzeichniss der . . . Eingeweidewürmer*, München, 11; Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 262 (*Angiostoma entomelas*, not *A. limacis*); v. Linstow, 1890, *Arch. f. Naturg.*, i, 185; Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 74, 123, 150; Schleip, 1911, *Arch. f. Zellforschg.*, Leipzig, vii, 87.

3. *Strongyloides* Grassi, 1879.

Syn. *Rhabdonema* Leuckart, 1879, et auctt., *e. p.*; *Pseudorhabditis* Perroncito, 1880, *nec* Szüts, 1912; *Stercoralis* Tanaka, 1910.

Free-living generation. Microscopic forms, comparatively stout. Sexes separate. Mouth with four indistinct lips and

six papillae. A short, cylindrical buccal capsule present. Oesophagus club-shaped, connected by a narrow neck with a pyriform posterior bulb. Tail of male short, conical. At least one pair of preanal and one pair of postanal papillae present. Spicules short, stout, equal. An accessory piece present. Tail of female somewhat longer, tapering. Vulva near the middle of the body, opening directly into the uterine branches, which are opposed. Ovaries reflexed. Eggs few and large, oval, thin-shelled, segmenting when laid, or, in the case of older females, hatching *in utero*.

Parasitic generation. Body considerably longer than in the free-living generation, and very slender. Consisting of "female" forms only. Mouth with four indistinct lips. A short buccal capsule present. Oesophagus long, slender, almost cylindrical, without a posterior bulb. Tail short, conical. Vulva in posterior half of body, opening directly into uterine branches, which are opposed. Ovaries reflexed. Eggs segmenting when laid.

Hab. Intestine of Vertebrates. (Free-living stages in faeces of these animals or in the soil).

Genotype : *S. [Anguillula] stercoralis* (Bavay, 1876).

Bavay, in Normand, 1876, *Compt. rend. Acad. Sci.*, Paris, lxxxiii, 316; Grassi, 1879, *Med. Contemp.*, Milano, An. 2, iii, 497; Looss, 1911, *Rec. Egypt. Govt. School Med.*, Cairo, iv, 215.

4. *Anguillula* Ehrenberg, 1831.

Cuticle extremely finely striated, with narrow lateral alae but without bristles. Head rounded or truncate, with more or less distinct lips and one or two crowns of papillae. Lateral organs apparently unknown. Buccal capsule small, thin-walled, hexagonal anteriorly, but for the most part three-sided, and consisting of two parts, of which the posterior contains (in the genotype) a very small dorsal tooth and two subventral processes. Oesophagus with a distinct posterior bulb. Caudal end of male with preanal and postanal papillae. A single accessory piece present. Spicules equal, broad. Testis single, anterior, sometimes reflexed. Female genital tubes paired, opposed, the anterior only with an ovary, which is reflexed; the posterior vestigial, apparently serving as a receptaculum seminis. Ovoviviparous. Caudal glands absent. Excretory system consists of paired lateral canals.

Hab. In decaying substances, stagnant water, etc.

Genotype : *A. [Vibrio] aceti* (Müller, 1783).

Müller, 1783, 162 [*fide* Stiles & Hassall, not verified]; 1786, *Animalcula infusoria*, 63; Ehrenberg, 1831, *Symbolae physicae (Evertabrata)*, Series Prima, Phytozoa Entozoa; Bastian,

1865, *Trans. Linn. Soc. London*, xxv, 110; Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, 34; de Man, 1910, *Zool. Jahrb., Syst.*, xxix, 362; Goodey, 1922, *Ann. Mag. Nat. Hist.*, (9) x, 297.

The original diagnosis of this genus given by Ehrenberg (1831) is valueless from the modern standpoint, as is that of the probable genotype, *A. fluviatilis* (= *Vibrio anguillula fluviatilis* Müller, 1786). Müller, 1786, is quoted by Stiles & Hassall (1905) as an earlier author of the name *Anguillula*. Müller, however, appears to us, in spite of Stiles & Hassall's statement, to have used this name in 1786 in a specific sense only, in combination with *Vibrio* as genus. Some of the forms included in *Vibrio* were given trinomial names (*Vibrio anguillula aceti*, etc.). Hence the author of the generic name *Anguillula* is Ehrenberg. As the species *fluviatilis* and the other species attributed to the genus by Ehrenberg in 1831 are probably unrecognizable, it seems advisable to regard as genotype one of the easily-recognized species *A. aceti* or *A. rediviva* (= *A. glutinis*), which were included by the same author later (1838) in the genus. Bastian (1865) designated the species *aceti* (Müller) as type of *Anguillula* Ehrenberg, and this designation does not appear to be invalidated by Stiles & Hassall's argument that *A. rediviva* (= *glutinis*) is the type of "*Anguillula* Müller." Accordingly, we have made de Man's (1910) diagnosis, based on the species *aceti*, the chief source of the characters given above. *A. rediviva* differs only in minor points from *A. aceti*, so that for practical purposes it is of little importance which is regarded as typical.

5. *Diploscapter* Cobb, 1913.

Cuticle extremely finely striated, without bristles. Lateral alae more or less well developed. Lips four, of which the dorsal and ventral each carries a powerful, outwardly-directed, chitinous hook-like tooth. Lateral lips larger. Buccal capsule prismoid, with uninterrupted wall. Oesophagus with median and posterior swellings, the latter a muscular bulb. Tail in both sexes fairly long, conical, with fine point. Male with caudal alae supported by seven pairs of papillae. Testis single. Vulva slightly behind the middle of the body. Uterine branches opposed. Oviparous. Eggs with rough shell. Uterus contains only one egg at a time.

Hab. About roots of diseased plants; cosmopolitan but usually tropical.

Genotype: *D. [Rhabditis] coronata* (Cobb, 1893).

Cobb, 1893, *Macleay Mem. Vol. Linn. Soc. N.S.W.*, Sydney, 279, 305; 1913, *Journ. Washington Acad. Sci.*, 442; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 266.

6. *Cephalobus* Bastian, 1865.

Cuticle striated. Lateral alae present, but sometimes very slight. Head not distinct. Lateral organs absent or very inconspicuous. Three more or less distinct lips, sometimes bilobed. A single crown of three or six labial papillae present. Cephalic bristles absent. Buccal capsule usually pyramidal or prismoid, its wall composed of two or three rings of longitudinal rods. Oesophagus with a muscular posterior bulb, and sometimes with a slight prebulbar swelling. Tail of male without alae. Preanal and postanal papillae present. Spicules equal, slightly curved, fusiform. One or two accessory pieces present. Testis single. Vulva at about the posterior third of the body. Female genital tubes paired, opposed; the posterior branch is vestigial and without ovary. The anterior ovary is often reflexed. Usually oviparous. Spinneret absent.

Hab. Usually free-living, in soil or decaying matter; also in fresh water. Sometimes parasitic or semi-parasitic.

Genotype: *C. persegnis* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 124; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 267; Cobb, 1924, *Journ. Parasitol.*, xi, 108.

6a. *Acrobeles* v. Linstow, 1877.

Subgenus of *Cephalobus*. Differs from type in the presence of cephalic bristles and spines.

Hab. Soil.

Type: *A. ciliatus* v. Linstow, 1877.

v. Linstow, 1877, *Arch. f. Naturg.*, i, 2; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 268; Cobb, 1924, *Journ. Parasitol.*, xi, 108; Thorne, 1925, *Trans. Amer. Microsc. Soc.*, xlv, 171.

Cobb (1924) maintains *Acrobeles* as a well-founded genus, and characterizes it as follows: "*Acrobeles* von Linstow amend. Characters of *Cephalobus* Bastian amend., but having also a second inner circle of labial organs, often simple and conoid, sometimes relatively long and branched, in which case the outer may also become compound. Pharynx narrower, and uniform, with fewer separate cuticular elements. Amphids though small usually visible, transversely elongate on outer surface of lip region."

He adds: "The future may very probably disclose reasons for subdividing *Acrobeles* as thus defined and designating separately a group (*Acrobelloides* gen. (aut. subg.) nov.) between *Cephalobus* and *Acrobeles* sensu restricto—characterized by having the inner and outer labial organs simple." See also Thorne (1925).

7. *Macrolaimus* Maupas, 1900, *nec* Ditlevsen, 1919.

Cuticle very finely striated. Head without lips. Mouth widely open, bordered by six short, stout bristles. Buccal cavity wide, cup-shaped, its wall in two portions, the anterior thin and transparent, the posterior thick and dark-coloured. Oesophagus with thick anterior portion, separated by a long, narrow neck from a well-developed posterior bulb. Parthenogenetic. Female genital tube single, anterior, with long reflexion. Oviparous. Excretory system consists of lateral canals.

Hab. Soil.

Genotype : *M. crucis* Maupas, 1900.

Maupas, 1900, *Arch. Zool. exp. et gén.*, Paris, (3) viii, 578.

8. *Diplogaster* M. Schultze, in Carus, 1857.

Syn. *Diplogasteroides* de Man, 1912; *Rhabditolaimus* Fuchs, 1916; *Fuchsia* Micoletzky, 1922.

Cuticle with transverse and also longitudinal striations. Head not distinct, sometimes with lips, sometimes with one or two crowns of small bristle-like papillae. A fold of cuticle, which may be longitudinally ribbed, sometimes present immediately behind the mouth. Lateral organs variable, probably always present, occasionally showing sexual differences. Buccal capsule wide and often deep, but variable in shape, thick-walled, with one large (dorsal) or two or three small, movable teeth at its base, or without teeth. Oesophagus with a muscular anterior bulb and a non-muscular posterior bulb-like swelling. Caudal end of male with or without alae, and with nine or ten pairs of papillae. In forms without alae the papillae are usually bristle-like. Two spicules and an accessory piece, of very variable shape, present. Testis usually single. Female genital tubes usually paired, opposed, reflexed. Usually oviparous, sometimes viviparous. Some species hermaphrodite, according to Cobb. Caudal glands absent.

Hab. Fresh water, soil, decaying matter. Some species have been found on plants, others in dead insects. It is uncertain whether any are true parasites.

Genotype : *D. micans* M. Schultze, in Carus, 1857.

Max Schultze, in Carus, 1857, *Icon. Zootom.*, Erste Hälfte, Pl. VIII, fig. 1; de Man, 1884, *Die frei . . . lebenden Nem. der Nederl. Fauna*, 84; Fuchs, 1915, *Zool. Jahrb., Syst.*, xxxviii, 158; Cobb, 1918, in Ward and Whipple, *Freshwater Biology*, 488; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 402.

Micoletzky (1922) divides this genus into two subgenera, *Diplogaster* and *Fuchsia*. The latter appears to be identical

with *Rhabditolaimus*, proposed as a genus by Fuchs, 1915. Apart from the fact that the species attributed to *Rhabditolaimus* are found associated, in a semi-parasitic condition, with insects, the only differences between the subgenera appear to be that in *Rhabditolaimus* the cuticle is, in species with a typical buccal cavity, marked with longitudinal striations resolvable into groups of dots, and in the other species the teeth are absent or rudimentary; while in *Diplogaster* the cuticle, if longitudinally striated, is not marked with groups of dots. These distinctions seem highly unsatisfactory, and the subgenera untenable. *Diplogasteroides* does not appear to possess sufficient characters to separate it from *Diplogaster*.

9. *Demaniella* Steiner, 1914.

Syn. *Demania* Steiner, 1914, *nec* Laurie, 1906, *nec* Southern, 1914.

Cuticle finely striated. Head not distinct, bluntly rounded, without lips, papillae or bristles. A small, conical, perforated stylet in front, and surrounding it at a short distance nine small crescentic cuticular thickenings. Buccal cavity prismatic, with rod-like chitinoid thickenings, and at its base a large dorsal tooth. Oesophagus with a median cylindrical muscular bulb and a slight posterior bulb. Male unknown. Female genital tubes paired.

Hab. Among rotting grass.

Genotype: *D. [Demania] cibourgensis* Steiner, 1914.

Steiner, 1914, *Arch. f. Hydrobiol. u. Planktonk.*, Stuttgart, ix, 426.

10. *Chambersiella* Cobb, 1920.

Cuticle very finely striated, without bristles. Lateral alae present. Lateral organs transversely oval. Six branched, non-motile, cephalic cirri present, and behind these six short bristles with swollen bases. Buccal capsule like that of *Cephalobus*, but not tapering posteriorly, with walls composed of rods, and with six powerful, protrusible labial teeth anteriorly. Oesophagus with a cylindrical prebulbar swelling and a posterior bulb. Tail conical, with tip hooked dorsally, and with paired lateral pores. Tail of male without alae, but with numerous preanal and postanal papillae. Spicules knobbed. An accessory piece present. Testis single, reflexed. Vulva prominent, slightly behind the middle of the body. A single uterine branch, anterior, with ovary reflexed and running posteriorly to near the anus. Eggs segmenting when laid.

Hab. On bark of trees, and in moss.

Genotype: *C. rodens* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 278; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 297.

11. *Teratocephalus* de Man, 1876.

Cuticle transversely striated, the striations usually composed of rows of dots, without bristles. Lateral organs, when present, small and spiral. Head may or may not be distinct, and has six movable cuticular flaps or lips, separated by deep furrows. Buccal capsule goblet-shaped, wide anteriorly and narrow posteriorly, and with isolated chitinoid elements. Oesophagus with a posterior bulb not separated by a distinct "neck" from the more or less cylindrical prebulbar swelling. Male with slender spicules. No accessory piece or caudal papillae. Vulva in the middle of the body or slightly posterior. Uterine branches opposed, usually with reflexed ovaries. In the genotype the posterior branch is reduced and without ovary.

Hab. In soil, on plants or in fresh water.

Genotype: *T. [Anguillula] terrestris* (Bütschli, 1873).

Bütschli, 1873, *Nov. Act. k. Leop.-Car. Akad. Naturf.*, Dresden, xxxvi, 69; de Man, 1876, *Tijdschr. Nederl. dierk. Vereen.*, 's Gravenhage and Rotterdam, 137; 1884, *Die frei . . . lebenden Nematoden der Niederl. Fauna*, 101; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 298.

12. *Rhabdolaimus* de Man, 1880.

Cuticle with fine transverse striations, without bristles or lateral alae. Lateral organs small, inconspicuous. Anterior end bluntly rounded, without lips, papillae or bristles. Buccal capsule very long and narrow, supported by three slender chitinous rods which converge slightly posteriorly and are connected anteriorly with hook-like or knob-like structures. Oesophagus with muscular posterior bulb. Tail long and tapering, with caudal glands and spinneret. Males rare, with stout spicules. Two chitinized thickenings of the cloacal wall represent rudimentary accessory pieces. No caudal papillae or alae. Vulva in middle of body. Uterine branches probably opposed.* Frequently parthenogenetic.

Hab. Damp soil, sand or fresh water.

Genotype: *R. terrestris* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 59; 1884, *Die frei . . . lebenden Nematoden der Niederl. Fauna*, 125; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 302.

13. *Protrellus* Cobb, 1920.

Cuticle with transverse striations, rather coarse in the female, much finer in the male, and without bristles. Cuticle of neck inflated in the adult only. Lateral organs absent. Lateral fields broad, without alae. Head truncate, with

* According to de Man, the female organs are apparently unpaired, although extending on either side of the vulva.

apparently six small indistinct lips, each with at least one papilla, and constricted off from the body. Buccal capsule prismoid, one-half to two-thirds as wide as long. Oesophagus with slight prebulbar swelling and ovoid posterior bulb, separated by a distinct constriction. Spinneret absent. Tail of male tapering, with three pairs of subventral papillae (one large pair preanal, two small pairs postanal). A single slender, pointed spicule. A small accessory piece doubtfully present. Testis single, reflexed. Tail of female stout at the base, conical posteriorly. Vulva very prominent, in front of oesophageal bulb. Vagina muscular. A single, posterior, uterus present, with two posterior, doubly reflexed ovaries. Eggs with the less pointed end, which is directed away from the vulva, "saddled" with a peculiar organ.

Hab. Rectum of a Cockroach (*Polyzostaria*). Australia.
Genotype : *P. aureus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 256 and key.

14. *Blattophila* Cobb, 1920.

Cuticle with plain transverse striations, without alae or bristles. Lateral organs absent. Head rounded, with very small lips forming almost an annular elevation. Buccal capsule very short, prismoid, about half as wide as long, with apophyses springing from its base, a dorsal one predominating, the whole contained in a small, spherical pharyngeal bulb. Oesophagus with club-shaped prebulbar swelling and distinct posterior bulb. Tail conical, pointed, without spinneret. Anterior lip of anus prominent. In the male two large submedian preanal papillae and two smaller postanal papillae present. Spicules rudimentary. A single testis, reflexed. Vulva not prominent, in the anterior third of the body. Ovaries paired, parallel, posterior and reflexed. Eggs numerous, elongated and ellipsoidal; may be segmenting when laid.

Hab. Intestine of a Cockroach (*Panesthia*). Australia.
Genotype : *B. sphaerolaima* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 271 and key.

15. *Cephalobium* Cobb, 1920.

Cuticle with fine transverse striations. Lateral alae present. Lateral organs absent. Lateral fields each contain about thirteen pores, of which the posterior pair is on the tail. Head with six bristle-like papillae. Buccal capsule composed of two portions and with a large, complex "glottoid organ" at its base. Oesophagus with a pronounced prebulbar swelling, in front of the nerve-ring, and a very slight posterior bulbous swelling. Tail conical, without spinneret. In the male one pair of preanal papillae and five pairs of postanal papillae

present. Spicules two, slender, tapering, ending in minute "buttons," and with four slender supporting rods towards their distal ends. A strong, straight accessory piece present. Testis single, not reflexed. Vulva prominent, at about the middle of the body. Ovaries opposed, reflexed.

Hab. Intestine of a Cricket (*Gryllus*).

Genotype: *C. microbivorum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 270 and key.

16. *Lepidonema* Cobb, 1898.

Cuticle, at least in anterior region, bearing longitudinal rows of scales. Head narrower than neck. Lips obscure. A very short buccal capsule present. Oesophagus club-shaped, with a distinct pyriform posterior bulb. Tail of male short, conical, ending in a short spike, and with a pair of large postanal papillae near the tip. A pair of small preanal papillae present. Spicules paired (?), short. Accessory piece apparently absent. Tail of female conical, with bifurcated tip. Vulva a little behind the middle of the body. Uterine branches opposed. Ovaries reflexed.

Hab. "In the larva of an insect" (one species known).

Genotype: *L. bifurcata* Cobb, 1898.

Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 315.

The only description available is contained in Cobb's fig. 36, with its legend and formula.

17. *Hystrignathus* Leidy, 1850.

Syn. *Xyo* Cobb, 1898.

Anterior region of body bearing transverse rows of simple, backwardly directed spines or scales. Mouth on the summit of a large, naked cone. Oesophagus long, cylindrical, ending in a distinct pyriform posterior bulb with a narrow neck. There is apparently a short pharynx, narrower behind, and with longitudinal supporting rods. Male unknown. Tail of female tapering. Vulva slightly behind middle of body. Uterine branches opposed. Ovaries reflexed. Eggs oval.

Hab. Intestine of Beetles (*Passalus*).

Genotype: *H. rigidus* Leidy, 1850.

Leidy, 1850, *Proc. Acad. Nat. Sci. Philadelphia*, v, 102; 1853, *Smithsonian Contr. Knowl.*, Washington, v, 44; Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 315; Johnston, 1913, *Proc. R. Soc. Queensland*, Brisbane (1912), 75.

18. *Heth* Cobb, 1898.

Head narrower than body, separated from it by a constriction, and provided externally with four submedian double

fringes. Neck ornamented with fringed "epaulettes," and behind these two pairs of lateral bifurcated lappets. Mouth a vertical (?) slit, bordered with fringes. Apparently eight setiform cephalic papillae and two circular lateral organs present. Oesophagus preceded by a tubular pharynx, and followed by a pyriform muscular bulb. Male undescribed. Tail of female tapering. Vulva near anus. Uterine branches parallel. Ovaries reflexed. Eggs segmenting when laid.

Hab. Intestine of a Myriopod (*Julus*). (One species known).
Genotype: *H. juli* Cobb, 1898.

Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 299.

The only description available is contained in Cobb's fig. 10, with its legend and formula. According to the legend, the organs which we have called lateral organs in our diagnosis are "two dorso-ventral markings." This would imply that the mouth is a horizontal slit, and not a vertical one as we have stated. On the other hand, the paired cervical organs which we have called lappets are termed by Cobb "dorso-ventral fins," but are figured (figs. II and IV) as being lateral in position.

APPENDIX TO RHABDITINAE.

The following two genera should probably be regarded as Rhabditinae greatly modified in consequence of their highly-specialised habits.

19. *Allantonema* Leuckart, 1884.

Syn. *Bradynema* zur Strassen, 1892; *Tylenchomorphus* Fuehs, 1914; *Howardula* Cobb, 1921.

Parasitic form (female), when fully grown, more or less sausage-shaped, without mouth, anus or alimentary canal. Genital tube single, the uterus greatly swollen and filling almost the whole body-cavity. Vulva at or near the posterior end of the body. Ovary long, doubly reflexed. Viviparous, numerous embryos escaping into the body-cavity of the host, and finally to the exterior.

Free-living form (bisexual) of typical Nematode shape. Head truncate, with very small lips. Oesophagus with a muscular anterior portion ending in a bulb, followed by a club-shaped glandular portion. A short, three-sided buccal capsule present. Tail conical in both sexes. In the male, the tail ends in a small spike, has narrow alae, and may carry two pairs of small preanal papillae. Spicules paired, short and slender. A very small accessory piece present. Vulva slightly behind the middle of the body. Female genital tubes paired, opposed, reflexed. Oviparous. Eggs few, segmenting when laid.

Hab. Parasitic forms in body-cavity of Beetles and their larvae, either free or encapsuled. Free-living forms in soil, or in material on which the beetles feed.

Genotype: *A. mirabile* Leuckart, 1884.

v. Siebold, 1836, *Arch. f. Anat., Physiol. u. wiss. Med.*, Berlin, 33; Leuckart, 1884, *Tagebl. 57 Versamml. deutsch. Nat. u. Aerzte*, Magdeburg, 320; 1887, *Abh. Math.-Phys. Cl. k. Sachs. Ges. Wiss.*, Leipzig, xiii, 567; zur Strassen, 1892, *Zeitschr. f. wiss. Zool.*, liv, 655; Fuchs, 1914, *Zool. Jahrb., Syst.*, xxxviii, 183; Cobb, 1921, *Science*, liv, 667; Wülker, 1923, *Zool. Anz.*, lvi, 160.

The parasitic stages of *Allantonema* [*Filaria*] *rigida* (v. Siebold, 1836), which was made by zur Strassen the type of a new genus, *Bradynema*, seem to agree in all essential characters with those of *A. mirabile*. Its free-living stages have not been described. zur Strassen was led to believe that, though the larvae which escaped to the exterior from the host developed into forms of both sexes, only the male forms took any part in the propagation of the race. These, he believed, penetrated into new hosts and became protandrous hermaphrodites, while the young potential females died, without becoming parasitic or giving birth to any offspring. In *A. mirabile*, according to Leuckart, there is a definite alternation of generations, the parasitic form, which is the offspring of the fertilized free-living female form, being a protandrous hermaphrodite. On the other hand, Wülker, as the result of a recent re-study, states that the parasitic form is the female free-living form itself, which is fertilized before penetrating into the host. He believes that the life-history is probably similar in *Bradynema*, *Sphaerularia*, *Atractonema* and *Howardula*.

20. *Sphaerularia* Dufour, 1837.

Syn. *Atractonema* Leuckart, 1887, *nec* Stein, 1878; *Asconema* Leuckart, 1887, *nec* *Askonema* Kent, 1870.

Parasitic form (female) penetrates into host probably immediately after fertilization. Here the vaginal region of the ventral surface grows out into a long appendage (finally becoming many times as large as the body of the worm), into which pass the uterus and fat-body or modified intestine. The body then becomes an empty sac, and may ultimately become detached. Embryos hatch *in utero* and escape into body-cavity of host.

Free-living form. The larva, after leaving the host, lives for several months without taking food. The mouth is completely closed by a stylet-like organ (which, according to Leuckart, is not a true stylet, and which may perhaps represent the buccal capsule). Oesophagus with median and posterior

fusiform swellings. Intestine a fat-body, without functional anus. The mature forms retain the stylet-like organ and the same structure of the alimentary canal. The head is rounded, the tail conical. The male has two very short and slender spicules and a very small accessory piece. Male genital tube single, short and reflexed. Vulva towards the posterior end of the body. Female genital tubes paired, opposed, but only the anterior branch of the uterus well developed and having a reflexed ovary; the posterior branch a small blind appendage.

Hab. Parasitic stages in body-cavity of Insects. Free-living stages in soil, etc.

Genotype: *S. bombi* Dufour, 1837.

Dufour, 1837, *Ann. Sci. Nat.*, Paris, Zool., (2) vii, 9; Leuckart, 1886, *Zool. Anz.*, ix, 743; 1887, *Abh. Math.-Phys. Cl. k. Sachs. Ges. Wiss.*, Leipzig, xiii, 614, 678.

Atractonema gibbosum, the genotype of *Atractonema*, does not appear to possess characters sufficiently distinctive to separate it generically from *Sphaerularia*.

Subfam. 2. **CYLINDROLAIMINAE** Micoletzky, 1922.

Buccal cavity elongate, typically cylindrical, without teeth. Lateral organs and caudal glands generally present. Excretory system usually in the form of a ventral unicellular gland.

1. **Cylindrolaimus** de Man, 1880.

Cuticle finely striated, without lateral alae or bristles. Head not distinct, without lips or papillae, but with bristles. Buccal capsule an elongate, cylindrical, or probably prismatic tube. Oesophagus cylindrical, very little enlarged posteriorly. Lateral organs circular, situated anteriorly. Tail of male elongate, sometimes with terminal spike, with one or more median preanal papillae. Spicules slender, without midrib. No accessory piece. Tail gland opens at the tip of the tail. Vulva in middle region or posterior part of body. Female genital tubes paired or unpaired.

Hab. In moist soil, sand or fresh water.

Genotype: *C. communis* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 34; 1884, *Die frei . . . lebenden Nematoden der Nederl. Fauna*, 82; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 204.

2. **Siphonolaimus** de Man, 1893.

Syn. *Anthraconema* zur Strassen, 1904.

Cuticle finely striated, with bristles. Head without lips, but with bristles. Mouth surrounded by six (?) small bristle-

like papillae. Lateral organs circular. Buccal capsule shaped like a slender, inverted funnel, and resembling a "stylet." Oesophagus swollen in front and behind, without bulb. Caudal end of male with a median preanal series of numerous papillae. Spicules slender. An accessory piece, with two oblique posterior processes, present. Female genital tube single, anterior. Caudal glands present.

Hab. Marine.

Genotype : *S. niger* de Man, 1893.

de Man, 1893, *Mém. Soc. Zool. France*, vi, 99; zur Strassen, 1904, *Zool. Jahrb.*, Suppl. vii, 302; Steiner, 1916, *Zool. Jahrb.*, *Syst.*, xxxix, 631.

3. *Chromagaster* Cobb, 1894.

Cuticular striations, if present, very fine. Bristles present throughout the body, but conspicuous only towards the extremities. Cephalic bristles present, in two crowns. Neck constricted behind the lateral organs. Lips inconspicuous, sometimes six in number. Buccal capsule short, narrow and tubular. Oesophagus club-shaped, gradually expanding into a bulb. Tail of male conical. Spicules equal, slender. Two accessory pieces, somewhat L-shaped. Testis single. Vulva not conspicuous. Female genital tube single, outstretched. Caudal glands absent.

Hab. Marine, in mud or sand.

Genotype : *C. purpurea* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, viii, 416; Steiner, 1916, *Zool. Jahrb.*, *Syst.*, xxxix, 633.

According to Steiner (1916) *Chromagaster nigricans*, the second species of this genus, is to be referred to *Siphonolaimus* de Man, but it is uncertain whether the genotype of *Chromagaster* is also a *Siphonolaimus*. The genus *Chromagaster* is therefore retained.

4. *Camacolaimus* de Man, 1889.

Syn. *Acontiolaimus* Filipjev, 1918.

Cuticle striated. Short cephalic bristles present. Lateral organs circular, or incipient spirals. Buccal capsule small, thickened on the dorsal side to form a rod-shaped chitinous structure or a "claw-shaped mobile tooth" (Filipjev). Oesophagus without bulb. Tail of male without preanal papillae. Two equal spicules and a small accessory piece. Female genital tubes symmetrical and reflexed. Caudal glands present.

Hab. Marine.

Genotype : *C. tardus* de Man, 1889.

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de Man, 1889, *Mém. Soc. Zool. France*, ii, 8; Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 186; 1922, *Act. Inst. Agronom. Stauropol*, I, (Zool.), 16, 110.

5. *Dermatolaimus* Steiner, 1916.

Cuticle striated. Body without bristles. Four submedian cephalic bristles present. Head distinct, abruptly conical. Lateral organs circular, incomplete behind, with posterior prolongations. Apparently no lips. Buccal capsule very narrow and elongated. Oesophagus slender, expanding gradually into a posterior bulb. Male unknown. Female genital tubes paired, symmetrical, reflexed.

Hab. Marine, arctic.

Genotype: *D. ditlevseni* Steiner, 1916.

Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 603.

6. *Gymnolaimus* Cobb, 1913.

Cuticle unstriated. Lips inconspicuous, three in number (?). Cephalic bristles absent. Lateral organs absent. Buccal capsule very long, slender. Oesophagus cylindrical, joined by a narrow neck to a pyriform bulb. Tail in both sexes long and tapering. Vulva at about the middle of the body. Female genital tube single, outstretched. Caudal glands and spinneret absent.

Hab. Soil.

Genotype: *G. [Aulolaimus] exilis* (Cobb, 1893).

Cobb, 1893, *Macleay Mem. Vol., Linn. Soc. N.S.W.*, Sydney, 289; 1913, *Journ. Washington Acad. Sci.*, 434.

7. *Leptolaimus* de Man, 1876.

Cuticle of body striated, with lateral alae and occasional bristles. Head distinct, without lips or bristles. Lateral organs circular. Buccal capsule an elongate, thin-walled tube. Oesophagus cylindrical, swollen into a bulb posteriorly. Tail of male slender, with several lateral "bristle-papillae" and with a knob-like termination on which the caudal gland opens. A median row of preanal papillae present, extending from just in front of the cloaca to the posterior oesophageal region, the four most anterior papillae being tubular and chitinized. Spicules slender. A single accessory piece present.

Hab. Soil, or brackish water.

Genotype: *L. papilliger* de Man, 1876.

de Man, 1876, *Tijdschr. Nederl. dierk. Vereen.*, 's Gravenhage and Rotterdam, 168; 1884, *Die frei . . . lebenden Nematoden der Niederl. Fauna*, 81.

8. Aulolaimus de Man, 1880.

Cuticle unstriated. No lateral alae or bristles. Head not distinct, without lips or bristles. Lateral organs apparently absent. Buccal capsule an elongate, thin-walled, narrow tube, much longer than the oesophagus. Tail of male with a few median preanal papillae. Spicules slender. A single accessory piece, bent posteriorly. Female genital tubes paired, symmetrical. Caudal gland apparently absent.

Hab. Sandy soil or fresh water.

Genotype: *A. oxycephalus* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 30; 1884, *Die frei . . . lebenden Nematoden der Nederl. Fauna*, 78.

9. Isolaimium Cobb, 1920.

Cuticle apparently unstriated. Lips and cephalic bristles absent. Buccal capsule tubular. Oesophagus "plain," without median or posterior enlargement. Tail of male bluntly conical, with four pairs of papillae. Six papilliform supplementary organs present. Spicules slender, blunt. A single slender accessory piece present, with a very small posterior process. Testes paired, opposed, outstretched. Female genital tubes opposed, reflexed.

Hab. Soil.

Genotype: *I. papillatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 258 and key.

10. Cryptonchus Cobb, 1913.

Cuticle finely striated, without bristles. Lateral alae present. Head not distinct, with six indistinct lips and a crown of very small papillae. Buccal capsule tubular, like that of *Cylindrolaimus*, but with a small dorsal tooth at its base. Oesophagus without bulb. Male unknown. Vulva in middle region of body. Female genital tube single, outstretched. Caudal glands and spinneret present.

Hab. About roots of fresh-water plants.

Genotype: *C. nudus* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, 441; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 210.

11. Ceramonema Cobb, 1920.

Cuticle with coarse annulations, each composed of eight imbricated elements. Neck region with small bristles in longitudinal rows. Six cephalic bristles present. Lips indistinct. Lateral organs crook-shaped. Buccal capsule very slender. Oesophagus "plain," slightly expanded behind.

Male of genotype unknown. In another species, tail of male without supplementary organs. Spicules stoutish. A single accessory piece present. Female genital tubes paired, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *C. attenuatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 264 and key.

12. *Colpurella* Cobb, 1920.

Cuticle finely striated, without lateral alae or bristles. Six lips present. Lateral organs trapezoidal. Buccal capsule long and tubular. Oesophagus with slight posterior swelling. Caudal end of male with five papillate supplementary organs. Testes paired, parallel. Spinneret absent. Female unknown.

Hab. Fresh water.

Genotype : *C. fontinalis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 257 and key.

13. *Cynura* Cobb, 1920.

Cuticle without bristles. Lateral alae present. Head with four cephalic bristles. Lateral organs spiral. Buccal capsule narrow and elongate. Oesophagus cylindrical, slightly swollen posteriorly. Male unknown. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *C. uniformis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 262 and key.

14. *Xinema* Cobb, 1920.

Cuticle finely striated. Body with papilliform bristles, and without lateral alae. Lateral organs spiral. Head with three lips and four bristles. Pharynx apparently narrow, tubular. Oesophagus cylindrical, gradually expanding behind. Caudal end of male without supplementary organs or special bristles. A pair of jointed spicules, and a pair of accessory pieces, with long posterior processes, present. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, outstretched, or, occasionally, reflexed at their ends. A pair of "spermathecae" apparently present, extending, when filled, to near the bases of the ovaries. Caudal glands present, near the anus.

Hab. Marine.

Genotype : *X. perfectum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 263 and key.

15. Halinema Cobb, 1920.

Cuticle with a few short bristles in neck region. Head with ten bristles, four of which are very long. Lateral organs circular. Buccal capsule short and wide. Oesophagus cylindrical, very slightly swollen posteriorly. Caudal end of male with preanal supplementary organs. Spicules slender. Two accessory pieces present, with tapering posterior processes. Testes paired, opposed (?). Tail of female with eight pairs of subventral bristles. Female genital tubes paired, the posterior vestigial. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *H. spinosum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 267 and key.

16. Crystallonema Cobb, 1920.

Cuticle with scattered bristles in neck region. Longitudinal fields contain large, doubly-refractive, crystalline masses. Head with ten bristles, four of which are long and two-jointed. Mouth surrounded by several labial "palps." Lateral organs circular. Buccal capsule short and wide. Oesophagus with a faint, elongate, more or less pyriform posterior swelling. Caudal end of male without supplementary organs or caudal bristles. Accessory piece with a posterior process. Testis single, outstretched. Female genital tubes paired, opposed, but posterior uterine branch vestigial. Ovary outstretched. Spinneret absent.

Hab. Marine.

Genotype: *C. simile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 282 and key.

17. Halanonchus Cobb, 1920.

Cuticle without bristles or lateral alae. Head with three crowns each of six bristles. Lips inconspicuous. Lateral organs circular. Buccal capsule deep and wide, supported by longitudinal ribs. Oesophagus cylindrical, without bulb. Caudal end of male with fifteen to eighteen inconspicuous supplementary organs. Spicules blunt. A single accessory piece present. Testes paired, opposed, outstretched. Female genital tube single, posterior, outstretched. Spinneret absent.

Hab. Marine.

Genotype: *H. macrurus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 266 and key.

18. Illium Cobb, 1920.

Cuticle finely striated, without bristles or lateral alae. Head truncate. Ocelli present. Lips inconspicuous. Cephalic

bristles absent. Lateral organs goblet-shaped. Buccal capsule rather short, prismoid. Oesophagus club-shaped. Male unknown. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *I. exile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 261 and key.

19. *Laimella* Cobb, 1920.

Cuticle finely striated, with submedian rows of bristles.* Lateral alae absent. Head rounded, with ten cephalic bristles. Lips not apparent. Lateral organs spiral. Buccal capsule apparently very narrow. An extremely minute tooth present (?). Oesophagus with oval bulb posteriorly. Male unknown. Female genital tubes paired, opposed, outstretched. Caudal glands and spinneret doubtful.

Hab. Marine.

Genotype : *L. longicauda* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 261 and key.

20. *Omicronema* Cobb, 1920.

Cuticle rather coarsely striated, without bristles. Slight lateral alae present. Head not distinct, with three crowns each of six bristles. Lateral organs circular. Lips inconspicuous. Buccal capsule relatively short and broad. Oesophagus slightly swollen posteriorly. Caudal end of male without supplementary organs. Preanal and postanal submedian bristles present. Spicules slender. A sigmoid accessory piece present. Testis single, outstretched. Female genital tube single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *O. litorium* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 265 and key.

21. *Pseudolella* Cobb, 1920.

Cuticle finely striated, without bristles or lateral alae. Head not distinct, with four bristles. Lateral organs long and slender, band-like. Lips indistinct. Buccal capsule long, tubular, slightly expanded posteriorly, apparently with a small ventral tooth at its anterior end. Oesophagus without bulb. Caudal end of male without bristles. Spicules acutely pointed. Two accessory pieces present, with blunt posterior processes.

* In the text of Cobb's description the cuticle is also said to be "naked." The bristles are mentioned in connection with the tail, and are there said to occur throughout the body.

Testes paired, the anterior reflexed, the posterior outstretched. Female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *P. granulifera* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 268 and key.

22. *Rhadinema* Cobb, 1920.

Cuticle apparently unstriated, without bristles or alae. Head not distinct, with four bristles. Lateral organs circular. Lips confluent. Buccal capsule minute, shallow and cup-shaped, its wall supported by six small longitudinal ribs. Oesophagus slightly swollen posteriorly. Male unknown. Female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Marine (in sand).

Genotype : *R. flexile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 256 and key.

23. *Rhynchonema* Cobb, 1920.

Cuticle rather coarsely striated, without bristles. Head not distinct, with ten bristles. Lateral organs circular. Lips confluent. Buccal capsule long and tubular. Oesophagus without bulb. Caudal end of male with three minute supplementary organs. Spicules slender. A single accessory piece present. Testis and female genital tube single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *R. cinctum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 260 and key.

24. *Myetolaimus* Cobb, 1920.

Cuticle faintly striated. No lateral alae or bristles. Head with six large conical lips. Lateral organs absent. Buccal capsule very long, about twice as long as the oesophagus, in two approximately equal parts; the anterior part a simple, narrow tube, the posterior an elongate bulb with triangular lumen. Oesophagus a narrow tube, gradually expanding into a posterior bulb. Tail of male without alae or supplementary organs. Nine pairs of papillae present, of which six are postanal. Spicules slender. Two accessory pieces, sigmoid. Testis single, reflexed. Tail of female conically pointed. Female genital tubes paired, opposed, reflexed. Spinneret absent.

Hab. In sheep-dung.

Genotype : *M. pellucidus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 276 and key.

25. *Plectus* Bastian, 1865.

Syn. *Plectoides* de Man, 1904 (as subgenus); *Anthonema* Cobb, 1906; *Pycnolaimus* Cobb, 1920.

Cuticle transversely striated, with scattered fine bristles. Lateral alae present. Head may or may not be distinct, with four or six bristles. Lateral organs elliptical or circular, or semicircular and open behind. Lips, if distinguishable, three or six. Buccal cavity elongate, three-sided. Male of genotype and most other species unknown. When known, the male usually has an accessory piece, preanal and postanal papillae and a single testis. Female genital tubes paired, symmetrical, and short, with a long reflexion. Caudal glands present.

Hab. In moss, roots of plants, moist soil, etc.; also in fresh water.

Genotype: *P. parietinus* Bastian, 1865. (See Stiles and Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, 103).

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 118; Micoletzky, 1914, *Zool. Jahrb., Syst.*, xxxvi, 454; 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 211.

25a. Subgenus *Wilsonema* Cobb, 1913.

Subgenus of *Plectus*, according to Micoletzky (1922).

Plectus with the anterior end furnished with lamellar cuticular expansions or processes.

Hab. Soil.

Genotype: *W. [Plectus] cephalatum* (Cobb, 1893).

Cobb, 1893, *Nematode Worms found attacking Sugar-cane*, N. South Wales Agric. Dept; 1913, *Journ. Washington Acad. Sci.*, iii, 443; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 241.

26. *Aplectus* Cobb, 1914.

Cuticle finely striated. Lateral alae present. Bristles present in the neck region. Lateral organs circular. Lips very indistinct. Buccal capsule long, probably in two parts, the anterior part narrow and tubular, the posterior a muscular pharynx. Oesophagus cylindrical, with a small bulb posteriorly. Caudal end of male with three protrusible supplementary organs and postanal bristles. Spicules rather strong. Two rather strong, slightly bent accessory pieces present. Testes paired, opposed, outstretched. Female genital tubes paired, symmetrical, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *A. antarcticus* Cobb, 1914.

Cobb, 1914, *Contr. Sci. Nematol.*, i, 12.

27. *Haliplectus* Cobb, 1913.

Cuticle finely striated, without bristles. Head truncate, without bristles. Lateral organs circular. Buccal capsule, if present, very narrow. Oesophagus with median and posterior bulbs. Caudal end of male with six supplementary organs. About six pairs of postanal papillae present. An accessory piece present. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Brackish and sometimes fresh water.

Genotype: *H. pellucidus* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 443 and key.

28. *Aulolaimoides* Micoletzky, 1917.

Cuticle unstriated, without bristles or lateral alae. Head not distinct, truncate, without bristles. Lateral organs semi-circular, open behind. Buccal capsule narrow, three-sided. Oesophagus with a spindle-shaped median swelling and a somewhat cylindrical posterior bulb. Caudal end of male with preanal and postanal papillae. An accessory piece present. Testis single. Female genital tubes paired, the anterior branch vestigial, both reflexed. No caudal gland or spinneret.

Hab. Mud.

Genotype: *A. elegans* Micoletzky, 1917.

Micoletzky, 1917, *Zool. Jahrb., Syst.*, xl, 516; 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 244.

29. *Bolbonema* Cobb, 1920.

Cuticle finely striated, with bristles. Lateral alae absent. Head somewhat wider than neck. Lips indistinct. Lateral organs spiral. Buccal capsule short and narrow. Oesophagus cylindrical, with pyriform posterior bulb. Male unknown. Tail of female conical. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine (in mud).

Genotype: *B. brevicolle* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 264 and key.

Subfam. 3. **BUNONEMINAE** Micoletzky, 1922.

Free-living forms. Body plump, with dorsal or lateral pairs of "warts" or crusty prominences, which are asymmetrical. Cuticle usually with lateral alae. Lateral organs inconspicuous. Head retractile, with large bristles and lamellae. Buccal cavity three-sided. Tail of male with rudimentary "bursa"

and with papillae. Uterine branches two, reflexed. No caudal glands or spinneret.

1. *Bunonema* Jägerskiöld, 1905.

Syn. *Bogdanowia* Zograf, 1913.

Cuticle apparently smooth, except between the rows of warts, where it is finely tessellated or slightly granular. Slight lateral alae typically present. One or two rows of paired "warts," usually lateral. Buccal cavity apparently three-sided. Labial structures complex, asymmetrical and apparently protrusible. A variable number of cephalic bristles present. Oesophagus with a true posterior bulb and a slight median swelling. Tail of male with about eight pairs of papillae, three pairs of which are preanal. Two equal spicules and an accessory piece present.

Hab. In moss or rotting wood.

Genotype: *B. richtersi* Jägerskiöld, 1905.

Jägerskiöld, 1905, *Zool. Anz.*, xxviii, 557; Cobb, 1915, *Contr. Sci. Nematol.*, iii, 101; Zograf, 1913, *Zool. Anz.*, xli, 162.

2. *Craspedonema* Richters, 1908.

Cuticle with "crust-like" swellings irregularly distributed all over the dorsal surface, but smooth ventrally. Lateral alae well developed, with jagged edges. Head distinct, conical, probably surrounded by six pointed cuticular flaps in front. Buccal cavity three-sided. Oesophagus without median swelling. Male with slender spicules and linear accessory piece.

Hab. In moss.

Genotype: *C. javanicum* Richters, 1908.

Richters, 1908, *Ber. Senckenb. Ges.*, Frankf. a. M., 23; Steiner, 1916, *Zool. Anz.*, xlvi, 332.

APPENDIX TO RHABDITIDAE.

The following genera are referred to the family with some uncertainty, and owing to the present rather unsatisfactory characterization of the subfamilies Rhabditinae and Cylindrolaiminae, we do not attempt to refer these doubtful genera to either group.

a. *Zalonema* Cobb, 1920.

Cuticle finely striated, without bristles or lateral alae. Head not distinct, with four bristles (?). Lateral organs spiral. Pharynx tubular, sinuous, with two prominent irregularities of its wall, one dorsal and one ventral. Oesophagus cylindrical, with broad pyriform posterior bulb. Caudal end of male with preanal alae, but without supplementary organs.

Two accessory pieces present. Testis apparently single, anterior, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *Z. nudum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 272 and key.

b. *Monhystrium* Cobb, 1920.

Cuticle unstriated, without bristles or lateral alae. Head not distinct, with ten short bristles. Lips three, more or less fused. Lateral organs small, circular. Buccal capsule very much reduced, funnel-shaped. Oesophagus with a pyriform posterior bulb. Caudal end of male without supplementary organs, but with several pairs of postanal papillae. Testis single, anterior, outstretched. Female genital tubes paired, opposed, the posterior branch vestigial.

Hab. Gill-chambers of Land-crabs.

Genotype: *M. transitans* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 284 and key.

c. *Tripylium* Cobb, 1920.

Cuticle smooth, without bristles or alae. Head not distinct, with six papilliform bristles and six labial papillae. Lateral organs incipient spirals. Pharynx wide, thick-walled, forming anteriorly three jaw-like inward projections on the inner surfaces of the lips. Oesophagus cylindroid, with a distinct bulb-like swelling posteriorly. Tail of male with three pairs of inconspicuous subventral papillae. Spicules slender. A slender accessory piece present. Testis single, reflexed at extreme end. Female genital tube single, anterior, outstretched. Viviparous. Caudal glands and spinneret present.

Hab. Gill-chambers of Land-crabs.

Genotype: *T. [Monhystera] carcinicola* (Baylis, 1915).

Baylis, 1915, *Ann. Mag. Nat. Hist.*, (8) xvi, 418; Cobb, 1920, *Contr. Sci. Nematol.*, ix, 288 and key.

There are some discrepancies between the original description of "*Monhystera*" *carcinicola* and Cobb's account of *Tripylium carciniculum*, but the material upon which both were based appears to have come from the same source, and presumably the species is the same. According to the original description, there was evidence that *M. carcinicola* was a protandrous hermaphrodite. The systematic position of *Tripylium* is difficult to determine. Its habits and general organization suggest that it should be placed near *Monhystrium*, which is here regarded as possibly belonging to the Rhabditidae. The presence of the three jaw-like structures

at the entrance to the pharynx might, however, be taken to indicate relationship with the Oncholaimidae, and it would be possible to include the genus in the subfamily Ironinae.

d. Leptodera Dujardin, 1845.

Syn. *Alloionema* Schneider, 1859; *Alloeonema* Leuckart, 1863.

Body fusiform, tapering finely at both extremities. Mouth with bilobed (?) border. A tubular buccal cavity present. Oesophagus with a large posterior club-shaped swelling. Caudal end of male with short alae supported by five or six pairs of elongate papillae. Behind the alae the tail tapers to a fine filament. Spicules equal, strongly curved, broad at the roots. A small accessory piece present. Testis outstretched. Vulva in the middle of the body. Female genital tubes apparently opposed, outstretched. Viviparous.

Hab. Genotype in the vas deferens of a slug. Other species found in soil, decaying substances, etc., have been referred to the genus.

Genotype: *L. flexilis* Dujardin, 1845.

Dujardin, 1845, *Histoire nat. des Helminthes*, Paris, 108; Schneider, 1866, *Monographie der Nematoden*, Berlin, 154.

e. Streptogaster Cobb, 1898.

Head not distinct. Lips obscure. Buccal capsule cylindrical, apparently with four (?) supporting rods in its wall, each having a small tooth at about its middle. Oesophagus proper long and cylindrical, followed by a pyriform posterior bulb with a short, narrow neck. Tail of male conical. Apparently a single spicule and two accessory pieces present. Several pairs of preanal and postanal papillae present. Testis single, anterior, reflexed. Female not described.

Hab. Not mentioned (presumably free-living).

Genotype: *S. papillatus* Cobb, 1898.

Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 320.

We have endeavoured to extract sufficient characters for a generic diagnosis from the figures of the male given by Cobb. The only description available is contained in the legend to these figures, and the formula. It appears unlikely that the genus can be recognized by means of the data available.

f. Walcherenia de Man, 1921.

Cuticle striated, apparently without bristles or lateral alae. Head with bristles. Lateral organs unknown. Buccal capsule cylindrical, suddenly constricted behind. Oesophagus

with a posterior bulb. Male unknown. Female genital tube single, anterior. Caudal glands absent.

Hab. Sand, near coast.

Genotype : *W. typica* de Man, 1921.

de Man, 1921, *Capit. Zool.*, i, 14.

This diagnosis is based on a single immature female.

g. *Terschellingia* de Man, 1888.

Cuticle unstriated, with a few small bristles anteriorly. Head distinct, without lips, but with small bristles. Buccal capsule very small. Oesophagus extremely short, with a large posterior bulb having a dilated lumen. Caudal end of male without papillae. Spicules short. An accessory piece, with two posterior processes, present. Female genital tubes paired, opposed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *T. communis* de Man, 1888.

de Man, 1888, *Mém. Soc. Zool. France*, i, 11; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 183.

gg. Subgenus *Oligomonohystera* Micoletzky, 1922.

(Subgenus of *Terschellingia*.) *

Lateral organs circular or slit-like. Buccal capsule small and typical, or spacious. Female genital tubes paired, opposed.

Hab. Marine and terri-colous.

Type : *Terschellingia* (O.) [*Monhystera*] *elongata* (Bütschli, 1874).

Bütschli, 1874, *Abhandl. Senckenb. naturf. Ges.*, Frankfurt a. M., ix, 262; Micoletzky, 1922, *Arch. f. Naturg.*, lxxxvii, 168.

h. *Chronogaster* Cobb, 1913.

Cuticle finely striated, without bristles or alae. Head not distinct, with four bristles. Lateral organs trapezoid, open behind. Buccal capsule funnel-shaped. Oesophagus with a posterior bulb. Caudal end of male with nine protrusible preanal supplementary organs. Testes paired, opposed, out-stretched. Female genital tube single, anterior, reflexed. Caudal glands and spinneret present.

Hab. Fresh water.

Genotype : *C. gracilis* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 443 and key.

* *Oligomonohystera* was proposed by Micoletzky (1922) as a subgenus of *Monhystera*. The only character serving to distinguish it from *Monhystera s.s.* is the fact that the female genital tubes are paired. We consider that this character excludes it from that genus, and suggests its inclusion in the genus *Terschellingia*.

i. *Dasynema* Cobb, 1920.

Cuticle very coarsely striated, without bristles, but with eight longitudinal alae. Head with two crowns of bristles. Lips three, each armed at the summit with a short internal tooth. Lateral organs spiral. Buccal cavity rather narrow. Oesophagus with a median club-shaped swelling and a distinct posterior bulb. Caudal glands and spinneret present. Description based on a single immature specimen, apparently of unknown sex.

Hab. Marine.

Genotype : *D. sexalineatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 253 and key.

j. *Halaphanolaimus* Southern, 1914.

Cuticle coarsely striated. Head separated from body by a circular groove, and with four submedian bristles. Lateral organs spiral. Neck with "chitinous gland-ducts," three in male, two in female, on ventral surface. A narrow buccal capsule present. Oesophagus with a posterior bulb. Caudal end of male apparently with preanal supplementary organs. Two simple accessory pieces present. Testes paired, parallel. Female genital tubes paired, symmetrical. Caudal glands present.

Hab. Marine.

Genotype : *H. pellucidus* Southern, 1914.

Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 11.

k. *Antomicron* Cobb, 1920.

Syn. *Eutelolaimus* de Man, 1922.

Cuticle coarsely striated, without bristles. Lateral alae present. Head with bristles. Lateral organs each consisting of two concentric ellipses. Buccal capsule very minute, conoid. Oesophagus expanding in middle and with a small, elongate, posterior bulb. Caudal end of male with eight preanal, protrusible supplementary organs. Preanal and postanal bristles present. Accessory piece present. Testes paired, opposed; the anterior outstretched, the posterior reflexed. Female genital tubes paired, symmetrical, reflexed. Caudal glands present.

Hab. Marine.

Genotype : *A. pellucidum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 241 and key; de Man, 1922, *Tijdschr. Ned. Dierk. Ver.*, xviii, 126.

de Man, in describing *Eutelolaimus*, from females only, suggests that this genus is probably identical with *Antomicron* Cobb, of which the male only has been described.

1. *Laxonema* Cobb, 1920.

Cuticle coarsely striated, with irregularly-distributed bristles, and without lateral alae. Cuticle of head radially striated, with four bristles and a double crown of papillae. Lateral organs tubular, open in front. Buccal capsule very small. Oesophagus with pyriform posterior bulb. Caudal end of male with minute longitudinal striations, without supplementary organs or caudal papillae. Spicules rather stout. An accessory piece present. Testis single, outstretched. Caudal glands and spinneret present. Female unknown.

Hab. Marine.

Genotype: *L. majum* Cobb, 1920 [rectius *majus*].

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 243 and key.

m. *Pararhabditis*, nom. nov.

Syn. *Pseudorhabditis* Szüts, 1912, nec Perroncito, 1880.

Body tapering towards each end. Head "pointed in the manner of a ninepin," with three naked lips. Cuticle longitudinally striated. Anterior portion of body covered thickly with curved, backwardly-directed spines, extending in constantly thinning rows to the middle of the body. Buccal cavity tubular, wide. Oesophagus with an oval median and a club-shaped posterior bulb. Vulva in posterior region of body. Female genital tubes symmetrical.

Hab. Parasitic in an Earthworm.

Genotype: *P.* [*Pseudorhabditis*] *entzi* Szüts, 1912.

Szüts, 1912, *Allatt. Közlem.*, Budapest, xi, 82.

Fam. 8. MERMITHIDAE Braun, 1883.

Greatly elongate and generally relatively slender forms (in the adult condition), with a smooth cuticle, frequently containing spiral fibres which run through it in criss-cross directions. Head usually with two lateral and four submedian papillae, and often with additional small circumoral papillae. A pair of lateral organs always present, usually well developed. Alimentary canal complete only in the larvae. In the early larval stage the mouth is provided with a piercing stylet, which is lost after penetration into the host. In the adults the oesophagus becomes reduced to a simple, narrow, cuticular tube, and the intestine becomes modified into a sausage-shaped, solid fat-body, without an anal opening. Genital tubes usually paired in both sexes. Caudal end of male without alae, but usually with three longitudinal rows of papillae. A pair of spicules or a single spicule present. Vulva at about the middle of the body. Vagina short and muscular,

frequently bent **S**-wise. Uterine branches opposed. Oviparous.

Hab. *Adults*, in soil or fresh water. *Larvae*, at first in soil or fresh water, afterwards becoming parasitic (until nearly full grown) in body-cavity of Arthropods (chiefly insects) or Mollusca.

1. *Mermis* Dujardin, 1842.

For synonyms see discussion below.

With the characters of the family.

Genotype: *M. nigrescens* Dujardin, 1842.

Dujardin, 1842, *Compt. rend. Acad. Sci.*, Paris, xv, 117; Hagmeier, 1912, *Zool. Jahrb., Syst.*, xxxii, 521; Daday, 1913, *Math.-natw. Ber. Ungarn*, Leipzig, xxvii, 214; Cobb, in Ward and Whipple, 1918, *Fresh-water Biology*; Steiner, 1923, *Journ. Hered.*, Washington, xiv, 147.

Attempts have been made to split up *Mermis* into a considerable number of genera. The characters available for this purpose are very slight and do not appear to be of sufficient importance to justify the erection of genera. Purely for the sake of convenience, it might be useful to retain the various names proposed as subgenera, but even this appears to us somewhat unnecessary at present. The following key, which is taken in a modified form from Cobb's article on the Mermithidae in Ward and Whipple's *Fresh-water Biology* (1918), indicates the nature of the classification adopted by some recent authors. To the genera included in the key must be added *Agamermis* Cobb, Steiner and Christie, 1923 (*Journ. Agric. Res.*, Washington, xxiii, 926), the only important character of which is that the parasitic larva, on entering its host, sheds a large portion of its body at a preformed "node." Some further genera have been still more recently proposed.

I. Subcuticula with only two longitudinal fields.

Cuticle with criss-cross fibres.

Spicules paired *Neomermis* v. Linstow, 1904.

II. Subcuticula with more than two longitudinal fields.

A. Longitudinal fields six.

a. Cuticle without criss-cross fibres.

a. spicules paired *Mesomermis* Daday, 1911.

b. spicule single.

a. Vagina of adult **S**-shaped

Limnomermis Daday, 1911.

β. Vagina of adult not **S**-shaped

Pseudomermis de Man, 1903.

b. Cuticle with criss-cross fibres.

a. Vagina of adult **S**-shaped.

a. spicule single . . . *Paramermis* v. Linstow, 1898.

β. spicules paired . . . *Mermis* Dujardin, 1842.

b. Vagina of adult not **S**-shaped

Bathymermis Daday, 1911.

B. Longitudinal fields eight.

a. Cuticle without criss-cross fibres

Hydromermis Corti, 1902.

b. Cuticle with criss-cross fibres

Eumermis Daday, 1911.

On the whole, we are inclined to the view that all these names should be regarded for the present as synonyms of *Mermis*, together with several others not included in the key, such as *Autoplectus* Balsamo-Crivelli, 1843, *Spinifer* v. Linstow, 1901 (*Jena. Zeitschr.*, xxxv, 418), *Tetradonema* Cobb, 1919 (*Journ. Parasitol.*, v, 185), *Aproctonema* Keilin, 1917 (*Compt. rend. Acad. Sci.*, Paris, clxv, 399), and *Gastromermis* Micoletsky, 1923 (*Zool. Anz.*, lv, 243). The last was proposed as a subgenus of *Paramermis*. *Agamomermis* Stiles, 1903, is not a generic name, but a collective name for immature Mermithidae.

Fam. 9. ANGUILLULINIDAE nov.

Syn. *Tylenchidae* Micoletzky, 1922.

Small, free-living, semi-parasitic or parasitic forms. Pharynx in the adult modified into a protrusible stylet or "spear." Oesophagus simple or with a median and a posterior bulb-like swelling. When two swellings are present, only the anterior of them is a muscular bulb. Caudal glands and spinneret usually absent.

Micoletzky (1922) divides the family Tylenchidae into three subfamilies (Diphtherophorinae, Dorylaiminae and Tylenchinae), basing his classification chiefly upon the structure of the stylet, which may be more or less evidently formed of three separate rods, and may show more or less obvious traces of three posterior knobs, one belonging to each of the rods. This system does not, however, appear to offer a natural classification of the group, and it seems to us that a somewhat more satisfactory subdivision is arrived at by considering primarily the characters of the oesophagus. There are two main types of oesophageal structure in the family, and if the genera be arranged in two groups according to the form of the oesophagus, it is possible to regard these as two subfamilies for which the comparatively well-known genera *Anguillulina* and *Dorylaimus* may stand as types.

Subfam. 1. ANGUILLULININAE nov.

Oesophagus with a median muscular bulb and a posterior non-muscular swelling, the latter sometimes not distinctly separated from the intestine.

1. *Anguillulina* Gervais & van Beneden, 1859.

Syn. *Anguina* Scopoli, 1777; *Tylelenchus* Bastian, 1865; *Tylenchus* Bastian, 1865; *Eutylenchus* Cobb, 1913; *Atylenchus*

Cobb, 1913; *Tylenchorhynchus* Cobb, 1913; *Dolichodoros* Cobb, 1914; *Iotonchium* Cobb, 1920; *Aphelenchulus* Cobb, 1920; *Parasitylenchus* Micoletzky, 1922; *Paratylenchus* Micoletzky, 1922; *Chitinotylenchus* Micoletzky, 1922.

Cuticle striated, without bristles. Lateral alae often present. Head usually not distinct, usually without lips, papillae or bristles. Lateral organs unknown. Stylet consists of three rods fused throughout, with distinct knobs posteriorly. Caudal end of male usually with alae. One or two accessory pieces generally present. Testis single. Female genital tubes paired, opposed; the posterior may be rudimentary and without ovary. Caudal glands and spinneret absent.

Hab. Chiefly soil, especially on roots of plants. Some species occur in fresh water or decaying substances, or even in the sea. Many are plant-parasites, a few parasites or semi-parasites of insects.

Genotype: *A. [Vibrio] tritici* (Steinbuch, 1799) (by page precedence).

Gervais & van Beneden, 1859, *Zoologie Médicale*, Paris, ii, 101; Bastian, 1865, *Trans. Linn. Soc. London*, xxv (2), 125; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 542.

Micoletzky (1922) proposes to divide *Tylenchus* into two subgenera, *Tylenchus s.s.* and *Chitinotylenchus*. The latter apparently has as its type *T. paragracilis* Micoletzky, 1922, and is characterized by the presence, on the anterior end of the body, of a more or less complex chitinoid investment. The value of this distinction appearing somewhat doubtful, we prefer to regard *Chitinotylenchus*, for the present, as a synonym. A number of other names included in the synonymy have been proposed for forms which apparently differ only in unimportant details from the type of *Anguillulina*. *Paratylenchus* was based on a single female specimen. *Parasitylenchus* was proposed for the reception of two species which are said to have a free-living generation and a generation parasitic in beetles. These forms have, in the free-living generation, a poorly-developed median oesophageal bulb, and the caudal alae of the male are slight or absent. Considered as generic differences from *Anguillulina* these characters are very indefinite, and we have therefore treated *Parasitylenchus* as a synonym.

2. *Tylenchulus* Cobb, 1913.

In most respects this genus agrees with *Anguillulina*,* from which it is said to differ in the following characters: (1) There

* In some respects, and especially in the swelling of the body of the female, *Tylenchulus* seems even more closely related to *Heterodera* (see below, p. 67). From this genus, however, it differs in having only a single female genital tube, in the absence of an anus, and in the fact that the vulva is not quite terminal.

is no functional anus. (2) The excretory pore is near the middle of the body. (3) The male has no caudal alae. (4) The male "practically loses the spear at the final moult." (5) The posterior portion of the body of the female becomes sac-like at maturity, and its cuticle much thickened. (6) The vulva is situated in a deep "suture."

Hab. Parasitic on the roots of *Citrus* trees.

Genotype: *T. semi-penetrans* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 288; 1914, *Journ. Agric. Res.*, Washington, ii, 217.

3. *Aphelenchus* Bastian, 1865.

Syn. *Paraphelenchus* Micoletzky, 1922; *Chitinoaphelenchus* Micoletzky, 1922.

Cuticle usually striated, without bristles. Lateral alae sometimes well developed. Head usually distinct, knob-like, without lips or bristles. Cephalic papillae rarely distinct. Lateral organs unknown. Stylet composed of three fused rods, not always distinctly knobbed behind. Caudal end of male without alae, usually with postanal papillae and sometimes with preanal papillae. Spicules slender. A slight accessory piece often present, sometimes composed of three fused pieces, two dorsal and one ventral, and usually with an expanded, handle-like inner end. Female genital tubes typically paired, opposed, outstretched, but with posterior branch of uterus vestigial and without ovary. Spinneret apparently absent.

Hab. Chiefly in soil, about roots of plants. Some species in fresh water, in decaying substances, or parasitic on plants.

Genotype: *A. avenae* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 93, 121; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 584.

Micoletzky (1922) proposes to divide this genus into three subgenera, *Aphelenchus*, *Paraphelenchus* and *Chitinoaphelenchus*. *Paraphelenchus* is intended to contain three species in which the oesophagus is marked off from the intestine more distinctly than in typical forms, while *Chitinoaphelenchus* contains only two species, characterized by "chitinous ornamentation" of the anterior end. These peculiarities are so slight that they scarcely seem to warrant the erection of special subgenera. The distinctions between *Aphelenchus* and *Anguillulina* do not appear to be very definite.

4. *Heterodera* Schmidt, 1871.

Syn. *Meloidogyne* Göldi, 1889; *Heterobolbus* Railliet, 1896; *Caconema* Cobb, 1924.

Male of typical cylindrical shape. Body of mature female becomes swollen into an ovoid or subspherical shape, only the neck region remaining normal. The tail disappears, its place being taken by a terminal prominence carrying the vulva, and the anus becomes dorsal in position. Cuticle striated, without bristles. Head rather distinct, with six lips. Lateral organs inconspicuous or absent. Stylet composed of three rods, fused throughout and knobbed behind. Caudal end of male without alae or papillae. Spicules equal, short and broad. No accessory piece. Testis, in genotype, single, anterior, outstretched. Female genital tubes paired, parallel, anterior, elongate and sinuous. Oviparous, but eggs remaining in the uterus after the death of the female hatch there and the larvae escape later. Excretory system a lateral canal on the left side only.

Hab. Parasitic on roots of plants.

Genotype: *H. schachtii* Schmidt, 1871.

Schmidt, 1871, *Zeitschr. d. Ver. f. Rüben-Indust. in Zollverein*, xxi, 1-19 (not verified); Strubell, 1888, *Bibliotheca Zool.*, Cassel, i (2), 1-50; Railliet, 1896, *Réc. Méd. vét.*, Paris, lxxiii, 161; Mareinowski, 1909, *Arb. k. Biol. Anst. f. Land-u. Forstwirtsch.*, Berlin, vii, 147; Cobb, 1924, *Journ. Parasitol.*, xi, 118, 120.

The name *Heterobolbus* was proposed by Railliet to replace *Heterodera*, on the ground that the name *Heteroderes* had previously been used by Latreille for another animal. This, however, does not seem to be a sufficient reason for abolishing *Heterodera*. The name *Caconema* has been proposed by Cobb for *Heterodera radicumicola* (Greeff), but the author expresses uncertainty as to whether it should be regarded as a distinct genus or as a subgenus of *Heterodera*. The characters in which it is said to differ from *Heterodera s.s.* are that it is "truly endoparasitic and less specialized in its parasitism; having the amphids protected by 'cheeks'; the males with two testes, instead of one as in *H. schachtii*."

5. *Nemonchus* Cobb, 1913.

Cuticle finely striated, without bristles. Head not distinct, without lips, papillae or bristles, but "helmeted" (presumably with a specialized external cuticular cap). Lateral organs unknown. Stylet relatively massive, in two portions, the posterior much thicker than the anterior but not so well chitinized, with knobbed base. Caudal end of male without supplementary organs or papillae. Testes paired, parallel, anterior, outstretched. Female genital tubes paired, opposed, outstretched.

Hab. Soil (?).

Genotype : *N. galeatus* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 434.

6. *Hoplolaimus* Daday, 1905.

Syn. *Iota* Cobb, 1913; *Criconema* (also *Krikonema*) Hofmänner and Menzel, 1914; *Ogma* Southern, 1914.

Cuticle with wide, often prominent annulations, sometimes forming series of "scales" or spines, but without bristles. Lateral alae absent. Head sometimes distinct. Lips usually poorly developed. Six cephalic papillae or bristles may be present. Lateral organs unknown. Stylet very long, more or less obviously formed of three rods, and knobbed behind. Stylet of male appears to be lost at the last moult. Male (known only in *H. [Iota] squamosus*) with two spicules, without accessory piece or caudal papillae, and with single, anterior, outstretched testis. Female genital tube single, anterior, outstretched, or paired, opposed, outstretched. Oviparous. Probably usually hermaphrodite. Caudal glands and spinneret absent. Anus sometimes absent in female.

Hab. Fresh water or soil.

Genotype : *H. tylenchiformis* Daday, 1905.

Daday, 1905, *Zoologica*, Stuttgart, xviii, 62; Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 434, 437; Hofmänner and Menzel, 1914, *Zool. Anz.*, xlv, 88; Menzel, 1917, *Rev. suisse Zool.*, xxv, 153; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 577.

7. *Psilenchus* de Man, 1921.

Cuticle striated, without bristles. Head slightly distinct, rounded, without lips, papillae or bristles. Lateral organs transversely elliptical, situated far forward. Stylet slender, hollow, not knobbed behind. Caudal end of male with alae, without papillae. An accessory piece present. Female genital tubes paired, symmetrical, outstretched. Caudal glands probably absent.

Hab. Soil.

Genotype : *P. hilarulus* de Man, 1921.

de Man, 1921, *Capit. Zool.*, i, 36.

8. *Isonchus* Cobb, 1913.

Cuticle finely striated, without bristles or alae. Head not distinct, without lips or bristles. Lateral organs unknown. Stylet long, not knobbed at base. Caudal end of male with alae, with four pairs of ray-like papillae. Four pairs of smaller papillae also present. An accessory piece present. Testis and female genital tube single, anterior, outstretched. Caudal glands absent.

Hab. Soil.

Genotype : *I. radicolus* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 434, 439;
Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 541.

9. *Tylopharynx* de Man, 1876.

Cuticle with fine transverse striations and with longitudinal striations, without bristles. Head slightly distinct, knob-like, without lips, papillae or bristles. Lateral organs unknown. Stylet consists of three rods, fused anteriorly and knobbed posteriorly. Caudal end of male with numerous subventral preanal and postanal papillae. An accessory piece present. Female genital tubes paired, opposed, reflexed. Caudal glands absent.

Hab. Soil.

Genotype : *T. striata* de Man, 1876.

de Man, 1876, *Tijdschr. Ned. dierk. Vereen.*, ii, 116; 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 131;
Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 432.

Subfam. 2. **DORYLAIMINAE** nov.

Oesophagus without median bulb, but usually with a more or less distinct posterior swelling, which sometimes forms a bulb.

1. *Dorylaimus* Dujardin, 1845.

Syn. *Antholaimus* Cobb, 1913; *Nygolaimus* Cobb, 1913; *Actinolaimus* Cobb, 1913; *Discolaimus* Cobb, 1913; *Dorylaimellus* Cobb, 1913; *Axonchium* Cobb, 1920; *Doryllium* Cobb, 1920; *Longidorus* Micoletzky, 1922.

Cuticle usually unstriated, without lateral alae or bristles. Head separated by a constriction from body, usually with six lips, each bearing two papillae, but without bristles. Lateral organs inconspicuous, probably usually slit-like. Stylet tubular, not knobbed behind. Oesophagus swollen behind, but without distinct bulb. Caudal end of male with a median row of preanal papillae. Postanal papillae present in both sexes. Spicules fairly stout. Two rod-like accessory pieces usually present, closely applied to the spicules. Testes paired, opposed, outstretched. Female genital tubes almost always paired, opposed, reflexed; occasionally single, posterior. Caudal glands and spinneret absent.

Hab. Soil, fresh water, on plants or in decaying substances.

Genotype : probably *D. stagnalis* Dujardin, 1845, according to Stiles & Hassall (1905).

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 230; Cobb,

1913, *Journ. Washington Acad. Sci.*, iii, 432-444; 1920, *Contr. Sci. Nematol.*, ix, 303, 305; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 434, 535.

Antholaimus and *Nygolaimus* are regarded, probably rightly, by Micoletzky (1922) as synonyms of *Dorylaimus*. *Actinolaimus*, according to Cobb (1918, in Ward and Whipple, *Freshwater Biology*, 485), was "proposed for species similar to *Dorylaimus labyrinthostomus*, in which the pharynx is more or less immobile, radially striated and elaborately constructed." According to Micoletzky, *Actinolaimus* differs from *Dorylaimus* only in having a very large "vestibule" with thick, chitinized walls. This character, however, is evidently subject to some variation, and its generic value seems questionable. We have also included in the synonymy five other names proposed for forms showing slight peculiarities in the form of the stylet or of the oesophagus, which have been treated by Micoletzky as subgenera of *Dorylaimus*.

2. *Trichodorus* * Cobb, 1913.

Syn. *Leptonchus* Cobb, 1920.

This genus apparently very closely resembles *Dorylaimus*, from which it differs chiefly in the following characters:—Lateral organs stirrup-shaped. Stylet very long, asymmetrical, bent dorsally, with a cap-like chitinous structure anteriorly. Testis single, outstretched.

Hab. Soil.

Genotype: *T.* [*Dorylaimus*] *primitivus* (de Man, 1884) (= *T. obtusus* Cobb, 1913).

de Man, 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 162; Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 434, 441; 1920, *Contr. Sci. Nematol.*, ix, 304; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 539.

3. *Campydora* Cobb, 1920.

Cuticle unstriated, without bristles, with eight longitudinal striations, becoming more marked and almost like alae in the neck region. Head truncate, with six lips and two crowns of six and twelve papillae respectively. Lateral organs elliptical. Stylet bent dorsally in front, its base not knobbed. Oesophagus expands suddenly behind into a distinct cylindrical bulb. Male unknown. Female genital tube single, anterior, reflexed. Spinneret absent.

Hab. Soil.

Genotype: *C. demonstrans* Cobb, 1920.

* Cobb (1913) uses the name *Trichodora* in the key at p. 434, changing it to *Trichodorus* on p. 441.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 307 and key; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 541.

4. *Onchium* Cobb, 1920.

Cuticle thin, very finely striated, without bristles. Head not distinct, with four bristles. Lateral organs incipient spirals, situated far forward. Stylet very short, hollow, not knobbed behind. Oesophagus cylindroid, not distinct from intestine (with posterior swelling, according to key). A pair of ocelli present. Male unknown. Female genital tube single, anterior, reflexed. Spinneret present.

Hab. Marine (in sand).

Genotype: *O. ocellatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 303 and key.

5. *Onchulella* Cobb, 1920.

Cuticle extremely finely striated, without bristles. Head not distinct, without lips or papillae, but with four bristles. Lateral organs incipient spirals, situated far forward. Stylet apparently solid, not knobbed behind. Oesophagus cylindroid anteriorly, "the posterior part more or less obscure." A pair of ocelli present, with lenses. Oesophageal region contains numerous elongate glands. Male unknown. Female genital tubes paired, opposed, reflexed. Caudal glands present.

Hab. Marine.

Genotype: *O. ocellata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 306 and key.

6. *Triplonchium* Cobb, 1920.

Cuticle unstriated, without bristles. Head not distinct, slightly conical, with six papillae. Lateral organs tubular, protrusible. Stylet short, slender, knobbed behind. Oesophagus cylindroid, with pyriform posterior bulb. Caudal end of male apparently with one or two inconspicuous preanal papillae. Spicules short and stout. "There are very obscure, straight accessory pieces." (According to the figures, the accessory pieces are a pair of peculiar ring-like structures, with a diameter nearly equal to the length of the spicules). Testis single, anterior, outstretched. Female with single uterus, running posteriorly from the vulva, then turning anteriorly. Ovaries paired, opposed, reflexed. Eggs few. Tail in both sexes short and blunt. Spinneret absent.

Hab. Soil.

Genotype: *T. cylindricum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 300 and key.

7. *Diphtherophora* de Man, 1880.

Syn. *Chaolaimus* Cobb, 1893; *Archionchus* Cobb, 1913.

Cuticle unstriated, without bristles or alae. Head without lips or bristles, but with papillae. Lateral organs slit-like or transversely elliptical. Stylet consists of three straight rods, each knobbed behind, one ("ventral") shorter than the others ("dorsal"), apparently connected anteriorly with a triangular chitinoid cap. Oesophagus swollen behind, but without posterior bulb. Caudal end of male with one or two median preanal papillae. Accessory piece absent. Female genital tubes paired, opposed.* Caudal glands absent (?).

Hab. Soil.

Genotype: *D. communis* de Man, 1880.

de Man, 1880, *Tijdschr. Ned. dierk. Vereen.*, Leiden, v, 62; 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 128; Cobb, 1893, *Agric. Gaz. N.S.W.*, iv, 821; 1913, *Journ. Washington Acad. Sci.*, iii, 438; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 421.

8. *Tylencholaimus* de Man, 1876.

Syn. *Xiphinema* Cobb, 1913.

Cuticle externally unstriated, without alae or bristles. Head usually distinct, without lips or bristles but with a crown of papillae. Lateral organs stirrup-shaped. Stylet consists of three rods, fused anteriorly and knobbed posteriorly. Oesophagus swollen posteriorly, occasionally with a bulb. Caudal end of male with a few median preanal papillae. Spicules stout, with a midrib. Accessory piece absent, or two accessory pieces present, closely applied to the spicules. Testis usually single, occasionally paired, opposed, outstretched. Female genital tube usually single, anterior or posterior; sometimes paired, opposed, reflexed. Caudal glands and spinneret absent.

Hab. Soil or fresh water.

Genotype: *T. [Tylenchus] mirabilis* (Bütschli, 1873).

Bütschli, 1873, *Nov. Act. k. Leop.-Car. Akad. Naturf.*, Dresden, xxxvi, 44; de Man, 1876, *Tijdschr. Ned. dierk. Vereen.*, ii, 119; 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 132; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 423.

* In *Chaolaimus*, according to Cobb (1893), the female genital tube is apparently single, anterior and reflexed, passing back beyond the vulva and extending half-way to the anus. His description, however, seems to have been based on an immature and moulting specimen.

9. *Brachynema* Cobb, 1893, *nec* Fieb., 1861.*

The type of this genus (which is based on a single immature specimen) appears to have possessed very generalized larval characters, and may possibly have belonged to some genus of Anguillulinidae whose adult characters are better known. In general it approaches perhaps most nearly to *Tylencholaimus*, but it is impossible to assign it definitely to this or to any other genus.

Hab. Soil.

Genotype : *B. obtusa* Cobb, 1893.

Cobb, 1893, *Agric. Gaz. N.S.W.*, iv, 811.

10. *Tylencholaimellus* M. V. Cobb, 1915.

Cuticle very finely transversely striated, and with longitudinal striations, without bristles. Head not distinct, with six low papillae, and apparently also less conspicuous circumoral papillae. No cephalic bristles. Stylet short, obliquely truncate anteriorly, with stouter posterior portion, knobbed at its base. A separate chitinous piece, directed slightly outwards, lies dorsally to the stylet. Oesophagus with an elongate posterior bulb. Caudal end of male with two preanal papillae. No postanal papillae or bristles. Spicules slender. No accessory piece. Testes paired, opposed, outstretched. Female unknown.

Hab. Fresh water.

Genotype : *T. diplotorus* M. V. Cobb, 1915.

M. V. Cobb, 1915, *Trans. Amer. Micr. Soc.*, xxxiv, 28; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 431.

11. *Tylolaimophorus* de Man, 1880.

Cuticle with fine transverse striations, without alae or bristles. Head not distinct, rounded, without bristles, but with a crown of small rod-like circumoral papillae and a second crown of conical papillae. Lateral organs transversely oval, situated far forward. Stylet consists of three rods, joined anteriorly and with a chitinous cap apparently composed of three short, curved rods. Oesophagus narrow, non-muscular, with bulb-like posterior swelling. Intestine with a postanal caecum. Male unknown. Female genital tubes paired, opposed, outstretched. Caudal glands absent.

Hab. Sandy soil.

Genotype : *T. typicus* de Man, 1880.

* Although the name *Brachynema* is preoccupied, this genus seems of such doubtful validity that we refrain from renaming it.

de Man, 1880, *Tijdschr. Ned. dierk. Vereen.*, Leiden, v, 63;
 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 130;
 Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 430.

12. *Eephyadophora* de Man, 1921.

Body extremely slender. Cuticle apparently unstriated, without bristles or alae. Head rounded, without distinct lips or papillae. Lateral organs apparently absent. Stylet with three knobs behind. Structure of oesophagus unknown. Male with a large, pointed process on either side at about the level of the cloaca, curved posteriorly and a little inwards. The two processes are united ventrally for about half their length. Two slender, equal spicules present. No accessory piece. Female unknown. (Description based on a single male specimen).

Hab. Soil.

Genotype: *E. tenuissima* de Man, 1921.

de Man, 1921, *Capit. Zool.*, i, 35.

APPENDIX TO ANGUILLULINIDAE.

We place here two forms which, owing to their possession of a buccal stylet, seem to have some relation to this family, but which are probably considerably modified as the result of their peculiar parasitic habits.

a. *Myenchus* Schuberg & Schröder, 1904.

Head truncate. Lips indistinct. At about the anterior fifth of the body there is a ventral sucker-like organ. Buccal cavity narrow, containing a "stylet," which is not knobbed behind. Oesophagus short, consisting of two spindle-shaped swellings. Tail tapering in both sexes, with three terminal processes. Male with two short and broad spicules, with expanded roots. Apparently no accessory piece. Testis single, anterior, outstretched. Vulva at about the posterior fourth of the body. Female genital tubes paired, opposed; the posterior uterine branch vestigial and without ovary, the anterior ovary outstretched. Eggs few and large.

Hab. In the connective tissue and (larvae) in the muscle-cells of a Leech (*Nepheleis*).

Genotype: *M. bothryophorus* Schuberg & Schröder, 1904.

Schuberg & Schröder, 1904, *Verh. Naturhist.-med. Ver.*, Heidelberg, N.F. vii, 629; 1904, *Zeitschr. f. wiss. Zool.*, lxxxvi, 509.

b. *Myoryctes* Eberth, 1863.

Very small worms. Cuticle smooth. Head very slightly expanded. Mouth contains a stylet ending anteriorly in a

minute knob. Oesophagus cylindroid, slightly expanded behind. Tail terminates, in both sexes, in an expanded knob. Male with two small spicules. Testis single, anterior, outstretched. Vulva at about the posterior fourth of the body. Female genital tubes short, paired, opposed, outstretched.

Hab. In galleries excavated under the sarcolemma of the muscle-fibres of Frogs.

Genotype : *M. weismanni* Eberth, 1863.

Eberth, 1863, *Zeitschr. f. wiss. Zool.*, xii, 530.

Fam. 10. TRILOBIDAE Micoletzky, 1922.

Free-living forms, mostly marine, with a distinct buccal cavity without teeth. Oesophagus typically without a true muscular posterior bulb containing valves, but slightly expanded behind. Reproductive organs simple. Sexes generally distinct. Mostly oviparous, producing few and large eggs.

Micoletzky (1922) divides this family into three subfamilies, Trilobinae, Monhysterinae and Prismatolaiminae. The distinctions (based upon the form of the buccal capsule) between these subfamilies are relative rather than absolute, and appear to us too vague to justify the subdivision.

1. *Trilobus* Bastian, 1865.

Cuticle unstriated, often with bristles. No lateral alae. Head not distinct, with a crown of stiff bristles, often in pairs. Lateral organs mostly unknown. Buccal capsule cup- or funnel-shaped, usually without teeth or local thickenings, its dorsal wall not jointed. Oesophagus with tooth-like processes near the anterior end but not immediately connected with the buccal capsule, and swollen posteriorly, but without bulb. Caudal end of male with preanal papillae and without postanal papillae. Two spicules and an accessory piece present. Testes paired. Female genital tubes paired, opposed, reflexed. Eggs relatively numerous. Caudal glands present. Spinneret present or absent.

Hab. Marine, fresh-water, or in sand or soil.

Genotype : *T. gracilis* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 93, 99; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 186.

Micoletzky (1922) divides the genus *Trilobus* into the subgenera *Trilobus* and *Paratrilobus*. The characters mentioned in the diagnoses of these subgenera appear to justify their separation as distinct genera.

2. Paratrilobus Micoletzky, 1922.

Head with short bristles. Buccal capsule well-chitinized, somewhat barrel-shaped, with longitudinal ribs in its wall. Its wall appears jointed dorsally as seen in lateral view. Oesophagus with three teeth at its anterior end in immediate connection with the buccal capsule. Caudal end of male with six large preanal papillae. Remaining characters as in *Trilobus*.

Hab. Marine.

Genotype: *P. grandipapilloides* Micoletzky, 1922.

Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 187, 188.

3. Choanolaimus de Man, 1880.

Cuticle striated, with granular sculpture, without bristles or lateral alae. Head not distinct, with two circumoral crowns of papillae but without bristles. Lateral organs large, spiral. Buccal capsule large, consisting of an anterior funnel-shaped portion, with walls composed of longitudinal rods, and a narrow posterior portion. Oesophagus cylindrical, slightly swollen behind. Caudal end of male without papillae. Two rod-shaped accessory pieces present. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret absent.

Hab. Soil.

Genotype: *C. psammophilus* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 28; 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 72; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 193.

4. Anoplostoma Bütschli, 1874.

Cuticle unstriated, usually with bristles. Head rather distinct, with a crown of bristles. Lateral organs variable. Buccal capsule very large, cup-shaped. Oesophagus swollen posteriorly. Caudal end of male typically with slight alae and papillae. An accessory piece present. Female genital tubes paired. Caudal glands present.

Hab. Marine.

Genotype: *A. [Symplacostoma] viviparum* (Bastian, 1865).

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 133; Bütschli, 1874, *Abh. Senckenb. Ges.*, Frankfurt a. M., 272; de Man, 1885, *Mém. Soc. Zool. France*, i, 17.

5. Sphaerolaimus Bastian, 1865.

Cuticle smooth or transversely striated, with many bristles. Head distinct, with bristles. Lateral organs circular. Buccal capsule large, sub-spherical, with linear parietal thickenings. Oesophagus gradually swollen behind. Caudal end of male

without papillae. Accessory piece single, flattened and shield-shaped. Female genital tube single, anterior. Caudal glands present.

Hab. Marine.

Genotype : *S. hirsutus* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 157; de Man, 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 71.

6. *Didelta* Cobb, 1920.

Cuticle unstriated, without bristles, but with transversely elongated, refractive, bubble-like markings. Head with four long and six short bristles. Lateral organs large, longitudinally elliptical, "really spiral." Buccal capsule somewhat asymmetrical, goblet-shaped, its wall shorter dorsally than ventrally. Oesophagus somewhat narrower posteriorly. Male unknown. Female genital tubes paired, opposed, outstretched. Spinneret absent.

Hab. Marine.

Genotype : *D. maculatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 252 and key.

7. *Desmolaimus* de Man, 1880.

Cuticle smooth or striated, without bristles or lateral alae. Head not distinct, without lips, with or without bristles. Lateral organs, when present, circular. Buccal capsule cup-shaped, with thin walls having three parallel annular thickenings or ridges, of which the innermost encircles the base of the capsule. Oesophagus expanded behind its middle into a large bulb with widened lumen, and again somewhat enlarged posteriorly, but not forming a distinct muscular bulb. Caudal end of male without papillae, but with several bristles. Spicules small, curved. The large accessory piece has two posterior processes. Female genital tubes paired, opposed, outstretched.

Hab. Soil or water (fresh or brackish).

Genotype : *D. zeelandicus* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 14; 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 50; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 84.

8. *Myolaimus* Cobb, 1920.

Cuticle finely striated, without bristles or lateral alae. Head with confluent lips and two crowns of bristles. Lateral organs faint transverse slits. Buccal capsule cup-shaped, with oesophageal teeth projecting at its base. Between the buccal capsule and the oesophagus is a pharynx surrounded by

radial muscles. Oesophagus cylindrical, expanding behind into an elongate bulb. Caudal end of male with four adanal pairs of elongate papillae supporting membranous alae. Three other pairs of caudal papillae present, two of which are close to the tip. Spicules and accessory piece possibly absent. Testis single, anterior, reflexed (?). Female genital tube single, anterior, reflexed. Caudal glands and spinneret absent.

Hab. Soil.

Genotype : *M. heterurus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 274 and key; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 192.

9. *Zanema* Cobb, 1920.

Cuticle finely striated, without bristles or lateral alae. Head not distinct, with six (?) lips bearing appendages. A double crown of cephalic bristles present. Lateral organs circular. Pharynx "somewhat spheroidal." Oesophagus without posterior bulb. Caudal end armed with short, backwardly-projecting, thorn-like bristles, ten on each sub-ventral line. Female genital tube probably single, anterior. Caudal glands and spinneret absent. Male unknown.

This diagnosis is based on a single, probably immature, female.

Hab. Marine.

Genotype : *Z. acanthurum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 283 and key.

10. *Paraphanolaimus* Micoletzky, 1923.

Cuticle coarsely striated, without bristles. Narrow lateral alae present. Head not distinct, with four short bristles. Lateral organs open spirals. A short and broad buccal capsule present, prismatic or cylindrical. Oesophagus gradually thickened behind, with a slight posterior pear-shaped, feebly muscular bulb. Male unknown. Female genital tubes paired, opposed, reflexed, ovaries short. Viviparous or ovoviviparous. Caudal glands and spinneret present.

Hab. Fresh water.

Genotype : *P. behningi* Micoletzky, 1923.

Micoletzky, 1923, *Arb. Biol. Wolga-Stat.*, vii, 23.

11. *Pseudonchus* Cobb, 1920.

Cuticle finely striated transversely, without bristles or lateral alae. Head not distinct, apparently with two lateral lips. Ten cephalic bristles present. Lateral organs spiral. Pharynx of irregular shape, with ridges, giving the appearance

of teeth, in its wall. Oesophagus cylindrical, with indistinct pyriform bulb. Caudal end of male without supplementary organs, bristles or papillae. An accessory piece, without posterior process, present. Testis single, anterior, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *P. rotundicephalus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 273 and key.

12. *Monhystera* Bastian, 1865.

Syn.* *Monohystera* de Man, et auctt.; *Tachyhodites* Bastian, 1865; *Theristus* Bastian, 1865; *Penzancia* de Man, 1889; *Austronema* Cobb, 1914; *Paramonohystera* Steiner, 1916; *Steineria* Micoletzky, 1922, nec Filipjev, 1922; *Allomonhystera* Micoletzky, 1923.

Cuticle smooth or striated, usually with bristles, irregularly distributed or in submedian rows. Lateral alae absent. Head generally with indistinct lips, almost always with bristles. Lateral organs usually circular. Buccal capsule very small, thin-walled, saucer- or cup-shaped, its walls continuous with the oesophageal lining, which is funnel-shaped anteriorly. Oesophagus cylindrical, usually slightly expanded posteriorly, without distinct bulb. Ocelli sometimes present in aquatic forms. Two equal spicules and usually an accessory piece present, the latter commonly with a posterior process. Testis generally single. Female genital tube usually single, anterior, outstretched. Mostly oviparous. Caudal glands and spinneret usually present. Parthenogenesis common in non-marine forms.

Hab. Aquatic (marine and fresh-water); also terricolous.

Genotype : *M. stagnalis* Bastian, 1865 (*vide* Stiles & Hassall, 1905).

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 93, 97; de Man, 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 35; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 165.

13. *Daptonema* Cobb, 1920.

Cuticle thick, rather coarsely striated. Scattered bristles present in cervical region. Head rounded, not distinct, with

* We have included as synonyms a number of names which have been variously regarded by different authors as genera or as subgenera of *Monhystera*. The available diagnoses of these forms are not mutually exclusive, and do not appear to us sufficient to separate them from *Monhystera* or from each other. *Allomonhystera* differs from the other forms in having three preanal papillae in the male, but is otherwise indistinguishable.

twelve bristles. Six eversible lips present, each strengthened internally by three dark, incurved, cuticular ribs. Oesophagus cylindroid, narrowing a little behind. Spicules stout, brownish, curved laterally at the tips. Two accessory pieces present, curved like the spicules distally. Testes paired, opposed, outstretched. Female genital tube single, anterior, outstretched. Caudal glands apparently preanal. Spinneret present, armed with two bristles.

Hab. Marine.

Genotype : *D. fissidens* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 281 and key.

14. *Dintheria* de Man, 1921.

Cuticle finely striated, without bristles or lateral alae. Head with six bristles. Lateral organs large, transversely elliptical, with posterior border probably interrupted. Buccal capsule and oesophagus as in *Monhystera*. Caudal end of male with a series of median preanal papillae. Accessory piece absent. Spicules broad and short. Caudal glands and spinneret probably absent. Female unknown.

Hab. Soil.

Genotype : *D. tenuissima* de Man, 1921.

de Man, 1921, *Capit. Zool.*, i, 9.

15. *Monohystrella* Cobb, 1918.

Buccal capsule more elongate than in *Monhystera*. Oesophagus with a rather distinct pyriform bulb posteriorly. Remaining characters, according to Cobb, are as in *Monhystera*. Male unknown.

Hab. Fresh water.

Genotype : *M. plectoides* Cobb, 1918.

Cobb, 1918, *Contr. Sci. Nematol.*, vii, 203.

Micoletzky (1922) has suggested that *Monohystrella* should be regarded as a subgenus of *Terschellingia*. The condition of the female genital tube and the presence of an oesophageal bulb induce us to retain it as a genus nearer to *Monhystera* than to *Terschellingia*.

16. *Cephalobellus* Cobb, 1920.

Cuticle rather coarsely striated. Head not distinct, subtruncate, without bristles. Lateral organs absent or obscure. Six lips probably present. Pharynx conoid or pyramidal, small. Oesophagus cylindroid, with pyriform posterior bulb. Caudal end of male conical, without alae, but with a pair of elongate subventral preanal papillae and two median postanal papillae. A single slender spicule of irregular shape. Testis

single, anterior, reflexed. Female unknown. Description based on a single male specimen.

Hab. Intestine of the larva of a Lamellicorn beetle, living under cowdung, Australia.

Genotype : *C. papilliger* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 245 and key.

17. *Trefusia* de Man, 1893.

Cuticle unstriated, without bristles, except towards anterior end. Head trilobed, with bristles. Lateral organs elliptical. Oesophagus cylindrical. Two spicules and an accessory piece present. Testes paired. Female genital tubes paired, opposed, reflexed.

Hab. Marine.

Genotype : *T. longicauda* de Man, 1893.

de Man, 1893, *Mém. Soc. Zool. France*, vi, 84; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 165.

18. *Tripyloides* de Man, 1886.

Cuticle unstriated, usually with bristles. Lateral alae apparently absent. Head with three large rounded lips, followed by strong bristles. Lateral organs spiral. Buccal capsule small, distinct from oesophagus, funnel-shaped in front, and with two lateral pocket-like expansions behind. Oesophagus slightly swollen behind. Male with a median row of preanal papillae, extending to the anterior end of the body. Two equal spicules and an accessory piece, having a median plate and two lateral pieces. Testis single. Female apparently unknown. Caudal glands present.

Hab. Marine.

Genotype : *T. vulgaris* de Man, 1886.

de Man, 1886, *Anatomische Untersuchungen über freilebende Nordsee-Nematoden*, 60.

19. *Bathylaimus* Cobb, 1894, *nec* Daday, 1905, *nec* Ditlevsen, 1919.

Cuticle unstriated, but with bristles. Lateral alae apparently absent. Head with twelve bristles and three lips, the latter with bidentate borders, each armed with two projecting bristles. Lateral organs spiral. Buccal capsule composed of two portions, a long anterior and a shorter posterior, of uniform diameter. Oesophagus club-shaped. Caudal end of male without alae or papillae. Two large accessory pieces present. Caudal glands present.

Hab. Marine.

Genotype : *B. australis* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, viii, 409.

20. *Axonolaimus* de Man, 1889.

Syn. *Conolaimus* Filipjev, 1918.

Cuticle unstriated, but with bristles. Head with a crown of four bristles. Lateral organs large, elliptical imperfectly divided by a longitudinal crest. Buccal capsule fusiform, in two parts, the anterior enlarging posteriorly, the posterior diminishing. Oesophagus swollen posteriorly. Caudal end of male without alae or preanal papillae, but with several bristles on the ventral surface of the tail. An accessory piece, with two stout posterior processes, present. Female genital tubes paired, outstretched. Caudal glands present.

Hab. Marine (in sand).

Genotype: *A. [Anoplostoma] spinosus* (Bütschli, 1874).

Bütschli, 1874, *Abh. Senckenb. Ges.*, Frankfurt a. M., 273; de Man, 1889, *Mém. Soc. Zool. France*, ii, 3.

Conolaimus angustilaimus, according to Filipjev (1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 323), differs from *Axonolaimus* in the shape and position of its lateral organs, which are more circular in outline and situated very far forward. From Filipjev's figures it appears probable that these differences are largely due to different states of contraction in the mouth region.

21. *Scaptrella* Cobb, 1917.

The only diagnosis of this genus is contained in the legend to a figure and a "formula." It is said to have the general appearance of *Axonolaimus*, but to differ from it in having "jointed mandibles," circular lateral organs, a single ovary, and only "faint" accessory pieces. Cuticle coarsely striated. Head with twelve bristles. Testes paired, opposed, outstretched (?). Female genital tube single, anterior, outstretched. Spinneret present.

Hab. Not given.

Genotype: *S. cincta* Cobb, 1917.

Cobb, 1917, *Contr. Sci. Nematol.*, v, 119.

22. *Polylaimium* Cobb, 1920.

Cuticle very finely striated, apparently without bristles or lateral alae. Head with three or six lips, and without bristles. Lateral organs large, circular. Buccal capsule tubular, elongate, with a narrower anterior and a wider posterior portion. Oesophagus with a very small, elongate or pyriform posterior bulb. Caudal bristles absent. Genital tubes paired, opposed, reflexed. Caudal glands and spinneret present. Apparently hermaphrodite.

Hab. Marine.

Genotype : *P. exile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 274 and key.

23. *Ascolaimus* Ditlevsen, 1919.

Syn. *Bathylaimus* Ditlevsen, 1919, *nec* Cobb, 1894, *nec* Daday, 1905.

Cuticle very finely striated, apparently without bristles or lateral alae. Head rather distinct, with papillae and a crown of bristles. Lateral organs large, double, incipient spirals. Buccal capsule a long and narrow funnel whose walls are continuous with the lining of the oesophagus. Oesophagus slightly swollen behind. Male unknown. Female genital tubes paired, opposed, outstretched.

Hab. Marine.

Genotype : *A. filiformis* Ditlevsen, 1919.

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 168, 299.

24. *Stephanolaimus* Ditlevsen, 1919.

Cuticle coarsely striated, apparently without bristles or lateral alae. Head with a funnel-shaped circumoral dilatation, and with four long bristles. Lateral organs absent (?). Buccal capsule moderately large, funnel-shaped, continuous with lining of oesophagus. Oesophagus swollen posteriorly. Male unknown. Vulva behind the middle of the body.*

Hab. Marine.

Genotype : *S. elegans* Ditlevsen, 1919.

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 183.

25. *Dactylaimus* Cobb, 1920.

Cuticle rather coarsely striated, without bristles. Head with six lips (of which three are larger than the others) with hooked bristles at their tips. Twelve cephalic bristles present. Lateral organs spiral.† Buccal capsule funnel-shaped. Oesophagus gradually swollen behind. Male unknown. Female genital tube single, anterior, outstretched. Description based on a single immature female specimen.

Hab. Marine (in mud).

Genotype : *D. aequalis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 250 and key.

* Description based on a single immature female.

† According to the key circular or elliptical, but in the figure distinctly spiral.

26. Krampia Ditlevsen, 1921.

Cuticle apparently unstriated, with a few rather fine bristles anteriorly. Head somewhat distinct, truncate, with four (?) rounded, somewhat swollen lips, and with a crown of stout bristles. Lateral organs unknown. Buccal capsule funnel-shaped. Oesophagus gradually swollen behind, and with chitinoid thickenings externally at the level of the buccal capsule. Male without accessory piece, supplementary organs or caudal papillae. Female genital tube single, anterior.

Hab. Marine.

Genotype : *K. acropora* Ditlevsen, 1921.

Ditlevsen, 1921, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxxiv, 57.

27. Leptogastrella Cobb, 1920.

Cuticle finely striated, with bristles in cervical and caudal regions. Lateral alae absent. Head with three or six lips and a crown of eighteen to twenty bristles. Lateral organs inconspicuous. Buccal cavity wide and funnel-shaped. Oesophagus without posterior bulb. Caudal end of male without supplementary organs or papillae. The spicules slide in tubular accessory pieces. Testis and female genital tube single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Marine (in mud).

Genotype : *L. pellucida* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 249 and key.

28. Margonema Cobb, 1920.

Cuticle unstriated, without bristles or lateral alae. Head not distinct, with three double lips but without bristles. Lateral organs spiral. Buccal cavity large, continuous with lining of oesophagus. Oesophagus without bulb. Male with thirty to forty supplementary organs close together, and a few scattered subventral caudal bristles. Accessory pieces with posterior processes. Testis single, anterior, outstretched. Female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *M. ringens* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 248 and key.

29. Xenolaimus Cobb, 1920.

Cuticle coarsely striated, without bristles but with twelve longitudinal alae. Head protrusible, with a cuticular collar. Six thick, somewhat digitate lips and a crown of cephalic

bristles present. Each lip with a two-jointed bristle and apparently also armed internally with a slender, flexible element longer than the bristle. Lateral organs circular or elliptical. Buccal cavity large and funnel-shaped. Oesophagus probably without bulb. Caudal glands and spinneret present. Genital organs not described.

The diagnosis is apparently based upon immature specimens.

Hab. Marine (in mud).

Genotype : *X. striatus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 250 and key.

30. *Necticonema* Marion, 1870.

Cuticle finely striated, and with fine granulations. Head blunt, with small papillae and a crown of bristles. Buccal capsule very narrow, consisting of a slight dilatation of the oesophageal lumen. •[“No chitinous armature in mouth.”] Male with broad spicules and several anterior accessory pieces of varying shape.

Hab. Marine.

Genotype : *N. prinzi* Marion, 1870.

Marion, 1870, *Ann. Sci. Nat.*, Paris (Zool.), xiii, 32, 34.

31. *Coinonema* Cobb, 1920.

Cuticle finely striated, without lateral alae, apparently with bristles towards anterior end (figure). Head not distinct, with four bristles. Lateral organs spiral, somewhat hook-shaped. Buccal capsule “obscure” (tubular in figure). Oesophagus slightly enlarged posteriorly. Two ocelli present. Spicules slender. Two accessory pieces present, with blunt posterior processes. Testes and female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *C. punctatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 259 and key.

32. *Prismatolaimus* de Man, 1880.

Cuticle finely striated, usually without bristles or lateral alae. Head not distinct, without lips but with bristles. Lateral organs linear, indistinct. Buccal capsule short, prismatic, unarmed. Oesophagus scarcely enlarged posteriorly. Male with a median row of preanal papillae, extending forward into the oesophageal region. Accessory piece absent. Female genital tubes paired and opposed, or unpaired, anterior and reflexed. Caudal glands present.

Hab. Soil or fresh water.

Genotype : *P. [Monhystera] intermedius* (Bütschli, 1873).

Bütschli, 1873, *Nova Acta k. Leop.-Car. Akad. Naturf.*, Dresden, xxxvi, 67; de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 31-33; 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*, 79; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 195.

33. *Anonchus* Cobb, 1913.

Cuticle finely striated, without bristles or lateral alae. Head with four bristles. Lateral organs spiral. Buccal capsule tubular, unarmed. Oesophagus without posterior bulb. Caudal end of male with twenty tubular supplementary organs. Four to five caudal bristles present. An accessory piece present. Testis and female genital tube single, anterior, reflexed.

Hab. Fresh water.

Genotype: *A. monohystera* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 444 and key.

34. *Araeolaimus* de Man, 1888.

Syn. *Spira* de Man, 1877, *nec* Bastian, 1865.

Cuticle unstriated, but usually with small submedian bristles. Head without lips, but with a crown of four bristles. Lateral organs spiral. Buccal capsule a rather short, slender tube, narrowing gradually behind. Oesophagus gradually expanded behind. Ocelli sometimes present. Caudal end of male without papillae. Two strongly-curved spicules, and an accessory piece with two posterior processes, present. Female genital tubes paired, opposed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *A. [Spira] bioculatus* (de Man, 1877).

de Man, 1877, *Tijdschr. Nederl. dierk. Vereen.*, 's Gravenhage and Rotterdam, 107; 1888, *Mém. Soc. Zool. France*, i, 14; Filipjev, 1922, *Act. Inst. Agronom. Stauropol.*, i (Zool.), (16), 176.

34a. Subgenus *Araeolaimoides* de Man, 1893.

Subgen. of *Araeolaimus*. The type of this subgenus differs from that of *Araeolaimus* in the apparent absence of a buccal capsule and in the oval enlargement of the oesophagus behind the ocelli.

Genotype: *A. microphthalmus* de Man, 1893.

de Man, 1893, *Mém. Soc. Zool. France*, vi, 86; Filipjev, 1922, *Act. Inst. Agronom. Stauropol.*, i (Zool.), (16), 175.

35. Fimbrilla Cobb, in Stiles & Hassall, 1905.

Syn. *Fimbria* Cobb, 1894, *nec* Megerle, 1811.

Cuticle striated, with bristles at least at posterior end. Head somewhat distinct, with a crown of bristles. Buccal capsule prismoid. Oesophagus expands gradually behind. Caudal end of male without alae or supplementary organs. Two accessory pieces, nearly as long as the spicules, joined posteriorly and protrusible. Female unknown.

Hab. Marine (among seaweed).

Genotype: *F. [Fimbria] tenuis* (Cobb, 1894).

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, viii, 421; Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, 107.

36. Anticyathus Cobb, 1920.

Cuticle very finely striated, with scattered papilloid cervical bristles. Head not distinct, with two crowns of short bristles. Lateral organs circular. Buccal capsule very small, prismoid. Oesophagus club-shaped. Caudal end of male with twenty-five papilloid preanal supplementary organs and a single papilla-like ventral bristle. An accessory piece, with a posterior process, present. Testes and female genital tubes paired, opposed, outstretched. Caudal glands and spinneret absent.

Hab. Marine (in sand).

Genotype: *A. tenuicaudatus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 245 and key.

37. Sphaerocephalum Filipjev, 1918.

Cuticle finely striated. Head with six small papillae, ten long and fine bristles and some supplementary bristles. Lateral organs spiral (apparently circular in figure). Buccal capsule, according to figure, extremely short and narrow, with wall gradually thickened posteriorly, giving it the appearance of a cone. Oesophagus slightly swollen at each end, but without bulb. Tail of female very thick, with subterminal spinneret. Female genital tubes paired, opposed, outstretched; the posterior without ovary. Male unknown.

Hab. Marine.

Genotype: *S. crassicauda* Filipjev, 1918.

Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 317, 328.

APPENDIX TO TRILOBIDAE.

The following genera are doubtfully referred to this family. The position of several of them is very uncertain, and can only

be established when much more complete descriptions are available.

a. Acmaeolaimus Filipjev, 1918.

Cuticle thick, finely striated. Head with two crowns each of six papillae, and four stout bristles. Lateral organs like thick plates, with spirals within. Buccal capsule like a shallow cup, its dorsal wall thickened and prolonged posteriorly. Internal anatomy unknown.

Hab. Marine.

Genotype : *A. diplopetloides* Filipjev, 1918.

Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 345.

b. Symplocostoma Bastian, 1865.

Cuticle without striations or bristles. Head not distinct, with or without bristles. Lateral organs unknown. Pharynx elongate, "somewhat fiddle-shaped, having a peculiar funnel-shaped body lying along its inferior aspect, and an appearance of three or more circular lines around the parietes." Oesophagus widening considerably but gradually behind, without bulb. Ocelli present or absent. Caudal end of male apparently without supplementary organs or papillae. Accessory piece absent. Female genital tubes paired, opposed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *S. longicolle* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 132.

This genus was only tentatively proposed by Bastian, and its validity is somewhat uncertain.

c. Pelagonema Cobb, 1894.

Cuticle unstriated, without bristles. Head not distinct. Lateral organs inconspicuous. Pharynx simple, elongate, without teeth. Oesophagus gradually swollen in its posterior half. Male unknown. Female genital organs paired, opposed, reflexed. Caudal glands present.

Hab. Marine.

Genotype : *P. simplex* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, viii, 391.

This genus is considered by Cobb, in spite of the absence of teeth, to be related to *Oncholaimus*.

d. Diplohystera Onorato-de Cillis, 1917.

Body considerably swollen in middle region. Cuticle smooth, without bristles or lateral alae. Head not distinct,

truncate, produced into a kind of low collar, and without lips, papillae or bristles. Lateral organs circular. Buccal cavity small, funnel-shaped, unarmed. Oesophagus cylindrical, slightly swollen behind. Male unknown. Female genital tubes paired, opposed, reflexed. Caudal glands well developed.

Hab. Fresh water.

Genotype : *D. inflata* Onorato-de Cillis, 1917.

Onorato-de Cillis, 1917, *Monit. Zool. Ital.*, xxviii, (4-5), 58.

e. *Seuratiella* Ditlevsen, 1921.

Syn. *Seuratia* Ditlevsen, 1919, *nec* Skrjabin, 1916.

Cuticle striated. Head truncate, with a single crown of short, rather stout bristles. Lateral organs spiral. Pharynx shallow and not very spacious, without teeth. Oesophagus cylindrical, without bulb. Caudal end of male with one large and three smaller preanal supplementary organs. Accessory pieces rod-shaped. Female unknown (description based on a single male specimen).

Hab. Marine.

Genotype : *S. [Seuratia] gracilis* (Ditlevsen, 1919).

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 197; and 1921, lxxiv, 60.

According to Ditlevsen, this genus is closely related to *Cyatholaimus*, but differs in the shallowness of its buccal capsule and in the absence of teeth.

f. *Cricolaimus* Southern, 1914.

Cuticle finely striated. Head rounded, with a single crown of four long submedian bristles. Lateral organs in the form of thick spirals. Buccal cavity small and narrow, surrounded at its junction with the oesophagus by a stout chitinous ring. Oesophagus with a posterior bulb. Caudal end of male with a median ventral series of supplementary organs. Spicules simple, curved. An accessory piece present, in the form of a flattened plate with a stout posterior process.

Hab. Marine (in sand).

Genotype : *C. elongatus* Southern, 1914.

Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 20.

g. *Platycoma* Cobb, 1894.

Cuticle unstriated, but with bristles throughout, which are inconspicuous except at the anterior end. Head separated from body by a broad and shallow constriction. Three small conical lips (termed teeth by Southern) and ten cephalic bristles present. Lateral organs more or less circular.

Pharynx "narrow, almost tubular, but expanding very slightly half-way back." Oesophagus cylindrical, without bulb. Caudal end of male with or without preanal or postanal papillae or both. An accessory piece present, with two posterior processes, each with a bifid end. Female genital tubes paired, opposed, outstretched.

Hab. Marine (in sand).

Genotype: *P. cephalata* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, viii, 399; Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 33.

Cobb based the genus on the description of a single male specimen. Southern records what he believes to be the same species, and adds a description of the female.

h. *Solenolaimus* Cobb, 1894.

Cuticle unstriated, but with bristles distributed throughout the surface of the body. Head rounded, with minute lips and two crowns of short bristles. Lateral organs circular (?). Pharynx narrow, tubular. Oesophagus spindle-shaped anteriorly, slender; posteriorly swollen and muscular. Male unknown. Tail of female subcylindrical, with rounded tip. Caudal glands absent.

Hab. Marine (in sand).

Genotype: *S. obtusus* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, viii, 419.

i. *Eleutherolaimus* Filipjev, 1922.

Cuticle thin, finely striated, apparently without bristles. Head not distinct, with six papillae and four bristles. Lateral organs circular. According to the figure, there is a wide, cylindrical buccal capsule which is prolonged anteriorly into a crown of convergent chitinoid rodlets (giving the whole structure much the appearance of the mouth of an Oesophagostome). Oesophagus gradually swollen posteriorly, without bulb. An accessory piece present, with two posterior processes.

Hab. Marine.

Genotype: *E. longus* Filipjev, 1922.

Filipjev, 1922, *Act. Inst. Agronom. Stauropol.*, i (16), 173.

The genus *Eleutherolaimus* is proposed by Filipjev for the reception of his species *longus* (described from a single male specimen), and of six other species which have been previously referred to *Monhystera* and *Terschellingia*. The unusual structure of the buccal capsule makes it imperative that the genotype should be better known before the genus can be accepted and the older species included in it.

j. *Trilepta* Cobb, 1920.

Cuticle unstriated, without bristles except anteriorly. Head slightly expanded, with two crowns of bristles, the posterior long and apparently jointed. Lateral organs short transverse slits. Pharynx wide, almost cylindrical, perhaps containing a single tooth at its anterior end. Oesophagus cylindroid, without bulb. Caudal end of male without supplementary organs. Spicules slender. An inconspicuous accessory piece present. Testis single, anterior, outstretched. Female undescribed. Caudal glands and spinneret apparently absent.

Hab Marine (in sand).

Genotype: *T. guttata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 312 and key.

Fam. 11. ALAIMIDAE Micoletzky, 1922.

Free-living forms, mostly marine, but sometimes terricolous or fresh-water. Buccal cavity absent or extremely small. Oesophagus generally without a true muscular bulb containing valves. Reproductive organs simple. Sexes generally distinct. Oviparous, producing few and large eggs.

Micoletzky (1922) proposes to divide this family into two subfamilies, Alaiminae and Leptosomatinae. The distinction between these subfamilies is that in the latter a ventral excretory gland, or lateral canals and an excretory pore, are present, while they are said to be absent in the former. It is scarcely credible that there are any forms without some such structures, though they may occasionally be very hard to detect. We have therefore felt it unjustifiable to retain the proposed subfamilies.

1. *Alaimus* de Man, 1880.

Cuticle unstriated, without bristles or lateral alae. Head not distinct, without bristles. Lips absent. Oesophagus elongate, expanding gradually behind. Caudal end of male usually with a median row of three to five preanal papillae. No accessory piece present. Testis single. Female genital tube single, posterior. Sometimes parthenogenetic. No caudal glands or spinneret.

Hab. Soil and plant-roots.

Genotype: *A. primitivus* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 2; 1884, *Die frei . . . lebenden Nematoden der Nederl. Fauna*, 29; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 134.

2. *Alaimella* Cobb, 1920.

Cuticle coarsely striated, with bristles only at the ends. Lateral alae apparently absent. Head not distinct, with four bristles. Lateral organs circular, open behind. Lips confluent. Oesophagus somewhat club-shaped. Spicules slender. Two simple accessory pieces present. Testes paired, parallel. Female genital tube probably single, posterior, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *A. truncata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 234 and key.

3. *Anticoma* Bastian, 1865.

Cuticle unstriated, with small scattered bristles throughout, and with special longitudinal rows of longer bristles, on the lateral and sometimes on the submedian lines, in the neck region. Head with ten bristles. Lateral organs slit-like. Lips three, rudimentary, rarely with papillae. Oesophagus club-shaped. Ocelli absent. Male without caudal alae. A single sigmoid preanal supplementary organ present. Caudal papillae, if present, inconspicuous. A few small anal bristles present. Spicules equal. Testes paired, both running anteriorly, but one usually reflexed near its end. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *A. eberthi* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 141; Cobb, 1890, *Proc. Linn. Soc. N.S.W.*, Sydney, v, 765.

4. *Enchelidium* Ehrenberg, 1836.

Cuticle unstriated, with small, scattered bristles. Head sometimes distinct, with a crown of bristles. Lateral organs transversely elliptical. Lips indistinct. No buccal cavity. Oesophagus gradually swollen behind, and surrounded near its anterior end by a single large mass of pigment bearing two, or rarely three, lenses. Caudal end of male usually with a median series of preanal papillae. Spicules equal, slender, slightly curved.

Hab. Marine.

Genotype : *E. [Vibrio] marinum* (Müller, 1783).

Müller, 1783, 163 (*vide* Stiles & Hassall, not verified); Ehrenberg, 1836, *Die Akalephen des Rothen Meeres*, etc., *Abh. k. Akad. Wiss.*, Berlin, for 1835, 219, 235 (Sep. 1836, 41, 57); de Man, 1888, *Mém. Soc. Zool. France*, i, 12.

5. *Aegialolaimus* de Man, 1907.

Cuticle striated but without bristles. Head slightly wider than neck, without lips or bristles. Lateral organs large, circular. Oesophagus with a posterior bulb and very wide lumen. Male unknown. Female genital tubes probably double and reflexed. Caudal glands present.

Hab. Marine.

Genotype: *A. elegans* de Man, 1907.

de Man, 1907, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, x, 228.

6. *Aphanolaimus* de Man, 1880.

Cuticle coarsely striated, without bristles. Lateral alae present. Head not distinct, with stout bristles, but without lips. Lateral organs circular or spiral, very large. Oesophagus cylindrical, not enlarged posteriorly. Caudal end of male with a median row of protrusible supplementary organs, also lateral preanal and postanal "bristle-papillae." An accessory piece present. Testes paired. Female genital tubes paired, symmetrical, rather short, apparently reflexed. Caudal glands and spinneret present. Sometimes hermaphrodite.

Hab. Marshy ground, fresh or brackish water.

Genotype: *A. attentus* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 5; 1884, *Die frei . . . lebenden Nematoden der Niederl. Fauna*, 34; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxviii, 142.

7. *Halalaimus* de Man, 1888.

Cuticle unstriated. Head without lips, but with a double crown of bristles. Lateral organs elongate, narrow, longitudinal grooves. Oesophagus slender, elongate, gradually enlarged behind. Male without caudal papillae. Two equal spicules and an accessory piece present. Testes paired. Caudal glands present.

Hab. Marine (littoral).

Genotype: *H. gracilis* de Man, 1888.

de Man, 1888, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 2; Filipjev, 1922, *Act. Inst. Agronom. Stavropol.*, i (Zool.), 100.

8. *Iotalaimus* Cobb, 1920.

Cuticle coarsely striated, without bristles. Crenate lateral alae present. Head not distinct, without bristles. Lateral organs semi-elliptical. Oesophagus slightly swollen posteriorly. Caudal end of male with some small postanal papillae. An accessory piece present. Testis and female genital tube single, anterior, reflexed. No caudal glands or spinneret.

Hab. Soil.

Genotype : *I. striatus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 239 and key.

9. *Bastiania* de Man, 1876.

Cuticle striated, without bristles. Lateral alae absent. Head not distinct, without lips, but with bristles. Lateral organs spiral. Oesophagus elongate and gradually, but slightly, swollen behind. Male with a ventral row of small papilliform supplementary organs extending throughout the greater part of the body. Spicules stout. No accessory piece. Testes paired. Female genital tubes paired, symmetrical. Caudal glands and spinneret present.

Hab. Soil.

Genotype : *B. gracilis* de Man, 1876.

de Man, 1876, *Tijdschr. Nederl. dierk. Vereen.*, 's Gravenhage and Rotterdam, 172; 1884, *Die frei . . . lebenden Nematoden der Nederl. Fauna*, 33; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 140.

10. *Deontolaimus* de Man, 1880.

Cuticle finely striated, without bristles or with few bristles. Lateral alae sometimes present. Head not distinct, without lips, but sometimes with fine bristles. Lateral organs absent. Oesophagus swelling slightly and gradually behind. Male with a row of ventral preanal papillae and one ventral post-anal papilla. Spicules large. A small rod-shaped accessory piece present. Testis single. Female genital tubes paired, symmetrical. Caudal glands and spinneret present.

Hab. Fresh or brackish water.

Genotype : *D. papillatus* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 3; 1884, *Die frei . . . lebenden Nematoden der Nederl. Fauna*, 31; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 141.

11. *Thalassoalaimus* de Man, 1893.

Cuticle unstriated, without bristles. Lateral alae apparently absent. Head without lips, but with bristles. Lateral organs small, probably in the form of transverse grooves. Oesophagus slender, expanding posteriorly. Caudal end of male with preanal papillae. Spicules short. An accessory piece present. Female genital tube single, posterior, reflexed. Caudal glands present.

Hab. Marine.

Genotype : *T. tardus* de Man, 1893.

de Man, 1893, *Mém. Soc. Zool. France*, vi, 81.

12. *Bolbinium* Cobb, 1920.

Cuticle finely striated, without bristles or lateral alae. Head not distinct, without lips or bristles, but with six papillae. Lateral organs large, deeply placed. Oesophagus with a pyriform posterior swelling. Tail of male short and rounded. A vestigial spicule.* No accessory piece or supplementary organs. Caudal glands and spinneret absent. Female unknown.

Hab. Soil.

Genotype: *B. brevicolle* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 240 and key; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 161.

13. *Cyartonema* Cobb, 1920.

Cuticle finely striated, without bristles except for a few on the tail. Slight lateral alae present. Head with four bristles and six minute papillae. Lateral organs large and circular. Oesophagus narrow, expanding gradually behind. Caudal end of male without supplementary organs. An accessory piece present, with a long posterior process. Testis single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Marine (in sand).

Genotype: *C. flexile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 242 and key.

14. *Tripyla* Bastian, 1865.

Syn. *Tripula* Bast., 1865; *Trischistoma* Cobb, 1913.

Cuticle striated or occasionally smooth, without bristles. Head not distinct, with three lips and with papillae and bristles, or bristle-like papillae. Lateral organs apparently absent. Oesophagus slightly swollen posteriorly. Caudal end of male usually with a long, ventral row of preanal papillae. No accessory piece. Testes paired. Female genital tubes generally paired, symmetrical, reflexed. Caudal glands and occasionally a spinneret present.

Hab. Soil and fresh water, rarely marine.

Genotype: *T. glomerans* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 93, 115; de Man, 1884, *Die frei . . . lebenden Nematoden der Nederl. Fauna*, 44; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 148.

* Cobb states in his description of the genotype that "the spiculum is vestigial," but in the key to genera the genus is placed among forms with "spicules two, equal, more or less arcuate."

15. *Nuada* Southern, 1914.

Cuticle smooth, extremely thick, without bristles or lateral alae. Head distinct, with four bristles. Lateral organs apparently absent. Oesophagus very long and slender. An accessory piece present. Female genital tubes paired, opposed.

Hab. Marine.

Genotype : *N. leptosoma* Southern, 1914.

Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 9.

16. *Leptosomatum* Bastian, 1865.

Syn. *Phanoglene* Eberth, 1863, *nec* Nordmann, 1840; *Enoplus* Eberth, 1863, *nec* Dujardin, 1845.

Cuticle unstriated or with longitudinal markings, without bristles. Lateral alae apparently absent. Head with three lips and two crowns of papillae. Oesophagus gradually expanded posteriorly. A pair of ocelli present. Caudal end of male occasionally with supplementary organs or "suckers." An accessory piece present. Testes paired, opposed. Female genital tubes paired, opposed, reflexed. Oviparous. Eggs comparatively numerous, smooth-shelled.

Hab. Marine.

Genotype : *L. elongatum* Bastian, 1865.

Bastian, 1865, *Proc. Roy. Soc. London*, xiv, 144; de Man, 1893, *Mém. Soc. Zool.*, Paris, vi, 102.

17. *Acoma* Steiner, 1916.

Cuticle unstriated, without bristles. Head distinct, without lips but with bristles. Oesophagus expanded gradually behind. Male unknown. Tail of female elongate. Female genital tubes paired, symmetrical, reflexed. Caudal glands rudimentary. Spinneret absent.

Hab. Marine (Arctic).

Genotype : *A. borealis* Steiner, 1916.

Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 652.

18. *Oxystomina* nom. nov.*

Syn. *Oxystoma* Bütschli, 1874, *nec* Dum., 1806.

Cuticle unstriated, without bristles. Head with fine bristles in genotype. Lateral organs elliptical. Oesophagus slightly expanded behind. Caudal end of male with two preanal bristles. An accessory piece present. Testis single.

* The name *Oxystomina* has, we believe, been proposed to replace the preoccupied name *Oxystoma*. We are unfortunately unable to trace its author and date of publication.

Female genital tubes paired, the anterior branch vestigial. Caudal glands present.

Hab. Marine.

Genotype : *O. [Oxystoma] elongatum* (Bütschli, 1874).

Bütschli, 1874, *Abh. Senckenb. Ges.*, Frankfurt a. M., ix, 270; Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 18.

19. *Litonema* Cobb, 1920.

Cuticle finely striated, without bristles. Lateral alae present. Head without bristles. Lips not apparent. Lateral organs pore-like or perhaps absent. A very narrow, elongate buccal capsule possibly present. Oesophagus slightly expanded posteriorly. Genital organs undescribed.

Hab. Fresh water (swamp).

Genotype : *L. nudum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 237 and key.

20. *Hyalaimus* Cobb, 1920.

Cuticle with irregular markings and finely crenate contour. Lateral fields broad, granular, with finely crenulate alae. Head truncate, without bristles. Lips indistinct. A crown of six cephalic papillae present. Lateral organs absent. Oesophagus with an anterior ("pharyngeal") swelling, and fusiform posteriorly. Male undescribed. Tail of female conical, pointed. Female genital tubes paired, opposed, outstretched.

Hab. (Apparently a single specimen) in the intestine of an Earthworm (Australia).

Genotype : *H. brevicollis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 238 and key.

21. *Macroposthonia* de Man, 1880.

Cuticle striated, apparently without bristles. Lateral alae present. Head without lips or bristles. Lateral organs not described. Oesophagus indistinctly separated from intestine. Tail of male completely surrounded by broad, bursa-like alae. Caudal papillae absent. Spicules slender, extremely long. No accessory piece. Caudal glands absent. Female unknown.

Hab. Soil.

Genotype : *M. annulata* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 58; 1884, *Die frei . . . lebenden Nematoden der Niederl. Fauna*, 124; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 163.

22. Campylaimus Cobb, 1920.

Cuticle finely striated. Lateral alae present. Head with a terminal cap, set off by a minute constriction, and with bristles which are asymmetrically placed. Mouth ventral, without distinct lips. Lateral organs elongate, half hoop-shaped. Oesophagus somewhat expanded behind. Testis apparently single. Female genital tubes paired, opposed, outstretched. Caudal glands "appear to be located in front of the anus, probably a long distance in front of it."

Hab. Marine (in sand and mud).

Genotype: *C. inaequalis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 232 and key.

23. Helalaimus Onorato-de Cillis, 1917.

Cuticle unstriated, without bristles. Head not distinct, without lips or bristles. Lateral organs circular. No true buccal capsule, but a very small cuticular vestibule. Oesophagus slightly expanded posteriorly. Tail of male apparently without preanal or postanal papillae. Spicules large. A small accessory piece present. Female genital tube single, anterior, outstretched. Caudal glands present.

Hab. Fresh water.

Genotype: *H. psilocephalus* Onorato-de Cillis, 1917.

Onorato-de Cillis, 1917, *Monit. Zool. Ital.*, xxviii, 45, 58.

24. Hemicycliophora de Man, 1921.

Cuticle rather coarsely striated, without bristles. Head hemispherical, distinct, without lips or bristles. Lateral organs probably elliptical. Oesophagus probably has a small bulb at about its middle. Caudal end of male alate, but without papillae. Spicules rather large. Presence of an accessory piece uncertain. Female unknown. Diagnosis based on a single male specimen.

Hab. Soil.

Genotype: *H. typica* de Man, 1921.

de Man, 1921, *Capit. Zool.*, i, 33.

25. Ionema Cobb, 1920.

Cuticle thin, without bristles. Head without lips but with four bristles. Lateral organs small, labial, unclosed, very inconspicuous. Oesophagus cylindrical, diminishing in thickness posteriorly. Ocelli present. Male unknown. Caudal end without bristles. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine (among Algae).

Genotype : *I. ocellatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 235 and key.

26. *Leptonemella* Cobb, 1920.

Cuticle striated, the striations retrorse posteriorly, the reverse anteriorly, without bristles or lateral alae. Head with eighteen small bristles. A few scattered bristles also present in the cervical region. Lips indistinct. Lateral organs apparently straight transverse slits. Oesophagus with wide pyriform posterior bulb. Caudal end of male with several submedian, slender, cuticular "thorns." An accessory piece present. Testes paired, opposed, outstretched. Caudal glands and spinneret present. Female unknown.

Hab. Marine.

Genotype : *L. cincta* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 244 and key.

27. *Litinium* Cobb, 1920.

Cuticle smooth or faintly striated, without bristles or lateral alae. Head with twelve bristles. Mouth merely a pore. Oesophagus gradually expanded behind. Male unknown. Female genital tube single, posterior, reflexed.

Hab. Marine (in sand).

Genotype : *L. aequale* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 234 and key.

28. *Litotes* Cobb, 1920.

Cuticle thin, without bristles. Lateral organs very inconspicuous. Male apparently unknown. Female genital tube single, anterior, outstretched. Eggs few.

Hab. Marine (among Algae).

Genotype : *L. minuta* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 230 and key.

29. *Molgolaimus* Ditlevsen, 1922.

Cuticle apparently unstriated, without bristles. Head rounded, not very distinct. Lateral organs absent. Oesophagus short and thin, with a large globular bulb posteriorly. [Another bulb may possibly be present.] Caudal end of male without postanal papillae but with two small preanal papillae. Spicules very long, filiform. No accessory piece seen. Female genital tubes paired, reflexed. Vulva somewhat in front of the middle of the body.

Hab. Marine.

Genotype : *M. tenuispiculum* Ditlevsen, 1922.

Ditlevsen, 1922, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxxiii, 2.

30. *Porocoma* Cobb, 1920.

Cuticle thin, finely striated, without bristles. Head with ten bristles, also a ventral bristle-like organ just behind the excretory pore. Mouth with relatively thick, minute lips. Lateral organs probably absent. Buccal capsule absent or vestigial. Oesophagus without bulb. Male unknown. Female genital tubes parallel, posterior. Caudal glands present.

Hab. Marine.

Genotype : *P. striata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 236 and key.

31. *Nemella* Cobb, 1920.

Cuticle finely striated, without bristles. Head with four bristles. Lateral organs small, with obvious internal elements. Oesophagus cylindrical. Two ocelli present, with lenses. Caudal end of male without supplementary organs or bristles. An accessory piece present, with a posterior process. Female unknown.

Hab. Marine.

Genotype : *N. ocellata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 236 and key.

32. *Schistodera* Cobb, 1920.

Cuticle thin, without bristles. Head without bristles. Lateral organs large and deep, with strongly chitinized posterior wall. Oesophagus expanding suddenly posteriorly. Caudal end of male with a pair of inconspicuous preanal bristles and two or three minute submedian postanal bristles. A straight accessory piece present. Testes probably paired. Caudal glands and spinneret present. Female unknown.

Hab. Marine (among Algae and sand).

Genotype : *S. exilis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 231 and key.

33. *Stilbonema* Cobb, 1920.

Cuticle with plain striations, retrorse posteriorly, the reverse anteriorly. Body with very short, slender, submedian bristles, six to nine striations apart. Head probably with a ring of very small papillae and twenty bristles. Lateral organs small, tubular, labial. Oesophagus very narrow, with pyriform posterior bulb. Caudal end of male with a row of acorn-shaped supplementary organs extending far forward. Spicules slender [very broad in figure]. Two parallel

accessory pieces present. Testis single, anterior, outstretched. Caudal glands and armed spinneret present.

Hab. Marine.

Genotype : *S. brevicolle* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 242 and key.

34. *Stenolaimus* Marion, 1870.

Cuticle with bristles, closer together towards anterior end. Head with six bristles, with or without papillae. Oesophagus club-shaped. Male with long slender spicules and two accessory pieces. Female genital tubes paired, opposed, reflexed, the anterior branch being vestigial. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *S. lepturus* Marion, 1870.

Marion, 1870, *Ann. Sci. Nat.*, Paris, Zool., (5) xiii, (Art. 14), 16.

35. *Tycnodora* Cobb, 1920.

Cuticle thick, apparently unstriated and without bristles. Lateral alae absent. Head with ten bristles. Lateral organs linear. Oesophagus apparently without bulb. Male apparently unknown. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *T. pachydermata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 231 and key.

36. *Xennella* Cobb, 1920.

Cuticle unstriated, with six to eight longitudinal ribs or alae on each side of the body, without bristles. Head mitriform, distinct, with four or six bristles. Lateral organs transversely elliptical, open behind. Oesophagus narrow, gradually expanded posteriorly. Male with two accessory pieces. Caudal glands and possibly spinneret present. Female unknown. [Type specimens immature.]

Hab. Marine.

Genotype : *X. cephalata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 233 and key.

37. *Neurella* Cobb, 1920.

Cuticle finely striated, without bristles, but with narrow lateral alae. Head not distinct, with apparently three lips and four bristles. Lateral organs spiral. Buccal cavity small. Oesophagus without bulb. Caudal end of male apparently with a single flattened supplementary organ.

Testes paired, parallel. Female genital tubes paired, opposed (?). Caudal glands and spinneret apparently absent.

Hab. Marine.

Genotype : *N. simplex* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 246 and key.

38. *Nannolaimus* Cobb, 1920.

Cuticle coarsely striated, without bristles except in cervical region. Head not distinct. Lips confluent. Two crowns of cephalic bristles present. Lateral organs spiral. Buccal cavity very small. Oesophagus without bulb. Ocelli present. Male unknown. Caudal end of female with a few median bristles. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *N. guttatus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 255 and key.

39. *Cytolaimium* Cobb, 1920.

Cuticle finely striated, without bristles. Head not distinct, with six papillae and six stout three-pointed bristles. Lateral organs circular, open behind. Buccal capsule very small. Oesophagus cylindrical. Caudal end of male with sixteen pairs of discoid subventral supplementary organs, of which five are postanal. A slender accessory piece present. Testes and female genital tubes paired, opposed, outstretched; anterior testis much larger than posterior. Caudal glands and spinneret (?) absent.

Hab. Marine.

Genotype : *C. exile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 251 and key.

40. *Diplopeltis* Cobb, in Stiles & Hassall, 1905.

Syn. *Dipeltis* Cobb, 1891, *nec* Packard, 1885.

Cuticle very finely striated, with or without conspicuous bristles. Head with three lips, of which one is more pointed than the others, and spear-like. In the genotype there are four submedian rows of about twelve stout bristles on the neck. Lateral organs with a thickened margin, more pointed in front than behind and extending to the base of the lips. Buccal capsule very small, "seems to be armed with a minute labial spear" [see reference already made to shape of lips]. Oesophagus club-shaped. Ocelli sometimes present. An accessory piece present, with a posterior process. Testes apparently paired and opposed. Female genital organs unknown. Caudal glands present.

Hab. Marine.

Genotype : *D. [Dipeltis] typicus* (Cobb, 1891).

Cobb, 1891, *Proc. Linn. Soc. N.S.W.*, Sydney, vi, 155;
Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, 100, 101.

41. *Zygonemella* Cobb, 1920.

Cuticle coarsely striated, without bristles except in cervical region. Lateral alae apparently absent. Head with two crowns of bristles. Lips three, indistinct, faintly bilobed. Lateral organs transversely elliptical. Pharynx indistinguishable except for a slight posterior expansion of its lumen. Oesophagus without posterior bulb. Caudal end of male apparently without supplementary organs or papillae. Testes paired, opposed, reflexed; the anterior about twice as long as the posterior. Caudal glands and spinneret present. Female undescribed.

Hab. Marine.

Genotype : *Z. striata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 247 and key.

42. *Spirina* Filipjev, 1918.

Syn. *Spira* Bastian, 1865, *nec* Brown, 1838.

Cuticle striated, with few bristles. Head not distinct, with bristles. Lateral organs circular, prominent or depressed. No buccal cavity. Oesophagus short, considerably swollen behind, but without distinct bulb. Caudal end of male without papillae or supplementary organs. Two accessory pieces present. Female genital tubes paired, opposed. Spinneret small and indistinct.

Hab. Marine.

Genotype : *S. [Spira] parasitifera* (Bastian, 1865).

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 159; Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 232.

43. *Nemanema* Cobb, 1920.

Head without lips. Lateral organs apparently circular, connected with cutinized ducts. Buccal capsule exceedingly minute, conoid, "possibly with a forward pointing tooth." Oesophagus expands gradually behind. Caudal end of male with a few ventral preanal and postanal bristles. Female genital tubes paired, opposed, reflexed, the anterior branch rudimentary. Caudal glands present.

Hab. Marine (among sand and Algae).

Genotype : *N. simplex* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 230 and key.

44. Disconema Filipjev, 1918.

Cuticle finely striated. Head without lips, but with six labial papillae, and ten bristles in a single crown. Lateral organs extremely large, oval, with some signs of concealed spirals. Buccal cavity absent. Oesophagus with indistinct bulb. Female genital tubes paired, outstretched.

Hab. Marine.

Genotype: *D. alaima* Filipjev, 1918.

Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 305.

45. Prosphaerolaimus Filipjev, 1918.

Cuticle finely striated. Head not distinct, with six lips and two crowns each of six papillae. Four cephalic bristles present, and behind these many supplementary bristles. Lateral organs large, circular. "Oral cavity nearly absent"; [the figure does not enable us to form a conception of its structure]. Oesophagus cylindrical, without bulb or posterior swelling. Tail of female long and tapering. Female genital tube (single?) outstretched. Male apparently unknown.

Hab. Marine.

Genotype: *P. eurypharynx* Filipjev, 1918.

Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 303.

APPENDIX TO ALAIMIDAE.

a. Linhomoella Cobb, 1920.

Cuticle finely striated, without bristles except towards the anterior end. Head not distinct, without apparent lips, but with a double crown of ten bristles. Lateral organs spiral. The presence of a pharynx is uncertain. Oesophagus cylindrical, without bulb. Caudal end of male with a few bristles on each subventral line. Accessory piece present, with a small process. "As to supplementary organs, there are almost invisible ventral innervations." Testes and female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *L. exilis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 254 and key.

b. Mastodex Steiner, 1921 (?).

Steiner (1921, *Zool. Jahrb., Anat.*, xliii, 25) figures a worm under the name of *Mastodex kerguelensis* Steiner. The individual figured appears to be an immature one, with a simple, club-shaped oesophagus. No buccal cavity is indicated.

Fam. 12. CHAETOSOMATIDAE Steiner, 1916.

(Chaetosomatiden Schepotieff, 1908).

Free-living (marine) forms, usually somewhat swollen in the middle region of the body. Cuticle, except at the extremities, transversely striated. Numerous bristles present, usually arranged in submedian rows. Lateral organs present, circular, horseshoe-shaped or spiral. On the ventral surface in the preanal region, in both sexes, there are two, three or four longitudinal rows of peculiar, tubular or solid, bristle-like "ambulatory" appendages. Lips not distinct. Six circumoral and numerous specialized cephalic bristles present. A small pharynx apparently present. Oesophagus relatively short, muscular, with a posterior bulb and sometimes an anterior swelling or swellings. Male with two slender spicules and usually one or two accessory pieces. Male genital tube single, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

1. *Chaetosoma* Claparède, 1863.Syn. *Tristichochaeta* Panceri, 1878.

Cephalic region swollen into an oval shape, and followed by a narrow "neck." Oesophagus cylindrical, with a posterior bulb. Ventral appendages in two or three rows, tubular, postvulvar in female.

Hab. Marine.

Genotype: *C. ophicephalum* Claparède, 1863.

Claparède, 1863, *Beobachtungen üb. Anat. u. Entwicklungsges. wirbelloser Thiere*, etc., Leipzig, 88; Panceri, 1878, *Atti R. Accad. Sci. Napoli*, vii (10), 7; Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 560; Irwin-Smith, 1918, *Proc. Linn. Soc. N.S.W.*, Sydney, xlii, 757.

2. *Draconema* Cobb, 1913.

Closely resembles *Chaetosoma*, but the oesophagus is very short and has one or two anterior swellings in addition to the posterior bulb. Ventral appendages in four rows, with free ends expanded.

Hab. Marine.

Genotype: *D. cephalatum* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 145; Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 560.

The differences between this genus and the last are very slight, and it seems possible that *Draconema* should be regarded as a synonym of *Chaetosoma*.

3. Prochaetosoma nom. nov.

Syn. *Rhabdogaster* Metchnikoff, 1867, *nec* Loew, 1858.

Cephalic region not swollen, passing gradually into body. Body stouter in posterior half. Head without papillae. Oesophagus cylindrical, with well-developed posterior bulb, and sometimes an anterior swelling. Ventral appendages in two submedian rows, solid, somewhat hooked, extending in front of vulva, or entirely in front of it, in female. Male without accessory piece. A single large caudal gland present.

Hab. Marine.

Genotype: *P. [Rhabdogaster] cygnoides* (Metchnikoff, 1867).

Metchnikoff, 1867, *Zeitschr. f. wiss. Zool.*, xvii, 542; Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 574; Stauffer, 1924, *Zool. Jahrb., Syst.*, xlix, 119.

4. Notochaetosoma Irwin-Smith, 1918.

Cephalic region not swollen. Oesophagus cylindrical, faintly swollen behind. Ventral appendages in four rows, mostly jointed near the tip, confined to postvulvar region. An accessory piece present. A single caudal gland present.

Hab. Marine.

Genotype: *N. tenax* Irwin-Smith, 1918.

Irwin-Smith, 1918, *Proc. Linn. Soc. N.S.W.*, Sydney, xlii, 798.

Fam. 13. DESMOSCOLECIDAE Southern, 1914.

(Desmoscoleciden Schepotieff, 1908).

Stout, spindle-shaped, free-living forms. Body and tail either with opaque transverse rings, or with numerous transverse rings or longitudinal rows of bristles. Head usually distinct, more or less rounded. Lateral organs present. Mouth circular or transversely elongate. Pharynx narrow, with thick cuticular lining. Oesophagus usually somewhat swollen behind. Male with two spicules and one or two accessory pieces. Testis single, reflexed. Female genital tubes paired, opposed. Eggs large and few, sometimes carried attached to the body of the parent.

1. Desmoscolex Claparède, 1863.

Syn. *Quadricoma* Filipjev, 1922.

Body and tail with opaque transverse rings, formed by a secretion to which foreign particles become cemented, and with more or less pronounced clear interspaces. A few bristles present on the body, sometimes jointed and usually arranged in pairs.

Hab. Marine.

Genotype : *D. minutus* Claparède, 1863.

Claparède, 1863, *Beobachtungen üb. Anat. u. Entwicklungsges. wirbelloser Thiere*, etc., Leipzig, 89; Schepotieff, 1908, *Zeitschr. f. wiss. Zool.*, xc, 181; Steiner, 1916, *Zool. Anz.*, xlvii, 324; Filipjev, 1922, *Act. Inst. Agronom. Stauropol.*, i (16), 150.

The chief character in which *Quadricoma* is said to differ from *Desmoscolex* is the larger number of annulations on the cuticle (seventeen or eighteen in *Desmoscolex*, thirty-three to seventy-six in *Quadricoma*, according to Filipjev). We are unable to accept this as a generic character, and therefore regard *Quadricoma* as a synonym of *Desmoscolex*.

2. *Tricoma* Cobb, 1894.

Like *Desmoscolex*, but with the clear interspaces of cuticle greatly reduced, almost the whole surface of the body being occupied by the opaque rings. Body with bristles in "cycles" of three in the genotype. Lips conical, flanked by cuticular "cephalic alae," and each bearing a bristle at its base.

Hab. Marine.

Genotype : *T. cincta* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, (2) viii, 389; Steiner, 1916, *Zool. Anz.*, xlvii, 324; Filipjev, 1922, *Act. Inst. Agronom. Stauropol.*, i (16), 155.

Cobb's description of the genotype was drawn up from memory, with the help of two drawings, the type having been lost. The genus is upheld by Filipjev, who has ascribed other species to it. The differences from *Desmoscolex* appear, however, to be very slight, and it is not improbable that *Tricoma* should be regarded as a synonym.

3. *Eudesmoscolex* Steiner, 1916.

Opaque rings on cuticle, as in *Tricoma*, not separated by clear interspaces. Bristles in two subdorsal rows of nine each. Lips apparently absent.

Hab. Marine.

Genotype : *E. oligochaetus* Steiner, 1916.

Steiner, 1916, *Zool. Anz.*, xlvii, 324; 1916, *Zool. Jahrb., Syst.*, xxxix, 579.

Here, again, the differences from *Desmoscolex* are slight, and the genus appears of somewhat doubtful validity.

4. *Greeffiella* Cobb, 1922.

Syn. *Trichoderma* Greeff, 1869, *nec* Steph., 1835.

Head distinct, rounded, with two crowns of bristles. Lateral organs present. Cuticle of body very coarsely

annulated, each ring bearing a circle of long, backwardly-directed, pointed bristles. Among these bristles there are a few stouter, tubular, subdorsal bristles resembling the ventral ambulatory appendages of the Chaetosomatidae. Lips not distinct. A minute pharynx apparently present. Oesophagus with two slight swellings. Spicules very slender, straight. Accessory piece apparently absent. Male genital tube single, reflexed. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *G. [Trichoderma] oxycaudata* (Greeff, 1869).

Greeff, 1869, *Arch. f. Naturg.*, xxxv, i, 115; Cobb, 1922, *Journ. Washington Acad. Sci.*, xii, 229 [*Contr. Sci. Nematol.*, xii].

5. *Richtersia* Steiner, 1916.

Body short and stout. Head distinct, with lips (probably six), papillae and bristles, and followed by a cuticular "collar." Lateral organs spiral. Cuticle of body finely striated, with numerous longitudinal rows of fine, hook-like appendages, and short, scattered bristles. The "collar" bears five longer bristles. Pharynx narrow, with a peculiar "kink" in its walls posteriorly. Oesophagus thick and muscular, without bulb. Caudal end of male with preanal and postanal papillae. Spicules slender. A forked accessory piece present. Female genital tubes paired, opposed. Spinneret present.

Hab. Marine.

Genotype: *R. collaris* Steiner, 1916.

Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 583.

Fam. 14. ONCHOLAIMIDAE nov.

Typically small, free-living forms with a buccal cavity having chitinous walls and containing usually three teeth, of which one is dorsal and two subventral. One or more of the teeth may be absent, or additional teeth or denticles may be developed. Oesophagus with or without a posterior bulb.

This group is nearly co-extensive with the family Odontopharyngidae proposed by Micoletzky (1922). It contains a large and heterogeneous collection of genera, very difficult to arrange in a natural and satisfactory manner. In Micoletzky's system the family Odontopharyngidae was divided into seven subfamilies (Ironinae, Enoplinae, Oncholaiminae, Microlaiminae, Chromadorinae, Anguillulinae and Diplogasterinae). On reviewing the whole of the genera, we have found it possible to retain the three first-mentioned subfamilies (their contents being somewhat altered), but

have been unable to accept the remainder. The subfamily Anguillulinae contained only *Anguillula* and *Macrolaimus*, which seem to us to fall more naturally into the family Rhabditidae (subfam. Rhabditinae). There seems to be nothing to prevent the contents of the subfamily Diplogasterinae also from being transferred to the same position in the system. The Microlaiminae and Chromadorinae are so vaguely defined as to be incapable of separation from each other or from the Oncholaiminae. On the other hand, there seems to be some justification for grouping together certain forms in which the pharynx contains only a single, frequently stylet-like, dorsal tooth, the other teeth characteristic of the family being absent. Accordingly, we have placed these genera in a new subfamily, Desmodorinae.

As regards the family name, it is not in accordance with existing rules to take as the type of a family a genus which is not also the type of one of its subfamilies. We have therefore substituted the name Oncholaimidae for Odontopharyngidae.

The provisional classification here outlined is admittedly far from satisfactory. It is based chiefly upon the characters of the buccal cavity, which, in accordance with the plan adopted throughout the system, we have taken to be of primary importance. The groups, however, grade into each other almost imperceptibly, and it is possible to connect them at various points with other families. In an ideal, or "natural," system of classification the genera would be better arranged in the form of a genealogical tree, and this would probably bear very little relation to the arbitrary and artificial system into which we have attempted to fit them.

Subfam. 1. **ONCHOLAIMINAE** Micoletzky, 1922.

Pharynx typically rather spacious, containing three teeth, frequently at or near its base. One or more of the teeth may be lost, or additional teeth may be developed on the walls of the pharynx. Oesophagus typically club-shaped, exceptionally with a posterior bulb.

1. **Oncholaimus** Dujardin, 1845.

Syn. *Viscosia* de Man, 1890; *Metoncholaimus* Filipjev, 1918; *Adoncholaimus* Filipjev, 1918; *Prooncholaimus* Micoletzky, 1924.

Some species of relatively large size (25 to 30 mm.). Cuticle unstriated, sometimes glutinous. Bristles usually present on the tail and papillae or bristles frequently present towards both extremities. Head not distinct, with rounded lips, and usually with bristles. Lateral organs transversely elliptical.

Pharynx spacious, cylindrical or six-sided, containing a dorsal and two subventral teeth. One of the subventral teeth is larger than the others, and all the teeth carry the ducts of oesophageal glands. Oesophagus gradually swollen behind, without bulb. Ocelli sometimes present. A single accessory piece may be present. Testis single or paired. Female genital tubes paired, opposed, or single, anterior, always reflexed. A peculiar "tubiform organ" in the body-cavity of the female, opening by paired lateral pores near the anus. Caudal glands present. Specialized spinneret apparently absent.

Hab. Mostly marine, a few species in fresh or brackish water.

Genotype: Probably *O. attenuatus* Dujardin, 1845, according to Stiles and Hassall (1905).

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 230, 235; de Man, 1884, *Die frei . . . lebenden Nematoden der Niederl. Fauna*, 67; Cobb, 1918, in Ward & Whipple, *Freshwater Biology*, 487; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 331; Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 110; 1924, *Zool. Anz.*, lviii, 108.

Viscosia is regarded by some authors (Micoletzky, 1922) as a subgenus of *Oncholaimus*. Its chief peculiarity appears to be the viscous nature of its cuticle, and this scarcely seems to warrant its separation from typical forms. *Metoncholaimus* is said by Filipjev (1918) to differ from *Oncholaimus* in having very long spicules and a "tubiform organ" of different structure. These points, however, scarcely appear to warrant a generic distinction. We have been unable to find any satisfactory characters in Filipjev's (1924) diagnosis to justify the separation of *Adoncholaimus*. *Prooncholaimus* Micoletzky is equally unsatisfactory.

2. *Paroncholaimus* Filipjev, 1916.

According to Filipjev this genus differs from *Oncholaimus* in the following characters. Of the teeth in the pharynx the two subventral are symmetrical and larger than the dorsal. In the female, a "tubiform organ" is absent.

Hab. Marine.

Genotype: *P. [Oncholaimus] vulgaris* (Bastian, 1865).

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 135; Filipjev, 1916, *Ann. Mus. Zool. Acad. Imp. Sci.*, Petrograd, xxi, 105.

3. *Oncholaimellus* de Man, 1890.

Head with ten bristles. Pharynx elongate, its anterior third separated by a constriction from the posterior part,

which is funnel-shaped. The large tooth is very well developed, occupying almost the whole lumen of the pharynx. It is asymmetrical (subventral), as in *Oncholaimus*. The remaining two teeth are blunt tubercles. Oesophagus slightly swollen behind. Caudal end of male with alae and three pairs of fine sublateral bristles, one pair preanal and two postanal. Both preanal and postanal papillae present. Spicules long, unequal, the longer (right) slightly S-shaped, the other only slightly curved and two-thirds of the length of the right. Female genital tubes paired, opposed, reflexed. "Tubiform organ" absent. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *O. calvadosicus* de Man, 1890.

de Man, 1890, *Mém. Soc. Zool. France*, iii, 189.

4. *Mononchulus* Cobb, 1917.

Cuticle unstriated and apparently without bristles. Head not distinct, with six lips and six papillae, but without bristles. Lateral organs very inconspicuous, semicircular. Pharynx large, with three teeth, of which one of the subventral is considerably the largest. Oesophagus comparatively long, somewhat swollen posteriorly. Apparently hermaphrodite, the anterior branch of the genital tube longer and reflexed, and functioning as a female organ; the posterior branch small, outstretched, producing spermatozoa. Spinneret opens ventrally and subterminally.

Hab. Fresh water.

Genotype: *M. ventralis* Cobb, 1918.

Cobb, 1917, *Soil Science* (May), 447, 453; 1918, *Contr. Sci. Nematol.*, vii, 195.

5. *Rhabdodemia* nom. nov.

Syn. *Demia* Southern, 1914, nec Laurie, 1906, nec Steiner, 1914.

Cuticle smooth. Head with ten bristles in one or two crowns. Lateral organs indistinct. Pharynx large and deep, the hinder portion having three longitudinal chitinous rods, each with an anterior tooth. All the teeth are apparently of equal size. Oesophagus slightly swollen posteriorly. Caudal end of male without preanal papillae or supplementary organs. Spicules equal. An accessory piece present. Female genital tubes paired, opposed, reflexed. Caudal glands present.

Hab. Marine.

Genotype: *D. major* Southern, 1914 (by page precedence).

Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 41.

6. *Gammanema* Cobb, 1920.

Cuticle rather finely striated, without bristles except near the extremities. Head not distinct, with six short labial bristles and six longer, jointed cephalic bristles. There are apparently twelve lips, joined by a membrane with various anterior appendages, the whole resembling a leaf-crown. Twelve of the appendages are longer than the others and have spatulate terminations. Lateral organs unknown. Pharynx wide, shallow and cup-shaped, with three inwardly-pointing teeth at its base. From the base of the pharynx extend three chitinoid rod-like structures, connected with the musculature of the oesophagus. Oesophagus diminishes in diameter behind, without bulb. Caudal end of male with at least sixteen small preanal supplementary organs, and a few submedian bristles near the anus. Spicules slender. Accessory pieces apparently two, "obscure." Testes paired, opposed, outstretched. Female genital tube single, posterior, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *G. ferox* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 291 and key.

7. *Spilophora* Bastian, 1865.

Syn. *Spiliphora* Bastian, 1865; *Hypodontolaimus* de Man, 1886; *Halichoanolaimus* de Man, 1886; *Trogolaimus* Cobb, 1920.

Cuticle striated. Head not distinct, without apparent lips, but with bristles. Lateral organs spiral. Pharynx more or less cup-shaped, with longitudinal folds anteriorly and three chitinoid processes extending backwards from its base into the walls of the oesophagus. Oesophagus somewhat swollen behind, sometimes with a bulb.

Hab. Marine or fresh water.

Genotype: *S. elegans* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 165, 178; Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 523.

Steiner (1916) considers it doubtful whether *Spilophora* can be distinguished from *Chromadora*. He refers to the fact that three posterior processes of the pharyngeal wall are mentioned by Bastian in his descriptions of both genera. A study of Bastian's figures shows, however, that the processes in *Spilophora* are quite different in nature from those in *Chromadora*, the latter appearing simply as thickenings of the posterior part of the pharyngeal wall. On this account we have retained *Spilophora* as a distinct genus, although on many points the description of the genotype is incomplete.

Hypodontolaimus, which was considered by Steiner (1916) as a possible synonym of *Chromadora*, can be regarded as a synonym of *Spilophora* on account of de Man's description of similar posterior pharyngeal processes. It appears very doubtful whether *Trogolaimus* can be separated from *Spilophora*.

8. *Cobbionema* Filipjev, 1922.

Cuticle smooth, with rows of internal dots. Head not distinct, with six (?) small lips and some slender bristles. Lateral organs large, spiral. Pharynx with a cup-shaped anterior portion and a funnel-shaped posterior portion. The former is surrounded by circular muscles. The latter contains three longitudinal chitinoid thickenings, each bearing at its anterior end several small teeth, irregularly arranged. Oesophagus with an anterior swelling, and somewhat swollen posteriorly, but without bulb. Male undescribed. Female genital tubes paired. Tail of female sharply constricted a little behind the anus. Spinneret present.

Hab. Marine.

Genotype: *C. acrocerca* Filipjev, 1922.

Filipjev, 1922, *Act. Inst. Agronom. Stauropol.*, i (Zool.), 16, 114.

9. *Bolbella* Cobb, 1920.

Cuticle very finely transversely striated, and also longitudinally striated, with some fine bristles towards the extremities. Head not distinct, truncate, with six circumoral papillae and a single crown of ten bristles (two single, lateral, and four submedian pairs). Lateral organs stirrup-shaped, with transversely elliptical anterior opening. Pharynx in two portions, the anterior slightly wider than the posterior. The latter contains three teeth, the dorsal and left subventral teeth small, the right subventral elongate and spear-like, extending forward into the anterior chamber of the pharynx. Oesophagus long, with a slender anterior portion and a stouter posterior portion consisting of a series of rounded bulbs. Caudal end of male with two cup-shaped preanal supplementary organs. Accessory piece (? pieces) with long posterior process. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands (preanal) and spinneret present.

Hab. Marine (in sand).

Genotype: *B. tenuidens* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 308 and key.

10. *Polygastrophora* de Man, 1922.

Cuticle unstriated but with bristles. Head slightly distinct. Twelve cephalic bristles present. Mouth probably

surrounded by papillae. Lateral organs unknown. Buccal cavity large, shaped somewhat as in *Symplocostoma*, with one large and two small anteriorly-directed teeth. Oesophagus gradually swollen behind, with a series of bulb-like expansions. Caudal end of male with a median series of preanal papillae. A slender accessory piece present, almost half as long as the spicules, its lateral portions running out proximally into a semicircular, anteriorly-directed hook. Female unknown. Caudal glands present.

Hab. Marine.

Genotype: *P. attenuata* de Man, 1922.

de Man, 1922, *Tijdschr. Ned. dierk. Vereen.*, Leiden, (2) xviii, 131.

11. *Eurystomina* Filipjev, 1921.

Syn. *Eurystoma* Marion, 1870, *nec* Rafinesque, 1818; *Amphistenus* Marion, 1870; *Marionella* Cobb, 1922.

Cuticle covered with very short, scattered bristles. Head truncate, with a crown of long, slender bristles. Lateral organs unknown. Pharynx spacious, armed with three chitinoid rods, each bearing a tooth anteriorly. Oesophagus relatively long, slightly swollen posteriorly. Two ocelli present. Caudal end of male with two large preanal supplementary organs. An accessory piece, with a long posterior process, present. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present or absent.

Hab. Marine.

Genotype: *E. [Eurystoma] spectabile* (Marion, 1870).

Marion, 1870, *Ann. Sci. Nat.*, Paris, Zool., xiii, 14, 19; Filipjev, 1921, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 568; Cobb, 1922, *Contr. Sci. Nematol.*, xi, 353.

We have included *Amphistenus* tentatively in the synonymy of this genus. The males of the two species described by Marion are still unknown. Cobb (1922) gives a somewhat different account of the structure of the pharynx from that given above, but as he designates *Eurystoma spectabile* Marion as genotype of *Marionella*, this is a synonym of *Eurystomina*.

12. *Phanoderma* Bastian, 1865.

Cuticle very transparent, unstriated or with longitudinal markings. Head with bristles. Pharynx indistinct, with obscure indications of three thickenings. Oesophagus swollen behind, not distinctly muscular. Two large ocelli present. Caudal end of male with a small supplementary organ. No accessory piece. Female genital tubes paired, opposed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *P. cocksi* Bastian 1865, according to Stiles & Hassall (1905).

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 142.

13. *Anaxonechium* Cobb, 1920.

Cuticle rather coarsely striated, without bristles. Lateral alae present. Head not distinct, with a crown of ten short, stout, two-jointed bristles. Lips apparently six, bilobed, each bearing externally a short bristle and two longer appendages with expanded ends (according to the figure, with which the description does not altogether agree). Lateral organs "peculiar, large, faint" (according to figure, incipient spirals). Pharynx narrow, largely occupied by a well-developed dorsal tooth. Opposite to this several smaller teeth, of which two subventral ones are probably the largest. Apparently small denticles also occur dorsally to and in front of the large dorsal tooth. Oesophagus without posterior bulb. Male with a series of fifteen to twenty preanal supplementary organs and a few small caudal bristles. Spicules rather broad. Two "somewhat shoe-shaped" accessory pieces present, with a median piece between and behind them. Testis single, anterior, reflexed. Female unknown.

Hab. Marine (in sand).

Genotype: *A. litorium* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 319 and key.

14. *Thoönchus* Cobb, 1920.

Cuticle finely striated. Head not distinct, with six lips, six papillae and ten bristles. Lateral organs apparently transversely elliptical. Pharynx rather wide, goblet-shaped, containing a rather small dorsal tooth and two subventral teeth at its base. In front of these teeth the walls of the pharynx bear numerous small denticles. Oesophagus gradually swollen behind, without bulb. Caudal end of male with a single preanal supplementary organ in the form of a transverse ridge, a pair of subventral preanal papillae, and a few short preanal and postanal bristles. Spicules rather stout. Accessory piece (? single) with expanded lower end in which spicules slide, and without posterior process. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands (preanal) and spinneret present.

Hab. Marine.

Genotype: *T. ferox* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 310 and key.

15. *Mononchus* Bastian, 1865.

Syn. *Onchulus* Cobb, 1920; *Promononchus* Micoletzky, 1923.

Cuticle unstriated and without bristles. Head not distinct, with or without papillae, without bristles. Lateral organs small, indistinct. Pharynx large, more or less oval, with a dorsal tooth projecting from its wall into the lumen, and frequently with two smaller subventral teeth. Small denticles may also be present on the ventral wall of the pharynx. Oesophagus without bulb, but slightly swollen posteriorly. Caudal end of male with a ventral row of eight to twenty supplementary organs, and with preanal and postanal papillae. Two accessory pieces present. Testes paired, opposed, outstretched. Female genital tubes usually paired, opposed, reflexed. Many species probably hermaphrodite. Caudal glands and spinneret present.

Hab. Soil or fresh water.

Genotype: *M. truncatus* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 100; Cobb, 1916, *Journ. Parasitol.*, ii, 196; 1917, *Soil Science* (May), 184, ff. [*Contr. Sci. Nematol.*, vi, 129, ff.].

Onchulus Cobb and *Promononchus* Micoletzky were both described from single immature specimens, and are insufficiently characterized to separate them from *Mononchus*.

Cobb (1916 and 1917) divides the genus *Mononchus* into the following subgenera:

a. *Mononchus*.

Dorsal tooth large, midway or further forward in the pharynx. Subventral teeth present or absent. Ventral denticles absent. Type: *truncatus* Bastian, 1865.

b. *Prionchulus* Cobb, 1916.

Dorsal tooth large, midway or further forward in the pharynx. Subventral teeth apparently absent. Ventral denticles arranged longitudinally. Type: *muscorum* Dujardin, 1845.

c. *Anatonchus* Cobb, 1916.

Dorsal tooth and subventral teeth small and backwardly-directed, at about the middle of the pharynx or behind it. Denticles apparently absent. Type: *tridentatus* de Man, 1876.

d. *Iotonchus* Cobb, 1916.

Dorsal tooth always at the base of the pharynx. The subventral teeth may be very small. Ventral denticles apparently absent. Type: *gymnolaimus* Cobb, 1893.

e. *Mylonchulus* Cobb, 1916.

Dorsal tooth large, midway or further forward in the pharynx. Subventral teeth frequently present. Ventral denticles numerous, arranged in transverse rows or on two rasp-like areas. Type: *minor* Cobb, 1893.

f. *Sporonchulus* Cobb, 1917.

Dorsal tooth as in *Mylonchulus*. Subventral teeth apparently absent. Ventral denticles irregularly arranged. Type (by page precedence): *dentatus* Cobb, 1917.

16. Oionchus Cobb, 1913.

Cuticle finely striated, without bristles or lateral alae. Lateral organs stirrup-shaped. Head without bristles. Lips indistinct. Two crowns of cephalic papillae present. Buccal cavity narrow, cylindrical or prismatic, almost completely filled by a dorsal spear-like tooth. Oesophagus cylindrical, without bulb. Male unknown.* Female genital tube single, anterior, reflexed. Tail short. Spinneret present.

Hab. Soil, about roots of grass.

Genotype: *O. obtusus* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 442 and key; 1917, *Soil Science*, 453; 1918, in Ward & Whipple, *Fresh-water Biology*, 487; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 367.

17. Udonchus Cobb, 1913.

Cuticle finely striated, without lateral alae. Lateral organs transversely elliptical. Head rounded, without bristles. Lips with two circles of papillae. Buccal cavity cup-shaped in front, somewhat narrowed behind, containing a small forwardly-directed dorsal tooth at the base of the cup-shaped portion, and opposite to this a very minute ventral tooth. Oesophagus with a posterior bulb. Male unknown. Tail of female elongate, slightly swollen at the tip. Spinneret present. Female genital tube single, anterior, reflexed.

Hab. Fresh water.

Genotype: *U. tenuicaudatus* Cobb, 1913.

Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 442 and key; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 368.

18. Odontopharynx de Man, 1912.

Cuticle very finely striated, without bristles. Head with papillae but without lips or bristles. Lateral organs transversely elliptical. Pharynx spacious, longer than wide, hexa-

* Cobb (1918) states that the male has a "bursa" and unequal or equal spicules.

gonal anteriorly, three-sided posteriorly, containing a large dorsal tooth and several much smaller teeth, some lateral, some subventral. Oesophagus with cylindrical, muscular anterior portion, and a non-muscular posterior portion which is narrower anteriorly than the former, but expands gradually behind. No oesophageal bulb. Caudal end of male with preanal and postanal papillae. "Probably" two equal spicules and an accessory piece present. Female genital tubes paired, the posterior short and without ovary.

Hab. On diseased Hyacinth bulbs.

Genotype : *O. longicaudatus* de Man, 1912.

de Man, 1912, *Zool. Jahrb., Syst.*, xxxiii, 637.

19. *Alaimonema* Cobb, 1920.

Cuticle finely striated, with scattered, inconspicuous bristles. Head not distinct, with four crowns each of four bristles. Lips indistinct. Lateral organs large, spiral. Pharynx very narrow, apparently three-sided, containing three small, sub-equal teeth towards its anterior end. Oesophagus with a pyriform posterior bulb. Caudal end of male with thirty-seven prominent preanal supplementary organs. A slender accessory piece present. Testis single, anterior, outstretched. Female unknown.

Hab. Marine (in sand).

Genotype : *A. multicinctum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 327 and key.

20. *Aponchium* Cobb, 1920.

Cuticle unstriated, apparently without bristles. Head very slightly distinct, with six labial papillae and a single crown of four bristles. Lateral organs circular. Pharynx small, its cavity almost filled by three forwardly-directed teeth, of which the dorsal is apparently smaller than the two subventral. Oesophagus with an elongated, pyriform, bulb-like posterior swelling. Caudal end of male with twelve highly-developed preanal supplementary organs having paired, spiny, shallow, cup-shaped ends. Spicules slender. Two accessory pieces present, with posterior processes, and also a median piece between the spicules. Testis single, anterior, reflexed. Female genital tube single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *A. cylindricolle* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 298 and key.

21. Catanema Cobb, 1920.

Cuticle finely striated. Head with ten bristles, of which four are longer than the rest and three-jointed. Lateral organs minute, directed forwards. Pharynx narrow, containing anteriorly several (? six) small teeth. Oesophagus with a posterior bulb. Caudal end of male with one small preanal supplementary organ, preceded by a number of minute ventral bristles. Seven pairs of subventral postanal supplementary organs also present. An accessory piece (? two accessory pieces) present, with posterior process. Testis single, anterior, outstretched. Female undescribed. Caudal glands and spinneret present. Genus apparently based on a single male specimen.

Hab. Marine (in sand).

Genotype: *C. exile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 271 and key.

22. Pseudobathylaimus Filipjev, 1918.

Syn. *Bathylaimus* Daday, 1905, *nec* Cobb, 1894, *nec* Ditlevsen, 1919; *Dadayia* Micoletzky, 1922, *nec* Travassos, 1921.

Cuticle markedly striated, without bristles. Head not distinct, without lips but with four or six bristles. Lateral organs unknown. Pharynx usually long, in two portions, the anterior with tooth-like structures, the posterior with longitudinal ribs. Oesophagus with a posterior bulb. Two or four rows of ocelli present. Caudal end of male, in the genotype, with numerous preanal supplementary organs. Two accessory pieces present. Female genital tubes paired, opposed, outstretched; or unpaired, anterior. Caudal glands and spinneret present.

Hab. Fresh water.

Genotype: *P. [Bathylaimus] maculatus* (Daday, 1905).

Daday, 1905, *Zoologica*, Stuttgart, xviii, 59; Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 347; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 328.

23. Croconema Cobb, 1920.

Cuticle thick, coarsely striated, with many short, slightly-curved bristles. Head slightly swollen, apparently covered by a single helmet-like cap of cuticle, bearing at least six irregular longitudinal rows of bristles. Apparently twelve small lips present. Lateral organs small, spiral. Pharynx narrow, nearly as long as the cephalic cap, its lumen nearly filled by the apices of teeth, of which one dorsal and one larger, submedian, have been made out. Oesophagus gradually swollen behind, without bulb. Male unknown. Female

genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *C. cinctum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 332 and key.

24. *Cylicolaimus* de Man, 1889.

Cuticle unstriated, with lateral and submedian bristles. Head not distinct, with three small lips and a crown of bristles. Lateral organs very small, transversely elliptical. A series of glands present in each lateral field. Pharynx relatively wide, surrounded externally by a secondary chitinous ring, and with three forwardly-projecting tooth-like processes at its base, through which the oesophageal glands open. There may be a crown of denticles within the mouth-opening, and behind these three larger teeth. In addition there may be two or more forwardly-pointing triangular plates projecting from the wall of the pharynx. Oesophagus gradually swollen behind, without bulb. Caudal end of male with numerous preanal and postanal bristles and a median preanal papilla (? supplementary organ). Spicules short and broad. Accessory piece composed of two lateral portions, each with a posterior process. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *C. [Leptosomatum] magnus* (Villot, 1875).

Villot, 1875, *Arch. Zool. exp. et gén.*, Paris, iv, 458; de Man, 1889, *Mém. Soc. Zool. France*, ii, 1; Jägerskiöld, 1901, *K. Svensk. Vetensk. Acad. Handl.*, Stockholm, xxxv, 5; Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 39.

25. *Synonchus* Cobb, 1894.

Cuticle finely striated, with short bristles, especially anteriorly, where they occur in bundles. Head truncate, with ten bristles (two single lateral, four submedian pairs). Three rather indistinct lips. Pharynx small, containing a prominent dorsal tooth and two rudimentary subventral teeth. Oesophagus gradually swollen behind. Caudal end of male with a single preanal supplementary organ and irregular subventral rows of preanal and postanal bristles. Spicules equal, slender. Accessory pieces (? two) with long posterior process. Female genital tubes paired, reflexed. No "tubiform organ." Caudal glands present.

Hab. Marine.

Genotype : *S. fasciculatus* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, (2) viii, 411.

26. *Microlaimus* de Man, 1880.

Cuticle striated, without bristles or alae. Head distinct, knob-like, without lips and usually without bristles. Cephalic papillae usually indistinct. Lateral organs circular. Pharynx narrow, goblet-shaped or cylindrical, containing a small tooth on its dorsal wall, and sometimes two smaller subventral teeth. Oesophagus with a posterior bulb. Caudal end of male without papillae or supplementary organs. Two rod-shaped accessory pieces present. Female genital tubes typically paired, opposed. Caudal glands and spinneret present.

Hab. Soil, or fresh or brackish water.

Genotype: *M. globiceps* de Man, 1880.

de Man, 1880, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, 15; 1884, *Die frei . . . lebenden Nematoden der Nederl. Fauna*, 51; Steiner, 1916, *Zool. Jahrb., Syst.*, xxxix, 590; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 371.

27. *Odontobius* Roussel de Vauzème, 1834.

Cuticle extremely finely, if at all, striated, without bristles. Head not distinct, with four (? six) very small bristles. Lateral organs incipient spirals. Pharynx goblet-shaped, rather wider than deep, with three small, blunt teeth at its base and a single tooth in its dorsal (?) wall. Oesophagus gradually swollen behind, without bulb. Tail of male with three pairs of postanal papillae. Spicules flattened dorso-ventrally. An accessory piece, with large posterior process, present. Testis apparently single, outstretched. Female genital tube single, anterior, outstretched. Caudal glands and spinneret doubtfully present.

Hab. Genotype on baleen-plates in mouth of whales. Certain free-living marine species have been attributed to the genus, probably erroneously.

Genotype: *O. ceti* Roussel de Vauzème, 1834.

Roussel de Vauzème, 1834, *Ann. Sci. Nat.*, Paris, Zool., i, 326; Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 161; Baylis, 1923, *Ann. Mag. Nat. Hist.*, (9) xii, 617.

28. *Chromaspira* Filipjev, 1918.

Syn. *Chromaspirina* Filipjev, 1918.

Cuticle striated. Head rounded, not distinct, with three crowns of short bristles. Oral opening surrounded by a slightly projecting cuticular wall. Lateral organs incipient spirals. Pharynx with a relatively wide anterior portion, with folded walls, and containing a large dorsal tooth and two small subventral teeth, and a narrower posterior portion

passing into the lining of the oesophagus. Oesophagus gradually swollen behind, without bulb. Spicules broad, membranous. Accessory piece complex. Testis single. Female genital tubes paired, reflexed.

Hab. Marine.

Genotype: *C. pontica* Filipjev, 1918.

Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 213, 229.

29. *Rhips* Cobb, 1920.

Cuticle coarsely striated, with rod-like or basketwork-like ornamentation. Head not distinct, apparently with six very small, double lips. Six labial papillae and ten cephalic bristles present. At the level of the latter there are also four shorter sublateral "scales" or "horns." Lateral organs transversely elongate. Pharynx small, containing an anteriorly-directed dorsal tooth and "one or two" minute subventral teeth. Oesophagus somewhat swollen behind. Caudal end of male probably with a series of preanal supplementary organs. Spicules composed of two curved sections jointed together end to end, the posterior section shorter than the anterior. Five accessory pieces present, two in front of the spicules and three behind them. Testis single, anterior, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *R. ornata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 339 and key.

30. *Linhomoeus* Bastian, 1865.

Cuticle finely striated, with bristles, especially anteriorly. Head not distinct, without apparent lips but with bristles. Lateral organs small, circular. Oral cavity widening behind into a shallow pharynx which may or may not be armed with teeth at its base. Oesophagus somewhat swollen posteriorly, without bulb. Caudal end of male apparently without papillae, but with two preanal supplementary organs. Testes paired and opposed, or single. An accessory piece present, with two posterior processes. Female genital tubes paired, opposed (exceptionally single), reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *L. hirsutus* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 154; de Man, 1889, *Mém. Soc. Zool. France*, ii, 207; 1907, *Tijdschr. Nederl.*

dierk. Vereen., Leiden, (2) x, 239; 1907, *Mém. Soc. Zool. France*, xx, 74.

de Man (1907) has proposed the subgenera *Eulinhomoeus* and *Paralinhomoeus*. In the former the tail is cylindrical and the pharynx is armed with teeth (type: *elongatus* Bastian, 1865). In the latter the tail is attenuated and the pharynx unarmed (type: *lepturus* de Man, 1907).

31. *Metalinhomoeus* de Man, 1907.

According to de Man, this genus closely resembles his subgenus *Paralinhomoeus* of *Linhomoeus*. It is to be distinguished by the fact that the oesophagus terminates in a bulb with a valvular apparatus.

Hab. Marine.

Genotype: *M. typicus* de Man, 1907.

de Man, 1907, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, (2) x, 241; 1907, *Mém. Soc. Zool. France*, xx, 81.

32. *Cothonolaimus* Ditlevsen, 1919.

Syn. *Macrolaimus* Ditlevsen, 1919, *nec* Maupas, 1900.

Cuticle thin, unstriated. Head with two crowns of bristles, six small in the anterior crown and four stout and twice as long in the posterior. Lateral organs incipient spirals. Buccal capsule very large, thin-walled, constricted transversely into two parts, the anterior larger and funnel-shaped, with minute teeth at its base, the posterior globular, with still smaller teeth in its middle. Oesophagus almost cylindrical throughout. Spicules rather slender. Accessory piece large and dark-coloured, with two long and slender posterior processes. Testis single. Female genital tubes paired, opposed, reflexed. Caudal glands present.

Hab. Marine.

Genotype: *C. [Macrolaimus] inermis* (Ditlevsen, 1919) (by page precedence).

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 188, 299.

33. *Comesoma* Bastian, 1865.

Syn. *Sabatieria* de Rouville, 1903; *Parasabatieria* de Man, 1907.

Cuticle finely striated, apparently without bristles except towards the extremities. Head more or less distinct, truncate, without apparent lips, but with papillae and two crowns of bristles. Lateral organs spiral or circular. Pharynx very small, typically three-sided, with a dorsal and two subventral teeth at its base. Oesophagus somewhat swollen posteriorly,

without bulb. Caudal end of male with submedian preanal and postanal bristles. Accessory piece single, bipartite. Testes paired. Female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *C. vulgare* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 158; de Man, 1890, *Mém. Soc. Zool. France*, iii, 171; 1907, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, x, 237; 1907, *Mém. Soc. Zool. France*, xx, 66; de Rouville, 1903, *Compt. rend. Soc. Biol.*, Paris, lv, 1529; Cobb, 1914, *Contr. Sci. Nematol.*, i, 14; Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 25.

Sabatieria, apart from the question whether teeth exist in its pharynx, which none of the observers seems to have been able to determine, appears to differ from the type of *Comesoma* only in having an accessory piece with a posterior process. *Parasabatieria*, again, differs from *Sabatieria* only in the presence of a series of preanal supplementary organs in the male. In view of the uncertainty regarding the presence of teeth, and the slight nature of the other differences, we prefer for the present to regard both these genera as synonyms of *Comesoma*.

34. *Dagda* Southern, 1914.

Cuticle finely striated. Head separated from body by a constriction, with rounded labial papillae and a single crown of four bristles. Lateral organs incipient spirals. Pharynx small, funnel-shaped, containing a dorsal and two subventral teeth. Oesophagus gradually swollen behind, without bulb. Caudal end of male with eleven median preanal supplementary organs. Accessory piece with two rounded posterior processes. Testis single. Caudal glands present. Female unknown. Description of genotype based on a single specimen.

Hab. Marine (in sand).

Genotype: *D. bipapillata* Southern, 1914.

Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 29.

35. *Cyatholaimus* Bastian, 1865.

Syn. *Achromadora* Cobb, 1913; *Nannonchus* Cobb, 1913; *Pomponema* Cobb, 1917; *Paracyatholaimus* Micoletzky, 1922 (as subgenus).

Cuticle striated, apparently without bristles. Head with six indistinct lips and inconspicuous papillae. Six to ten cephalic bristles present. Lateral organs usually present, spiral or circular. Pharynx cup-shaped, with longitudinal thickenings in its wall anteriorly. A dorsal tooth almost always well developed, and not infrequently ventral or sub-

ventral teeth are also present in a recess in the pharyngeal wall. Oesophagus usually without a bulb.* Ocelli present in marine forms. Caudal end of male with or without papillae, and occasionally with supplementary organs. Four accessory pieces, in two pairs, present. Testis single or paired. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret usually present.

Hab. Marine, in brackish or fresh water, or in soil.

Genotype: *C. ocellatus* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 162; Cobb, 1913, *Journ. Washington Acad. Sci.*, iii, 434; 1917, *Contr. Sci. Nematol.*, v, 118; 1918, in Ward & Whipple, *Freshwater Biology*, 489; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 375, 377.

We have included certain genera and subgenera in the synonymy of *Cyatholaimus* owing to their insufficient characterization.

36. *Chromadora* Bastian, 1865.

Syn. *Acanthopharynx* Marion, 1870 (?); *Ethmolaimus* de Man, 1880; *Euchromadora* de Man, 1886; *Graphonema* Cobb, 1898; *Chromadorissa* Filipjev, 1917; *Spilophorella* Filipjev, 1917; *Chromadorina* Filipjev, 1918; *Chromadorella* Filipjev, 1918; *Spilipherella* Filipjev, 1918; *Odontocricus* Steiner, 1918; *Polysigma* Cobb, 1920; *Ptycholaimellus* Cobb, 1920; *Chromadorita* Filipjev, 1922; *Prochromadora* Filipjev, 1922; *Endolaimus* Filipjev, 1922.

Cuticle striated, usually with submedian bristles. Lateral alae usually absent, except in marine forms. Head without lips, but with six to twelve papillae. Submedian cephalic bristles usually present, lateral cephalic bristles absent. Lateral organs in the form of grooves or transversely oval, rarely definitely spiral. Pharynx typically in two portions, the anterior wide, the posterior funnel-shaped. The anterior portion has longitudinal rod-like thickenings (or folds?) in its wall, and usually contains a dorsal tooth, and sometimes two subventral teeth. Oesophagus with a more or less distinct posterior swelling, but usually without a bulb. Caudal end of male with or without preanal papillae. Postanal papillae absent. Spicules sometimes unequal and dissimilar. Accessory piece complex, consisting of a posterior, a median, and two lateral portions. Testis usually single. Female genital tubes paired, opposed, reflexed. Caudal glands present. Spinneret present or absent.

* According to Cobb there is no oesophageal bulb. Micoletzky, however, states that a bulb is usually present. The species figured by Bastian do not appear to possess bulbs.

Hab. Marine, in fresh water, or in soil.

Genotype: *C. vulgaris* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 167; de Man, 1888, *Mém. Soc. Zool. France*, i, 47; Cobb, 1918, in Ward & Whipple, *Freshwater Biology*, 490; Filipjev, 1917, *Rev. Zool. Russe*, Moscow, ii, 29; 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 226, 256; 1922, *Act. Inst. Agronom. Stauropol.*, i, 138; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 383.

The genera *Chromadora* and *Euchromadora* both have the same genotype. Bastian's selection of *vulgaris* as type of *Chromadora* (1905) was actually preceded by de Man's selection of the same species as type of *Euchromadora* (see Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, p. 94). The distinguishing characters of the two genera do not appear to be of great importance, and, since it seems probable that Bastian based his genus largely upon the species which he eventually selected as type, we regard *Euchromadora* as untenable. A considerable number of genera or subgenera proposed for the reception of slight variants of *Chromadora* are here included in the synonymy of that genus.

37. *Parachromadora* Micoletzky, 1914.

Syn. *Triodontolaimus* Micoletzky, 1913, *nec* de Man, 1893.

Cuticle striated, with four submedian rows of bristles. Lateral alae absent. Head not distinct, without lips but with bristles. Lateral organs spiral. Pharynx elongate, thick-walled, prismatic or cup-shaped. Anteriorly it is stiffened by ten to twelve longitudinal rods. Three teeth present, two subdorsal and one ventral. The latter may be contained in a pocket near the base of the pharynx. Oesophagus with a posterior bulb. Caudal end of male with a median ventral row of twelve or thirteen bristle-bearing preanal papillae. The accessory piece appears to be double. Testes paired. Female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Fresh water.

Genotype: *P.* [*Triodontolaimus*] *alpina* (Micoletzky, 1913).

Micoletzky, 1913, *Sitz. k. Akad. Wiss.*, Wien, cxxii, 117; 1914, *Zool. Jahrb., Syst.*, xxxvi, 492.

Micoletzky has proposed the subgenus *Parachromadora*, of the genus *Chromadora*, to replace his genus *Triodontolaimus*, which was preoccupied, as the examination of male specimens led him to believe that a special genus was unjustified. In view of the unusual disposition of the pharyngeal teeth we

do not consider that the two species concerned can be included in *Chromadora*, and have accordingly treated *Parachromadora* as a separate genus.

38. *Bolbolaimus* Cobb, 1920.

Cuticle striated or unstriated, without bristles. Head not distinct, with (? six) indistinct lips. Lip region elastic and finely subdivided; its margin "serrated by the forward projection of about fifteen (?) papillae with minute bristles outside the serrations. The appearance is as if each papilla is armed with a pair of minute bristles very difficult to see." Three crowns of short cephalic bristles present. Lateral organs inconspicuous, incipient spirals. Pharynx with a wider anterior portion and a narrow, funnel-shaped posterior portion, the former containing a relatively large, protrusible, dorsal tooth and a ventral tooth, which, in the type, is smaller, at its base. (According to the figures, there should be two subventral teeth). Oesophagus with an anterior pharyngeal bulb, and an elongate posterior bulb with a transverse division in its musculature. Caudal end of male with six inconspicuous preanal supplementary organs. Spicules stoutish, tapering. Accessory pieces (? two) present. Testis, according to formula, single, anterior, outstretched; "testes" mentioned in the plural in text. Female genital tubes paired, opposed, outstretched. Caudal glands and spinneret present.

Hab. Marine (in sand).

Genotype: *B. pellucidus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 319 and key.

39. *Cobbia* de Man, 1907.

Cuticle striated, with bristles. Head slightly distinct, with six bristles. Lateral organs circular. Buccal capsule cup-shaped, armed with three teeth (one dorsal, two subventral). Spicules with a very small spur close to their tips. Accessory piece without posterior process. Female genital tube single, anterior.

Hab. Marine.

Genotype: *C. trefusiaeformis* de Man, 1907.

de Man, 1907, *Tijdschr. Nederl. dierk. Vereen.*, Leiden, x, 232.

Subfam. 2. **DESMODORINAE** nov.

Pharynx variable in shape, typically containing a single forwardly-directed (dorsal) tooth. Oesophagus with or without posterior bulb.

This subfamily is more or less equivalent to the Desmodorini of Filipjev.

1. *Desmodora* de Man, 1889.

Syn. *Chromadoropsis* Filipjev, 1918; *Metachromadora* Filipjev, 1918; *Amphispira* Cobb, 1920; *Cinctonema* Cobb, 1920; *Micromicron* Cobb, 1920; *Acanthonchus* Cobb, 1920; *Xenonema* Cobb, 1920; *Steineria* Filipjev, 1922, nec Micoletzky, 1923; *Prodesmodora* Micoletzky, 1923.

Cuticle typically with prominent transverse annulations, except at the extremities, and with fine bristles. Head usually somewhat swollen, smooth, with very small papillae and one or two crowns of small bristles. Lateral organs large, spiral or circular. Pharynx small, consisting of a wider anterior portion with folded walls and containing a dorsal tooth, and a narrower posterior portion passing into the oesophageal lining. Oesophagus with a posterior bulb. Caudal end of male usually with a median series of preanal papillae. Two accessory pieces present. Testis single, outstretched. Body of female swollen in region of genital organs. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Usually marine. One species in soil.

Genotype: *D. [Spilophora] communis* (Bütschli, 1874).

Bütschli, 1874, *Abh. Senckenb. Ges.*, Frankfurt a. M., ix, 282; de Man, 1889, *Mém. Soc. Zool. France*, iii. 9.

Xenonema and *Prodesmodora* are both described from single female specimens, *Micromicron*, *Cinctonema* and *Steineria* from single males, and *Amphispira* from an immature specimen of unknown sex. The few characters in which these forms differ from the type of *Desmodora* appear too slight to warrant their separation from that genus. The same observation applies to *Metachromadora* and *Chromadoropsis*.

2. *Odontolaimus* de Man, 1880.

Syn. *Neonchus* Cobb, 1893.

Cuticle very finely striated, with scattered bristles. Head without lips or papillae, but with ten bristles. Lateral organs circular. Pharynx a very long, slender tube, decreasing in diameter posteriorly and with somewhat thickened dorsal wall; preceded by a thin-walled "vestibule" containing a triangular dorsal tooth. Oesophagus with a fusiform pharyngeal swelling and a sudden, bulb-like, posterior swelling. Male unknown. Female genital tubes apparently paired. Caudal glands absent.

Hab. Soil.

Genotype: *O. chlorurus* de Man, 1880.

de Man, 1880, *Tijdschr. Ned. dierk. Vereen.*, Leiden, v, 61; 1884, *Die frei . . . lebenden Nematoden d. Niederl. Fauna*,

Leiden, 127; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 419.

3. *Nudora* Cobb, 1920.

Cuticle with coarse transverse striations and with ten longitudinal alae, each containing a series of V-shaped markings. Head not distinct, with much-thickened cuticle. Lips apparently twelve. Six labial bristles and four longer cephalic bristles present. In addition to these, six bristle-like labial papillae. Lateral organs circular. Pharynx rather small, with cup-shaped anterior portion and narrower posterior portion, and containing a single large, forwardly-directed tooth. Oesophagus with an anterior pharyngeal swelling, separated from the rest by a constriction, and with a cylindroid posterior bulb divided into two parts by a break in its musculature. Tail in both sexes with a few slender submedian preanal and postanal bristles. Caudal end of male with two "obscure" preanal supplementary organs. Spicules very slender. Two stoutish accessory pieces present, somewhat longer than the spicules. Female genital tube single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *N. lineata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 334 and key.

4. *Rhinema* Cobb, 1920.

Cuticle with coarse transverse striations and with twelve longitudinal alae, each with a series of bifurcate spines presenting a "fishbone-like" appearance. Head not distinct, with six lips whose apices turn outwards. Six cephalic bristles present. Lateral organs circular. Pharynx apparently wide anteriorly and narrow posteriorly, containing a forwardly-pointing dorsal tooth. Oesophagus with a specialized pharyngeal portion and expanding gradually behind into a bulb-like swelling. Caudal end of male without supplementary organs or papillae, but with a few small bristles at the tip of the tail. Spicules slender. A single, slightly sigmoid, partly protrusible, accessory piece present. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, reflexed. Spinneret present.

Hab. Marine.

Genotype: *R. retrorsum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 335 and key.

5. *Oistolaimus* Ditlevsen, 1922.

Cuticle finely striated, with a few scattered bristles. Head with a single crown of fine bristles. Lateral organs spiral,

situated far forward. Pharynx with cup-shaped anterior portion and nearly cylindrical posterior portion, the latter occupied by a short spear-like tooth with a barb, like a fish-hook. This tooth is apparently protrusible. Oesophagus with large oval posterior bulb. Male unknown. Female genital tube probably single, posterior. (Description based on a single immature female).

Hab. Marine.

Genotype : *O. ferox* Ditlevsen, 1922.

Ditlevsen, 1922, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxxiii, 4.

6. *Digitonchus* Cobb, 1920.

Cuticle rather finely striated, without bristles. Head not distinct, with three, perhaps double, lips, six labial papillae and six rather stout bristles. Lateral organs spiral, situated far forward. Pharynx elongate, with short wide portion anteriorly, and a narrow posterior portion, containing a long, "spear-like" tooth. Male undescribed. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine (in sand).

Genotype : *D. uniformis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 314 and key.

7. *Anticyclus* Cobb, 1920.

Cuticle unstriated, without bristles. Head not distinct, with six indistinct lips and two or three crowns of bristles. Lateral organs large, circular. Pharynx relatively short and wide, with a single conical tooth at its base. Oesophagus gradually swollen behind, without bulb. Caudal end of male with seventeen equidistant preanal supplementary organs. Two accessory pieces present. Testes paired, opposed, outstretched, the posterior considerably the shorter. Female genital tube single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Hot salt springs.

Genotype : *A. exilis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 331 and key; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 128.

Micoletzky apparently regards *Anticyclus* as a subgenus of *Linhomoeus*.

8. *Cophonchus* Cobb, 1920.

Cuticle with very fine transverse and also longitudinal striations. A few short bristles in the cervical region. Head rather narrowed, with thickened cuticle. Lips apparently

three. Six (?) labial papillae and a crown of cephalic bristles present. Lateral organs circular. Pharynx short and wide, containing a relatively large, forwardly-projecting tooth. Oesophagus swollen gradually behind, without bulb. A pair of ocelli present. Caudal end of male with a single large supplementary organ, and apparently some caudal papillae. Spicules slender. Accessory pieces present both in front of and behind the spicules. Testes paired, opposed, outstretched. Female undescribed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *C. ocellatus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 328 and key.

9. *Anoncholaimus* Cobb, 1920.

Cuticle finely striated, very thin. A few bristles on the tail. Head not distinct, with thin, flattened lips. Labial papillae and a crown of cephalic bristles present. Lateral organs small, transversely elliptical, opening anteriorly. Pharynx nearly as wide as long, straight-sided anteriorly, somewhat narrower behind. At its anterior end there is a vestigial dorsal tooth. Oesophagus somewhat expanded at each end, without bulb. Male undescribed. Female genital tubes paired, opposed, reflexed, the posterior ovary a little smaller than the anterior. Caudal glands (preanal) and spinneret present.

Hab. Marine.

Genotype : *A. mobilis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 312 and key.

10. *Asymmetrella* Cobb, 1920.

Cuticle unstriated. Head slightly distinct, with three unequal lips and a crown of ten bristles. Lateral organs apparently large, transversely elliptical, open behind. Pharynx cylindrical, spacious, considerably longer than wide, with a dorsal tooth at its entrance, bent inwards at right angles. Oesophagus cylindroid, without bulb. Three ocelli (?) present. Male unknown. Female genital tubes "probably double and symmetrically placed." (Description apparently based on a single immature female).

Hab. Sea-water.

Genotype : *A. glabra* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 287 and key.

11. *Isonemella* Cobb, 1920.

Cuticle unstriated, with bristles only at the extremities. Head narrowed, without recognizable lips. Ten cephalic

bristles present. Lateral organs circular. Pharynx funnel-shaped, preceded by a small "vestibule," and containing a minute, forwardly-directed tooth ("ventral (?) " in description, dorsal in figure). Oesophagus gradually swollen behind, without bulb. A pair of ocelli present. Genital organs not described. Caudal glands and spinneret present. (Description based on a single immature male specimen).

Hab. Marine.

Genotype : *I. acuta* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 329 and key.

12. *Synonema* Cobb, 1920.

Cuticle unstriated, without bristles. Head not distinct, with four submedian bristles. Lip-region apparently with twelve ribs (? folds). Lateral organs small, incipient spirals. Pharynx narrow, somewhat funnel-shaped, containing a single dorsal tooth. Oesophagus with pyriform posterior bulb-like swelling. Male unknown. Female genital tube single, anterior, outstretched. Caudal glands and spinneret present. (Description based on a single immature female specimen).

Hab. Marine.

Genotype : *S. braziliense* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 330 and key.

13. *Mesodorus* Cobb, 1920.

Cuticle very finely striated, without bristles except at anterior end. Head not distinct, rounded, with twelve labial papillae and three crowns of bristles. Lateral organs spiral. Pharynx funnel-shaped, narrow, containing a single forwardly-directed tooth near its anterior end. Oesophagus with a "rather obscurely pyriform" posterior bulb. Caudal end of male with twenty-five preanal supplementary organs. Spicules slender. Two accessory pieces present. Testis single, anterior, straight. Female unknown.

Hab. Marine.

Genotype : *M. cylindricollis* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 325 and key.

14. *Iotadorus* Cobb, 1920.

Cuticle coarsely striated, without bristles. Head not distinct, truncate, with twelve papilla-like lips. Cephalic bristles "probably" present. Lateral organs transversely elliptical, situated far forward. Pharynx apparently very narrow, completely filled by a forwardly-directed tooth. Oesophagus with pyriform posterior bulb. Caudal end of

male with a few minute bristles. Spicules with bifurcate tips, the anterior fork rudimentary, the posterior somewhat sigmoid and acute. An accessory piece present, with posterior process. Testis single, anterior, outstretched. Female unknown. Spinneret present.

Hab. Marine.

Genotype : *I. punctulatus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 336 and key.

15. *Ypsilon* Cobb, 1920.

Cuticle coarsely striated, with a few bristles in the cervical and caudal regions. Head with four bristles and three minute, indistinct lips, surrounded by three pairs of labial papillae. Pharynx narrow and funnel-shaped, containing a large dorsal tooth, the anterior portion of which is cup-shaped and fixed obliquely on to the main shaft. Oesophagus with cylindroid posterior swelling. Caudal end of male with three minute preanal supplementary organs. Spicules rather slender, appearing as if barbed near their roots. A single slender accessory piece present, with indistinct posterior process. Female undescribed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *Y. exile* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 314 and key.

16. *Monoposthia* de Man, 1889.

Cuticle striated, with bristles. Head with papillae and bristles. Lateral organs small, circular. Pharynx similar to that of *Spilophora*, containing a dorsal tooth. Oesophagus with a posterior bulb. Caudal end of male without preanal or postanal papillae. A single symmetrical spicule present, and no accessory piece, according to de Man.* Testes paired. Female genital tube single, anterior, outstretched.

Hab. Marine.

Genotype : *M. [Spiliphora] costata* (Bastian, 1865).

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 166; de Man, 1889, *Mém. Soc. Zool. France*, ii, 9.

17. *Thoracostoma* Marion, 1870.

Syn. *Hemipsilus* de Quatrefages, 1846; *Dcontostoma* Filipjev, 1916, *Jägerskiöldia* Filipjev, 1916; *Leptosomatides* Filipjev, 1918.

* According to Steiner, a large accessory piece is present in the genotype. The presence of a single spicule, as described by de Man, prevents the inclusion of this genus in *Spilophora*, with which it seems to be otherwise in agreement.

Cuticle finely striated, without bristles except in the cervical region. Head not distinct, but narrowed, with two crowns of bristles and covered by a specialized cuticular cap. Pharynx short, three-sided, containing a dorsal tooth which may be simple or bilobed. Oesophagus without bulb, but with ocelli, which may be furnished with lenses. Caudal end of male with several pairs of ventral preanal and postanal bristles. There may be a single median preanal supplementary organ and two rows of submedian supplementary organs. A bipartite accessory piece present. Testes opposed, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: probably *T. echinodon* Marion, 1870, according to Stiles & Hassall (1905).

Marion, 1870, *Ann. Sci. Nat.*, Paris, Zool., xiii, 25; Cobb, 1914, *Contr. Sci. Nematol.*, i, 31; de Man, 1904, *Res. Voy. S.Y. Belgica* (Zool.), 25.

The genus *Hemipsilus* was considered by Bütschli (1874, *Abh. Senckenb. Ges.*, Frankfurt a. M., ix, 277) to be a synonym of *Thoracostoma*. The original diagnosis (de Quatrefages, 1864, *Ann. Sci. Nat.*, Paris, Zool., (3) vi, 131) and the description of his unnamed species are so incomplete that we have decided to follow Bütschli, although it is doubtful whether the genus could ever be recognized. The genus *Jägerskiöldia* Filipjev, 1916, appears to have been proposed for certain "sharp-tailed" species of *Thoracostoma*, including *T. acuticaudatum* Jägerskiöld, 1901, which is probably intended as its type. *Deontostoma* Filipjev was proposed for *Thoracostoma arcticum* Savelev. The description of this species (Savelev, 1912, *Trav. Soc. Nat.*, Petrograd, xliii, 124) does not, in our view, indicate any characters of sufficient importance to justify the erection of a separate genus for it. *Leptosomatides*, according to Filipjev (1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 50), is intermediate between *Leptosomatium* and *Deontostoma*. *Leptosomatium*, in our view, belongs to the family Alaimidae, and has no close relationship to *Thoracostoma*. *Leptosomatides*, however, appears to differ from typical species of *Thoracostoma* almost solely in the less well-developed condition of its cephalic cuticular cap. We have therefore included it in the synonymy of this genus.

18. *Thoracostomopsis* Ditlevsen, 1919.

According to Ditlevsen, this genus differs from *Thoracostoma* in having the head much narrower than the rest of the body, and also in the presence within the pharynx of a thin, acute "spear" which may protrude from the mouth-opening.

The cephalic bristles are highly developed, those in the posterior crown being extremely long and tentacle-like.

Hab. Marine.

Genotype : *T. barbata* Ditlevsen, 1919.

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 181.

19. *Discophora* Villot, 1875, nec Boissduval, 1836.

This genus is very vaguely defined by Villot. The following characters are taken from Eberth's description and figures of the genotype :—

Cuticle smooth, with short lateral rows of bristles in the neck region. Head not distinct. Mouth with three small papillae. Head strengthened internally by a pair of lateral plates, each having two perforations. Oesophagus simple, club-shaped. Ocelli present. Male with a pair of rather stout sickle-shaped spicules and a small accessory piece with a posterior process. Female genital tubes paired, opposed. Spinneret present.

Hab. Marine.

Genotype : *D. [Enoplus] cirrhatus* (Eberth, 1863).

Eberth, 1863, *Untersuchungen über Nematoden*, Leipzig, 34; Villot, 1875, *Arch. Zool. exp. et gén.*, iv, 463.

The armature of the head seems to suggest that this genus may be related to *Thoracostoma*. Eberth describes the lateral plates as belonging to the "pharynx," but this organ is not otherwise described. The validity of the genus being somewhat doubtful, we do not suggest a new name for it.

20. *Onyx* Cobb, 1891.

Cuticle finely striated. Head rounded, with retractile lips (? twelve) and pointed papillae. Lateral organs large, spiral. Pharynx contains a spear-like tooth attached to its dorsal wall, and a threefold growth from the walls of the anterior part of the pharynx acts as guide for this tooth. Oesophagus with narrow anterior half and stouter, nearly cylindrical, posterior half. Caudal end of male with a single, bristle-bearing, ventral postanal papilla, and a number of ventral preanal supplementary organs. Two accessory pieces present. Testes paired, opposed, sometimes reflexed at ends. Female genital tubes paired, opposed, reflexed. Caudal glands present.

Hab. Marine (in sand).

Genotype : *O. perfectus* Cobb, 1891.

Cobb, 1891, *Proc. Linn. Soc. N.S.W.*, Sydney, vi, 146.

21. Pharetrolaimus de Man, 1921.

Cuticle smooth. Head hemispherical, slightly distinct, with two crowns each of six papillae, but without bristles. Lateral organs small, pit-like. Buccal cavity tubular, narrow and thin-walled, containing a spear-like tooth, which is arrow-shaped in ventral view, with three posterior processes. There are also apparently three very small denticles near the anterior end. Structure of oesophagus uncertain. Male unknown. Vulva in oesophageal region. Female genital tube single, posterior, reflexed. Caudal glands absent. (Description based on a single immature female).

Hab. Soil.

Genotype : *P. sagittifer* de Man, 1921.

de Man, 1921, *Capit. Zool.*, i, 42.

22. Catalaimus Cobb, 1920.

Cuticle very finely striated, without bristles. Head not distinct, rounded, with six labial papillae and a crown of ten short bristles. Lateral organs apparently horseshoe-shaped, open behind. Pharynx with somewhat funnel-shaped anterior portion, containing a long and slender, forwardly-directed tooth, and an extremely long, slender, tubular posterior portion, extending backwards behind the nerve-ring. Oesophagus cylindroid, without bulb. A pair of ocelli present. Male unknown. "Ovaries probably double and reflexed." Spinneret present. (Description based on a single immature female).

Hab. Marine.

Genotype : *C. acuminatus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 308 and key.

23. Laxus Cobb, 1894.

Cuticle rather coarsely striated, with bristles throughout. Head not distinct, with bristles. Lateral organs spiral. In the genotype the oral cavity has transverse chitinous ridges. Pharynx narrow, "probably containing an obscure dorsal tooth" [in *L. septentrionalis*]. Oesophagus with anterior swelling and spherical posterior bulb. Caudal end of male with several pairs of submedian preanal and postanal bristles. One or two accessory pieces present. Testis single, or paired, opposed. Female genital tubes paired, opposed, reflexed or outstretched. Caudal glands present.

Hab. Marine (in sand).

Genotype : *L. longus* Cobb, 1894.

Cobb, 1894, *Proc. Linn. Soc. N.S.W.*, Sydney, (2) viii, 413; 1914, *Contr. Sci. Nematol.*, i, 29.

The status of this genus appears very unsatisfactory. It was originally based on a single male specimen of the genotype and the female of a second species, *contortus*. To these the third species, *septentrionalis*, was added in 1914, and this differs in several respects from the others (single accessory piece, paired testes, ovaries outstretched instead of reflexed, etc.). In the figure of the genotype no pharyngeal cavity is shown, and the presence of a pharyngeal tooth seems, in any case, to be rather uncertain.

24. *Xanthodora* Cobb, 1920.

Cuticle coarsely striated, except on the head. Head not distinct, with three lips and a crown of twenty-six short, stout bristles, arranged in groups. Lateral organs incipient spirals. Pharynx apparently narrow and elongate, containing a single dorsal, anteriorly-directed tooth. Oesophagus with a constriction immediately behind the pharynx, and gradually swollen behind, where it is divided by breaks in the musculature into three regions of unequal length, the anterior the longest. Caudal end of male with six preanal supplementary organs, and additional nerve-endings between them. Spicules tapering towards each end. Accessory pieces inconspicuous except for their distal portion. Testis probably single, anterior, outstretched. Female genital tubes paired, opposed, reflexed. Ova "occur in the uteri one at a time." Caudal glands and spinneret present.

Hab. Marine.

Genotype: *X. nuda* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 317 and key.

25. *Choniolaimus* Ditlevsen, 1919.

Cuticle striated, apparently without bristles except for a single ring in the constriction behind the head. Head truncate, separated by a shallow groove. Lateral organs large, spiral. Pharynx funnel-shaped, without teeth. Oesophagus with a distinct posterior bulb. Caudal end of male with thirteen ventral preanal supplementary organs. "Accessory piece (or pieces?) embracing the tips" of the spicules like a sheath. Female unknown. (Genus based on a single male specimen).

Hab. Marine.

Genotype: *C. papillatus* Ditlevsen, 1919.

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 185.

Ditlevsen expresses the view that possibly this form will prove to be related to *Chromadora*.

26. *Dorylaimopsis* Ditlevsen, 1919.

Cuticle striated, and marked with transverse and longitudinal rows of dots. Head not distinct, with smooth cuticle and a crown of short and stout bristles. Lateral organs large, spiral. Pharynx apparently tubular, its walls presenting the appearance of a protrusible "spear," but of quite different structure from that of the Anguilluliniidae. Oesophagus swollen posteriorly, without bulb. Caudal end of male with a median ventral row of preanal papillae and two subventral rows of postanal bristles. Spicules rather long, bent almost at right angles before the tip, and with a hook-shaped prominence ventrally somewhat behind the middle. Two accessory pieces present, the posterior with a posterior process. Female genital tubes paired, opposed, outstretched.

Hab. Marine.

Genotype: *D. punctatus* Ditlevsen, 1919.

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 162.

Subfam. 3. **IRONINAE** Micoletzky, 1922.

Pharynx typically elongate, tubular, with three, or a multiple of three, teeth (sometimes eversible) near its anterior end. Oesophagus club-shaped, usually without distinct bulb.

1. *Ironus* Bastian, 1865.

Syn. *Thalassironus* de Man, 1889; *Cephalonema* Cobb, 1893, *nec* Pierantoni, 1916; *Nanonema* Cobb, in Stiles & Hassall, 1905.

Cuticle unstriated, without bristles or lateral alae. Head with three lips and four submedian bristles. Lateral organs variable. Pharynx long and narrow, with three strong hook-shaped teeth at its anterior end, and three smaller denticles a little further back. The lips are movable, allowing protrusion of the teeth in the pharynx. Oesophagus gradually swollen behind. Caudal end of male without papillae or with a few ventral preanal bristles. Female genital tubes usually paired, opposed. Some species are hermaphrodite (Cobb). Caudal glands present. Spinneret absent.

Hab. Fresh water and soil.

Genotype: *I. ignavus* Bastian, 1865.

Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 103; Cobb, 1893, *Agric. Gaz. N.S.W.*, Sydney, iv, 825; Cobb, in Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, 122; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 323.

de Man appears to have been influenced chiefly by the marine habitat of the species *britannicus* in creating a new

genus *Thalassironus* for this form. As regards its morphology, he does not mention any satisfactory distinguishing characters.

2. *Odontophora* Bütschli, 1874.

Cuticle apparently unstriated, with scattered bristles. Head truncate, not distinct, with bristles. Mouth surrounded by three triangular tooth-like structures, capable of inversion. Pharynx funnel-shaped, unarmed except for the tooth-like structures mentioned. Oesophagus with a rather pronounced bulb-like posterior swelling. Female genital organs paired, opposed. Male undescribed.

Hab. Marine.

Genotype: *O. marina* Bütschli, 1874.

Bütschli, 1874, *Abh. Senckenb. Ges.*, Frankfurt a. M. ix, 3, 285.

This genus is very imperfectly known, and, apart from the presence of bristles on the body, there appears to be little to distinguish it from *Ironus*.

3. *Mesonchium* Cobb, 1920.

Syn. *Pepsonema* Cobb, 1920.

Cuticle rather finely striated, with some bristles towards the extremities. Head slightly expanded, with indistinct lips. Two crowns each of six labial papillae present, and a single crown of four cephalic bristles. Lateral organs spiral. Pharynx rather narrow, apparently three-sided, containing anteriorly three forwardly-pointing teeth. Oesophagus slightly swollen behind, but without bulb. Caudal end of male with a series of very indistinct nerve-endings. Spicules slender. An accessory piece (? two accessory pieces) with slender posterior process present. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, reflexed at their ends. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *M. poriferum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 294 and key.

Pepsonema is regarded tentatively as a synonym of *Mesonchium*, the descriptions of the genotypes being almost identical. The presence of "one or two minute, onchium-like processes" at the base of the pharynx is mentioned in *Pepsonema*, but these are not shown in the figure. The spicules are said to be "obscurely retrorsely barbed" in *Pepsonema*, and this character is not mentioned in *Mesonchium*. The accessory piece is spoken of in the singular in *Mesonchium*, and accessory pieces, in the plural, in *Pepsonema*.

4. Ironella Cobb, 1920.

Cuticle unstriated and without bristles. Slight lateral alae present. Head not distinct, with six small lips and twelve short bristles. Lateral organs apparently consisting of a transverse groove. Pharynx long, tubular. At its anterior end there are three bicuspid teeth projecting into the mouth-opening, and behind these numerous minute denticles. Oesophagus without posterior bulb. Caudal end of male with a single preanal supplementary organ and a large, curved bristle. Testes paired, parallel, outstretched. Female genital tubes opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *I. prismatolaima* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 277 and key.

There appears to be nothing to separate this genus from *Ironus* except the presence of numerous denticles in place of the three posterior denticles of *Ironus*.

5. Apodontium Cobb, 1920.

Cuticle finely striated, with a few bristles towards the extremities. Head not distinct, with four stout bristles. Lateral organs transversely elliptical, open behind. Pharynx narrow, funnel-shaped, with six eversible teeth at its anterior end. Oesophagus cylindroid, without bulb. Caudal end of male without supplementary organs, special bristles or papillae. Spicules slender. Two accessory pieces present, simple and rather stout. Testis single, anterior, outstretched. Caudal glands and spinneret present. Female undescribed.

Hab. Marine.

Genotype : *A. pacificum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 277 and key.

6. Trissonchulus Cobb, 1920.

Cuticle unstriated and without bristles. Head distinctly marked off by a constriction, with six swollen lips, each bearing two papillae, one behind the other. Inner surface of each lip beset with numerous minute denticles. Lateral organs pocket-like, with transversely elliptical anterior opening. Pharynx small, containing three forwardly-pointing, apparently eversible teeth. Oesophagus with a slight posterior bulb-like swelling. Caudal end of male with a slight preanal ventral elevation (possibly a supplementary organ), and three pairs of preanal and four pairs of postanal subventral papillae. A slender accessory piece present. Testes paired, opposed, the anterior longer and reflexed, the

posterior shorter and outstretched. In connection with the male genital organs there are several glands opening into the ejaculatory duct behind. Female genital tubes paired, the anterior without ovary, the posterior reflexed. Caudal glands and spinneret present, the latter ventral.

Hab. Marine.

Genotype : *T. oceanus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 297 and key.

7. *Synodontium* Cobb, 1920.

Cuticle rather finely striated, with bristles towards the extremities. Head not distinct, apparently with six lips, each bearing a papilla. Six long and stout cephalic bristles present. Lateral organs very indistinct. Pharynx funnel-shaped, fairly large, with a ring of twelve (?) small teeth at its anterior end. Oesophagus "ends posteriorly in a faint, elongated, pyriform, valveless bulb." Caudal end of male with fifty to seventy preanal supplementary organs. Spicules slender. Two accessory pieces present, with blunt posterior processes. Testes paired, opposed, outstretched. Female genital tube single, posterior, outstretched. Caudal glands and spinneret present, the latter terminating in a hemispherical button with three eversible sectors.

Hab. Marine.

Genotype : *S. fecundum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 280 and key.

8. *Trigonolaimus* Ditlevsen, 1919.

Cuticle unstriated and without bristles. Head rounded, with two crowns of bristles. Lateral organs hoop-shaped. Pharynx long, prismoid, with the apex directed backwards. Anteriorly it contains a bundle of six stout, slightly curved, apparently movable, chitinoid rods with their tips projecting forwards (? three bicuspid teeth), and near the bases of these a number of small prismatic bodies. Oesophagus somewhat swollen posteriorly. An accessory piece, with a posterior process, present. Female genital tubes paired, opposed.

Hab. Marine.

Genotype : *T. armatus* Ditlevsen, 1919 (by page precedence).

Ditlevsen, 1919, *Vid. Medd. Naturh. Foren.*, Copenhagen, lxx, 177.

9. *Diodontolaimus* Southern, 1914.

Cuticle coarsely striated. Head not distinct, with conical labial papillae and a single crown of four submedian bristles. Lateral organs incipient spirals. A cylindrical buccal capsule present, with thick walls, and armed with two subventral

teeth at its anterior end. Dorsal tooth absent. Oesophagus gradually swollen behind, without bulb. Caudal end of male with nine median preanal supplementary organs. Accessory piece with a posterior process. Testis single. Female unknown.

Hab. Marine (in sand).

Genotype : *D. sabulosus* Southern, 1914.

Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 31.

10. *Gonionchus* Cobb, 1920.

Cuticle very coarsely striated, with submedian bristles throughout. Head not distinct, with six lips having "hinged" terminal prolongations. Ten cephalic bristles present. Lateral organs large, spiral. Pharynx wide, funnel-shaped, containing two submedian blade-like teeth anteriorly. Oesophagus somewhat swollen behind, without bulb. Caudal end of male without supplementary organs, caudal papillae or special bristles, but with bristles similar to those on the body. Spicules slender, their shafts straight near the root, curved distally. Two inconspicuous accessory pieces present. Testes paired, opposed, outstretched. In connection with the male genital organs there are three pairs of preanal accessory glands, with ducts leading to the cloaca. Female genital tubes paired, opposed, outstretched, the posterior without ovary.

Hab. Marine (in mud).

Genotype : *G. villosus* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 315 and key.

11. *Dolicholaimus* de Man, 1888.

Cuticle unstriated and without bristles or lateral alae. Head with feebly-developed lips and without, or with very short, bristles. Lateral organs in the form of grooves. Pharynx elongate, divided by a constriction into a short anterior and a much longer, probably six-sided, posterior portion. At the base of the anterior portion there are three, probably movable, teeth which project into the mouth-opening. Oesophagus without posterior bulb. Caudal end of male with preanal and postanal papillae. An accessory piece present. Female genital tubes paired, reflexed. Caudal glands present.

Hab. Marine.

Genotype : *D. marioni* de Man, 1888.

de Man, 1888, *Mém. Soc. Zool. France*, i, 31.

12. *Syringolaimus* de Man, 1888.

Cuticle unstriated and without bristles. Head with feebly-developed lips and without bristles. Lateral organs

short, narrow grooves. Pharynx an elongate, probably three-sided tube, narrowing a little behind, and furnished anteriorly with three small teeth. Oesophagus with a posterior bulb. Two ocelli present at the anterior end of the oesophagus. Caudal end of male without papillae. An accessory piece present. Female genital tubes paired. Caudal glands present.

Hab. Marine (littoral).

Genotype: *S. striatocaudatus* de Man, 1888.

de Man, 1888, *Mém. Soc. Zool. France*, i, 34.

13. *Actinonema* Cobb, 1920.

Cuticle thick, coarsely striated, without bristles. "Head set off by contraction and a deep constriction, subtruncate; mouth more or less depressed. The lip-region is one-half as high as wide, and appears to be composed of three fairly well-developed, rounded, subdistinct lips, which are set off by constriction. This lip-region appears as if protruding from within the thick cuticle. . . . On the lips there are no obvious signs of a cuticle. The pharynx is very small and inconspicuous, or even absent apparently." Apparently a minute dorsal tooth (situated, according to the figure, on one of the "lips"). Lateral organs greatly elongate transverse slits. Oesophagus swollen behind, without bulb. Caudal end of male without supplementary organs or papillae. Spicules rather stout, tapering. A single, slender, accessory piece present. Testis single, anterior, outstretched. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: *A. pachydermatum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 338 and key.

Subfam. 4. **ENOPLINAE** Micoletzky, 1922.

Chitinoid wall of pharynx typically reduced to three stout jaws, bearing simple or complex teeth anteriorly and connected with the lips, which are eversible. Oesophagus more or less club-shaped, usually without distinct bulb.

1. *Enoplus* Dujardin, 1845.

Syn. *Tricontus* Dujardin, 1845; *Lineola* Kölliker, 1845, nec Baer, 1827; *Enoplolaimus* de Man, 1893; *Demonema* Cobb, 1894; *Enoploides* Savelev, 1912.

Cuticle with transverse striations and without bristles except near the extremities. Head usually with three lips

and a varying number of bristles. The lips may, in some species, be considerably reduced. Lateral organs oval, inconspicuous. Cavity of pharynx much reduced, funnel-shaped, containing three jaws, each of which consists of a more or less complex chitinous structure, connected with one of the lips, and provided with a simple or complex tooth anteriorly. Oesophagus not distinctly muscular, without posterior bulb, and frequently much pigmented, the pigment sometimes forming ocelli. Caudal end of male with preanal and postanal bristles, and with a single supplementary organ. A pair of accessory pieces present. Female genital tubes paired, opposed. Caudal glands and spinneret present.

Hab. Marine.

Genotype: Probably *E. tridentatus* Dujardin, 1845, according to Stiles & Hassall (1905).

Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 233; Bastian, 1865, *Trans. Linn. Soc. London*, xxv, 147; Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 48.

Enoplolaimus and *Enoploides* are treated by Micoletzky (1922) as subgenera of *Enoplus*. There is considerable variation in the form of the jaws in *Enoplus* (*sens. lat.*), and we do not feel that the species can at present be grouped conveniently in subgenera based on the structure of these organs. For similar reasons we have included *Demonema* in the synonymy.

2. *Synonchium* Cobb, 1920.

Cuticle rather coarsely striated, with transverse rows of large circular elements, and on each side two irregular sub-lateral rows of pores. Head truncate, the mouth surrounded by a ring of twelve slight swellings (? lips), and behind these two crowns of six papillae each. Lateral organs spiral. Pharynx rather narrow when closed, containing three large, elongate, protrusible, jaws, each with three incurved teeth at its apex and two smaller teeth at its sides. Oesophagus with an anterior swelling but without posterior bulb. Caudal end of male apparently with two small preanal supplementary organs. Spicules stout, straight to near the tips, where they are bent ventrally at an obtuse angle. Apparently no accessory piece. Female genital tubes probably paired, opposed, reflexed. Spinneret present.

Hab. Marine.

Genotype: *S. obtusum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 290 and key.

3. *Triodontolaimus* de Man, 1893, *nec* Micoletzky, 1913.

Cuticle unstriated and without bristles. Head rather distinct, with three inconspicuous lips and a crown of ten short, thick

bristles. Lateral organs oval. Pharynx much reduced, containing anteriorly three large, single-pointed teeth carried on chitinoid jaws. Oesophagus without bulb, unpigmented. Caudal end of male with a few postanal papillae, but without preanal papillae or supplementary organs. An accessory piece present. Testes paired. Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *T. [Enoplus] acutus* (Villot, 1875).

Villot, 1875, *Arch. Zool. exp. et gén.*, iv, 460; de Man, 1893, *Mém. Soc. Zool. France*, vi, 114.

4. *Xyala* Cobb, 1920.

Cuticle with numerous longitudinal alae, subdivided by coarse transverse striations. A few bristles, in groups of four, present in the cervical region, and a few subdorsal caudal bristles. Head with two crowns of bristles. Lateral organs circular. Lips form three simple, incurved, protrusible jaws. Pharynx divided transversely into two portions by an internal cuticular ridge. Oesophagus with pyriform pharyngeal swelling, but without posterior bulb. Caudal end of male without supplementary organs or papillae. Spicules slender. Two slender accessory pieces present, their proximal ends enveloping the spicules. Testes paired, opposed, outstretched. Ovary single, anterior, outstretched. Caudal glands and spinneret present.

Hab. Marine.

Genotype : *X. striata* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 289 and key.

5. *Selachinema* Cobb, 1915.

Cuticle finely striated. Head with two crowns of bristles. Lateral organs spiral. Pharynx "triangularly concave-pyramidal," with three jaws; two submedian, well developed, one median, rudimentary. The jaws consist of two parts, each bearing two rows of denticles. Oesophagus without posterior bulb. Genital organs undescribed. (Description based on a single immature specimen).

Hab. Marine.

Genotype : *S. ferox* Cobb, 1915.

Cobb, 1915, *Contr. Sci. Nematol.*, iv, 113.

6. *Fiaera* Southern, 1914.

Cuticle smooth or faintly striated. Head distinct, with a single crown of ten stout bristles. Lateral organs cup-shaped. Pharynx small, containing three jaws. The two submedian

jaws bear each a large tooth, the dorsal jaw two small teeth. Oesophagus without bulb. Caudal end of male with a large median preanal papilla and a double row of subventral bristles. A sheath-like accessory piece present. Female genital tubes paired, opposed, reflexed. Caudal glands present.

Hab. Marine.

Genotype : *F. longisetosa* Southern, 1914.

Southern, 1914, *Proc. R. Irish Acad.*, xxxi, 34.

7. *Dignathonema* Filipjev, 1918.

Cuticle striated. Head not distinct, with submedian bristles. Lateral organs large, spiral. Pharyngeal walls apparently represented by three rod-like jaws, contained within a much swollen anterior part of the oesophagus, and bearing anteriorly each three teeth, of which the two outer are bifid, the middle tooth simple. The dorsal jaw and its teeth are apparently much less well developed than the others, and the jaw itself not well chitinized. Oesophagus much swollen behind. Female genital tubes short, reflexed. Male unknown.

Hab. Marine.

Genotype : *D. bulbosa* Filipjev, 1918.

Filipjev, 1918, *Trav. Lab. Zool., Stat. Biol. Sebastopol*, Ser. II, No. 4, 205.

Filipjev, in his generic diagnosis, states that there are two large lateral lips and two large papillae. His figures indicate the presence of three lips, and our diagnosis, as regards the head, is chiefly based upon the figures. The genus is considered by Filipjev to resemble closely *Cyatholaimus* and *Halichoanolaimus*, although highly specialised for carnivorous habits. We consider it much more nearly related to *Enoplus*, *Triodontolaimus*, *Selachinema* and *Fiacra*, with one of which it may possibly prove to be synonymous.

8. *Rhabdotoderma* Marion, 1870.

Cuticle with characteristic transverse ring-shaped thickenings, and with scattered bristles. Head not distinct, truncate, with a crown of bristles. Pharynx elongate, apparently containing (three ?) broad teeth at its anterior end. Behind these there is a complex apparatus consisting of two jaw-like structures, with serrate internal surfaces, in connection with two stouter chitinous rods, directed posteriorly and converging towards their posterior ends. Each of these rods carries three teeth at intervals along its inner surface. Oesophagus slightly swollen behind, without bulb. A pair of ocelli

present, with lenses. Male with two complex accessory pieces (?). Female genital tubes paired, opposed, reflexed. Caudal glands and spinneret present.

Hab. Marine.

Genotypè : *R. morstatti* Marion, 1870.

Marion, 1870, *Ann. Sci. Nat.*, Paris, Zool., (5) xiii, Art. 14, 31.

It is difficult to draw up an intelligible diagnosis of this genus from the description given by Marion, which is somewhat obscure and occasionally self-contradictory. Although the structures connected with the pharynx are stated to be paired, it seems very probable that they are in reality tri-radially arranged. In his brief generic diagnosis Marion states that there are two longitudinal accessory pieces in front of the spicules, and two other median pieces. In the specific description of the type, however, he mentions two lateral, bifid, accessory pieces and one median piece. The figure suggests two accessory pieces, each with three sharp, forwardly-directed processes.

9. *Cheironchus* Cobb, 1917.

The only available diagnosis of this genus is contained in the legend to a figure and in the "formula" of the genotype. The genotype is said to be "A nema whose bilaterally symmetrical mandibles have arisen from the ventrally submedian sectors of the head at the same time that the dorsal elements of the pharynx have disappeared. *Cheironchus* has the general appearance of *Selachinema*, but has no vestigial dorsal jaw, and presents both pharyngeal and cardiac bulbs." According to the formula, the testes are paired, opposed, outstretched; the female genital tubes paired, opposed and reflexed. Spinneret present.

Hab. Not mentioned.

Genotype : *C. vorax* Cobb, 1917.

Cobb, 1917, *Contr. Sci. Nematol.*, v, 119.

APPENDIX TO ONCHOLAIMIDAE.

The following forms are of uncertain position.

a. *Heterocephalus* Marion, 1870, *nec* Rüppel, 1842.

Head suddenly narrowed, distinct, truncate, surrounded by a crown of stout, recurved bristles. Buccal cavity rather large, armed with chevron-shaped cuticular thickenings. Two long, slender spicules, strongly denticulate on their lower surfaces near the tips. A "roof-shaped" accessory piece present. A single preanal supplementary organ present

in the male, and a series of button-like, bristle-bearing prominences.

Hab. Marine.

Genotype : *H. laticollis* Marion, 1870.

Marion, 1870, *Ann. Sci. Nat.*, Paris, Zool., (5) xiii, Art. 14, 18.

If this be a valid genus, it will require to be renamed on account of the previous use of *Heterocephalus*. As, however, its status is at present uncertain, we refrain from introducing a fresh complication into the synonymy.

b. *Enoplostoma* Marion, 1870.

Body short and stout, especially anteriorly. Head with numerous circumoral papillae and a crown of very stout, recurved bristles. Buccal cavity rather small, armed with three cuticular "pieces" of peculiar shape. Ocelli present. Male with a single preanal supplementary organ. Spicules short and thick, with serrated inner border. Two pairs of accessory pieces present.

Hab. Marine.

Genotype : (by page precedence) *E. hirtum* Marion, 1870.

Marion, 1870, *Ann. Sci. Nat.*, Paris, Zool., (5) xiii, Art. 14, 22.

c. *Lasiomitus* Marion, 1870.

Body elongate, with numerous bristles, sometimes arranged in bunches, and longer and thicker near the head and cloacal aperture. Head rounded in front. Buccal capsule narrow, its wall strengthened by two long, slender chitinoid structures which are expanded in front and behind. Two ocelli, with lenses, present at the level of the base of the buccal capsule. Oesophagus simple, slightly enlarged behind. Tail conical. Male sometimes with a series of setiform preanal papillae. Spicules relatively long and slender, bent at an obtuse angle or almost at right angles. Accessory piece absent. Female genital organs undescribed. Spinneret present.

Hab. Marine.

Genotype : *L. exilis* Marion, 1870.

Marion, 1870, *Ann. Sci. Nat.*, Paris, Zool., (5) xiii, Art. 14, 11; and 1870, xiv, Art. I, 8.

d. *Rhabdocoma* Cobb, 1920.

Cuticle thin, unstriated, without bristles except at anterior end. Head not distinct. Three lips, six labial papillae, six jointed cephalic bristles and four cervical bristles present. Lateral organs circular. Pharynx small, with three small, possibly transversely ribbed, thickenings in its wall. Oesoph-

agus without median or posterior swelling. Tail tapering. Male with twelve to sixteen papilliform preanal supplementary organs and a second series of about eight such organs in the cervical region. Spicules rather short and broad. Two poorly-developed accessory pieces present. Testes paired, opposed, outstretched. Female genital tubes paired, opposed, with short, rudimentary, anterior branch and reflexed posterior branch.

Hab. Marine (in sand).

Genotype : *R. americanum* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 252 and key.

ORDER II. **STRONGYLOIDEA** Weinland, 1858.

Males with a terminal or subterminal caudal bursa, supported by a system of rays consisting typically of six paired main rays and a median unpaired dorsal ray with accessory branches. Oesophagus more or less club-shaped, without a posterior bulb.

Fam. I. **STRONGYLIDAE** Baird, 1853.

Buccal capsule well developed ; its anterior margin without teeth or cutting-plates, but usually bearing a leaf-crown.

Subfam. I. **STRONGYLINAE** Railliet, 1893.

Buccal capsule relatively large, more or less subspherical or infundibular. Dorsal gutter usually well developed, forming a ridge in the wall of the buccal capsule and extending nearly to its anterior margin. Parasites of the alimentary tract of Vertebrates.

1. **Strongylus** Müller, 1780.

Syn. *Sclerostoma* Rudolphi, 1809, et auctt. ; *Sclerostomum*, auctt.

Elements of external leaf-crown numerous. Internal leaf-crown usually absent. Buccal capsule eup-shaped, thick-walled, with an external circular ridge immediately behind its anterior border. Teeth may be present towards the base of the capsule. Dorsal gutter strongly developed. Bursa of male small, entire. Spicules not barbed. Uterine branches opposed.

Hab. Large intestine of Equidae and Elephants.

Genotype : *S. equinus* Müller, 1780, of Looss, 1900.

Müller, 1780, *Zool. Dan.*, ii, Pl. 42; Looss, 1900, *Centralbl. f. Bakt.*, (I) xxvii, 150; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, *Zool.* i, 19.

The genus has been divided into the following subgenera :

1a. Subgen. *Strongylus* Railliet, 1923.

Buccal capsule with two dorsal and two subventral teeth at its base. Genital cone strongly developed. An accessory piece present.

Hab. Large intestine of Equidae.

Type-species : *S. (Strongylus) equinus* Müller, 1780, of Looss, 1900.

Railliet, 1923, *Réc. Méd. vét.*, xcix, 380.

1b. Subgen. *Alfortia* Railliet, 1923.

An internal leaf-crown present. Buccal capsule without teeth. Genital cone well developed. An accessory piece present.

Hab. Large intestine of Equidae.

Type-species : *S. (Alfortia) [Sclerostoma] edentatus* (Looss, 1900).

Railliet, 1923, *Réc. Méd. vét.*, xcix, 381.

1c. Subgen. *Delafondia* Railliet, 1923.

Buccal capsule with two dorsal teeth towards its base. Genital cone very feebly developed. An accessory piece present.

Hab. Large intestine of Equidae.

Type-species : *S. (Delafondia) [Sclerostoma] vulgaris* (Looss, 1900).

Railliet, 1923, *Réc. Méd. vét.*, xcix, 386.

1d. Subgen. *Decrusia* Lane, 1914.

Mouth subterminal, facing slightly dorsally. Buccal capsule with two subventral teeth at its base. Accessory piece absent.

Hab. Large intestine of Indian Elephant.

Type-species : *S. (Decrusia) [Strongylus] additicta* (Railliet, Henry & Bauche, 1914).

Railliet, Henry & Bauche, 1914, *Bull. Soc. Path. exot.*, Paris, vii, 30, 132; Lane, 1914, *Ind. Journ. Med. Res.*, ii, 386; Railliet, 1923, *Réc. Méd. vét.*, xcix, 394.

2. *Triodontophorus* Looss, 1902.

Syn. *Triodontus* Looss, 1900, *nec* Westwood, 1845.

External and internal leaf-crowns present, their elements of equal number. Buccal capsule almost globular, rather small, but with relatively thick walls. Dorsal gutter present. From the oesophageal funnel three pairs of teeth project into the buccal capsule. Spicules terminate in small hooks. Vulva relatively close to the posterior end of the body. Uterine branches parallel.

Hab. Large intestine of Equidae.

Genotype: *T.* [*Triodontus*] *minor* (Looss, 1900).

Looss, 1900, *Centralbl. f. Bakt.*, (I), xxvii, 153; 1902, *Rec. Egypt. School Trop. Med.*, Cairo (1901), 78; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, Zool. i, 26.

3. *Craterostomum* Boulenger, 1920.

This genus differs from *Triodontophorus* in the absence of teeth in the oesophageal funnel, in the fact that the elements of the external leaf-crown are fewer in number than those of the internal leaf-crown, and in the somewhat more anteriorly placed vulva.

Hab. Large intestine of Equidae.

Genotype: *C.* [*Cylicostomum*] *acuticaudatum* (Kotlán, 1919) (= *C. tenuicaudatum* Boulenger, 1920).

Kotlán, 1919, *Közlem. összehas. élet-és körtan köréből*, Budapest, XV; Boulenger, 1920, *Parasitol.*, xii, 105; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, Zool. i, 33.

4. *Codiostomum* Railliet & Henry, 1911.

External and internal leaf-crowns present. Buccal capsule large, subglobular, without teeth, but with a well-developed dorsal gutter. Dorsal lobe of bursa placed almost at right angles to the main axis of the body. Prebursal papillae present, situated in the bursa itself. Lateral and ventral rays appear to arise from a common trunk. Externo-dorsal leaves dorsal ray very high up, almost at its root. Dorsal ray cleft for about half its length. An accessory branch, which divides into two, leaves each branch of the main stem high up. Accessory piece absent. Vulva close to anus. The cuticle in the neighbourhood of the vulva may be inflated to form a sheath over a portion of the tail. Uterine branches parallel.

Hab. Caeca of Ostrich (one species known).

Genotype: *C.* [*Sclerostoma*] *struthionis* (Horst, 1885).

Horst, 1885, *Notes Leyden Mus.*, vii, 263; Railliet & Henry, 1911, *Bull. Soc. nat. Acclim.*, Paris, 574; Monnig, 1924,

9th and 10th Rep. Dir. Vet. Educ. and Res., Pretoria (1923), 458.

5. *Oesophagodontus* Railliet & Henry, 1902.

Syn. *Pseudosclerostomum* Quicl, 1919.

External and internal leaf-crowns present. Mouth-collar depressed. Buccal capsule goblet-shaped, with a circular ridge posteriorly. The lining of the oesophageal funnel is thrown into three small folds or teeth which do not project into the buccal capsule. Dorsal gutter absent. Bursa entire. Dorsal ray cleft to the point of origin of the accessory branches. Postero-lateral ray with an accessory branch. Vulva relatively distant from anus. Uterine branches parallel.

Hab. Large intestine of Equidae.

Genotype: *O. [Sclerostoma] robustus* (Giles, 1892).

Giles, 1892, *Sci. Mem. Med. Off. Army, India* (7), 26; Railliet & Henry, 1902, *Compt. rend. Soc. Biol., Paris*, liv, 110; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, Zool. i, 103.

6. *Equinurbia* Lane, 1914.

Fairly stout worms. External leaf-crown composed of numerous elements of two lengths, two short elements being placed between each pair of long elements. Mouth-opening roughly circular. Buccal capsule subglobular, with a long dorsal gutter. Externo-dorsal rays of bursa with two accessory branches and a dorsal boss. Dorsal ray cleft for about half its length. The externo-dorsal rays and two pairs of accessory branches of the dorsal ray spring from the median stem of that ray. Vulva prominent, close to anus. Uterine branches parallel.

Hab. Alimentary tract of Elephants.

Genotype: *E. [Sclerostoma] sipunculiformis* (Baird, 1859).

Baird, 1859, *Proc. Zool. Soc., London*, 425; Lane, 1914, *Ind. Journ. Med. Res.*, ii, 381.

7. *Choniangium* Railliet, Henry & Bauche, 1914.

Syn. *Asifia* Lane, 1914.

Anterior extremity obliquely truncate, so that the mouth-opening faces somewhat dorsally. External leaf-crown composed of numerous long, fine elements. Internal leaf-crown absent. Buccal capsule elongate, narrowing posteriorly. No teeth in the buccal capsule, but paired hemispherical bosses are present on the internal surface of its wall. Dorsal gutter apparently absent. Postero-lateral ray of bursa with a well-developed accessory branch. Externo-dorsal rays and a pair of accessory branches of the dorsal ray both spring from the median dorsal stem, the accessory branches being cleft

almost to their bases. Main stem of dorsal ray cleft for less than half its length. An accessory piece present. Tail of female short and straight. Vulva close to anus. Uterine branches parallel.

Hab. Intestine of Elephants.

Genotype: *C. [Sclerostomum] epistomum* (Piana & Stazzi, 1900).

Piana & Stazzi, 1900, *Arch. Parasitol.*, Paris, iii, 467; Railliet, Henry & Bauche, 1914, *Bull. Soc. Path. exot.*, Paris, vii, 207; Lane, 1914, *Ind. Journ. Med. Res.*, ii, 384.

8. *Ransomus* Hall, 1916.

Anterior end obliquely truncate, so that the mouth faces antero-ventrally. External leaf-crown present. Buccal capsule large, subglobular, without internal teeth. Antero-lateral ray of bursa arises separately from the medio-lateral and postero-lateral. The latter rays are fused for about half their length. Externo-dorsal ray also originates separately. The dorsal ray gives off a pair of accessory branches, and almost immediately behind these the main stem bifurcates. The cleft portion of the main stem represents approximately a quarter to a third of the length of the whole ray. Spicules long, tubular, markedly alate. An accessory piece present. Vulva a little in front of anus. Uterine branches opposed.

Hab. Intestine of a Rodent (one species known).

Genotype: *R. rodentorum* [sic] Hall, 1916.

Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 116.

Subfam. 2. **TRICHONEMINAE** Railliet, 1916.

Buccal capsule cylindrical, with relatively thick walls. Dorsal gutter comparatively short, not reaching the anterior margin of the buccal capsule. No ventral cervical groove or cephalic vesicle. Parasites of the alimentary tract of Vertebrates.

1. *Trichonema* Cobbold, 1874.

Syn. *Cyathostomum* Molin, 1861, nec *Cyathostoma* E. Blanchard, 1849; *Cyathostomum* Looss, 1900; *Cylicostomum* Railliet, 1901, et auctt.; *Cylicnostomum* Looss, 1902.

External and internal leaf-crowns present. Buccal capsule rather shallow, more or less cylindrical, without teeth. Oesophageal funnel generally well developed. Dorsal ray of bursa bifurcate almost to the point of origin of the externo-dorsal rays. The two pairs of accessory branches of the dorsal ray spring from the bifurcate portion and not from the median stem. Genital cone with a well-developed dermal

collar and usually with appendages. Spicules terminating in double hooks. Vulva close to anus. Uterine branches parallel.

Hab. Large intestine of Equidae.

Genotype: *T. [Cylicostomum] longibursatum* (Yorke & Macfie, 1918).

Cobbold, 1874, *Veterinarian*, London, xlvii, 6, 237; Mehlis, 1831, *Isis* (v. Oken), 79; Looss, 1900, *Centralbl. f. Bakt.* (I), xxvii, 150; 1902, *Rec. Egypt. School Trop. Med.*, Cairo (1901), 36, 86; Railliet, 1901, *Echo vét.*, Liège, xxxi, 40; Yorke & Macfie, 1918, *Ann. Trop. Med. Parasit.*, Liverpool, xi, 400; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, Zool. i, 37; Le Roux, 1924, *Journ. Helminthol.* ii, 115.

Since Le Roux (1924) has made use of *Trichonema*, there is no alternative but to acknowledge the probable correctness of that name. So far as the genotype is concerned, Le Roux points out that *S. tetracanthus* Mehlis, 1831, cannot be identified with certainty, and therefore ceases to be a valid type. He designates *T. longibursatum* as type of the genus, since he believes that Müller's fig. 12 in *Icones Zool. Dan.*, ii (1780), refers to a male of this species, and since he considers this to be the most common species in the horse in Europe. This definite designation of a type is undoubtedly to be preferred to further speculation concerning the probable identity of *S. tetracanthus* Mehlis.

This genus has been divided into the following subgenera:

1a. Subgen. *Trichonema* Le Roux, 1924.

Syn. *Cylicostephanus* Ihle, 1922.

Mouth-opening circular. Mouth-collar depressed. Buccal capsule usually long and cylindrical, or somewhat narrowed anteriorly. The elements of the internal leaf-crown are short rods, situated in the immediate neighbourhood of the anterior margin of the capsule. Tail of female usually straight.

Type-species: *T. (Trichonema) [Cylicostomum] longibursatum* (Yorke & Macfie, 1918).

Yorke & Macfie, 1918, *Ann. Trop. Med. Parasit.*, Liverpool, xi, 400; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, Zool. i, 77; Le Roux, 1924, *Journ. Helminthol.*, ii, 118.

1b. Subgen. *Cylicostomum* Ihle, 1922.

External leaf-crown consists of eighteen to twenty-four, mostly pointed, elements. Internal leaf-crown composed of thin, triangular, radially-disposed plates, whose origin extends backwards on to the internal surface of the buccal capsule some distance from its anterior margin. A "problematical structure" is present in the mouth-collar. Buccal capsule rather short, thick-walled. Tail of female straight or slightly bent dorsally.

Type-species : *T. (Cylicostomum) aegyptiacum* Railliet, 1923 (= *C. tetracanthum* Mehlis of Looss, 1900).

Ihle, 1922, *tom. cit.*, 39.

1c. Subgen. *Cylicocyclus* Ihle, 1922.

Elements of internal leaf-crown usually small and numerous, generally in the form of fine rods, originating in the immediate neighbourhood of the anterior margin of the buccal capsule. The posterior margin of the buccal capsule-wall forms a hoop-like thickening. Tail of female straight or only slightly bent dorsally, very seldom strongly bent.

Type-species : *T. (Cylicocyclus) [Cyathostomum] radiatum* (Looss, 1900).

Ihle, 1922, *tom. cit.*, 63.

1d. Subgen. *Cylicocercus* Ihle, 1922.

External leaf-crown composed of twenty to twenty-nine elements. Elements of internal leaf-crown like those of the subgenus *Cylicostomum*, but the region of their origin may extend back to a great distance from the anterior margin of the buccal capsule. Posterior end of female strongly bent dorsally, with a pre-vulvar swelling, the whole somewhat resembling a human foot when viewed laterally.

Type-species : *T. (Cylicocercus) [Cyathostomum] alveatum* (Looss, 1900).

Ihle, 1922, *tom. cit.*, 50.

1e. Subgen. *Cylicodontophorus* Ihle, 1922.

Elements of external leaf-crown generally small and numerous; those of the internal leaf-crown very large and broad when seen from outside. The latter are plates, radially disposed, originating not far behind the anterior margin of the buccal capsule. Buccal capsule short and wide, thick-walled. Tail of female generally straight. Vulva often rather distant from anus.

Type-species : *T. (Cylicodontophorus) [Cyathostomum] bicoronatum* (Looss, 1900).

Ihle, 1922, *tom. cit.*, 86.

2. *Poteriostomum* Quiel, 1919.

Syn. *Hexodontostomum* Ihle, 1920.

Elements of external leaf-crown numerous, those of the internal leaf-crown large and broad when seen from outside. Sometimes six of the latter elements are longer than the rest. Postero-lateral ray of bursa has an accessory branch. The

externo-dorsal ray and the two branches of the dorsal ray leave the main stem in its anterior half, and run almost at right angles to it. The median dorsal ray is bifurcate only as far as the point of origin of the more posterior of the two pairs of accessory branches. Tail of female long, straight and free from swellings.

Hab. Large intestine of Equidae.

Genotype: *P. imparidentatum* Quiel, 1919.

Quiel, 1919, *Centralbl. f. Bakt.* (I), lxxxiii, 466; Ihle, 1920, *Centralbl. f. Bakt.* (I), lxxxiv, 43; 1922, *Rep. Comm. Sclerostom. Holland*, I; *Zool.* i, 98.

3. *Murshidia* Lane, 1914.

(For questions of synonymy see discussion under *Pteridopharynx*, *infra*).

Body tapering anteriorly. In the male the thickest portion of the body may be just anterior to the bursa. Mouth-collar well defined, incised dorsally and ventrally. External leaf-crown composed of numerous fine elements originating along a curved line which runs closer to the anterior margin of the buccal capsule dorsally and ventrally. The dorsal and ventral elements are also shorter than the lateral, thus giving to the mouth the shape of a dorso-ventral slit. No teeth at base of buccal capsule. Antero-lateral ray of bursa divergent from the remaining lateral rays. The externo-dorsal ray may have a dorsal boss or a small accessory branch. It lies relatively close to the postero-lateral ray, which also is furnished with a dorsal boss. Dorsal ray cleft to the origin of the accessory branches, of which there are typically two pairs. Spicules long and slender. An accessory piece present. Vulva close to anus. Uterine branches parallel.

Hab. Alimentary tract of Elephants and Wart-hogs.

Genotype: *M. murshida* Lane, 1914.

Lane, 1914, *Ind. Journ. Med. Res.*, ii, 387.

4. *Pteridopharynx* Lane, 1921.

Syn. *Memphisia* Khalil, 1922.

Slender forms. External leaf-crown composed of numerous elements which may be of uneven length. Buccal capsule more or less cylindrical, with two or more small teeth projecting from its base. The sectors of the oesophagus may be plumose internally. Postero-lateral ray of bursa with a dorsal boss or an accessory branch. Externo-dorsal ray typically with a similar boss or accessory branch. The two pairs of accessory branches of the dorsal ray fused throughout the greater part of their length. Median stem of dorsal ray cleft for about one-third of its length or about half-way to the

point of origin of its accessory branches. Vulva close to anus. Uterine branches parallel.

Hab. Alimentary canal of Elephants and Rhinoceroses.
Genotype : *P. africana* Lane, 1921.

Lane, 1921, *Ind. Journ. Med. Res.*, ix, 165; Khalil, 1922, *Proc. Zool. Soc.*, London, 212; Ware, 1924, *Journ. Comp. Path. Ther.*, xxxvii, 282; Neveu-Lemaire, 1924, *Ann. Paras. hum. et comp.*, Paris, ii, 134, 138, 142.

Khalil (1922) separated *Memphisia* from *Pteridopharynx* on account of the presence of a well-defined cuticular collar just behind the mouth-collar, and of the occurrence of an accessory branch on the externo-dorsal ray of the bursa. The cuticular collar, however, is extremely poorly developed in the second species (*M. aziza*) assigned to the genus by Khalil. So far as the presence of an accessory branch or boss on the externo-dorsal ray is concerned, the figures of Lane (1921) and Ware (1924) show that such a branch may be present in species of *Pteridopharynx* totally without the cuticular collar already mentioned. In fact there is a boss or rudimentary branch also in most species of *Murshidia*. In our opinion *Memphisia* and *Pteridopharynx* cannot be distinguished from each other, and the presence of the cuticular collar can only be considered as of specific importance.

The genus *Pteridopharynx* is very closely related to *Murshidia*. It differs from the latter genus in the presence of teeth at the base of the buccal capsule and in the form of the dorsal ray of the bursa. In *Murshidia* the main dorsal stem is cleft right to the origin of the two pairs of accessory branches, which are well separated from each other for the greater part of their length; whereas in *Pteridopharynx* the dorsal ray is cleft for only half the distance between its tip and the origin of the accessory branches, which are fused for the greater part of their length. The dorsal lobe of the bursa is particularly elongate in *Pteridopharynx*, while in *Murshidia* the whole bursa is short and stunted. The recently-described genera *Henryella* Neveu-Lemaire, 1924, and *Buissonia* Neveu-Lemaire, 1924, appear to resemble *Murshidia* in the absence of teeth at the base of the buccal capsule, but approach more closely to *Pteridopharynx* in the arrangement of the dorsal ray. They thus form a connecting-link between *Murshidia* and *Pteridopharynx*, and it appears probable that further investigation will show that not only Neveu-Lemaire's genera, but also *Pteridopharynx*, cannot be generically separated from *Murshidia*.

5. *Gyalcephalus* Looss, 1900.

External and internal leaf-crowns present. Buccal capsule more or less cylindrical, with thick walls which, decreasing in

thickness posteriorly, are prolonged as delicate triangular plates over the anterior portion of the oesophageal funnel. Three wedge-like septa or "teeth" project from the funnel into the buccal capsule. Dorsal gutter absent. Prebursal papillae very long and ray-like, within the bursa proper. Dorsal ray cleft almost to origin of externo-dorsal rays. Two accessory branches spring from each branch of the dorsal ray.

Hab. Large intestine of Equidae.

Genotype: *G. capitatus* Looss, 1900.

Looss, 1900, *Centralbl. f. Bakt.* (I), xxvii, 191; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, Zool. i, 105.

6. *Amira* Lane, 1914.

Syn. *Khalilia* Neveu-Lemaire, 1924.

Cuticle thick, sometimes with bosses in front of the bursa in the male. External and internal leaf-crowns present. Buccal capsule very shallow, with thick walls. Oesophagus hourglass-shaped, with a large oesophageal funnel and lined almost throughout with thickened cuticle. Dorsal lobe of bursa may be enormously elongate. Prebursal papillae long and slender, appearing as additional rays. All the bursal rays relatively long and slender, more particularly the dorsal, which is cleft almost to its base. Accessory branches of dorsal ray typically two pairs, arising from the bifurcate portion. One pair may be much reduced. Spicules extremely long and filiform. An accessory piece present. Vulva close to anus. Uterine branches parallel.

Hab. Alimentary tract of Elephants.

Genotype: *A. [Cylicostomum] pileata* (Railliet, Henry & Bauche, 1914).

Railliet, Henry & Bauche, 1914, *Bull. Soc. Path. exot.*, Paris, vii, 208; Lane, 1914, *Ind. Journ. Med. Res.*, ii, 394; and 1915, iii, 107.

7. *Quilonia* Lane, 1914.

Syn. *Evansia* Railliet & Henry, 1913, *nec* Scott, 1906; *Nematevansia* Ihle, 1919; *Paraquilonia* Neveu-Lemaire, 1924.

External leaf-crown composed of a few long elements. Internal leaf-crown present or absent. Buccal capsule a wide, shallow ring, its wall widely separated from the mouth-cavity, which is bounded by the elements of the leaf-crowns. The latter extend backwards and become continuous with the cuticle lining the oesophageal funnel. There may be teeth at the base of the buccal capsule. Lateral rays of bursa rather divergent from each other. Externo-dorsal rays spring from the median stem of the dorsal ray near its base. Dorsal ray cleft for about one-third of its total length. Two small

accessory branches originate together from each branch. An accessory piece present. Vulva in posterior third of body. Uterine branches opposed, but the posterior branch turns and runs anteriorly.

Hab. Intestine of Elephants and Rhinoceroses.

Genotype : *Q. [Evansia] renniei* (Railliet & Henry, 1913).

Railliet & Henry, in Railliet, Henry & Joyeux, 1913, *Bull. Soc. Path. exot.*, Paris, vi, 264; Lane, 1914, *Ind. Journ. Med. Res.*, ii, 391; Neveu-Lemaire, 1924, *Ann. Paras. hum. et comp.*, Paris, ii, 122.

8. *Bourgelatia* Railliet, Henry & Bauehe, 1919.

External leaf-crown composed of about twenty large, pointed elements. Internal leaf-crown with about forty elements. Buccal capsule shallow, cylindrical, its wall in two thick portions, of which the posterior is more or less continuous with the cuticular lining of the wide, shallow oesophageal funnel. Ventral rays of bursa parallel and closely applied to each other. Bursa incised near the tips of the ventral rays, giving the appearance of a pair of additional lobes. Antero-lateral ray somewhat shorter than, but not divergent from, the remaining lateral rays. Externo-dorsal ray originates high up on the main dorsal stem. Dorsal ray cleft for almost half its length. A single accessory branch springs from each main branch. An indistinct accessory piece present. Vulva close to anus. Uterine branches parallel.

Hab. Intestine of Pigs (one species known).

Genotype : *B. diducta* Railliet, Henry & Bauehe, 1919.

Railliet, Henry & Bauehe, 1919, *Bull. Soc. Path. exot.*, Paris, xii, 324.

Railliet, Henry & Bauehe suggest that this form belongs to the Oesophagostominae, in spite of the absence of a ventral cervical groove. Certainly the single pair of accessory branches of the dorsal ray suggests relationship with the Oesophagostomes, in which the second pair of accessory branches is much reduced or absent, but since the grouping of that subfamily has been based almost entirely on the presence of a ventral groove, we have no alternative but to include the genus under discussion in the Trichoneminae, at the same time remarking that it is perhaps the nearest relative of the Oesophagostominae.

9. *Kiluluma* Skrjabin, 1916.

Mouth-collar divided by grooves into six sections, each bearing one of the cephalic papillae. An external leaf-crown of six elements present, these arising from the base of the buccal capsule and projecting from the mouth-opening.

Buccal capsule shallow, cylindrical, with thick walls. Pre-bursal papillae of male appear as an additional pair of ventral rays within the bursa. Externo-dorsal rays originate high up on the median dorsal stem. Dorsal ray with one pair of accessory branches, also arising high up on the median stem. The tips of these branches may be bifurcate. Spicules broad, alate, and twisted distally. An accessory piece present. Vulva near the anus. Uterine branches parallel.

Hab. Alimentary tract of Rhinoceroses.

Genotype: *K. [Deletrocephalus] stylosa* (v. Linstow, 1907).

v. Linstow, 1907, *Mitt. Zool. Mus. Berlin*, iii, 254; Skrjabin, 1916, *Sci. Res. Zool. Exp. Brit. E. Africa* (Dogiel and Sokolow), Petrograd, i (4), 44.

10. *Cylindropharynx* Leiper, 1911.

External leaf-crown composed of six very large elements, three on each side. Dorsally and ventrally there projects from the mouth-opening a broad plate directed towards the main axis of the body. Internal leaf-crown consists of twelve large elements, arising from the anterior margin of the buccal capsule. Buccal capsule extremely long, cylindrical, thick-walled. Dorsal ray of bursa cleft almost to origin of externo-dorsal rays. An accessory branch, bifurcate at its tip, springs from each of the main branches of the dorsal ray.

Hab. Large intestine of Equidae.

Genotype: *C. brevicauda* Leiper, 1911.

Leiper, 1911, *Proc. Zool. Soc.*, London, 551; Yorke & Macfie, 1920, *Ann. Trop. Med. Parasit.*, Liverpool, xiv, 169; Ihle, 1922, *Rep. Comm. Sclerostom. Holland*, I, Zool. i, 108.

11. *Trachypharynx* Leiper, 1911.

An external leaf-crown present. The anterior third of the buccal capsule is thickly reinforced with chitinous material. The posterior two-thirds are surrounded by the oesophageal musculature and thinly lined with chitinous material bearing internally-projecting knobs. Vulva a little in front of anus.

Hab. Intestine of a large Rodent (one species known).

Genotype: *T. nigeriae* Leiper, 1911.

Leiper, 1911, *Proc. Zool. Soc.*, London, 552; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 109.

12. *Eucyathostomum* Molin, 1861.

Buccal capsule large, with wide anterior opening whose internal border is armed with a leaf-crown consisting of numerous slender, pointed elements. Bursa with projecting dorsal lobe. Ventral and lateral rays arising from a common trunk. The ventral rays may be fused. Dorsal ray may be

cleft almost to its origin, or its main branches may appear to be fused almost to the tip. There are externo-dorsal rays and two pairs of accessory branches. The latter spring from the branches of the main dorsal ray. Spicules long, filiform, equal. Tail of female acutely pointed. Vulva close to anus.

Hab. Intestine of Ruminants.

Genotype: *E. longesubulatum* Molin, 1861.

Molin, 1861, *Mem. R. Ist. Veneto*, ix, 435, 455; Ransom, 1911, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 127, 38.

This genus is insufficiently known.

13. *Deletrocephalus* Diesing, 1851.

External leaf-crown composed of six elements, fibrous and opaque, "dilated at each end," converging in front. Mouth terminal, suborbicular. Bursa exsised, with many rays. Tail of female pointed, straight. Vulva near anus.

Hab. Alimentary tract of *Rhea*.

Genotype: *D. dimidiatus* Diesing, 1851.

Diesing, 1851, *Systema Helminthum*, ii, 298; 1855, *Denkschr. k. Akad. Wiss., Wien*, ix, 183.

This genus is insufficiently characterized. It is uncertain whether the forms described as *D. dimidiatus* by later authors were identical with Diesing's species.

14. *Cloacina* v. Linstow, 1898.

Cuticle with prominent transverse striations. Lateral fields so highly developed as sometimes to meet in the middle axis of the body. Head with six lips, a dorsal, a ventral and four submedian, each of the latter bearing a projecting, club-shaped papilla. Buccal capsule a shallow ring. An internal leaf-crown apparently present. Bursa entire, almost circular. Dorsal ray bifurcate for about two-thirds of its length, each branch bearing a short accessory branch. Externo-dorsal rays originate separately from the dorsal ray. Postero-lateral and medio-lateral rays closely apposed; antero-lateral widely separated from them. Latero-ventral and ventro-ventral rays closely apposed. Spicules very long. Tail of female tapering, curved dorsally. Vulva very close to anus.* Uterine branches parallel.

Hab. Alimentary canal of Kangaroo.

Genotype: *C. dahli* v. Linstow, 1898.

v. Linstow, 1898, *Arch. f. Naturg.*, lxiii, i, 286; Railliet & Henry, 1912, *Arch. Parasitol.*, Paris, xiv, 563; 1913, *Bull. Soc. Path. exot.*, Paris, vi, 506.

* von Linstow describes the vulva as opening with the anus into a common cloaca. According to Railliet & Henry (1913), however, this is inaccurate.

15. *Zoniolaimus* Cobb, 1898.

The only available description of the type of this genus is contained in the figures given by Cobb, with their legend, and a "formula." According to Railliet & Henry (1913, *Bull. Soc. Path. exot.*, Paris, vi, 506), the genus is synonymous with *Cloacina* v. Linstow, and this may very possibly be the case. The arrangement of the bursal rays is apparently the same in both genera, but according to Cobb's figures the cephalic papillae in *Zoniolaimus* are bristle-like and slender, not club-shaped; while the oesophagus appears to possess a median and a posterior bulb (possibly only dilatations of the lumen), and a ring-shaped buccal capsule is not indicated.

Hab. Alimentary canal of a Kangaroo.

Genotype: *Z. setifera* Cobb, 1898.

Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 312.

Subfam. 3. OESOPHAGOSTOMINAE Railliet, 1915.

Buccal capsule cylindrical, or large and subglobular. A transverse ventral cervical groove present. The cuticle of the anterior end may be dilated to form a cephalic vesicle, limited ventrally by the cervical groove. Parasites of the alimentary tract of Mammals.

1. *Oesophagostomum* Molin, 1861.

Syn. *Hypostomum* Stewart, 1898.

Anterior end usually with a cuticular inflation or vesicle limited behind, at about the level of the excretory pore, by a transverse ventral groove. This groove extends for a varying distance on to the lateral surfaces of the worm. Lateral cervical alae may be present, originating at the level of the groove. An external leaf-crown present. Internal leaf-crown present or absent. Oesophageal funnel occasionally with three teeth. Medio-lateral and postero-lateral rays of bursa closely applied to each other and somewhat divergent from the antero-lateral ray. Externo-dorsal arising high up on the main stem of the dorsal ray, which is bifurcate in its posterior two-fifths. A much-reduced accessory branch arises from each of the main branches. The second pair of accessory branches is occasionally represented by a minute, slender branch on each side posterior to this. An accessory piece present. Vulva near anus. Uterine branches parallel.

Hab. Intestine of Mammals.

Genotype: *O. [Strongylus] dentatum* (Rudolphi, 1803).

Rudolphi, 1803, *Arch. f. Zool. u. Zoot.*, Brunswick, iii, 12;
Molin, 1861, *Mem. R. Ist. Veneto*, ix, 435, 443; Ransom, 1911,

U.S. Dept. Agric., Bur. Anim. Indust. Bull. 127, 40; Railliet & Henry, 1913, *Bull. Soc. Path. exot.*, Paris, vi, 506-7.

Railliet & Henry (1913) proposed the subgenera *Proteracrum* and *Hysteracrum* for the reception of the species of this genus occurring in Ruminants, while Ihle (1922, *Bijdr. Dierk. Natura Artis Magistra*, Amsterdam, xxii, 92) has proposed a subgenus *Conoweberia* for the species *O. apiostomum* and *O. brumpti*. The subgenus *Proteracrum*, of which *O. columbianum* is apparently to be considered the type, differs from the type of the genus in the slightly-swollen cephalic vesicle and in the presence of cervical alae. *Hysteracrum*, with *O. venulosum* as type, differs in the post-oesophageal situation of the cervical papillae. *Conoweberia* is defined as having a buccal capsule shaped like a truncate cone, and having three teeth in the oesophageal funnel. Goodey (1924, *Journ. Helminthol.*, ii, 97) has expressed the opinion that such a division into subgenera is unnecessary, and we are in agreement with this view.

2. *Ternidens* Railliet & Henry, 1909.

Ventral cervical groove present, but no cephalic vesicle. External and internal leaf-crowns present. Mouth opens obliquely towards the dorsal side. Buccal capsule subglobular, with three prominent, bifid teeth projecting from the oesophageal funnel.

Hab. Intestine of Primates (one species known).

Genotype: *T.* [*Triodontophorus*] *deminutus* (Railliet & Henry, 1905).

Railliet & Henry, 1905, *Bull. Mus. Hist. nat.*, Paris, xi, 269; 1909, *Compt. rend. Soc. Biol.*, Paris, lxvi, 169; 1912, *Arch. Parasitol.*, xiv, 564, 577.

3. *Chabertia* Railliet & Henry, 1909.

Anterior end obliquely truncate, so that the mouth faces antero-ventrally. Ventral cervical groove faint. A trace only of a cephalic vesicle, just in front of the ventral groove. Much-reduced external and internal leaf-crowns present, just behind the anterior margin of the buccal capsule. Buccal capsule large, subglobular, without teeth. Spicules long, tubular, slender. An accessory piece present.

Hab. Intestine of Ruminants (one species known).

Genotype: *C.* [*Strongylus*] *ovina* (Gmelin, 1790).

Gmelin, 1790, *Syst. Nat.*, 13th ed., i, Pt. VI, 3044; Fabricius, 1794, *Entomologia Systematica*, 5; Railliet & Henry, 1909, *Compt. rend. Soc. Biol.*, Paris, lxvi, 169; Ransom, 1911, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 127, 35.

Subfam. 4. **STEPHANURINAE** Railliet, Henry & Bauche, 1919.

Buccal capsule well developed, cup-shaped, with a leaf-crown at its anterior margin. Bursa of male subterminal and poorly developed, with stunted rays. Parasitic in the perirenal tissue or kidneys, less commonly in the liver and lungs, of Mammals.

1. **Stephanurus** Dicsing, 1839.

A relatively stout form. Mouth circular, provided with an external leaf-crown of small elements. Cuticle surrounding the mouth reflected externally into six thickenings or "epaulettes," two median and four submedian. Buccal capsule cup-shaped, with thick walls. At its base there are six teeth which may be bicuspid or tricuspoid. Rays of bursa short and stout. Dorsal ray divides into two branches which are bifurcate or trifurcate at their tips. Lateral rays closely applied to each other, the postero-lateral thicker than the other two. Spicules equal or subequal. An accessory piece present. Tail of female short, abruptly attenuated behind the anus, and bearing a pair of lateral globular cuticular processes. Vulva close to anus. Uterine branches parallel. The intestine is considerably longer than the body, and is therefore convoluted.

Hab. Perirenal fat, liver, abdominal viscera and, more rarely, lungs of Pigs; liver of cattle (one species known).

Genotype: *S. dentatus* Dicsing, 1839.

Dicsing, 1839, *Ann. Wien. Mus. Naturg.*, ii, 232; Taylor, 1899, *16th Ann. Rep. Bur. Anim. Indust.*, Washington, 612; Daubney, 1922, *Journ. Comp. Path. Ther.*, xxxvi, 97.

Subfam. 5. **SYNGAMINAE** nov.

Buccal capsule well developed, subglobular, without leaf-crowns at its anterior margin, but with teeth at its base. Eggs operculate. Parasites of the respiratory tract of Birds and Mammals.

1. **Syngamus** v. Siebold, 1836.

Sexes joined permanently *in copula*. Buccal capsule large, furnished at its base with eight or nine teeth. Bursa of male thick-walled, fleshy, its rays short and stout. Spicules small, in some species extremely small and difficult to detect. Vulva in anterior third of body.

Hab. Respiratory tract of Birds and Mammals.

Genotype: *S. [Fasciola] trachea* (Montagu, 1811) (= *S. trachealis* v. Siebold, 1836).

Montagu, 1811, *Mem. Werner. Nat. Hist. Soc.*, Edinburgh, i, 176; v. Siebold, 1836, *Arch. f. Naturg.*, ii, 105; Chapin, 1925, *Journ. Agric. Res.*, Washington, xxx, 558.

2. *Cyathostoma* E. Blanchard, 1849.

Sexes not permanently joined *in copula*. Buccal capsule large, cup-shaped, with six or seven teeth at its base. Externodorsal rays of bursa leave median dorsal stem high up, almost at its root. Dorsal ray cleft for about one-third of its total length. Spicules long and filiform. An accessory piece may be present. Vulva in the middle or anterior third of the body.

Hab. Respiratory tract of Birds.

Genotype: *C. lari* E. Blanchard, 1849.

E. Blanchard, 1849, *Ann. Sci. nat.*, Paris, Zool., iii, 182; Chapin, 1925, *Journ. Agric. Res.*, Washington, xxx, 565.

Fam. 2. ANCYLOSTOMIDAE (Looss, 1905) Lane, 1917.

Buccal capsule relatively well developed,* infundibular, bearing ventral teeth or cutting-plates on its anterior margin. Accessory branches of dorsal ray much reduced.

Subfam. 1. ANCYLOSTOMINAE (Looss, 1905) Stephens, 1916.

Anterior margin of buccal capsule armed ventrally with from one to four pairs of teeth.

1. *Ancylostoma* † (Dubini, 1843) Creplin, 1845.

Syn. *Diploodon* Molin, 1861.

Anterior end bent dorsally. Mouth-opening guarded by one to three pairs of ventral teeth. Buccal capsule deep, infundibular, provided internally with two triangular dorsal teeth. Dorsal gutter traverses the dorsal wall of the capsule and opens in a deep notch on its anterior margin. Bursa with a small dorsal lobe. Externodorsal rays arise high up from median stem of dorsal ray. The latter is cleft for about one-third of its length. The terminations of the main branches appear tridigitate, *i.e.* there are two very short accessory branches close to the tip of each. Spicules not barbed. An accessory piece present. Vulva behind the middle of the body. Uterine branches opposed.

* The structure of the buccal capsule in *Agriostomum* suggests that not improbably the buccal capsule in the Ancylostomidae represents in reality a buccal capsule and oesophageal funnel combined.

† The spelling *Ancylostoma* has been adopted by the International Commission on Zoological Nomenclature. The name was spelt *Agchylostoma* by Dubini, and there are numerous other variants, which we have not considered it necessary to give in the synonymy.

Hab. Intestine of Mammals.

Genotype: *A. duodenale* Dubini, 1843.

Dubini, 1843, *Ann. Univ. Med.*, Milan, cvi, 5; Looss, 1911, *Rec. Egypt. School Trop. Med.*, Cairo, iv, 252; Lane, 1916, *Ind. Journ. Med. Res.*, iv, 76.

Lane (1916) has proposed to divide the genus into two subgenera, *Ancylostoma* for forms with three pairs of ventral teeth, viz. *A. duodenale* and *A. caninum*; and *Ceylancylostoma* for forms with two pairs, viz. *A. ceylanicum* and *A. malayanum*. He considers that the form of the lateral rays of the bursa is correlated with the number of ventral teeth. The subdivision of the genus, however, appears unnecessary.

2. *Galoneus* Railliet, 1918.

Anterior end bent dorsally. Mouth-opening guarded by two or three pairs of ventral teeth. Buccal capsule very much reduced in size, cup-shaped and imperfectly chitinized, with one or two pairs of teeth towards its base. Bursa with a small dorsal lobe. Externo-dorsal ray arises from the main stem of the dorsal ray. The cleft portion of the dorsal ray is extremely short in comparison with its total length. Its terminations are tridigitate, *i.e.* there are two accessory branches on each branch. Spicules long, filiform, apparently united at their tips. An accessory piece present. Vulva towards the posterior fourth of the body. Uterine branches opposed.

Hab. Submucous cysts in the intestine of Felidae.

Genotype: *G. [Ankylostomum] perniciosus* (v. Linstow, 1885).

v. Linstow, 1885, *Arch. f. Naturg.*, li, i, 238; Railliet, 1900, *Arch. Parasitol.*, Paris, iii, 91; 1918, *Bull. Soc. Path. exot.*, Paris, xi, 82.

3. *Agriostomum* Railliet, 1902.

Mouth-opening circular, guarded by four pairs of marginal teeth. Dorsal gutter ends in a cone, bifid at its tip and projecting freely. In front of the teeth there are indications of a primitive leaf-crown. Buccal capsule short, more or less cylindrical. Oesophageal funnel much dilated, with thickened wall. The buccal capsule proper and the oesophageal funnel together have much the shape of the buccal capsule of a typical Ankylostome. Antero-lateral ray of bursa thicker than, and somewhat divergent from, the remaining lateral rays. Externo-dorsal rays spring from the median dorsal stem about half-way between its root and its bifurcation. Dorsal ray cleft for about one-third of its length. Its terminations are bidigitate. Spicules equal, alate. An accessory

piece present. Vulva close to anus. Uterine branches parallel.

Hab. Alimentary tract of *Bos indicus*. (One species known).

Genotype: *A. vryburgi* Railliet, 1902.

Railliet, 1902, *Compt. rend. Soc. Biol.*, Paris, liv, 107; Lane, 1923, *Parasitol.*, xv, 351; Ware, 1925, *Journ. Comp. Path. Ther.*, xxxviii, 83.

Lane suggests that this genus forms an interesting link between the Aneylostomidae and the Oesophagostominae, and proposes to place it in a separate subfamily, Agriostominae. While we are in agreement with the first of these suggestions, we prefer to retain the genus in the Aneylostominae.

4. *Strongylacantha* van Beneden, 1873.

Anterior extremity bent slightly towards the ventral side, the mouth-opening being obliquely ventral. Buccal capsule small. From the ventral border of the mouth protrude laterally and posteriorly two large, hook-like teeth. Within the dorsal border there is a small, conical, median tooth. Bursa short. Externo-dorsal rays originate at the base of the dorsal ray. Dorsal ray usually undivided, terminating in six small branches, the arrangement of which is subject to much variation. Spicules short, bifurcate in their distal halves. An accessory piece present. Vulva slightly in front of the posterior third of the body. Uterine branches opposed.

Hab. Intestine of Bats.

Genotype: *S. glycirrhiza* van Beneden, 1873.

van Beneden, 1873, *Mém. Acad. Roy. Sci. Belg.*, xl, (1), 13; Seurat, 1920, *Bull. Mus. Hist. nat.*, Paris, xxvi, 618; 1921, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xii, 202.

Subfam. 2. **NECATORINAE** Lane, 1917.

Anterior margin of buccal capsule usually bearing ventral cutting-plates, but without teeth.

1. *Necator* Stiles, 1903.

Anterior end bent dorsally. Mouth-opening guarded by a pair of ventral cutting-plates. Buccal capsule large, infundibular. At its base a pair of ventral lancets, a pair of subdorsal teeth and a prominent dorsal cone projecting into the lumen and carrying the dorsal gutter. Bursa with two large lateral lobes and a small dorsal lobe. Externo-dorsal rays relatively long and slender, arising high up on the main dorsal stem. Dorsal ray cleft for almost half its length. Its terminations

are bidigitate, *i.e.* there is a single pair of accessory branches. Spicules slender, barbed. Vulva slightly in front of the middle of the body. Uterine branches opposed.

Hab. Intestine of Primates, Pigs and Rhinoceroses.

Genotype: *N. [Uncinaria] americanus* (Stiles, 1902).

Stiles, 1902, *Amer. Med.*, Philadelphia, iii, 777; 1903, *Journ. Amer. Med. Ass.*, Chicago, xli, 312; Looss, 1905, *Rec. Egypt. School Trop. Med.*, Cairo, iii, 78.

2. *Brachyclonus* Railliet & Henry, 1910.

Anterior end bent dorsally. Mouth-opening guarded by a pair of ventral cutting-plates. Buccal capsule large, cup-shaped. At its base a pair of strong ventral lancets, a pair of subdorsal lancets and a strongly-developed dorsal cone projecting into the lumen and carrying the dorsal gutter. Bursa entire and elongate. The lateral and ventral rays arise from a much-elongated common trunk, the antero-lateral ray being very widely separated from the remaining lateral rays. Externo-dorsal rays stout, arising about midway along the median stem of the dorsal ray. The latter is cleft for about one-sixth of its length, and its terminations are tridigitate, *i.e.* there are two pairs of accessory branches. Spicules slender, not barbed. Vulva in anterior half of body. Uterine branches opposed.

Hab. Small intestine of Tapir (*Tapirus indicus*). (One species known).

Genotype: *B. indicus* Railliet & Henry, 1910.

Railliet & Henry, 1910, *Bull. Soc. Path. exot.*, Paris, iii, 312; Khalil, 1922, *Ann. Mag. Nat. Hist.*, (9) x, 235.

3. *Globocephalus* Molin, 1861.

Syn. *Cystocephalus* Railliet, 1895; *Characostomum* Railliet, 1902; *Crassisoma* Alessandrini, 1909; *Raillietostrogylus* Lane, 1923.

Stout forms without leaf-crowns or cutting-plates at the anterior margin of the buccal capsule. Buccal capsule deep, infundibular or subglobular, supported anteriorly by an external chitinoid ring. Mouth-opening tilted dorsally. There may or may not be a pair of teeth at the base of the buccal capsule. Dorsal gutter projects almost to the mouth-opening. Dorsal ray cleft for less than one-sixth of its length, its terminations tridigitate. Spicules slender, curved dorsally at their tips or bent into an S-shape. An elongate accessory piece present. Vulva in posterior half of body. Uterine branches opposed.

Hab. Alimentary tract of Pigs and Monkeys.

Genotype: *G. longemucronatus* Molin, 1861.

Molin, 1861, *Mem. R. Ist. Veneto*, ix, 436, 534; Railliet, 1902, *Compt. rend. Soc. Biol.*, Paris, liv, 109; Alessandrini, 1909, *Arch. Parasitol.*, Paris, xiii, 459; Lane, 1923, *Parasitol.*, xv, 358; Cameron, 1924, *Journ. Helminthol.*, ii, 65.

We have placed this genus in the subfamily Necatorinae on account of its general resemblances to the other members of that group. Although the ventral cutting-plates characteristic of the group are apparently absent, the general structure of the buccal capsule and the form of the bursal rays suggest its inclusion here.

4. *Bunostomum* Railliet, 1902.

Syn. *Monodontus* Molin, 1861, e. p. (= *Monodontus* Ransom, 1911, Cameron, 1923); *Bustomum* Lane, 1917.

Anterior end bent dorsally. Mouth guarded by a pair of ventral cutting-plates. Buccal capsule large, infundibular. Towards its base a strong dorsal tooth along which runs the dorsal gutter, and two or four smaller ventral lancets. Bursa with an asymmetrical dorsal lobe. The right externo-dorsal ray arises high up on the main dorsal stem, and is long and slender. The left externo-dorsal ray is much shorter, arising at about the level of the bifurcation of the dorsal ray. Terminations of dorsal ray tridigitate. Spicules slender, not barbed. Vulva a little in front of the middle of the body. Uterine branches opposed.

Hab. Small intestine of Ruminants.

Genotype: *B. [Strongylus] trigonocephalum* (Rudolphi, 1808).

Rudolphi, 1808, *Entozoorum . . . Historia naturalis*, i, Pl. II, figs. 5-6; Molin, 1861, *Mem. R. Ist. Veneto*, ix, 435, 463; Railliet, 1902, *Compt. rend. Soc. Biol.*, Paris, liv, 108; 1910, *Bull. Soc. Path. exot.*, Paris, iii, 312; Ransom, 1911, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 127, 27, 124; Lane, 1917, *Ind. Journ. Med. Res.*, iv, 414; Cameron, 1923, *Journ. Helminthol.*, i, 99.

Railliet (1902) proposed the genus *Bunostomum*, with *B. trigonocephalum* as type, to replace *Monodontus* Molin, 1861, on account of the existence of earlier, very similar, generic names. There may be no justification for Railliet's proposal, but, as Ransom (1911) pointed out, if it is shown that *M. semicircularis* Molin, 1861, and *M. trigonocephalus* are not congeneric, then the genus *Bunostomum*, with the latter species as its type, must be retained. The two species mentioned are certainly not congeneric, and therefore the genus *Bunostomum* stands.

Cameron (1923) considers that the statement of Railliet (1895) that Molin had made *B. trigonocephalum* the type of

Monodontus amounts to a designation by Railliet himself of *B. trigonocephalum* as the type of that genus, and rejects Stiles & Hassall's (1905) designation of *M. semicircularis* as type. There seems to be no justification for this conclusion. Railliet's statement that Molin had designated *trigonocephalum* as type was merely incorrect, and cannot be taken as a definite designation on his own part.

5. *Monodontus* Molin, 1861.

Syn. *Eumonodontus* Railliet, 1910, Cameron, 1923.

(For discussion of nomenclature, *vide Bunostomum, supra*).

Body stout, fusiform. Head bent slightly dorsally. A mouth-collar, raised into a ventral and two lateral lobes, apparently present. Buccal capsule cup-shaped, containing a small, prominent, dorsal tooth (cone?). Cervical papillae spine-like. Bursa very large, entire, with small, symmetrical dorsal lobe. Genital cone well developed. Externo-dorsal rays symmetrical. Terminal branches of dorsal ray bidigitate. Spicules alate and transversely striated, apparently fused distally and with a spatulate termination. Vulva a little behind the middle of the body. Uterine branches opposed.

Hab. Small intestine of Peccary (one species known).

Genotype: *M. semicircularis* Molin, 1861.

Molin, 1861, *Mem. R. Ist. Veneto*, ix, 469; Railliet, 1910, *Bull. Soc. Path. exot.*, Paris, iii, 314.

This genus is imperfectly known, but is apparently quite distinct from *Bunostomum*. It bears a much closer resemblance to *Necator*, and may even be synonymous with that genus.

6. *Gaigeria* Railliet & Henry, 1910.

Buccal capsule large, cup-shaped. At its base a freely-projecting dorsal cone carrying the dorsal gutter, and a pair of ventral lancets. Bursa with a large dorsal lobe and two much smaller lateral lobes which are joined together ventrally. Antero-lateral ray widely separated from the remaining lateral rays. Externo-dorsal rays leave the main trunk of the dorsal ray in front of its bifurcation. Dorsal ray cleft for about a quarter of its length. Its terminal branches are tridigitate. Spicules slender, recurved distally, not barbed. Vulva just in front of the middle of the body.

Hab. Alimentary tract of Ruminants.

Genotype: *G. pachyscelis* Railliet & Henry, 1910.

Railliet & Henry, 1910, *Bull. Soc. Path. exot.*, Paris, iii, 313; Cameron, 1924, *Journ. Helminthol.*, ii, 41.

7. *Uncinaria* Frölich, 1789.

Syn. *Dochmius* Dujardin, 1845; *Dochmoides* Cameron, 1924.

Mouth guarded by ventral cutting-plates. Buccal capsule large, infundibular. Two subventral teeth present towards its base. Dorsal cone within the wall of the capsule, its tip not projecting into the lumen. Antero-lateral ray of bursa rather divergent from the remaining lateral rays. Externo-dorsal rays arise almost at the root of the median dorsal stem. Dorsal ray cleft for almost half its length; its terminations tridigitate. Spicules slender, not barbed. Vulva at about the posterior third of the body.

Hab. Intestine of Mammals.

Genotype: *U. [Ascaris] criniformis* (Goeze, 1782).

Goeze, 1782, *Naturg. d. Eingeweidewürmer*, Blankenburg, 106; Frölich, 1789, *Naturforscher*, Halle, xxiv, 136; Schneider, 1866, *Monographie der Nematoden*, Berlin, 139; Looss, 1905, *Rec. Egypt. School Trop. Med.*, Cairo, iii, 28; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 108.

Cameron (1924, *Journ. Helminthol.*, ii, 46) has proposed the generic name *Dochmoides* to replace *Uncinaria*, on the ground that the type of the latter genus, *U. vulpis* (designated by Stiles & Hassall, 1899, *Rep. Fur Seal Invest.*, Washington, Pt. 3, 164), is a *species inquirenda*. Looss (1902, *Centralbl. f. Bakt.*, (I), xxxi, 423) has pointed out that Frölich indicated plainly that he regarded *A. criniformis* Goeze, 1782, as the more important species of his genus *Uncinaria*, and he considers it, therefore, to be the type. Since Stiles (1902) has suggested that *U. vulpis* is in all probability a synonym of *U. criniformis*, it seems reasonable to follow Looss in regarding *U. criniformis* as the genotype. *U. criniformis* may be identified by comparison of specimens collected from the type host with the description and figure of Schneider (1866), who re-examined the original material.

8. *Tetragomphius* Baylis & Daubney, 1923.

Mouth guarded by poorly-developed ventral cutting-plates. Buccal capsule cup-shaped. At its base a pair of subdorsal and a pair of subventral lancets, the former bicuspid and the latter usually tricuspoid. Dorsal cone represented by a blunt tubercle carrying the dorsal gutter. Bursa short and stunted. Dorsal ray cleft almost to point of origin of externo-dorsal rays, its terminations bidigitate. Spicules extremely long, filiform, not barbed. Vulva in posterior half of body.

Hab. Stomach of Raccoon (one species known).

Genotype: *T. procyonis* Baylis & Daubney, 1923.

Baylis & Daubney, 1923, *Ann. Mag. Nat. Hist.*, (9) xi, 334; 1923, *Rec. Ind. Mus.*, xxv, 573.

9. *Acheilostoma* Leiper, 1911.

Mouth-opening slightly tilted dorsally. Buccal capsule fairly large, subglobular. At its base a dorsal cone, which may carry also two smaller lateral lancets, and two pairs of subventral lancets. Antero-lateral ray of bursa divergent from the remaining lateral rays, which are closely applied to each other. Externo-dorsal rays spring from median stem of dorsal ray. Dorsal ray cleft for at least two-thirds of its length; its terminations bidigitate. Spicules long and filiform. No accessory piece. Vulva near middle of body.

Hab. Intestine and gall-bladder of Rodents.

Genotype: *A. simpsoni* Leiper, 1911.

Leiper, 1911, *Proc. Zool. Soc.*, London, 549; Railliet, 1918, *Bull. Soc. Path. exot.*, Paris, xi, 97.

10. *Grammocephalus* Railliet & Henry, 1910.

Buccal capsule wide anteriorly and narrowed posteriorly, the narrowing being more abrupt on the dorsal wall and accompanied by an infolding of the capsule. Towards the base of the capsule a pair of lateral and a pair of subventral teeth, also a dorsal cone carrying the dorsal gutter. Intestine with a long, anteriorly-directed dorsal caecum arising close to its union with the oesophagus. Externo-dorsal rays of bursa spring from median stem of dorsal ray just in front of its division. Terminations of dorsal ray bidigitate. Spicules stout, alate. Vulva close to the middle of the body.

Hab. Bile-ducts of Elephants.

Genotype: *G. [Sclerostoma] clathratus* (Baird, 1868).

Baird, 1868, *Proc. Zool. Soc.*, London, 262; Railliet & Henry, 1910, *Bull. Soc. Path. exot.*, Paris, iii, 313; Lane, 1921, *Ind. Journ. Med. Res.*, ix, 163.

11. *Bathmostomum* Railliet & Henry, 1909.

Buccal capsule fissured on its dorsal and lateral aspects. Its internal surface raised, chiefly ventrally and laterally, into shelf-like projections encroaching on the oral cavity. A small dorsal tooth surmounts the dorsal column of the oesophagus. Externo-dorsal rays of bursa spring from the branches of the dorsal ray. The latter is cleft for almost the whole of its length. Spicules stout. Vulva near the middle of the body.

Hab. Caecum of Elephants (one species known).

Genotype: *B. [Dochmius] sangeri* (Cobbold, 1879).

Cobbold, 1879, *Parasites*, London, 393, 399; Railliet & Henry, 1909, *Compt. rend. Soc. Biol.*, Paris, lxvi, 170; Lane, 1921, *Ind. Journ. Med. Res.*, ix, 163; Khalil, 1922, *Proc. Zool. Soc.*, London, 275.

Fam. 3. DIAPHANOCEPHALIDAE Travassos, 1919.

Head laterally compressed. A rudimentary leaf-crown may be present or absent. Mouth-opening a dorso-ventral slit, facing anteriorly or more or less inclined towards the dorsal side. Walls of buccal capsule valve-like, supported by six external longitudinal parenchymatous bands which terminate as cephalic papillae, and by one or two transverse internal ridges. A dorsal and a ventral cuticular pad present towards the base of the buccal capsule. Oviparous. Parasitic in the alimentary tract of Reptiles.

1. *Diaphanocephalus* Diesing, 1851.

Head slightly constricted off from body. Margin of mouth shows signs of differentiation into a leaf-crown. Valves of buccal capsule supported by two transverse internal chitinoid ridges, of which the posterior is V-shaped dorsally and ventrally. A pair of delicate chitinoid flanges project into the buccal capsule from the ventral cuticular pad. There is a dorsal hump in front of the bursa of the male. Bursa short, entire. Genital cone very long, with the cloacal opening on its ventral surface some distance from its tip.

Hab. Alimentary tract of Lizards and (?) Snakes.

Genotype: *D. [Strongylus] galeatus* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 648; Diesing, 1851, *Systema Helminthum*, ii, 82, 297; Molin, 1861, *Mem. R. Ist. Veneto*, ix, 578; Railliet & Henry, 1909, *Compt. rend. Soc. Biol.*, Paris, lxvi, 171; Baylis and Daubney, 1922, *Mem. Ind. Mus.*, vii, 331; Daubney, 1923, *Parasitol.*, xv, 67; Ortlepp, 1923, *Journ. Helminthol.*, i, 165.

2. *Kalicephalus* Molin, 1861.

Syn. *Occipitodontus* Ortlepp, 1923.

A rudimentary leaf-crown may be present or absent. Valves of buccal capsule supported by a single internal transverse chitinoid ridge, which is V-shaped dorsally and ventrally. Oesophageal funnel may contain three small teeth. There is no dorsal hump in front of the bursa of the male. Bursa well developed. Genital cone relatively small, not protruding beyond the margin of the bursa. An accessory piece may be present or absent. Vulva in posterior half of body. Uterine branches opposed or parallel.

Hab. Alimentary tract of Snakes and Lizards.

Genotype: *K. mucronatus* Molin, 1861.

Molin, 1861, *Mem. R. Ist. Veneto*, ix, 436, 538; Baylis and Daubney, 1922, *Mem. Ind. Mus.*, vii, 331; Daubney, 1923, *Parasitol.*, xv, 67; Ortlepp, 1923, *Journ. Helminthol.*, i, 165.

Ortlepp (1923) proposed the genus *Occipitodontus* for *O. fimbriatus* (= *Kalicephalus willeyi* v. Linstow, 1908, Baylis and Daubney, 1922, Daubney, 1923), on account of the presence in this form of a rudimentary leaf-crown at the entrance to the mouth and the occurrence of three small teeth in the oesophageal funnel. Indications of a leaf-crown are present in other species of *Kalicephalus*, and we do not consider the other character mentioned of sufficient importance to warrant the separation of a species agreeing so closely in all other characters with the remaining members of the genus *Kalicephalus*. A similar position, as regards the occasional presence of teeth in some of the members of a genus, is found in the genera *Oesophagostomum* and *Globocephalus*.

Fam. 4. METASTRONGYLIDAE Leiper, 1908.

Buccal capsule much reduced or absent. Bursa of male may be relatively well developed or vestigial, with a corresponding degree of development of the bursal rays. Parasites of the respiratory and circulatory systems, and of the cranial sinuses, of Vertebrates.

1. *Metastrongylus* Molin, 1861.

Mouth with six "lips," of which the two lateral are the largest. Bursa small, with its greatest diameter antero-posteriorly. The wall of the bursa is thickened in its posterior half. All the bursal rays are very stout, except the dorsal and externo-dorsal. The tip of the antero-lateral ray bears a large, lobulate swelling. Spicules long, terminating in simple hooks. Tail of female recurved ventrally. Vulva immediately in front of anus. Uterine branches parallel. Eggs contain embryos when laid.

Hab. Respiratory passages of Suidae and (accidentally) of Man and Ruminants.

Genotype: *M. [Strongylus] elongatus* (Dujardin, 1845).

Dujardin, 1845, *Histoire nat. des Helminthes*, Paris, 127; Molin, 1861, *Mem. R. Ist. Veneto*, ix, 437, 588; Railliet & Henry, 1907, *Compt. rend. Soc. Biol.*, Paris, lxiii, 751; 1911, *Bull. Soc. Path. exot.*, Paris, iv, 695; Gedocst, 1923, *Bull. Soc. Path. exot.*, Paris, xvi, 622.

2. Choerostrogylus Gedoelst, 1923.

Mouth-structures as in *Metastrongylus*. Bursa voluminous, with its greatest dimension at right angles to the long axis of the body. Wall of bursa not thickened in its distal part. The tip of the antero-lateral ray not swollen. Spicules long, terminating in double hooks. Tail of female straight, with a ventral cuticular dilatation covering the vulva and anus.

Hab. Respiratory passages of Suidae.

Genotype: *C. [Metastrongylus] pudendotectus* (Wostokow, 1905) (= *M. brevivaginatus* Railliet & Henry, 1907).

Wostokow, 1905, *Rec. Trav. Inst. Vet. Charkow*, vii, 2 (not verified); Railliet & Henry, 1907, *Compt. rend. Soc. Biol.*, Paris, lxiii, 751; Gedoelst, 1923, *Bull. Soc. Path. exot.*, Paris, xvi, 622; Skrjabin, 1924, *Compt. rend. Soc. Biol.*, Paris, xc, 1215.

3. Dietyocaulus Railliet & Henry, 1907.

A very short and small buccal capsule present, with a chitinoid ring at its base. Bursa of male short. Medio-lateral and postero-lateral rays fused throughout the greater part of their length. Terminations of dorsal ray bidigitate or tridigitate. Spicules short and stout, simple in structure. An accessory piece present. Vulva near the middle of the body. Uterine branches opposed. Eggs contain embryos when laid, and may be without shells.

Hab. Bronchi of herbivorous Mammals.

Genotype: *D. [Strongylus] filaria* (Rudolphi, 1809).

Rudolphi, 1809, *Entozoorum Historia naturalis*, ii, 219; Railliet & Henry, 1907, *Compt. rend. Soc. Biol.*, Paris, lxiii, 752; Neveu-Lemaire, 1918, *Mém. Soc. Zool. France*, xxvii, 5.

4. Synthetocaulus Railliet & Henry, 1907.

Extremely slender forms. Posterior end of male reinforced with a chitinoid arc. Bursa short. Medio-lateral and postero-lateral rays parallel and close together. Dorsal ray a thick trunk with short terminal digitations. Spicules fairly stout, simple in structure or divided into two processes distally. An accessory piece present. A "telamon" also present. Vulva near anus. Uterine branches parallel. Eggs unsegmented when laid. Larva with an undulating terminal caudal process and a subterminal caudal spine.

Hab. Finer bronchioles and connective tissue of lungs of Mammals.

Genotype: *S. [Strongylus] commutatus* (Diesing, 1851).

Diesing, 1851, *Systema Helminthum*, ii, 315; Railliet & Henry, 1907, *Compt. rend. Soc. Biol.*, Paris, lxiii, 752; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 163.

5. Haemostrongylus Railliet & Henry, 1907.

Syn. ? *Haematozoon* Leisering, 1865.

Small but relatively stout forms. Ventral rays of bursa of male fused except at their tips. Antero-lateral rays somewhat shorter than, and divergent from, the remaining lateral rays, which are fused proximally. Median stem of dorsal ray stout and relatively elongate; its terminal branches very short. Externo-dorsal rays originate separately from the dorsal ray and are short. Spicules long and slender. Accessory piece absent. Vulva in posterior half of body. Oviparous or viviparous. Embryos with an undulating caudal process, and at the anterior extremity a small ventral button.

Hab. Circulatory and respiratory systems of Carnivores.

Genotype: *H. [Strongylus] vasorum* (Baillet, 1866).

Baillet, 1866, *Hist. nat. des Helminthes des principaux Mamm. domestiques*, Paris, 69; Railliet & Henry, 1907, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 753; 1913, *Bull. Soc. Path. exot.*, Paris, vi, 451.

6. Troglostrongylus Vevers, 1923.

Antero-lateral and medio-lateral rays of bursa fused to form one large ray. Postero-lateral and externo-dorsal rays separate and of about the same size. Dorsal ray single and thick. Spicules long, tessellated and with pectinate lamellae along their inner edges. Each spicule ends in a palmate expansion, the fingers of which are webbed with cuticular material bearing spines. Vulva just behind the middle of the body. Ovoviviparous.

Hab. Frontal sinus of Tiger (one species known).

Genotype: *T. troglostrongylus* Vevers, 1923.

Vevers, 1923, *Proc. Zool. Soc.*, London (1922), 906.

7. Crenosoma Molin, 1861.

Cuticle, at least towards the anterior end, bearing rings of minute spines. Bursa consists of two large lateral lobes and a dorsal lobe. Antero-lateral ray arises separately from the remaining lateral rays. Externo-dorsal ray arises separately from the dorsal, which is undivided except at its tip. Spicules long. An accessory piece present. Vulva towards the middle of the body. Viviparous.

Hab. Respiratory tract of Carnivores and Insectivores.

Genotype: *C. [Strongylus] striatum* (Zeder, 1800).

Zeder, 1800, *Naturg. der Eingeweidewürmer*, Leipzig, 74; Molin, 1861, *Mem. R. Ist. Veneto*, ix, 435, 437; Eberth, 1863, *Unters. über Nematoden*, Leipzig, Pls. viii, ix; Stossich, 1896, *Boll. Soc. Adriat. Sci. nat.*, Trieste, xvii, 125; Railliet & Henry, 1909, *Compt. rend. Soc. Biol.*, Paris, lxxvi, 86.

8. *Pseudalius* Dujardin, 1845.

Bursa reduced to two elongate lateral lobes projecting ventrally almost at right angles to the longitudinal axis of the body, and containing each a lateral ray bearing on its inner surface two papillary terminations, one near the extremity and one near the base. These lobes are joined dorsally by a flange of cuticle in the middle of which there is a slight indication of a dorsal lobe. Spicules short, membranous, folded, not fused at their tips. Posterior end of female bent dorsally in front of the vulva. Vulva just in front of the anus, at the extremity of a tubular outgrowth. Viviparous.

Hab. Respiratory and circulatory systems of Porpoise (one species known).

Genotype: *P. [Strongylus] inflexus* (Rudolphi, 1809).

Rudolphi, 1809, *Entozoorum Hist. nat.*, ii, 227; Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 135; Baylis & Daubney, 1925, *Parasitol.*, xvii, 202.

9. *Stenurus* Dujardin, 1845.

Syn. *Pharurus* Leuckart, 1848; *Prosthecosacter* Diesing, 1851.

A shallow buccal capsule present. Bursa fairly well developed, more or less divided into a dorsal lobe and a pair of lateral lobes. Each of the latter contains a lateral and a ventral ray, the former with a trilobed extremity and a single papillary termination on its inner surface, the latter also with a single termination. Dorsal ray relatively elongate, with a pair of ventral terminations near its tip. Spicules typically broad, membranous, folded and apparently fused at their tips. A flattened, tongue-shaped accessory piece present. Tail of female with a small terminal process or button, situated dorsally. Anus subterminal. Vulva just in front of anus, with a euticular process or swelling on its anterior lip. Viviparous.

Hab. Tympanic cavity, blood-sinusoid of head, and respiratory passages of Cetacea.

Genotype: *S. [Strongylus] minor* (Kuhn, 1829).

Kuhn, 1830 [1829], *Mém. Mus. Hist. nat.*, Paris, xviii, 363; Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 266; Schneider, 1866, *Monographie der Nematoden*, Berlin, 174; Baylis & Daubney, 1925, *Parasitol.*, xvii, 204.

10. *Filaroides* van Beneden, 1858.

A very shallow buccal capsule present, with slightly thickened walls. Tail of male bears two subventral, kidney-shaped swellings, each with five papillae (of which two are lateral and

three ventral), and ends in a short spike. Anus of female has apparently a swollen border. Vulva somewhat behind the middle of the body. Uterine branches parallel. Viviparous.

Hab. Respiratory passages of Mustelidae (probably one species known).

Genotype: *F. [Ascaris] bronchialis* (Gmelin, 1790) (= *F. mustelarum* van Beneden, 1858).

Gmelin, 1790, *Systema Naturae*, 13th ed., 3031; van Beneden, 1858, *Mém. sur les Vers intestinaux*, Paris, 267; 1861, *Compt. rend. Acad. Sci.*, Paris, ii, 267; v. Linstow, 1873, *Arch. f. Naturg.*, xxxix, 300; and 1874, xl, 135.

Fam. 5. TRICHOSTRONGYLIDAE Leiper, 1912.

Buccal capsule rudimentary or absent. Bursa of male with well-developed lateral lobes. Dorsal lobe small or ill-defined. Parasites of the alimentary tract of Vertebrates.

Subfam. 1. TRICHOSTRONGYLINAE Leiper, 1908.

More or less slender forms. Buccal capsule absent or rudimentary and ill defined. Vulva towards the posterior end of the body. Female genital tubes paired.

1. *Trichostrongylus* Looss, 1905.

Syn. *Libyostrongylus* Lane, 1923.

Cuticle of anterior end may be raised into swellings. Cervical papillae absent. Buccal cavity ill defined. Bursa with large lateral lobes but without well-developed dorsal lobe. Ventral rays widely separated and of very different thicknesses; the ventro-ventral thin and ventrally directed, the latero-ventral thick, divergent from the ventro-ventral and close to the lateral rays. Postero-lateral ray thinner than, and divergent from, the remaining lateral rays, lying close to the externo-dorsal ray. Dorsal ray cleft near its tip, ending in short digitations. Prebursal papillae present. Spicules short, spoon- or spatula-shaped, appearing twisted on account of ridges on their surfaces. An accessory piece present. Vulva typically with protruding lips. Eggs thin-shelled, segmenting when deposited.

Hab. Alimentary tract of Herbivores, Rodents, Birds and, more rarely, Man.

Genotype: *T. [Strongylus] retortaeformis* (Zeder, 1800).

Zeder, 1800, *Naturg. der Eingeweidewürmer*, 73; Looss, 1905, *Centralbl. f. Bakt.*, (I), xxxix, 409; Travassos, 1914, *Brazil Medico*, Rio de Janeiro, xxviii, 325; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 123; Lane, 1923, *Parasitol.*, xv, 348.

2. *Cooperia* Ransom, 1907.

Cuticle of anterior end frequently dilated. Cuticle of body marked with fourteen to sixteen longitudinal lines or ridges. Cervical papillae absent. Mouth-cavity small, indefinite. Bursa with two lateral lobes and a small dorsal lobe. Latero-ventral ray rather widely separated from, and considerably thicker than, ventro-ventral ray, but curving distally in the same direction. Postero-lateral ray slender. Externo-dorsal rays long, arising high up on main dorsal stem. Dorsal ray cleft for from one-third to one-half of its length; its main branches parallel or curved to form a lyre or horseshoe. From each of the main branches, usually near its origin, a short branch extends ventrally into a vesicular swelling on the inner surface of the bursa. Prebursal papillae absent. Spicules short, foliaceous. Accessory piece absent.

Hab. Alimentary tract of Mammals.

Genotype: *C. [Strongylus] curticei* (Giles, 1892).

Giles, 1892, *Sci. Mem. Med. Off. Army, India, Calcutta*, Pt. 7, 49; Railliet, 1893, *Traité de Zool. méd. et agric.*, 2nd ed., Paris, 442; Ransom, 1907, *U.S. Dept. Agric., Bur. Anim. Indust. Circular* 116, 3; 1911, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 127, 69.

3. *Travassosius* Khalil, 1922.

Cuticle longitudinally striated except at the head, where it is transversely striated. Cervical papillae prominent. Buccal cavity not well defined. Bursa with large lateral lobes, but without well-developed dorsal lobe. Ventral rays widely separated and of very different thicknesses. Ventro-ventral ray thin and directed ventrally; latero-ventral thick and in close relation to the lateral rays. Dorsal ray long, slender, and cleft at its tip, each branch ending in two digitations. Prebursal papillae long and conspicuous. Spicules short, twisted, with knob-like terminations. Accessory piece absent. Eggs segmenting when deposited.

Hab. Stomach of Beaver.

Genotype: *T. rufus* Khalil, 1922.

Khalil, 1922, *Ann. Mag. Nat. Hist.*, (9) x, 288.

4. *Graphidium* Railliet & Henry, 1909.

Cuticle with prominent longitudinal striations. Cervical papillae present. Mouth large, limited by a chitinoid buccal ring. Bursa with large lateral lobes, but without a well-defined dorsal lobe. Latero-ventral ray larger than ventro-ventral ray, but running nearly parallel to it. Externo-

dorsal rays long and prominent, arising high up on the median dorsal stem and reaching margin of bursa. Dorsal ray relatively long, bifurcate at its tip, each branch again bifurcate. Prebursal papillae present. Spicules long, slender, and branched at their tips to form multiple terminations. An accessory piece present. Vulva sometimes covered by a euticular process. The body narrows abruptly behind the vulva.

Hab. Alimentary tract of Rodents.

Genotype: *G. [Strongylus] strigosum* (Dujardin, 1845).

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 120; Railliet & Henry, 1909, *Compt. rend. Soc. Biol.*, Paris, lxxvi, 86; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 123, 139; Travassos, 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 70; Cameron, 1923, *Journ. Helminthol.*, i, 71.

5. *Graphidioides* Cameron, 1923.

Cuticle with prominent longitudinal striations. Cervical papillae absent. Bursa with large lateral lobes, joined by a small, ill-defined dorsal lobe. Latero-ventral ray much longer and thicker than, and widely divergent from, ventro-ventral ray. Externo-dorsal rays originate high up on the median dorsal stem, but do not reach the margin of the bursa. Dorsal ray long and slender, cleft near its tip, each branch ending in three short digitations. Prebursal papillae present. Spicules long and filiform, each consisting of two chitinized rods joined at the distal extremity, which is simple. Each spicule possesses a median membranous expansion, and the membranes join each other near the tips of the spicules. An accessory piece present.

Hab. Stomach of Rodents.

Genotype: *G. [Strongylus] affinis* (Mégnin, 1895).

Mégnin, 1895, *Bull. Soc. Zool. France*, xx, 173; Travassos, 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 71; Cameron, 1923, *Journ. Helminthol.*, i, 71.

6. *Obeliscoides* Graybill, 1924.

Syn. *Obeliscus* Graybill, 1923, *nec* Humphreys, 1797.

Cuticle with a number of longitudinal striations. Cervical papillae present. Bursa with large lateral lobes and a small, but well-defined, dorsal lobe. Ventral rays, after a pronounced divergence, terminate near each other. The ventro-ventral ray is small, while the latero-ventral is the thickest and longest of all the rays. Antero-lateral ray long and stout, the remaining lateral rays and the externo-dorsal slender and considerably shorter. Dorsal ray short, with a pair of short

accessory branches and bidigitate terminations. Prebursal papillae present. Spicules slender, bifid distally, each branch ending in a barb, one branch more or less enfolding the other laterally and ventrally. Accessory piece apparently absent. Eggs segmenting when deposited.

Hab. Alimentary tract of Rabbit (one species known).
Genotype: *O. [Obeliscus] cuniculi* (Graybill, 1923).

Graybill, 1923, *Parasitol.*, xv, 340; and 1924, xvi, 317.

7. *Hyostrongylus* Hall, 1921.

Cervical papillae present. Bursa with well-developed lateral lobes and a small, distinct dorsal lobe. Latero-ventral ray larger than ventro-ventral ray, its tip turning ventrally towards that ray. Postero-lateral ray rather widely divergent from the remaining lateral rays. Externo-dorsal rays well developed. Dorsal ray fairly long, bifurcate at its tip, and having a pair of small accessory branches at about one-third of its length from the tip. Prebursal papillae present. Spicules with bifid terminations. An accessory piece and a "telamon" present. Eggs segmenting when deposited.

Hab. Stomach of Suidae.

Genotype: *H. [Strongylus] rubidus* (Hassall & Stiles, 1892).

Hassall & Stiles, 1892, *Journ. Comp. Med. Vet. Arch.*, New York, xiii, 207; Hall, 1921, *Proc. U.S. Nat. Mus.*, lix, 543.

8. *Ostertagia* Ransom, 1907.

Cuticle marked with twenty-five to thirty longitudinal ridges. Cuticle of head may be slightly dilated. Cervical papillae present. Mouth-cavity small. Bursa with two lateral lobes and a smaller dorsal lobe. Ventral rays close together, parallel. Dorsal ray with two main branches, each giving off one or two short accessory branches. Attached to the posterior end of the male, towards the dorsal side and within the bursa, is an accessory bursal membrane, with a free posterior edge, and supported by two slender, divergent rays. Prebursal papillae present. Spicules short, divided distally into two or three terminal processes. An accessory piece may be present or absent. Vulva naked or covered by a flap.

Hab. Stomach of Ruminants and Opossums.

Genotype: *O. [Strongylus] ostertagi* (Stiles, 1892).

Stiles, 1892, *Journ. Comp. Med. Vet. Arch.*, New York, xiii, 147; Ransom, 1907, *U.S. Dept. Agric., Bur. Anim. Indust. Circular* 116, 2; 1911, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 127, 55; Travassos, 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 56.

9. Ornithostrongylus Travassos, 1914.

Syn. *Cephalostrongylus* Irwin-Smith, 1920.

Cuticle of anterior end inflated. Buccal cavity with indications of chitinous structure. Ventro-ventral and latero-ventral rays of bursa equal in thickness and close to each other. Postero-lateral ray about as thick as, but divergent from, the remaining lateral rays. Dorsal ray cleft for a varying distance, up to half its total length; each branch ending in three or four digitations. Prebursal papillae present. Spicules short, ending in three points. A "telamon" present. Accessory piece apparently absent. Eggs segmenting or containing embryos when deposited.

Hab. Small intestine of Birds.

Genotype: *O. fariai* Travassos, 1914.

Travassos, 1914, *Brazil Medico*, Rio de Janeiro, xxviii, No. 17; 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 1; Irwin-Smith, 1920, *Proc. Linn. Soc. N.S.W.*, Sydney, xlv, 553.

10. Trichohelix Ortlepp, 1922.

Body spirally coiled. Cuticle of anterior end inflated, the inflation limited behind by a deep constriction encircling the neck. Cuticle of the rest of the body markedly inflated and showing transverse striations only on the ventral surface of the anterior half of the body. Longitudinal striations faint. Cervical papillae absent. Bursa indistinctly trilobate. Ventro-ventral ray curved ventrally at its tip, diverging from latero-ventral ray. Antero-lateral ray rather divergent from the remaining lateral rays. Tip of medio-lateral ray sharply recurved inwards. Externo-dorsal rays relatively short and stout, originating from the median stem of the dorsal ray near its base. Dorsal ray stout, cleft for about one-third of its length, with tridigitate terminations. Prebursal papillae absent. Spicules tubular, bifid distally. An accessory piece present. Vulva slightly in front of anus. Eggs segmenting when deposited.

Hab. Intestine of Armadillos (one species known).

Genotype: *T. [Oesophagostomum] tuberculata* (Parona and Stossich, 1901).

Parona and Stossich, 1901, *Boll. Mus. Zool. Anat. Comp.*, Genova (110), 1; 1902, *Atti Soc. Ligust. Sci. nat.*, Genova, xiii, 7; Ortlepp, 1922, *Ann. Mag. Nat. Hist.*, (9) ix, 413.

11. Oswaldoeruzia Travassos, 1917.

Cuticle of anterior end inflated and transversely striated. Ventral rays of bursa close together and equal in size. Antero-lateral ray divergent from the remaining lateral rays, not

very dissimilar in size. Externo-dorsal rays about as long as the lateral rays. Dorsal ray long, fairly stout, cleft at its tip, with two pairs of small accessory branches and a number of short terminal digitations. Spicules distinctly bifurcate, but of complex structure, with multiple terminations. Accessory piece absent. Eggs contain embryos when deposited.

Hab. Intestine and lungs of Reptiles and Batrachians.

Genotype: *O. [Strongylus] subauricularis* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 649; Travassos, 1917, *Brazil Medico*, Rio de Janeiro, xxxi, 73; 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 53.

12. *Molineus* Cameron, 1923.

Cuticle of anterior end inflated and transversely striated. Cervical papillae absent. Bursa not distinctly divided into lobes. Ventral rays long and parallel, but slightly separated distally. Antero-lateral ray about half the length of the other lateral rays and somewhat divergent from them. Externo-dorsal rays considerably shorter than the postero-lateral and medio-lateral rays, not reaching the margin of the bursa. Dorsal ray bifurcate at its tip, each branch ending in three short digitations. Prebursal papillae absent. Spicules equal, with double points directed posteriorly. An accessory piece present. Eggs contain embryos when deposited.

Hab. Alimentary tract of Mammals (Felidae and Squirrel-monkeys).

Genotype: *M. felineus* Cameron, 1923.

Travassos, 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 84; Philpot, 1922, *Ann. Mag. Nat. Hist.*, (9) x, 242; Cameron, 1923, *Journ. Helminthol.*, i, 71.

13. *Haemonchus* Cobb, 1898.

Syn. *Abomesi* Simmonds, 1881 (? 1882).

A small buccal cavity present, with a slender tooth or lancet originating from the dorsal part of its base. A pair of well-developed, spine-like cervical papillae present. Bursa with large lateral lobes and a small, very asymmetrical dorsal lobe attached to one of the lateral lobes near its base. Ventral rays separate distally. Externo-dorsal rays very long and slender. Main trunk of dorsal ray originates with the left externo-dorsal ray in the left lateral lobe of the bursa, and is bifurcate distally. Prebursal papillae present. Spicules relatively short, barbed at their tips. An accessory piece present. Vulva covered by a cuticular flap. Eggs segmenting when deposited.

Hab. Stomach of Ruminants, doubtfully of Mouse and accidentally of Man.

Genotype : *H. [Strongylus] contortus* (Rudolphi, 1803).

Rudolphi, 1803, *Arch. f. Zool. u. Zoot.*, Brunswick, iii, 15; Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 447; Ransom, 1911, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 127, 49.

14. *Nematodirus* Ransom, 1907.

Syn. ? *Microcephalus* Romanovitch, 1915.

Body markedly tapering and thread-like anteriorly. Anterior end with a slight vesicular swelling. Body with eighteen longitudinal lines. Cervical papillae absent. Dorsal lobe of bursa reduced to two small, short lobules, each supported by a separate ray. Ventral rays close together and parallel. Postero-lateral ray divergent distally from the other lateral rays. There is no unpaired median dorsal ray. Spicules slender, relatively long, united by a membrane, at least distally. Accessory piece absent. Tail of female truncate, usually with a terminal spike. Vulva typically in posterior region of body. Eggs relatively large (generally over 150 μ long).

Hab. Stomach and small intestine of Mammals, chiefly Herbivores.

Genotype : *N. [Ascaris] filicollis* (Rudolphi, 1802).

Rudolphi, 1802, *Arch. f. Zool. u. Zoot.*, Brunswick, ii, 23; Ransom, 1907, *U.S. Dept. Agric., Bur. Anim. Indust. Circular* 116, 4; Railliet & Henry, 1912, *Bull. Soc. Path. exot.*, Paris, v, 36; May, 1920, *Proc. U.S. Nat. Mus.*, lviii, 577.

We have included as a doubtful synonym of *Nematodirus* the genus *Microcephalus* Romanovitch, 1915 (*Compt. rend. Soc. Biol.*, Paris, lxxviii, 451). This genus is insufficiently characterized. The only character at present available to distinguish it from *Nematodirus* is the position of the vulva, which is stated by the author to be at the junction of the anterior and second fourths of the body. It is significant that *M. longissime spiculatus* Romanovitch shares with *Nematodirus* the character, unique amongst the Trichostrongylidae, of having eggs over 150 μ in length (in Romanovitch's species they are said to be 240 μ long).

15. *Mecistocirrus* Railliet & Henry, 1912.

Body markedly attenuated anteriorly. Anterior end with a slight vesicular swelling. Cuticle of body with numerous inconspicuous longitudinal ridges. Cervical papillae conspicuous, spine-like. Mouth subterminal, slightly dorsal, with a large buccal lancet. Bursa divided into two lateral lobes and a small, but distinct, dorsal lobe. Ventro-ventral

ray short, slender and widely divergent from the latero-ventral. Latero-ventral and antero-lateral rays extremely stout, close together and parallel. The remaining rays are all slender. Dorsal ray short, bifurcate terminally, with three pairs of papillary terminations. Prebursal papillae present. Spicules very long, slender and united for almost their whole length. Accessory piece apparently absent. Vulva close to anus, prominent, with chitinous lips. Vagina very long, anteriorly directed. Eggs of normal size, *i.e.* less than 150 μ in length.

Hab. Stomach and small intestine of Ruminants, Pig and (doubtfully) Man.

Genotype: *M. [Strongylus] digitatus* (v. Linstow, 1906).

v. Linstow, 1906, *Spolia Zeylanica*, iii, 168; Railliet & Henry, 1912, *Bull. Soc. Path. exot.*, Paris, v, 38; Neveu-Lemaire, 1914, *Bull. Soc. Zool. France*, xxxix, 293; Morishita, 1922, *Annot. Zool. Japon.*, x, 89; Cameron, 1923, *Journ. Helminthol.*, i, 71.

16. *Histiostongylus* Molin, 1861.

Cuticle of anterior end swollen and with a campanulate cuticular collar, armed with large, simple or bifurcate, backward-directed spines. Mouth small and circular. Oesophagus short, club-shaped. Bursa with large lateral lobes and a small dorsal lobe. Ventral rays large, equal in size, slightly divergent from each other. Antero-lateral ray divergent from the other lateral rays, which have a common stem. Externo-dorsal ray markedly shorter and more slender than the lateral rays. Dorsal ray with a pair of small lateral branches, and bifurcate at its tip. Spicules rather long, with slightly expanded terminations. An accessory piece present. Caudal end of female with a slender terminal spike and two small subventral processes. Vulva behind the middle of the body. Uterine branches opposed. Eggs contain embryos when deposited.

Hab. Alimentary tract of Bats.

Genotype: *H. coronatus* Molin, 1861.

Molin, 1861, *Mem. R. Ist. Veneto*, ix, 611; Travassos, 1918, *Rev. Soc. Braz. Sci.*, iii, 194; 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 72; Boulenger, 1926, *Parasitol.*, xviii, 87.

Parts of this diagnosis, especially those parts relating to the arrangement of the bursal rays, are derived mainly from Boulenger (1926), who has pointed out that the two species, *H. tipula* (van Beneden) and *H. paradoxus* Travassos, provisionally referred by Travassos (1918) to *Histiostongylus*, are not congeneric with *H. coronatus*, and has proposed for them the name *Anoplostongylus*.

Subfam. 2. **HELIGMOSOMINAE** Travassos, 1914.

Slender forms. Buccal capsule absent or rudimentary. Vulva situated close to anus. Female genital tube single.

1. **Heligmosomum** Railliet & Henry, 1909.

Usually minute forms, not spirally coiled. Cuticle of normal thickness, with prominent transverse striations and longitudinal markings, of which the dorsal and ventral may be very salient. Head with a cuticular dilatation. Bursa of male large, trilobate. Ventral rays widely separated and divergent distally. Postero-lateral ray relatively long and divergent from the other lateral rays. Externo-dorsal rays originate high up on the main dorsal trunk, and are short and thin, not reaching the margin of the bursa. Dorsal ray usually fairly thick, bifurcating distally. A pair of accessory branches spring from the bifurcate portion. The terminal branches are bidigitate. Spicules long, filiform. Accessory piece absent or poorly developed.

Hab. Alimentary tract of Rodents and Marsupials.

Genotype: *H. [Strongylus] costellatum* (Dujardin, 1845).

Dujardin, 1845, *Histoire nat. des Helminthes*, Paris, 116; Railliet & Henry, 1909, *Compt. rend. Soc. Biol.*, Paris, lxvi, 86; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 149; Travassos, 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 86.

2. **Heligmosomoides** Hall, 1916.

Body commonly coiled spirally. Cuticle with transverse and longitudinal striations, that of the head slightly inflated. Bursa of male wide, without separate dorsal lobe or mid-dorsal incision. Ventral rays divergent from each other. Externo-dorsal rays long and slender, arising separately from the dorsal ray. Dorsal ray extremely short, with four small branches. Prebursal papillae long and apparently within the bursa. Spicules long and filiform. Accessory piece absent. Tail of female truncate, with a slender terminal spike. Eggs segmenting when deposited.

Hab. Intestine of Rodents (one species known).

Genotype: *H. [Strongylus] polygyrus* (Dujardin, 1845).

Dujardin, 1845, *Histoire nat. des Helminthes*, Paris, 116; v. Linstow, 1878, *Arch. f. Naturg.*, xlv, 218; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 149; Boulenger, 1922, *Parasitol.*, xiv, 206.

Hall erected the genus *Heligmosomoides* for the reception of *H. linstowi* Hall, 1916 (= *S. polygyrus* v. Linstow, 1878), believing that *S. polygyrus* v. Linstow was different from

S. polygyrus Dujardin. The latter species he removed to Travassos' genus *Viannaia*. Boulenger, however, has shown that the species of Dujardin and v. Linstow are identical and should be retained in Hall's genus *Heligmosomoides*.

3. *Nematospira* Walton, 1923.

Body spirally coiled. Cuticle of head inflated to form two wing-like swellings, limited behind by an annular constriction and showing transverse striations. Cuticle of body with faint transverse striations and numerous (over twenty-five) longitudinal ridges. Three small, poorly-defined lips present. Cervical papillae absent or minute. Bursa indistinctly trilobate. Ventral rays fused towards their bases, but rather widely separated distally. Lateral rays all arise from a common trunk, but are well separated distally. Externodorsal rays almost parallel, long, but not reaching the margin of the bursa. Dorsal rays paired, very small, originating from the bases of the externodorsal rays. Spicules long, slender, usually twisted, grooved on their ventral surfaces. An accessory piece present. Eggs with thin, rugose shells.

Hab. Alimentary tract of Rodents.

Genotype: *N. turgida* Walton, 1923.

Walton, 1923, *Journ. Parasitol.*, x, 59, 61.

4. *Heligmostrongylus* Travassos, 1917.

Cuticle transversely striated and with prominent longitudinal markings, of which one appears as a dorsal ala. Cuticle of head dilated. Bursa of male not distinctly separated into three lobes. Ventral rays short and divergent. Postero-lateral ray longer than, and widely divergent from, the remaining lateral rays. Externodorsal rays arise from the cleft portion of the dorsal ray, and are fairly long and slender but do not reach the margin of the bursa. Dorsal ray cleft to its base, its divisions being the longest rays in the bursa. One pair of short accessory branches present, originating about half-way from the tips of the dorsal ray. Spicules simple, filiform. An imperfectly-chitinized accessory piece present. Anterior lip of vulva swollen into a pendulous process which may cover the anus and extend beyond the tip of the tail.

Hab. Small intestine of Rodents (one species known).

Genotype: *H. [Strongylus] sedecimradiatus* (v. Linstow, 1899).

v. Linstow, 1899, *Mitt. Zool. Mus. Berlin*, i, 19; Travassos, 1917, *Brazil Medico*, Rio de Janeiro, xxxi, 3; 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 95.

5. *Nippostrongylus* Lane, 1923.

Cuticle transversely striated and with ten prominent longitudinal ridges. Cuticle of head inflated. Cervical papillae absent. Bursa of male with a small dorsal lobe and two asymmetrical lateral lobes, the right being larger than the left. In the left lobe the ventro-ventral, latero-ventral, antero-lateral and medio-lateral rays are all thin, tapering and approximately equally separated from each other. The postero-lateral ray is much stouter, strongly divergent and recurved dorsally towards its tip. In the right lobe the ventral rays are thin, the ventro-ventral being divergent from, and shorter than, the latero-ventral, which is closely applied to the antero-lateral ray. The antero-lateral and medio-lateral rays are stout and closely applied to each other. The postero-lateral ray is short, very slender and divergent. The externo-dorsal rays are within the dorsal lobe and are equal, short and slender, arising high up on the median dorsal stem. Dorsal ray fairly thick, bifurcating distally, with a pair of accessory branches just in front of the bifurcation. Its terminations are bidigitate or tridigitate. Spicules simple, rod-shaped. An accessory piece present.

Hab. Alimentary canal of Rodents (one species known).

Genotype: *N. [Heligmosomum] muris* (Yokogawa, 1920).

Yokogawa, 1920, *Journ. Parasitol.*, vii, 29; 1922, *Parasitol.*, xiv, 127; Lane, 1923, *Parasitol.*, xv, 360.

6. *Viannaia* Travassos, 1914.

Body spirally coiled. Cuticle with faint transverse striations but without longitudinal markings, and enormously thickened, especially in the male. Cuticle of head inflated. Lateral lobes of bursa slightly unequal. Ventral rays parallel. Lateral rays more or less equal, diverging at their tips. Externo-dorsal rays originate high up on the median dorsal stem. Dorsal ray relatively long, cleft in its distal third. Its terminations are tridigitate. Spicules equal or subequal, hooked at their tips. Accessory piece present or absent.

Hab. Intestine of Marsupials, Edentates, Insectivores and Rodents.

Genotype: *V. viannai* Travassos, 1914.

Travassos, 1914, *Brazil Medico*, Rio de Janeiro, xxviii, 326; 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 96; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 149, 158.

7. *Viannella* Travassos, 1920 (?).

Body sometimes spirally coiled. Cuticle slightly swollen, with transverse striations. Cuticle of head inflated. Bursa large. Ventro-ventral ray shorter than, and divergent

distally from, latero-ventral ray. Medio-lateral and postero-lateral rays united for the proximal three-quarters of their length in a common trunk which runs parallel to the antero-lateral ray. Externo-dorsal rays originate high up on the median dorsal stem. Dorsal ray long, stout, and cleft in its distal half. Its terminations are bidigitate or tridigitate. Spicules relatively short, twisted, foliaceous. Accessory piece rudimentary or absent.

Hab. Small intestine of Rodents.

Genotype: *V. [Viannaia] hydrocheri* (Travassos, 1914).

Travassos, 1914, *Brazil Medico*, Rio de Janeiro, xxviii, 326; 1920 (?), *Rev. Vet. e Zootech.*, Rio de Janeiro, 66; 1920, *Rev. Soc. Braz. Sci.* (3), 204; 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 101.

8. *Impalaia* Monnig, 1923.

Body not spirally coiled. Cuticle with fine longitudinal markings, but transversely striated only towards the anterior end. The cervical region is studded with numerous irregular tubercles. Cuticle of head inflated. Bursa hood-shaped, without well-marked dorsal lobe. Ventral rays separate and forwardly directed. Postero-lateral ray somewhat longer than, and divergent from, the other lateral rays. Externo-dorsal rays originate, at different levels, near the base of the median dorsal stem. Dorsal ray stout near its base, tapering distally and bifurcate near its tip. Its terminations are bidigitate. Spicules long, filiform. An accessory piece present.

Hab. Intestine of an Antelope (one species known).

Genotype: *I. tuberculata* Monnig, 1923.

Monnig, 1923, *Trans. Roy. Soc. S. Africa*, xi, 114.

APPENDIX TO HELIGMOSOMINAE.

The following genera are referred somewhat doubtfully to this subfamily.

9. *Citellinema* Hall, 1916.

Cuticle of head inflated. Ventral rays and antero-lateral ray originate from a common trunk which itself unites at its base with the common trunk of the medio-lateral and postero-lateral rays. Dorsal ray not examined. Spicules bifurcating near their proximal ends to form each two long filiform processes. Female unknown.

Hab. Intestine of a Rodent (one species known).

Genotype: *C. bifurcatum* Hall, 1916.

Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 123, 141.

This genus is insufficiently characterized. Travassos (1921, *Mem. Inst. Oswaldo Cruz*, xiii, 104) considers that *C. bifurcatum* much resembles *Viannella fariai* Travassos. It is possible that *Citellinema* and *Viannella* are synonymous, but the point cannot be decided until Hall's species is redescribed.

10. Warrenius Hall, 1916.

Cuticle of head inflated. A short, unilateral cervical ala present. Bursa of male deeply incised ventrally to form two large lateral lobes and a small, distinct dorsal lobe. Ventral rays divergent, unusually long and thick. Postero-lateral and medio-lateral rays arise from a common trunk, but are separated distally. Externo-dorsal rays originate from the median dorsal stem near its base and are relatively long and slender. Dorsal ray small, with a pair of short accessory branches just in front of its terminal bifurcation. Spicules long and slender. Female unknown.

Hab. Intestine of a Rodent (one species known).

Genotype: *W. quadrivittati* Hall, 1916.

Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 123, 142; Travassos, 1921, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiii, 103.

Travassos (1921) considers that the presence of a cervical ala is probably an artefact brought about during preservation. He suggests that *W. quadrivittati* closely resembles *Heligmosomum aculeatum* and *H. nematodiriforme* and ought perhaps to be included in the genus *Heligmosomum*. As in the case of *Citellinema*, only a fuller description can establish the validity of Hall's genus.

11. Ollulanus Leuckart, 1865.

A minute form, with the anterior end generally coiled upon itself. The cuticle of the anterior end is invaginated to form a very small, subspherical buccal cavity. Large cervical papillae present. Bursa without distinct dorsal lobe or mid-dorsal incision. Ventral rays separate but parallel. Antero-lateral ray much thicker than, but parallel to, the remaining lateral rays. Externo-dorsal rays originate from the median stem of the dorsal ray at about its middle. Dorsal ray comparatively stout, bifurcate distally. Spicules bifurcate distally, one termination being rounded, the other acutely pointed. Accessory piece absent. Tail of female truncate, typically with three terminal cusps or spines, but occasionally with two additional cusps. Vulva at about the beginning of the posterior sixth of the body. Eggs large and few. Mature females with from one to three very large larvae in the body.

Hab. Stomach, diaphragm and lungs of Cat. Larvae also in Mice (one species known).

Genotype: *O. tricuspis* Leuckart, 1865.

Leuckart, 1865, *Arch. f. Naturg.*, xiii, 227; Cameron, 1923, *Journ. Helminthol.*, i, 157.

Fam. 6. AMIDOSTOMIDAE nov.

Buccal capsule very shallow but broad, without teeth, cutting-plates or leaf-crowns at its anterior margin. Oesophagus typically with three axial chitinous plates internally. Spicules relatively short, bifurcate or trifurcate distally. Vulva in posterior half of body.

The members of this group possess some of the characters of the Strongylidae and some of those of the Trichostrongylidae. They cannot conveniently be assigned a definite position in either of these families, and accordingly, small though the group is, we feel compelled to accord it family rank.

1. *Amidostomum* Railliet & Henry, 1909.

Buccal capsule very wide, thick-walled, with one or three teeth at its base. Oesophagus with three axial chitinous plates extending throughout its whole length or reaching to the posterior swelling. Bursa with long lateral lobes and a short dorsal lobe. Externo-dorsal rays arise separately from the dorsal ray and are short. Dorsal ray cleft for a short distance only, and with bidigitate terminations. Pre-bursal papillae present. Spicules equal, each divided for the greater part of its length into two branches. An accessory piece present. Tail of female long and finger-shaped. Uterine branches opposed.

Hab. Wall of gizzard of Ducks and other Birds.

Genotype: *A. [Strongylus] nodulosum* (Rudolphi, 1803) (= *S. anseris* Zeder, 1800, *e.p.*).

Zeder, 1800, *Naturg. der Eingeweidewürmer*, 73; Rudolphi, 1803, *Arch. f. Zool. u. Zoot.*, Brunswick, iii, 18; 1809, *Entozoorum Hist. nat.*, ii, 230; Railliet & Henry, 1909, *Compt. rend. Soc. Biol.*, Paris, lxxvi, 171; Skrjabin, 1915, *Mess. méd. vét. Soc. Petrograd*, xxix, 694; Seurat, 1918, *Bull. Mus. Hist. nat.*, Paris, 348.

2. *Epomidiostomum* Skrjabin, 1916.

Cuticle thick, with conspicuous transverse striations. Head distinct, with a pair of backwardly-directed "nodules" or epaulettes dorsally and ventrally, hooked or blunt at their tips. Buccal cavity short. Oesophagus with three internal chitinous lamellae. Tail of male hooked ventrally. Antero-

lateral ray short, not reaching the margin of the bursa. Medio-lateral and postero-lateral rays parallel and fused proximally. Externo-dorsal rays short and thick. Terminations of dorsal ray bidigitate. Two large, sessile papillae are situated almost on the lip of the cloaca. Prebursal papillae also present. Spicules short, equal, bifurcate distally. Accessory piece absent. Tail of female long and finger-shaped. Uterine branches opposed.

Hab. Wall of gizzard of Ducks and Geese.

Genotype: *E. [Strongylus] uncinatum* (Lundahl, 1848).

Lundahl, 1848, *Notis. Sällsk. Fauna et Flora Fenn. Förh.*, Helsingfors, (1) 283; Skrjabin, 1916, *Ann. Mus. Zool. Petrograd*, xx, 461; Seurat, 1918, *Bull. Mus. Hist. nat.*, Paris, (5) 345.

3. *Amphibiophilus* Skrjabin, 1916.

Buccal capsule resembles that of *Amidostomum* and is furnished with a large, triangular, pointed denticle at its base. Lateral rays of bursa originate from a common trunk, from which the antero-lateral separates while the remaining rays are still fused for some distance. Externo-dorsal rays arise from the main stem of the dorsal ray. Dorsal ray cleft for about a quarter of its length. Its terminations are tridigitate. Spicules composed of a broad and flat anterior portion and a narrow, cylindrical posterior portion, provided distally with a small hook composed of two branches. Tail of female slender and pointed.

Hab. Alimentary tract of Amphibia.

Genotype: *A. acanthocirratu*s Skrjabin, 1916.

Skrjabin, 1916, *Sci. Res. Zool. Exp. Brit. E. Africa* (Dogiel & Sokolow), 1914, *Petrograd*, i, (4) 38, 117.

ORDER III. FILARIOIDEA Weinland, 1858.

Parasitic forms with paired lateral lips, or with or without prominent lip-like structures. Oesophagus without bulb, but divided into a muscular anterior portion and a more glandular posterior portion. Eggs contain embryos when laid or hatch *in utero*. An intermediate host probably always necessary for development.

In endeavouring to simplify the classification of the two-lipped forms, we have found it impossible to maintain many of the groups that have been proposed. The prevailing tendency to raise repeatedly the rank of comparatively small groups, without taking a sufficiently broad view of the classification of the Nematodes as a whole, seems to have brought

about too wide a separation of groups which, when considered together, are obviously closely related to each other. On this account we have included in the Filarioidea the forms which have been regarded by some authorities as forming a superfamily Spiruroidea, or a suborder Spirurata.

Similarly, the difficulty of finding characters common to all the members of a family, and yet of sufficient importance to separate it from another family, has led us to discard certain families, and to reduce others to the rank of subfamilies. Thus, to take an example, when the characters common to the Acuariinae and the Physalopterinae are reviewed, it is evident that the family Acuariidae is indistinguishable from the family Spiruridae, and it has accordingly been suppressed.

Fam. 1. FILARIIDAE Claus, 1885.

Body usually filiform and much elongated. Head with two lateral and four submedian papillae. Mouth usually without lip-like structures. A simple buccal capsule rarely present. Oesophagus usually with a short anterior muscular portion and a long and thicker posterior glandular portion. Spicules two, usually unequal and dissimilar. Vulva towards the anterior end of the body. Adults in connective tissue, blood-vessels or serous cavities of Vertebrates.

Subfam. 1. FILARIINAE Stiles, 1907.

Head without epauletté-like structures. Oesophagus typical. Spicules unequal and dissimilar. Adults in connective tissue, serous cavities or blood-vessels of Vertebrates.

The subfamily Onchocercinae Leiper, 1911, does not appear to be a natural group. It is based upon the presence of the spiral thickenings of the cuticle characteristic of *Onchocerca*. This character does not occur in any of the other genera that have been referred subsequently to the subfamily. Moreover, it is a character that hardly seems to warrant the separation of *Onchocerca* itself from the subfamily Filariinae. We have accordingly suppressed the subfamily Onchocercinae, and have included all its genera among the Filariinae.

1. *Filaria* Müller, 1787.

Cuticle thick, smooth. Mouth small, with six large papillae* (two lateral, four submedian). In the male two additional pairs of small submedian papillae anterior to the former, and in the female one pair of small subventral papillae just posterior. Oesophagus short, not distinctly separated into glandular and muscular parts. Tail of male spirally twisted,

* According to Seurat (1920) *F. maris* has, in addition to six small cephalic papillae, four lips, two of which are lateral, one dorsal and one ventral.

relatively long, with long and wide alae, which have fine transverse striations, and are continuous behind the extremity of the tail. Caudal papillae variable in number and frequently asymmetrical. Three or four pairs of preanal papillae and six to eight pairs of postanal papillae. Spicules two, markedly unequal, the right short and slender, the left several times longer, divided into a proximal solid portion and a distal portion with transversely striated alae. Tail of female blunt. Vulva immediately behind the mouth, large and oval. Uterus with long common trunk and two shorter branches. Eggs with thick shell, containing embryos *in utero*.

Hab. Adults in connective tissue of Vertebrates. Larvae in blood-stream and lymphatic vessels of the same hosts. Intermediate stages in blood-sucking Arthropods.

Genotype: *F. martis* Gmelin, 1790.

Müller, 1787, *Naturforscher*, Halle, xxii, 64; Gmelin, 1790, *Systema Naturae*, 13th ed., 3040; Stiles, 1907, *U.S. Pub. Health and Mar.-Hosp. Serv., Hyg. Lab. Bull.* 34, 40; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 180; Seurat, 1920, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xi, 34; Monnig, 1924, *9th & 10th Rep. Dir. Vet. Ed. and Res.*, Pretoria, 435.

The type of the genus *Filaria* s.s. is held by Stiles & Hassall (1905, 106) to be *F. martis* Gmelin, 1790. The identity of this species is somewhat uncertain. Seurat (1920) and Monnig (1924) have described forms which they assign to *F. martis*, and their descriptions are, on the whole, in agreement; in neither case, however, was the material collected from the type-host. We have been obliged to make use of these specific descriptions in endeavouring to arrive at a satisfactory diagnosis for the genus.

2. *Dirofilaria* Railliet & Henry, 1911.

Mouth without lip-like structures. Oesophagus slender. Tail of male short and rounded, with slight alae. Caudal papillae variable in number and asymmetrical. A preanal group generally consisting of three to five pairs of voluminous papillae, and two pairs of ventral adanal papillae present. The postanal papillae consist usually of one large pair and three smaller pairs close to the tip of the tail. Spicules unequal and dissimilar, the longer terminating in a sharp point, the shorter stout and spatulate. Tail of female short and rounded. Vulva some distance from the anterior end of the body. Viviparous. Embryos in blood-stream of host, without "sheath."

Hab. Blood-stream (chiefly right ventricle of heart) and connective tissue of Mammals.

Genotype: *D. [Filaria] immitis* (Leidy, 1856).

Leidy, 1856, *Proc. Acad. Nat. Sci. Philadelphia*, viii, 55; Welch, 1873, *Month. Micr. Journ.*, London, x, 157; Fülleborn, 1912, *Centrabl. f. Bakt.*, (I) lxxv, 341; Railliet & Henry, 1911, *Bull. Soc. Path. exot.*, Paris, iv, 386.

3. *Acanthocheilonema* Cobbold, 1870.

Cuticle with fine transverse striations, or none, or striated only longitudinally. Head blunt, with a pair of lateral papillae, and four submedian papillae which may have double terminations. Oesophagus consists of a relatively short, muscular, anterior portion and a long and stouter, glandular, posterior portion. Tail of male spirally twisted, usually without alae. Three or four pairs of preanal and at least three pairs of postanal papillae present. Frequently also, near the tip of the tail, a pair of small conical lateral appendages. Spicules very unequal and dissimilar; the left long, with a stout, tubular proximal portion and a narrow, filamentous, sometimes alate, distal portion, the right short, usually much stouter and variable in shape. Tail of female moderately long, digitiform, usually with a pair of conical appendages near its tip. Vulva circular, near the anterior end of the body. Common trunk of uterus long. Uterine branches parallel. Eggs small, thin-shelled. Viviparous. Embryos without "sheath."

Hab. Serous membranes or vascular system of Mammals. Genotype: *A. dracunculoides* Cobbold, 1870.

Cobbold, 1870, *Proc. Zool. Soc.*, London, 9; Railliet, Henry & Langeron, 1912, *Bull. Soc. Path. exot.*, Paris, v, 395; Boulenger, 1920, *Proc. Zool. Soc.*, London, 494; Baylis & Daubney, 1923, *Rec. Ind. Mus.*, xxv, 564.

4. *Dipetalonema* Diesing, 1861.

Apparently a synonym of *Filaria* (*sens. lat.*). No adequate generic definition exists. Diesing's genotype, *D. caudispina*, appears to be generally recognized as a synonym of *Filaria gracilis* Rudolphi, now referred to *Acanthocheilonema* Cobbold. If it were proved definitely that *F. gracilis* and *D. caudispina* are identical, then the name *Dipetalonema* would supersede *Acanthocheilonema*.

Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 620, 703.

5. *Wuchereria* Silva Araujo, 1877, of Seurat, 1921.

Body tapering anteriorly. Cuticle smooth. Head distinct, rounded, followed by a narrower neck. Mouth circular, without lips. Two crowns of cephalic papillae present. Oesophagus rather indistinctly divided into two portions. Caudal end of male digitiform, rather sharply curved ventrally, provided with alae. A number of preanal and postanal papillae

present. Spicules unequal, the longer tapering distally to a long lash with delicate alae and having a spoon-like termination; the shorter thicker, uniform and gutter-like, coarsely marked distally. A small accessory piece present, crescentic in optical section. Tail of female rather long, bluntly rounded. Vulva a little behind the middle of the oesophagus. Vagina with thick, pyriform ovejector, followed by a long, cylindrical tube. Embryos with "sheath."

Hab. Adults in connective tissue of Mammals. Embryos in vascular system of Mammals, and in blood-sucking Insects.

Genotype: *W. [Filaria] bancrofti* (Cobbold, 1877).

Cobbold, 1877, *Lancet*, ii, 70, 495; Silva Araujo, 1877, *Gaz. med. da Bahia*, (2) ii, 492, 503; Leiper, 1913, *Trans. Soc. Trop. Med. Hyg.*, vi, 273; Seurat, 1921, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xii, 36; Yorke & Maplestone, 1926, *The Nematode Parasites of Vertebrates*, London, 401.

According to Stiles & Hassall (1920, *U.S. Pub. Health Serv., Hyg. Lab. Bull.* 114, 881) it is not clear whether *Wuchereria* Silva Araujo was intended as a new genus, with type *filaria*, or whether it was a lapsus for *Filaria wuchereria*. According to Seurat (1921) Silva Araujo's species is a synonym of *Filaria bancrofti*, and Yorke & Maplestone follow him in regarding *Wuchereria* as a genus. We have taken our diagnosis largely from Yorke & Maplestone (who have examined specimens of the genotype), and have provisionally accepted the genus. It may be noted, however, that there seems to be very little to separate this from *Acanthocheilonema*, unless it be the "sheathed" condition of the larvae.

6. *Litomosa* Yorke & Maplestone, 1926.

Syn. *Litosoma* van Beneden, 1873, *nec* Douglas & Scott, 1865.

Cuticle transparent, smooth. Head slightly thickened. Mouth without lip-like structures, leading into a short buccal capsule with thickened walls, narrower in front than behind. Oesophagus short, apparently not divided into two regions. Tail of male digitiform, without alae or papillae, but with a short subterminal point. Spicules unequal; the left long, with a stout proximal portion and a slender, filiform, distal portion; the right short and broad, with a spatulate process at the tip. Tail of female elongate, digitiform, with two divergent terminal points between which are two small spines. Vulva small, not prominent, situated at the level of the posterior end of the oesophagus. Common trunk of uterus long. Uterine branches parallel.

Hab. Abdominal cavity of Bats (one species known).

Genotype: *P. [Litomosa] filaria* (van Beneden, 1873).

van Beneden, 1873, *Mém. Acad. Roy. Sci. Belg.*, xl, 21; Seurat, 1921, *Bull. Mus. Hist. nat.*, Paris, i, 103.

7. *Hamatospiculum* Skrjabin, 1916.

Cuticle with fine transverse striations. Head rounded, with four double submedian and two lateral papillae. Mouth with two salient lateral lip-like structures. Oesophagus with a narrow anterior portion and a wider posterior portion. Tail of male rounded, with lateral alae. About five pairs of preanal and six pairs of postanal papillae present, all with short peduncles. Spicules two, very unequal and dissimilar; the left with a hooked appendage and nearly ten times as long as the right. Vulva in oesophageal region.

Hab. Subcutaneous connective tissue of Birds (one species known).

Genotype: *H. [Filaria] insigne* (Schneider, 1866).

Schneider, 1866, *Monographie der Nematoden*, Berlin, 91; Skrjabin, 1916, *Journ. Russe Zool.*, Petrograd, i, 751.

8. *Foleyella* Seurat, 1917.

Narrow lateral alae present, extending throughout the length of the body. Lateral fields wide and conspicuous. Mouth with six low papillae and four "outer" papillae. Oesophagus very short, with narrower anterior portion and stouter posterior portion. Rectum narrow and very long. Tail of male with wide caudal alae. About four pairs of preanal and three pairs of postanal papillae present, all pedunculate and very large, except the most posterior postanal pair. An unpaired sessile papilla on the anterior lip of the cloaca. Spicules unequal; the right short and broad. Vulva postoesophageal. Uterine branches run at first posteriorly and parallel, then diverge, the oviducts being situated anteriorly and posteriorly and enlarged into receptacula seminis. Viviparous. Embryos with "sheath," occurring in blood-stream of host.

Hab. Subcutaneous connective tissue and muscles of a Lizard (one species known).

Genotype: *F. [Filaria] candezei* (Fraipont, 1882).

Fraipont, 1882, *Bull. Acad. Roy. Sci. Belg.*, lxi, 104; Seurat, 1916, *Compt. rend. Soc. Biol.*, Paris, 1133; 1917, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, viii, 236.

9. *Onchocerca* Diesing, 1841.

Cuticle thick, with transverse striations and also spiral thickenings, often interrupted at the level of the lateral fields. In the male usually one thickening for each striation; in the female the thickenings are at intervals of from two to four

striations. Mouth without lip-like structures. Tail of male strongly curved, flattened ventrally and with narrow alae. Caudal papillae variable in number and often asymmetrical, but always including a group of four pairs of nipple-like adanal papillae. Spicules unequal; the longer spicule tubular in its proximal portion, alate distally, the alae rolled to form a tube; the shorter spicule barbed distally. Tail of female bluntly conical. Vulva postoesophageal. Viviparous.

Hab. Connective tissue of mammals.

Genotype: *O. reticulata* Diesing, 1841.

Diesing, in Hermann, 1841, *Repert. Thierh.*, Stuttgart, ii, 199; Railliet & Henry, 1910, *Compt. rend. Soc. Biol.*, Paris, i, 249; Leiper, 1911, [*Rep. to Local Govt. Board, London, No. 45, Food Report II.*] *Journ. Trop. Med. Hyg.*, xiv, 87.

10. *Elaeophora* Railliet & Henry, 1912.

Mouth without lip-like structures. Oesophagus very long. Tail of male curved or spirally twisted, without alae. Five pairs of small, sessile caudal papillae present, of which two pairs are preanal. Spicules unequal; the longer with blunt tip, the shorter with a knob-like swelling at the tip. Posterior portion of body of female much thicker than anterior portion. Uterus divides dichotomously into four branches.

Hab. Nodules in the wall of the aorta of cattle (one species known).

Genotype: *E. [Filaria] poeli* (Vrijburg, 1897).

Vrijburg, 1897, xi, 43 (*vide* Stiles & Hassall, not verified); Railliet & Henry, 1912, *Bull. Soc. Path. exot.*, Paris, v, 115.

11. *Katanga* Yorke & Maplestone, 1926.

Syn. *Grammophora* Gedoelst, 1916, *nec* Guénée, 1852.

Body attenuated at each end, especially posteriorly. Head rounded, followed by a slight constriction. Mouth without lip-like structures. Caudal end conical in both sexes, with three appendages, two of which are lateral and button-like, the third terminal and cylindrical. In the male an adanal group of six pairs of caudal papillae, and a subterminal pair, present. Spicules unequal, both short and broad. Vulva near anterior end. Common trunk of uterus long.

Hab. Connective tissue of a Jumping-shrew (*Petrodromus*). (One species known).

Genotype: *K. [Grammophora] katangensis* (Gedoelst, 1916).

Gedoelst, 1916, *Rev. Zool. Afric.*, Brussels, v, 49.

12. *Lemdana* Seurat, 1917.

Cuticle thick, smooth. Lateral fields narrow. Mouth without lip-like structures. Tail of male short, without alae.

One pair of large preanal and one pair of postanal papillae, situated near the cloaca. Spicules very unequal; the left long and filiform. Vulva in oesophageal region. Oviviviparous. Embryos in blood-stream of host, without "sheath."

Hab. External surface of crop of Gallinaeous birds (one species known).

Genotype: *L. marthae* Seurat, 1917.

Seurat, 1917, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, viii, 208.

13. *Icosiella* Seurat, 1917.

Cuticle thin, transparent. Lateral fields wide. Mouth with four prominent submedian, rounded papillae, and four small submedian teeth. Oesophagus very long. Intestine narrow and dark-coloured. Tail, in both sexes, short and rounded. In the male the cloaca is bordered by two strong lips. No caudal alae or papillae. Spicules unequal; the left longer. Vulva in oesophageal region. Ovoviviparous. Embryos in blood-stream of host, with "sheath."

Hab. Connective tissue of Frogs (one species known).

Genotype: *I. [Filaria] neglecta* (Diesing, 1851).

Diesing, 1851, *Systema Helminthum*, ii, 276; Seurat, 1917, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, viii, 240.

14. *Politospiculum* Skrjabin, 1916.

Cuticle with fine transverse striations. Two narrow lateral alae present, extending throughout the length of the body. Head rounded, with two pairs of submedian and one pair of lateral papillae. Mouth with two salient lateral lip-like structures. Oesophagus with a narrow anterior portion and a thicker posterior portion. Tail of male rounded. Four pairs of pedunculate preanal papillae and four pairs of postanal papillae present. Spicules unequal and dissimilar; the left curved, slightly stouter proximally, the right shorter and straight. Vulva in oesophageal region.

Hab. Articular cavities of Birds (one species known).

Genotype: *P. arthricola* Skrjabin, 1916.

Skrjabin, 1916, *Journ. Russe Zool.*, Petrograd, i, 753.

15. *Setaria* Viborg, 1795.

Syn. *Crinon* Chabert, 1782; *Crino* Lamarck, 1801; *Hamularia* Treutler, 1793, of Stiles, 1907; *Tentacularia* Zeder, 1800, of Stiles, 1907; ? *Amularia* Brera, 1810; ? *Anchilocephali* Brera, 1810; ? *Helminthus* Dunglison, 1895; *Deraiphoronema* Romanovitch, 1916; *Papillosetaria* VEVERS, 1923.

Cuticle finely striated transversely, in some species bearing small tubercles. No lateral alae. Mouth surrounded by a raised chitinous ring, notched laterally and usually also dorsally and ventrally, giving the impression of teeth. Four submedian and two lateral papillae present behind the peribuccal ring. Oesophagus with a short, narrow, anterior portion and a much longer and stouter posterior portion. Tail of male considerably attenuated and spirally twisted. Four pairs of preanal papillae and a median papilla just in front of the cloaca. Three or four pairs of postanal papillae, and usually a pair of small lateral appendages near the tip of the tail. Spicules very unequal and dissimilar; the left long, consisting of a tubular proximal portion and a membranous distal portion, the right short, stout and irregularly shaped. Tail of female conically tapering, curved dorsally, with a pair of lateral appendages near the tip, which is usually knobbed or spiny. Vulva near anterior end of body. Eggs thin-shelled. Ovoviviparous.

Hab. Peritoneal cavity of Ungulates and (?) Marsupials.
Genotype: *S. [Gordius] equina* (Abildgaard, 1789).

Abildgaard, in Müller, 1789, *Zool. Dan.*, iii, 49; Viborg, 1795, *Samml. v. Abhandl. f. Thierärzte und Oekonomen*, Copenhagen, i; Stiles, 1907, *U.S. Pub. Health and Mar.-Hosp. Serv., Hyg. Lab. Bull.* 34, 40; Boulenger, 1921, *Parasitol.*, xii, 342; Seurat, 1921, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xii, 35; Romanovitch, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 745; Vevers, 1923, *Proc. Zool. Soc.*, London, 913.

16. *Loa* Stiles, 1905.

Cuticle with numerous irregularly-distributed tubercles or "bosses." Mouth at the summit of a truncate conical process, which is narrower than the succeeding portion of the head. Towards the base of this process are two lateral and four submedian sessile papillae. Oesophagus short. Tail of male short, bluntly rounded, without alae, slightly curved ventrally. Apparently nine pairs and two unpaired caudal papillae present, the latter on the anterior and posterior lips of the cloaca respectively. Of the former four pairs are large lateral papillae with swollen peduncles, forming a group, three of which are preanal and one postanal. Two short, unequal spicules. Tail of female short and rounded. Vulva towards the anterior end of the body. Common trunk of uterus long. Uterine branches two, parallel, both recurving anteriorly at different levels. Eggs hatch *in utero*.

Hab. Connective tissue, serous membranes and (?) lymphatic system of Man and Primates.

Genotype: *L. [Dracunculus] loa* (Guyot, 1778).

Guyot, 1778 (*vide* Stiles & Hassall, 1905, not verified); Cobbold, 1864, *Entozoa*, London, 147; Looss, 1904, *Zool. Jahrb., Syst.*, xx, 549; Stiles, in Stiles & Hassall, 1905, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 79, 150; Stiles, 1907, *U.S. Public Health and Mar.-Hosp. Serv., Hyg. Lab. Bull.* 34, 34, 40, 42; Leiper, 1913, *Trans. Soc. Trop. Med. Hyg.*, vi, 272; Fantham, Stephens & Theobald, 1916, *The Animal Parasites of Man*, 409, 411.

17. *Micipsella* Seurat, 1921.

Body sharply attenuated at both ends. Cuticle not striated, but bearing small, barely salient tubercles, disposed in two alternating rows along each lateral line. No lateral or caudal alae. Mouth * situated at the summit of a conical process, and surrounded by a ring of small papillae. Two pairs of submedian papillae situated close to the base of this process. Tail in both sexes digitiform, relatively long, spirally twisted, especially in the male. Male with five to seven pairs of preanal and two pairs of postanal papillae. The papillae may be asymmetrically disposed. Numerous tubercles on the dorsal and ventral surfaces near posterior end of male. Spicules short, subequal; the left longer, terminating in a point, the right blunt. Vulva near the posterior end of the oesophagus. Common trunk of uterus long. Uterine branches parallel. Eggs without shell, hatching *in utero*. Embryos without "sheaths."

Hab. Peritoneal cavity of a Rodent (one species known).

Genotype: *M. [Filaria] numidica* (Seurat, 1917).

Seurat, 1917, *Compt. rend. Soc. Biol.*, Paris, lxxx, 354; 1921, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xii, 33.

18. *Pelecitus* Railliet & Henry, 1910.

Cuticle with faint longitudinal striations. Head rounded, with a pair of lateral papillae, and four submedian papillae which may be double. Mouth circular, without lip-like structures. Lateral alae extend throughout the length of the body in both sexes. Tail of male truncate, with broad caudal alae. Two to four pairs of preanal papillae present, or none. Postanal papillae vary in number. Spicules subequal, short, transparent, with pointed tips. Tail of female with one or two pairs of pedunculate papillae. Vulva close to anterior end.

Hab. Connective tissue of limbs of Birds (free or in nodules).

Genotype: *P. [Spiroptera] helycinus* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xxxviii, 948; Railliet & Henry, 1910, *Compt. rend. Soc. Biol.*, Paris, lxxviii, 251; Skrjabin, 1916, *Journ. Russe Zool.*, Petrograd, i, 748.

* According to Seurat there is a short buccal capsule with chitinous walls.

We have placed this genus at the end of the subfamily Filariinae, although its position is rendered somewhat uncertain by the statement of Railliet & Henry (1910) that lateral alae are present.

Subfam. 2. **DIPLOTRIAENINAE** Skrjabin, 1916.

Head provided laterally with a pair of trilobed chitinoid epaulette-like structures ("tridents"), which may be superficially situated or more deeply, at the sides of the oesophagus. Oesophagus typical. Spicules unequal and dissimilar. Adults in connective tissue and serous cavities of Birds and Reptiles.

1. **Diplotriaena** Railliet & Henry, in Henry & O'Zoux, 1909.

Syn. *Triplotriaena* Connal, 1912.

Head with six inconspicuous papillae (two lateral, four submedian). Mouth small, circular. Oesophagus with a short, slender, anterior, muscular portion and a stouter, very long, posterior portion. Tail of male short, bluntly rounded or truncate. Up to six pairs of small, sessile, caudal papillae present. Spicules unequal, dissimilar, the left longer and straight, the right shorter and spirally twisted. Vulva in oesophageal region. Common trunk of uterus long. Uterine branches at first parallel, then divergent. Eggs thick-shelled, containing embryos *in utero*. Embryos occur in blood-stream of host.

Hab. Connective tissue of Birds.

Genotype: *D. [Filaria] tricuspis* (Fedchenko, 1874).

Fedchenko, 1874, *Izviest. Imp. Obsh. Liub.*, etc., Moscow, x, 60; Henry & O'Zoux, 1909, *Bull. Soc. Path. exot.*, Paris, ii, 547; Seurat, 1915, *Novit. Zool.*, London, xxii, 17; Skrjabin, 1917, *Parasitol.*, ix, 471.

2. **Dicheilonema** Diesing, 1861.

Syn. *Contortospiculum* Skrjabin, 1915.

Mouth with two strong, prominent, lateral lip-like structures. Head with two lateral and four double submedian papillae. The posterior lobes of the "tridents" are much expanded. Oesophagus with a short, narrow, anterior portion and a stouter, very long, posterior portion. Tail of male with broad alae supported by five or six pairs of pedunculate preanal papillae and a varying number of pairs of postanal papillae. Spicules unequal and dissimilar; the proximal end of each swollen and clubbed, the distal half of the longer spicule with an aliform expansion, the alae being rolled so as to form a more or less closed tube, and with serrated edges. The

shorter spicule is curved and smooth. Vulva close to anterior end of body. Eggs contain embryos *in utero*.

Hab. Connective tissue of Birds.

Genotype: *D. [Filaria] labiatum* (Creplin, 1825).

Creplin, 1825, *Observationes de Entozois*, 1; Diesing, 1861, *Sitz. k. Akad. Wiss., Wien*, xlii, 620, 707; Skrjabin, 1917, *Parasitol.*, ix, 474.

Since *Filaria labiata* Creplin, the species indicated by Stiles & Hassall (1905) as type of *Dicheilonema*, is referred by Skrjabin to his genus *Contortospiculum*, the latter appears to fall into synonymy. Accordingly, we have taken Skrjabin's diagnosis as that of *Dicheilonema*. Railliet (1918, *Bull. Soc. Zool. France*, xliii, 104) declined to accept *F. labiata* as the type of *Dicheilonema*. He suggested that, since Diesing, in defining *Dicheilonema*, had used the expression "*penis vagina tubulosa*," and since at that time *D. bifidum* (Molin) was the only species in which the large spicule had already been described as tubular, this species should be taken as the type of the genus. The term "*vagina penis*," so frequently used by Molin and Diesing, appears to us one of very uncertain significance, and it is somewhat arbitrary to assume that it refers to the large spicule. Moreover, as Railliet admits, the species *bifidum* is insufficiently characterized to distinguish it generically from *Contortospiculum*, in which the large spicule may also be described as "tubular."

3. *Hastospiculum* Skrjabin, 1923.

Mouth oval, with two prominently projecting lateral lip-like structures arising from a broad base. Behind these there are epaulette-like structures, of which the posterior ends form each three processes. The head bears two lateral and four double submedian papillae, situated on the epaulettes. The epaulettes are joined dorsally and ventrally by a cuticular band without papillae. Tail of male with three pairs of preanal papillae. Spicules very unequal; the longer slender, with a spatulate expansion at the tip, the shorter bow-shaped and apparently alate. Eggs contain embryos *in utero*.

Hab. Serous membranes of Reptiles.

Genotype: *H. varani* Skrjabin, 1923.

Skrjabin, 1923, *Russk. Zhurn. Trop. Med.*, Moscow, i.

4. *Serratospiculum* Skrjabin, 1915.

Cuticle bearing numerous small papillae or tubercles. Mouth with two trilobed lateral lip-like structures. Oesophagus with short, slender, anterior muscular portion and long, much wider, posterior glandular portion. Tail of male with small

alae, which are continuous posteriorly and supported by four to six pairs of preanal and five or six pairs of postanal papillae. Spicules unequal and dissimilar. The middle portion of each spicule is alate, while the smaller bears on the inner side of its distal part a row of serrations. Vulva close to the anterior end of the body. Eggs thick-shelled, containing embryos *in utero*.

Hab. Serous cavities of Birds of prey.

Genotype: *S. turkestanicum* Skrjabin, 1915.

Skrjabin, 1915, *Vestn. Obshest. vet.*, Petrograd, 133; 1916, *Ann. Mus. Zool.*, Petrograd, xx, 546; Seurat, 1915, *Novit. Zool.*, London, xxii, 23.

Subfam. 3. **APROCTINAE** Yorke & Maplestone, 1926.

Cuticle thin. Oesophagus atypical, relatively short, not divided into anterior and posterior regions. Intestine dark-coloured. Anus usually not functional, sometimes absent. Tail of male short, bluntly rounded, without alae and usually without prominent papillae. Spicules short, equal or subequal. Adults in connective tissue of Birds or Reptiles.

1. *Aprocta* v. Linstow, 1883.

Syn. *Lissonema* v. Linstow, 1903.

Cuticle smooth. Mouth small, without papillae. Excretory pore absent. Anus frequently absent, and when present usually not functional. Tail of male without papillae. Spicules equal or subequal. Vulva in oesophageal region. Uterine branches parallel. Ovaries and oviducts posterior. Eggs small, thick-shelled, containing embryos *in utero*.

Hab. Orbit and nasal cavities of Birds.

Genotype: *A. cylindrica* v. Linstow, 1883.

v. Linstow, 1883, *Arch. f. Naturg.*, xlix, i, 289; 1903, *Arch. f. mikr. Anat.*, lxii, 117; Railliet & Henry, 1910, *Bull. Soc. Path. exot.*, Paris, .iii, 152; Skrjabin, 1917, *Compt. rend. Soc. Biol.*, Paris, lxxx, 303.

Morphologically there seems to be very little difference between this genus and the two following genera, *Thamugadia* and *Eufilaria*. We have retained these genera provisionally, chiefly on account of the differences stated to exist in the eggs and embryos. *Eufilaria* contains only two species and *Thamugadia* one, and it seems not improbable that they represent no more than specific differences within the genus *Aprocta*. The alimentary canal in all three genera appears to be extremely degenerate, and we do not, therefore, attach great significance to the peculiar structure of the oesophagus in *Eufilaria*.

2. *Thamugadia* Seurat, 1917.

Cuticle smooth. Lateral fields narrow, not distinct from the rest of the cuticle. Mouth with six small papillae. Tail of male without papillae. Spicules equal. Tail of female digitiform, relatively long. Vulva slightly behind posterior end of oesophagus. Eggs thin-shelled, containing embryos *in utero*. Embryos with "sheaths," occurring in blood-stream of host.

Hab. Subcutaneous connective tissue of a Lizard (*Tarentola*). (One species known).

Genotype: *T. hyalina* Seurat, 1917.

Seurat, 1917, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, viii, 237.

See note under *Aprocta*, *supra*.

3. *Eufilaria* Seurat, 1921.

Cuticle smooth. Lateral fields very broad. Excretory pore absent (?). Mouth very small. Oesophagus transparent, short and narrow, formed of a single layer of cells and a cuticular lining. Anus apparently not functional. Tail of male without papillae. Cloaca very small. Spicules subequal. Vulva in oesophageal region. Uterine branches parallel. Ovaries in posterior region. Eggs thin-shelled, hatching *in utero*. Embryos without "sheath," occurring in blood-stream of host.

Hab. Subcutaneous connective tissue of Passerine birds.

Genotype: *E. sergenti* Seurat, 1921.

Seurat, 1921, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xii, 28.

See note under *Aprocta*, *supra*.

4. *Splendidofilaria* Skrjabin, 1923.

Cuticle with fine transverse striations and numerous small tubercles. Mouth without lip-like structures, but with four submedian papillae. No cervical papillae. Tail of male hooked. Four pairs of postanal papillae present, forming a group. No preanal papillae. Spicules subequal. Tail of female bluntly rounded. Vulva in oesophageal region. Viviparous.

Hab. Circulatory system of Birds (one species known).

Genotype: *S. pawlowskyi* Skrjabin, 1923.

Skrjabin, 1923, *Vestn. Microbiol. i Epidem.*, Saratow, ii, 27.

5. *Eucamptus* Dujardin, 1845, *nec* Chevrolat, 1833, *nec* Dejean, 1833.

Body filiform. Head blunt. Mouth circular, unarmed. Oesophagus cylindrical. Tail in both sexes blunt, in the male twisted spirally and attenuated posteriorly. Spicules short, equal, curved. No accessory piece. Vulva near anterior end. Common trunk of uterus fusiform. Viviparous.

Hab. Connective tissue of Birds.

Genotype: *E. obtusus* Dujardin, 1845.

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 106.

This genus appears to fall into the subfamily Aproctinae. The name *Eucamptus*, however, is preoccupied, and *E. obtusus* Dujardin is referred by Yorke & Maplestone (1926) to their new genus *Coronofilaria*, the type of which is *C. pillersi* Yorke & Maplestone, 1926.

APPENDIX TO FAMILY FILARIIDAE.

a. *Solenonema* Diesing, 1861.

The generic diagnosis given by Diesing is quite inadequate. The genotype, by page precedence, would be *S. [Filaria] aequale* (Molin, 1858), but neither this nor either of the other two species included in the genus is sufficiently characterized to form the basis of a generic diagnosis. For the present, the genus cannot be distinguished from *Filaria, sens. lat.*

Molin, 1858, *Sitz. k. Akad. Wiss.*, Wien, xxviii, 383; Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 620, 704.

b. *Tetracheilonema* Diesing, 1861.

Hab. Connective tissue of Birds.

Genotype: *T. [Filaria] quadrilabiatum* (Molin, 1858).

c. *Tricheilonema* Diesing, 1861.

Syn. *Schizocheilonema* Diesing, 1861.

Hab. Unknown.

Genotype: *T. [Filaria] megalochilum* Diesing, 1851.

d. *Monopetalonema* Diesing, 1861.

Hab. Birds (position not stated).

Genotype: *M. [Filaria] physalurum* (Bremser, in Diesing, 1851).

These three genera are unrecognizable, none of the species included being sufficiently well known to enable a diagnosis to be constructed. The species must be regarded as belonging to the genus *Filaria, sens. lat.*

e. *Tipasella* Seurat, 1921 (?).

Lip-like structures not apparent. Oesophagus clearly differentiated into a shorter muscular region and a longer glandular region. Tail of male without alae. Spicules short and equal (?).

Genotype: (?).

Seurat, 1921, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xii, 33.

f. *Microfilaria* Cobbold, 1880, et auctt.

This is not a generic name, but a collective name for immature Filariidae occurring in the blood-stream of Vertebrates.

g. *Dermofilaria* Rivolta, 1884.

According to Railliet & Henry, the type and only species (*D. irritans*) is the larva of *Habronema* sp.

Rivolta, 1884, *Giorn. Anat., Fisiol. e Patol. Anim.*, Pisa, xvi, 128; Railliet & Henry, 1915, *Bull. Soc. Path. exot.*, Paris, viii, 695 ff.

Fam. 2. PHILOMETRIDAE nov.

Body more or less elongated. Anterior end rounded, sometimes with a cuticular shield. Mouth simple, without lip-like structures, but surrounded by six or eight papillae. Anus sometimes absent in adult. Male, when known, much smaller than female. Spicules two, equal, slender, finely pointed. An accessory piece present. Vulva very inconspicuous or absent, and vagina rudimentary or absent, in gravid females. Uterine branches directly opposed, forming a continuous tube. Ovaries relatively very short, situated at opposite ends of the body. Viviparous. Adults in body-cavity, serous membranes or connective tissue of vertebrates.

This family is doubtfully placed in the Order Filarioidea, which contains some other atypical forms. The three genera *Philometra*, *Micropleura* and *Dracunculus* have certain peculiar characters in common, and it is difficult to refer them to any of the better-established families. A new subfamily, Micropleurinae, within the family Filariidae, was tentatively proposed by us (1922, *Mem. Ind. Mus.*, vii, 319) to accommodate *Micropleura*. But in view of the great differences between the female organs of this genus and those typical of the Filariidae, the erection of a separate family seems a more natural arrangement. A family Dracunculidae appears to have been proposed by Leiper in 1912, to contain *Dracunculus medinensis*. Of this species, however, the female only has been at all adequately described, and it seems better to take as the type of the family a genus which is better founded, and of which both sexes, and more than one species, are known.

1. *Philometra* Costa, 1846.

Syn. *Ichthyonema* Diesing, 1861.

Lateral fields broad. Mouth funnel-shaped, surrounded by small papillae. Oesophagus relatively short, swollen anteriorly, cylindrical posteriorly, and accompanied by a long dorsal unicellular gland which opens into it by a narrow canal

near the mouth. A pair of small, blind, subventral glands also present. Anus non-functional in adult, the posterior end of the intestine being joined to the body-wall by a solid column of cells. Tail of male truncate, with a pair of large lateral processes posteriorly. Cloacal aperture terminal. Spicules equal, sharply pointed. Accessory piece large and well-developed. Testis single. Tail of female short and bluntly rounded. Vulva at about the posterior third of the body. Vagina apparently functional only in very young females, subsequently losing its connection with the uterus. Uterine branches form a continuous tube. Ovaries short, usually reflexed.

Hab. Adult in body-cavity and genital glands of Fishes; larva, at least in some cases, in body-cavity of Copepods.

Genotype: *P. [Filaria] globiceps* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 7, 215; Costa, 1846, *Ann. Accad. d. Aspiranti nat. di Napoli*, iii, 80; Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 620, 698; Schneider, 1866, *Monographie der Nematoden*, Berlin, 175; Willemoes-Suhm, 1871, *Zeitschr. f. Wiss. Zool.*, Leipzig, xxi, 190; v. Linstow, 1902, *Arch. f. mikr. Anat.*, lx, 223; zur Strassen, 1907, *Verh. deutsch. zool. Ges.*, Leipzig, xvii, 110.

2. *Micropleura* v. Linstow, 1906.

Cuticle without striations, but with irregularly-distributed longitudinal series of from two to seven minute tubercles. Two lateral and four submedian cephalic papillae present. Oesophagus with a short anterior muscular portion and a long and wider posterior glandular portion. Tail of male * conically tapering, with a single, somewhat interrupted, transversely striated ala on the right side, in the preanal region only. Seven pairs of subventral caudal papillae present, of which four are postanal and three preanal. Spicules short, equal, very slender and tapering to fine points. A well-chitinized accessory piece present. Tail of female bluntly rounded, with a pair of very large, prominent subventral papillae. Vulva slightly in front of the middle of the body, very inconspicuous. Vagina very short, non-muscular near the vulva. Uterine branches directly opposed, very wide. Ovaries relatively very short, usually reflexed. Embryos hatching *in utero*.

Hab. Body-cavity and serous membranes of Reptiles (one species known).

Genotype: *M. vivipara* v. Linstow, 1906.

v. Linstow, 1906, *Journ. Proc. Asiat. Soc. Bengal*, Calcutta,

* The description of the male given by v. Linstow refers, in all probability, to a different worm. The description followed here is that of Baylis (1924).

ii, 269; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 317; Baylis, 1924, *Ann. Mag. Nat. Hist.*, London, (9) xiii, 199.

3. *Dracunculus* [pre-Linnean authors] Kniphof, 1759.

Syn. *Vena Gallandat*, 1773; *Vermiculus* Duglison, 1895.

Body greatly elongated in female. Head with a cuticular thickening or shield. Lateral fields broad. Mouth surrounded by eight papillae. Oesophagus very short. Into its lumen there open by narrow canals a very large dorsal and two small subventral unicellular glands. Intestine rudimentary and anus non-functional in adult. Male undescribed. Tail of female curled ventrally, pointed at tip. Body almost completely filled by the uterus, the two branches of which form a continuous tube. Ovaries short. Vulva apparently absent.* Embryos said to escape through the mouth, by rupture of the uterus, on contact with water.

Hab. Adult in connective tissue of Man and other Mammals; larva in body-cavity of Copepods.

Genotype: *D. [Gordius] medinensis* [pre-Linnean authors] (L., 1758).

Kniphof, 1759, *De Pediculis*, Erfurt, 12; Bastian, 1864, *Trans. Linn. Soc. Lond.*, xxiv, 101; Leuckart, 1876, *Die menschlichen Parasiten*, Leipzig, ii, 642; zur Strassen, 1907, *Verh. deutsch. zool. Ges.*, Leipzig, xvii, 110.

Fam. 3. SPIRURIDAE Örley, 1885.

Mouth with two lips. A buccal capsule usually present. Oesophagus with a short anterior muscular portion and a long and thicker posterior glandular portion. Spicules two, usually unequal and dissimilar. Position of vulva variable, but never very close to anterior end. Eggs thick-shelled, containing embryos when laid. Adults parasitic in Vertebrates; larvae, so far as known, in Arthropods.

Subfam. 1. SPIRURINAE Railliet, 1915.

Lips followed by a cuticular collar, which is prominent dorsally and ventrally, and may form dorsal and ventral shields overlapping the lips. Buccal capsule without spiral or annular thickenings. Male typically with four pairs of preanal papillae. An accessory piece usually present.

* The statement sometimes made, that a vulva is present near the mouth, is unintelligible in view of the opposed arrangement of the genital organs.

1. *Spirura* E. Blanchard, 1849, *nec* Diesing, 1861.

Lips poorly developed, surrounded at their bases by a projecting cuticular collar which is specially prominent dorsally and ventrally. A buccal capsule present. Body-wall raised some distance from the anterior end into a hump on the ventral surface, serving as a hold-fast. No cervical alae. Tail of male with well-developed alae. Four pairs of preanal papillae and a single median precloacal papilla present. Five pairs of postanal papillae. Spicules somewhat unequal, the shorter alate. Tail of female bluntly conical and curved ventrally. Vulva in middle region of body. Uterine branches opposed.

Hab. Alimentary canal, chiefly stomach, of Rodents and Insectivores.

Genotype: *S. [Ascaris] talpae* (Gmelin, 1790) [= *Spiroptera strumosa* Rudolphi].

Gmelin, 1790, *Systema Naturae*, 13th ed., 3032; E. Blanchard, 1849, *Ann. Sci. Nat.*, Paris, Zool., xi, 161; Seurat, 1915, *Novit. Zool.*, London, xxii, 7; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 199.

2. *Protospirura* Seurat, 1914.

Syn. *Cephalacanthus* Diesing, 1853, *e.p.*; *Mastophorus* Diesing, 1853, *e.p.*

Each lip with three lobes, each of which carries three teeth on its inner surface. A buccal capsule present. Tail of male with well-developed alae. Four pairs of subventral preanal papillae, with short peduncles, and an unpaired precloacal papilla. Two pairs of large postanal papillae and a group of small papillae near the tip of the tail. Right spicule longer and stouter than the left, which is alate distally. Tail of female short. Vulva in the middle region of the body. Uterine branches opposed.

Hab. Stomach of small Mammals, chiefly Rodents.

Genotype: *P. numidica* Seurat, 1914.

Seurat, 1914, *Compt. rend. Soc. Biol.*, Paris, lxxvii, 344; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 203.

3. *Habronema* Diesing, 1861.

Syn. *Cyrnea* Seurat, 1914; *Dermoflaria* Rivolta, 1884.

Cervical alae may be present. Lips large, entire or trilobed, sometimes with internal teeth, and overlapped dorsally and ventrally by shields of cuticle [sometimes described as dorsal and ventral lips]. A well-developed buccal capsule present. Tail of male with wide alae. Four pairs of preanal papillae and a variable number of postanal papillae, usually

asymmetrically placed. Spicules very unequal and dissimilar. Vulva in middle region of body, occasionally displaced posteriorly.

Hab. Stomach of Mammals, proventriculus and gizzard of Birds.

Genotype: *H. [Filaria] muscae* (Carter, 1861).

Carter, 1861, *Trans. Med. Phys. Soc., Bombay*, 62; Diesing, 1861, *Sitz. k. Akad. Wiss., Wien*, xliii, 270, 273; Ransom, 1913, *U.S. Dept. Agric., Bur. Anim. Indust. Bull.* 163; Seurat, 1914, *Compt. rend. Soc. Biol., Paris*, lxxix, 295.

Seurat (1914) proposes the genus *Cyrnea* for a Spirurid parasite of a partridge which, he says, differs from *Habronema* in the absence of lateral alae and usually in the presence of an egg-reservoir in the ovejector.

4. *Parabronema* Baylis, 1921.

Syn. ? *Squammanema* Van Thiel, 1925.

Lips and dorsal and ventral shields resembling those of *Habronema*. Cuticle of head thick, folded so as to form a circle of six horseshoe-shaped auricular appendages, of which two are lateral and four submedian. Buccal capsule elongate, cylindrical posteriorly. Tail of male with lateral alae towards its tip, four pairs of preanal and two pairs of postanal papillae, arranged somewhat asymmetrically, and a large median double precloacal papilla. Spicules markedly unequal. Tail of female short, bluntly conical, and curved dorsally. Vulva near posterior end of oesophagus.

Hab. Stomach wall of Elephants and other Mammals.

Genotype: *P. indicum* Baylis, 1921.

Baylis, 1921, *Parasitol.*, xiii, 58; Khalil, 1922, *Proc. Zool. Soc.*, London, 205; van Thiel, 1925, *Ann. Parasitol.*, Paris, iii, 176.

Squammanema bonnei Van Thiel, 1925, the only species of the genus, is compared by the author with *Gongylonema*, but appears to us to be much more closely related to *Habronema* and *Parabronema*, with the latter of which it is probably identical.

5. *Hartertia* Seurat, 1915.

Lips large, triangular, with trilobed pulp and with three internal lobes. A reduced buccal capsule present. Lateral cervical alae may be present. Tail of male with broad symmetrical alae. Six pairs of pedunculate caudal papillae present (four preanal and two postanal), and a group of small sessile papillae near the tip of the tail. Spicules very unequal. Accessory piece present. Vulva in middle region of body.

Hab. Intestine of Birds (one species in a Mammal).

Genotype : *H. obesa* Seurat, 1915.

Seurat, 1915, *Novit. Zool.*, London, xxii, 11.

6. *Histiocephalus* Diesing, 1851.

Lips large, bearing a pair of lateral cuticular fringes with a variable number of terminal processes having simple or subdivided extremities. Dorsal and ventral shields present as in *Habronema*. Neck region with a number of longitudinal folds of cuticle. Tail of male with broad alae and six pairs of pedunculate papillae, four preanal and two postanal. Spicules equal, extremely long and filiform in the genotype; in other species markedly unequal and dissimilar. No accessory piece. Vulva usually towards the anterior end of the body, sometimes behind the middle.

Hab. Beneath the lining of the gizzard of Birds.

Genotype : *H. [Spiroptera] laticaudatus* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 24, 239; Diesing, 1851, *Systema Helminthum*, ii, 230; Gedoelst, 1919, *Compt. rend. Soc. Biol.*, Paris, lxxxii, 1145; Skrzjabin, 1916, *Ann. Mus. Zool.*, Petrograd, xx, 509; Gendre, 1921, *Proc.-verb. Soc. Linn. Bordeaux*, lxxiii, 49; and 1922, lxxjii, 138.

7. *Hadjelia* Seurat, 1916.

Syn. *Gilsonia* Gedoelst, 1919.

Head followed by a constriction. Lateral alae absent. Lips trilobed. Tail of male with well-developed alae, four pairs of preanal and two of postanal pedunculate papillae. Spicules very unequal. No accessory piece. Vulva in oesophageal region.

Hab. Beneath lining of gizzard of Birds.

Genotype : *H. thuillieri* Seurat, 1916.

Seurat, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 517; Gedoelst, 1919, *Compt. rend. Soc. Biol.*, Paris, lxxxii, 1145; Gendre, 1922, *Proc.-verb. Soc. Linn. Bordeaux*, lxxiii, 132.

8. *Hedruris* Nitzsch, 1821.

Syn. *Heteroura* v. Siebold, 1836; *Synplecta* Leidy, 1851.

Body stout posteriorly, slender anteriorly. Lips overlapped by dorsal and ventral shields. Buccal capsule present. Caudal alae of male much reduced or absent. One pair of preanal and at least six pairs of postanal papillae present. Spicules short, equal. Accessory piece present or absent. Posterior end of female can be invaginated to form a sucker-like organ, and has a chitinized claw-like hook for attachment

to host. Vulva near anus. Eggs oval, with terminal opercula and containing embryos when laid.

Hab. Stomach and mouth-cavity of Amphibia and Chelonia.

Genotype: *H. androphora* Nitzsch, 1821.

Nitzsch, 1821, *Allg. Encycl. Wiss. Künste (Ersch & Gruber)*, Leipzig, i, 48; Chandler, 1919, *Journ. Parasitol.*, v, 117.

9. *Desmidocerca* Skrjabin, 1916.

Small forms with inconspicuous lips and, apparently, a cuticular ring somewhat resembling that seen in *Spirura*, especially prominent laterally. A slender buccal capsule present. Oesophagus extremely long. Tail of both sexes bluntly rounded, furnished with a group of small spines or processes at its tip. Spicules unequal. No caudal papillae observed. Vulva in posterior region of body.

Hab. Air-sacs of aquatic Birds.

Genotype: *D. aërophila* Skrjabin, 1916.

Skrjabin, 1916, *Ann. Mus. Zool.*, Petrograd, xx, 530; Seurat, 1920, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, xi, 9.

Seurat (1920) has suggested that *Desmidocerca* ought to be considered as a Filariid. We feel that the position of the vulva and the presence of a buccal capsule indicate the relationship of this genus to the Spiruridae. As Skrjabin has pointed out, this is an adult form retaining larval characters. The spines at the tip of the tail closely resemble those seen in the larvae of *Habronema* and other Spirurid genera.

Subfam. 2. **ARDUENNINAE** Railliet & Henry, 1911.

Lips not prominent, but trilobed. Dorsal and ventral cuticular shields absent. Buccal capsule or pharynx typically with annular or spiral thickenings in its walls. Asymmetry frequently present in cervical and caudal alae, and in caudal papillae and other structures of male. Four pairs of preanal and one or two pairs of large postanal papillae present. An accessory piece present.

1. *Arduenna* Railliet & Henry, 1911.

A cervical ala present on the left side only. Lips trilobed. Two lateral teeth in the oral cavity. Buccal capsule with spiral cuticular ridges in its wall. Tail of male with asymmetrical alae. Four pairs of preanal and one pair of postanal pedunculate papillae present. Cloaca surrounded by a serrate cuticular thickening. Spicules very unequal.

Hab. Adults in stomach of Suidae. Larvae in coprophagous Beetles.

Genotype : *A. [Spiroptera] strongylina* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 23, 237; Railliet & Henry, 1911, *Bull. Soc. Path. exot.*, Paris, iv, 695; Foster, 1912, *U.S. Dept. Agric., Bur. Anim. Ind. Bull.* 158, 9.

2. *Simondsia* Cobbold, 1864.

Lateral cervical alae present. Lips inconspicuous. Within the opening of the mouth a large dorsal and a large ventral tooth. Buccal capsule long, cylindrical, with spiral thickenings in its wall. Tail of male short. Four pairs of preanal and one pair of postanal papillae present. Spicules very unequal. Body of gravid female enlarged posteriorly into a subspherical sac enclosing the uterus and a portion of the intestine.

Hab. Stomach of Suidae.

Genotype : *S. paradoxa* Cobbold, 1864.

Cobbold, 1864, *Entozoa*, London, 79; Piana, 1897, *Atti. Soc. Ital. Sci. Nat.*, Milan, xxxvii, 17.

3. *Physocephalus* Diesing, 1861.

Syn. *Leiuris* Leuckart, 1850 (?); *Cephalacanthus* Diesing, 1853, *e. p.*; *Mastophorus* Diesing, 1853, *e. p.*

Cuticle of anterior extremity inflated. Three lateral alae on each side. Lips trilobed. Oral cavity small, without teeth. Buccal capsule voluminous, with spiral and annular thickenings in its wall. Tail of male with narrow symmetrical alae. Four pairs of preanal papillae present. Spicules unequal. Vulva in posterior half of body.

Hab. Adults in stomach of Mammals. Larvae in coprophagous Beetles.

Genotype : *P. [Spiroptera] sexalatus* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xxxviii, 957; Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 619, 686; Foster, 1912, *U.S. Dept. Agric., Bur. Anim. Ind. Bull.* 158; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 218.

4. *Spirocerca* Railliet & Henry, 1911.

Lips trilobed, reduced. Within the opening of the mouth six small papillae. Buccal capsule short, expanded anteriorly, without special thickenings. Tail of male with narrow alae. Four pairs of preanal, two pairs of large postanal papillae and a group of small papillae near the tip of the tail. Vulva in anterior region of body.

Hab. Adults in stomach and oesophagus of Carnivores.
Larvae in coprophagous Beetles.

Genotype: *S. [Spiroptera] sanguinolenta* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 27, 249; Railliet & Henry, 1911, *Bull. Soc. Path. exot.*, Paris, iv, 695; Dujardin, 1845, *Histoire naturelle des Helminthes*, Paris, 88, 278; Baillet, 1866, *Histoire Naturelle des principaux Mammifères domestiques*, Paris, 44; Baylis, 1923, *Trans. Soc. Trop. Med. Hyg.*, London, xvi, 492.

5. *Cylicospirura* Vevers, 1923.

Differs from *Spirocerca* in having six bicuspid teeth at the entrance to the buccal capsule.

Hab. Stomach of Carnivores.

Genotype: *C. [Spiroptera] subaequalis* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xxxviii, 921; Vevers, 1923, *Proc. Zool. Soc.*, London, 909.

6. *Streptopharagus* Blanc, 1912.

A single cervical ala may be present on the left side. Lips trilobed, very much reduced. Within the opening of the mouth six cuticular teeth which may be simple or complex. Buccal capsule elongate, with irregular transverse ridges in its wall, and forming a half-turn of a spiral in its course. Two additional teeth at the anterior end of the buccal capsule. Tail of male with broad alae. Four pairs of preanal and one pair of postanal pedunculate papillae present, and a group of small sessile papillae near the tip of the tail. Cloaca sometimes partially surrounded by a fringe of cuticular processes. Spicules very unequal and dissimilar. A small accessory piece present. Vulva in anterior half of body.

Hab. Stomach of mammals.

Genotype: *S. armatus* Blanc, 1912.

Blanc, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxii, 456; Seurat, 1917, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, viii, 21; 1918, *Arch. Inst. Past. Tunis*, x, 265; Baylis, 1923, *Trans. Soc. Trop. Med. Hyg.*, London, xxi, 487.

7. *Gongylonema* Molin, 1857.

Syn. *Myzomimus* Stiles, 1892.

Lips inconspicuous. A short pharynx present. Anterior portion of body with irregular longitudinal rows of cuticular bosses, at least on the left side. Cervical alae present, at least on the left side. Tail of male with asymmetrical alae. A variable number of pairs of preanal and postanal pedunculate

papillae present. Spicules very unequal. An accessory piece present. Vulva towards the posterior end of the body.

Hab. Adults in mouth, oesophagus, or stomach of Mammals, or crop of Birds, in galleries in the thickness of the mucous membrane. Larvae in Cockroaches and coprophagous Beetles.

Genotype: *G. [Filaria] musculi* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 8; Molin, 1857, *Atti. Ist. Veneto di Sci., Lett. ed Arti*, ii, 146, 216; Hall, 1916, *Proc. U.S. Nat. Mus.* 1, 191; Baylis, 1925, *Journ. Comp. Path. Ther.*, Edinburgh, xxxviii, 46.

Hall (1916) has proposed a subfamily Gongyloneminae to include only *Gongylonema*. We consider the formation of a separate subfamily for this genus unnecessary at present. *Gongylonema* can quite conveniently be appended to the subfamily Arduenninae.

Subfam. 3. **ACUARIINAE** Railliet, Henry & Sisoff, 1912.

Lips conical and quite distinct, but very small. Anterior end provided with "cordons," "epaulettes" or other homologous cuticular structures. Buccal capsule thin-walled, without thickenings. Typically four pairs of preanal papillae in the male. No accessory piece.

1. *Acuaria* Bremser, 1811.

Syn. *Anthuris* Rudolphi, 1819; *Spiroptera* Rudolphi, 1819; *Dispharagus* Dujardin, 1845.

Anterior end without vesicular swelling, but bearing four cuticular "cordons" in the form of grooves or bands salient from, or counter sunk in, the cuticle. The cordons extend sometimes directly backwards or, more often, return forwards. They may be joined in pairs across the lateral lines.

Hab. Oesophagus, crop or gizzard (free or in wall) of Birds.

Genotype: *A. [Spiroptera] anthuris* (Rudolphi, 1819).

Bremser, 1811, *Nachricht von einer betrachtlichen Sammlung thierischer Eingeweidewürmer*, Vienna, 11, *et passim*; Rudolphi, 1819, *Entozoorum Synopsis*, 25, 243; Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 622; Baylis & Daubney, 1922; *Mem. Ind. Mus.*, vii, 321.

This genus includes, in our view (1922, 321), eight subgenera, as follows:—

Subgen. 1a. *Acuaria* Bremser, 1811, *emend.* Railliet, Henry & Sisoff, 1912.

"Cordons" run straight posteriorly, being non-recurrent and not anastomosed. Six to eight pairs of postanal papillae in the male. Spicules short, thick and subequal.

Type-species: *A. (A.) [Spiroptera] anthuris* (Rudolphi, 1819).

Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 622; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 321.

Subgen. 1b. *Cheilospirura* (Diesing, 1861) Railliet, Henry & Sisoff, 1912.

“Cordons” run straight posteriorly, being non-recurrent and not anastomosed. Five to seven pairs of postanal papillae in the male. Spicules very unequal and dissimilar.

Type-species: *A. (C.) [Spiroptera] hamulosa* (Diesing, 1851).

Diesing, 1851, *Systema Helminthum*, ii, 217; 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 618, 683; Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 622; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 321.

Subgen. 1c. *Dispharynx* Railliet, Henry & Sisoff, 1912.

“Cordons” recurrent, not anastomosed. Usually five pairs of postanal papillae in the male. Spicules unequal and dissimilar.

Type-species: *A. (D.) [Spiroptera] nasuta* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 23, 238; Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 623-4; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 321.

Subgen. 1d. *Synhimantus* Railliet, Henry & Sisoff, 1912.

“Cordons” recurrent and anastomosed across the lateral lines. Usually five pairs of postanal papillae in the male. Spicules unequal and dissimilar.

Type-species: *A. (S.) [Spiroptera] laticeps* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 23, 238; Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 623-4; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 321.

Subgen. 1e. *Cosmocephalus* Molin, 1858.

“Cordons” sinuous, recurrent and anastomosed across the lateral lines. Extensive lateral alae present. Usually five pairs of postanal papillae in the male. Spicules very unequal.

Type-species: *A. (C.) [Cosmocephalus] diesingii* Molin, 1858.

Molin, 1858, *Sitz. k. Akad. Wiss.*, Wien, xxviii, 151-2; Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 622; Seurat, 1919, *Novit. Zool.*, London, xxvi, 186; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 320-1.

The only character that serves to separate Molin's genus *Cosmocephalus* from the subgenus *Synhimantus* is the presence of lateral alae. We consider, therefore, that it should be included here as a subgenus of *Acuaria*.

Subgen. 1f. *Echinuria* Soloviev, 1912.

Syn. *Hamannia* Railliet, Henry & Sisoff, 1912.

“Cordons” non-recurrent, but anastomosed in pairs. Body sometimes spiny. Four or five pairs of postanal papillae in the male. Spicules unequal and dissimilar.

Type-species: *A. (E.) [Echinuria] jugadornata* Soloviev, 1912.

Soloviev, 1912, *Ann. Mus. Zool.*, Petrograd, xvii, 110; Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 623; Seurat, 1919, *Novit. Zool.*, London, xxvi, 179; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 321.

Subgen. 1g. *Rusguniella* Seurat, 1919.

Two crescentic cuticular “epaulettes” at anterior end. Lateral alae present, extending from behind the epaulettes. Male unknown.

Type-species: *A. (R.) [Spiroptera] elongata* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 26, 246; Seurat, 1919, *Novit. Zool.*, London, xxvi, 184; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 321.

Subgen. 1h. *Seurattia* Skrjabin, 1916.

Syn. *Prionostemma* Gendre, 1921, *e. p.*

Two crescentic cuticular “epaulettes” at anterior end, with denticulate free edges. Two double rows of spines also present on the body. Spicules unequal.

Type-species: *A. (S.) [Gnathostoma] shipleyi* (Stossich, 1900) (= *Rictularia paradoxa* v. Linstow, 1903 = *Acuaria pelagica* Seurat, 1916).

Stossich, 1900, *Boll. Soc. Adriat. Sci. nat.*, Trieste, xx, 1; v. Linstow, 1903, *Ann. Mus. Zool. St. Petersb.*, viii, 272; Seurat, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 785; Skrjabin, 1916, *Compt. rend. Soc. Biol.*, Paris, lxxix, 973; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 321.

2. *Chevreuxia* Seurat, 1918.

Anterior end with four cuticular “cordons” which are non-recurrent but anastomosed in pairs across the lateral fields. Cuticle in front of cervical papillae raised into a deep conical collar or vesicular swelling. Five pairs of postanal papillae in the male. Spicules very unequal.

Hab. In galleries between coats of gizzard of a Charadriiform bird (one species known).

Genotype: *C. [Spiroptera] revoluta* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 26, 247; Seurat, 1918, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, ix, 106.

3. *Streptocara* Railliet, Henry & Sisoff, 1912.

Syn. *Yseria* Gedoelst, 1919; *Prionostemma* Gendre, 1921, *e. p.*

Anterior end surrounded by a cuticular collar with denticulate or festooned border. Five or six pairs of postanal papillae in the male. Spicules very unequal, the longer provided distally with one or two recurrent hooks.

Hab. Beneath lining of gizzard of Birds (chiefly fish-eating).
Genotype: *S. [Spiroptera] pectinifera* (Neumann, 1900).

Neumann, 1900, *Rev. vét.*, Toulouse, xxv, 513-515; Railliet, Henry & Sisoff, 1912, *Compt. rend. Soc. Biol.*, Paris, lxxiii, 623; Gedoelst, 1919, *Compt. rend. Soc. Biol.*, Paris, lxxxii, 901; Gedoelst & Liégeois, 1922, *Compt. rend. Soc. Biol.*, Paris, lxxxvii, 1237; Travassos, 1920 (?), *Rev. Vet. e Zootech.*, Rio de Janeiro, 67.

Travassos has referred this genus, together with *Schistorophus*, to a subfamily Schistorophinae Travassos, 1918, within the family Acuariidae. We are in agreement with Railliet (1916) and with Skrjabin (1916) in adopting the view that *Schistorophus* is more nearly related to the genera included in the family Thelaziidae, while *Streptocara*, in our view, is referable to the subfamily Acuariinae.

4. *Sciadiocara* Skrjabin, 1916.

Anterior end provided with two lateral pairs of cuticular lappets. Six pairs of preanal and five or more pairs of postanal papillae present in the male. Spicules unequal and dissimilar, the shorter being deeply grooved to form a canal in which the longer glides.

Hab. Beneath lining of gizzard of Birds.

Genotype: *S. [Spiroptera] umbellifera* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xxxviii, 968; Skrjabin, 1916, *Ann. Mus. Zool.*, Petrograd, xx, 519.

APPENDIX TO ACUARIINAE.

5. *Tropisurus* Diesing, 1835.

Syn. *Tetrameres* Creplin, 1846; *Tropidocerca* Diesing, 1851; *Astomum* Schlotthauber, 1860; *Tropidurus* Wiegmann, 1835, *nec* Neuwied, 1824; *Acanthophorus* v. Linstow, 1876; *Microtetrameres* Travassos, 1915.

Lips inconspicuous. A short buccal capsule present. Cuticle of body may be armed with irregular longitudinal rows of spines. Tail of male without alae and with a few pairs of sessile papillae. Spicules unequal. The body of the gravid female is enormously distended by the contents of the uterus,

so that it becomes spindle-shaped or even subglobular. The oesophageal region and the tail remain normal.

Hab. Proventriculus of Birds; males free in lumen, females in nodules in wall.

Genotype: *T. paradoxus* Diesing, 1835.

Diesing, 1835, *Med. Jahrb. k. k. Österr. Staates*, Wien, xvi, 83, 93; Travassos, 1914, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, vi, 155; 1915, *Braz. Med.*, Rio de Janeiro, No. 38, 297; 1919, *Mem. Inst. Oswaldo Cruz*, xi, 71; Skrjabin, 1916, *Ann. Mus. Zool.*, Petrograd, xx, 526.

Travassos (1915) proposes to divide the genus *Tetrameres* into two subgenera, *Tetrameres* and *Microtetrameres*. In the former the male is provided with spines along the lateral lines, while in the latter the spines are absent and the long spicule is of excessive length. This subdivision seems to us to be unnecessary. If it were desired to retain the subgenera, the name *Tetrameres* would have to be changed in accordance with the generic name. The family Tetrameridae, within the Spiruroidea, was proposed by Travassos (1914) for the reception of the genus *Tetrameres*. We have placed this genus in the Spiruridae, but hesitate to create a special subfamily to contain it.

6. *Crassicauda* Leiper & Atkinson, 1914.

Cuticle thick, transversely striated, sometimes raised at one point into a swelling or holdfast. Mouth without lips, but with four submedian papillae and two lateral papillae. The pulp of the lateral papillae divides into two processes, one exterior and the other terminating within the buccal cavity. A buccal capsule present. Mouth and buccal capsule laterally compressed. Oesophagus with a relatively short, feebly-muscular anterior portion and a very long posterior portion which is partly muscular, partly glandular, and may be doubled upon itself several times. Tail of male laterally compressed and spirally coiled, with a ventral groove behind the cloaca, within which on either side there is a somewhat irregular row of papillae. Spicules small and unequal, or absent. Anus terminal in female. Vulva in a constricted portion of the body, just in front of the knob-like posterior extremity. Vagina short. Uterine branches parallel, running forwards. Ova thick-shelled, containing embryos when laid.

Hab. Urino-genital system or, rarely, other parts of the body of Cetacea.

Genotype: *C. [Filaria] crassicauda* (Creplin, 1829) *nec* Leiper and Atkinson, 1914 and 1915.

Creplin, 1829, *Nova Acta Phys.-Med. Acad. Nat. Curios.*, Bonn, xiv, 874; Leiper and Atkinson, 1914, *Proc. Zool. Soc.*,

London, 266; 1915, *Brit. Antarct. ("Terra Nova") Exp.*, 1910, *Nat. Hist. Rep., Zool.*, ii, (3) 29; Baylis, 1920, *Ann. Mag. Nat. Hist.*, London, (9) v, 418; 1922, *Parasitol.*, xiv, 9.

This apparently aberrant genus is placed here on account of its considerable resemblance to *Tropisurus*. It has been treated by some authors as a member of the family Filariidae, but its resemblance to that group is due chiefly to its elongated form. It is definitely excluded from the Filariidae by the position of the vulva.

Subfam. 4. **PHYSALOPTERINAE** Stossich, 1898 (*vide* Stiles & Hassall).

Lips large and entire, with forwardly-projecting teeth and frequently followed by a cuticular collar, which is entire and does not form dorsal and ventral shields. No buccal capsule.

1. **Physaloptera** Rudolphi, 1819.

Syn. *Chlamydonema* Noordhoek Hegt, 1910; *Abreviata* Travassos, 1920; *Leptosoma* Travassos, 1920, *nec* Whitman, 1886; *Turgida* Travassos, 1920.

Each lip armed with a variable number of teeth; typically a large, external, median tooth and three internal teeth. In addition there may be a row of small denticles on the inner surface. Head usually more or less retractile within a sheath of cuticle. Tail of male with swollen lateral alae which are continuous across the ventral surface in front of the cloaca. Four pairs of pedunculate papillae supporting the alae, generally close to the cloaca. A variable number of subventral, sessile papillae; usually three pairs preanal and five pairs postanal. Spicules unequal, subequal or equal. Uterus with two, four or many branches.

Hab. Alimentary canal (generally stomach) of Mammals, Birds and Reptiles, rarely Amphibians.

Genotype: *P. clausa* Rudolphi, 1819.

Rudolphi, 1819, *Entozoorum Synopsis*, 29, 255-6, 643; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 212; Ortlepp, 1923, *Proc. Zool. Soc.*, London (1922), 1004, 1011.

2. **Heliconema** Travassos, 1919.

Head resembles that of *Physaloptera*. Tail of male with broad alae, supported by ten pairs of pedunculate papillae, four of which are preanal and one adanal. Spicules very unequal, the longer filiform and at least ten times as long as the shorter.

Hab. Stomach of a Fish (one species known).

Genotype: *H. heliconema* Travassos, 1919.

Travassos, 1919, *Arch. Mus. Nac.*, Rio di Janeiro, xxii, 165.

3. *Thubunaea* Seurat, 1914.

Each lip armed with three teeth on the inner surface. Tail of male with broad alae, supported by eight pairs of pedunculate papillae, of which four pairs are preanal and four pairs postanal. Five to seven pairs of subventral sessile papillae also present. Spicules short, subequal.

Hab. Stomach of Reptiles (one species known).

Genotype: *T. pudica* Seurat, 1914.

Seurat, 1914, *Compt. rend. Soc. Biol.*, Paris, lxxvi, 724.

4. *Proleptus* Dujardin, 1845.

Syn. *Spiropterina* van Beneden, 1858; *Coronilla* van Beneden, 1870; *Histiocephalus* Molin, 1860, *e. p.*

Anterior end closely resembling that of *Physaloptera*. Each lip with a single median conical tooth on its inner surface. Tail of male with voluminous alae, supported by eight to ten pairs of pedunculate papillae. Spicules unequal.

Hab. Adults in stomach and intestine of Selachians, larvae encapsuled in Decapod Crustacea.

Genotype: *P. acutus* Dujardin, 1845.

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 105; Seurat, 1919, *Bull. Mus. Hist. nat.*, Paris, No. 3, 166; Lloyd, 1920, *Proc. Zool. Soc.*, London, 449.

Although *acutus* is designated by Stiles & Hassall (1905) as the type of this genus, we have taken the characters for the diagnosis largely from *P. obtusus*, the commoner and, at present, better known species.

5. *Ochetocephalus* v. Linstow, 1907.

Head with two conical lateral lips, followed by a collar-like fold of cuticle. Behind this, dorsally and ventrally, there is a pair of longitudinal grooves. Oesophagus long. Tail of male conical, with three pairs of preanal and two pairs of postanal papillae, the two anterior preanal pairs having slender peduncles. Spicules short, broad, equal. Tail of female bluntly rounded, ending in a small spike. Vulva in anterior region of body.

Hab. Body-cavity of Ants (*Camponotus*).

Genotype: *O. javanicus* v. Linstow, 1907.

v. Linstow, 1907, *Notes Leyden Mus.*, xxix, 82.

Subfam. 5. **THELAZIINAE** nov.

(= Fam. Thelaziidae Railliet, 1916.)

Lips inconspicuous. Dorsal and ventral cuticular shields absent. Buccal capsule not well developed, without annular or spiral thickenings in its wall. Tail of male typically with numerous preanal papillae. Accessory piece usually absent.

1. Thelazia Bosc, 1819.

Cuticle with coarse striations, resembling in profile the teeth of a saw. Lips inconspicuous. A buccal capsule present, having its anterior edge turned back and cut into six festoons. Tail of male short, without alae. Preanal papillae numerous, including an unpaired preloacal papilla. Three or four pairs of postanal papillae present. Spicules unequal. Tail of female bluntly rounded. Vulva in anterior region of body. Uterine branches parallel, running posteriorly. Viviparous.

Hab. Lachrymal canals of Birds and Mammals.

Genotype: *T.* [*Thelazius*] *rhodesii* (Desmarests, 1828).

Bosc, 1819, *Journ. Phys.*, etc., Paris, lxxxviii, 215; Desmarests, 1828, *Veterinarian*, London, i, 79; Railliet & Henry, 1910, *Compt. rend. Soc. Biol.*, Paris, lxxviii, 213; Railliet, 1916, *Journ. Parasitol.*, ii, 99.

2. Rhabdochona Railliet, 1916.

Syn. *Pseudancyracanthus* Skrjabin, 1923, *e. p.*; ? *Ichthyospirura* Skrjabin, 1917.

Lips small. Buccal cavity funnel-shaped anteriorly, and supported in this region by longitudinal ribs, which project as teeth anteriorly. Tail of male conical, without alae. Numerous preanal and five or six pairs of postanal papillae present. Spicules unequal. Vulva in middle region of body. Uterine branches opposed.

Hab. Intestine of fresh-water Fishes.

Genotype: *R.* [*Dispharagus*] *denudata* (Dujardin, 1845).

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 81; Railliet, 1916, *Journ. Parasitol.*, ii, 104; Gendre, 1922, *Proc. verb. Soc. Linn. Bordeaux*, lxxiii, 148.

3. Oxyspirura v. Drasche, in Stossich, 1897.

Lips inconspicuous. Mouth surrounded by a small cuticular ring. A short buccal capsule present. Cervical alae may be present. Tail of male laterally compressed, without alae. A very variable number of sessile papillae present, often asymmetrical. Preanal papillae sometimes absent. Spicules very unequal. Vulva in posterior region of body.

Hab. Orbital cavity of Birds.

Genotype : *O. [Spiroptera] cephaloptera* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xxxviii, 956; v. Drasche, in Stossich, 1897, *Filarie e Spiroptere. Lavoro Monografico*, Trieste, 123; Railliet, 1916, *Journ. Parasitol.*, ii, 104; Skrjabin, 1916, *Ann. Mus. Zool.*, Petrograd, 529; 1916, *Journ. Russe Zool.*, i, 720, 744.

4. *Cystidicola* Fischer v. Waldheim, 1798.

Syn. *Ophiostoma* Rudolphi, 1801; *Fissula* Lamarck, 1801; *Ophiostomum* Creplin, 1839; *Pseudancyracanthus* Skrjabin, 1923, *e. p.*

Lips small and pointed. A cylindrical buccal capsule present. Tail of male rounded, with narrow alae. Numerous double preanal papillae, and four or five pairs of postanal papillae present. Spicules very unequal. Tail of female blunt. Vulva in middle or anterior region. Uterine branches opposed.

Hab. Swim-bladder [rarely vascular system or oesophagus] of fresh-water Fishes.

Genotype : *C. farionis* Fischer, 1798.

Fischer von Waldheim, 1798, *Journ. Phys.*, etc., Paris, iv, 306; 1798, *Bull. sci. Soc. philom.*, Paris, ii, 98; 1799, *Arch. Physiol.*, Halle, iii, 95; Leiper, 1908, *Parasitol.*, i, 193; Railliet, 1916, *Journ. Parasitol.*, ii, 103.

5. *Ceratospira* Schneider, 1866.

Lips inconspicuous. A short buccal capsule present. Tail of male very short and blunt, with broad alae. Nine to eleven pairs of preanal papillae present. Spicules very unequal. Tail of female short and blunt. Vulva in anterior region of body. Oviparous or viviparous.

Hab. Orbital cavity of Birds.

Genotype : *C. vesiculosa* Schneider, 1866.

Schneider, 1866, *Monographie der Nematoden*, Berlin, 29, 108; Railliet, 1916, *Journ. Parasitol.*, ii, 99.

6. *Viguiera* Scurat, 1913.

Anterior end covered by a circular disc with a freely projecting border. Buccal capsule cylindrical. Lateral alae absent. Tail of male with broad, asymmetrical alae. Preanal papillae asymmetrical (nine on the left side, seven on the right). Two pairs of postanal papillae present, relatively close to the cloaca. Spicules very unequal. No accessory piece. Tail of female conical. Vulva close to anus. Uterine branches parallel.

Hab. Between coats of proventriculus of Birds.

Genotype : *V. [Spiroptera] euryoptera* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 26, 248; Seurat, 1913, *Bull. Soc. Hist. nat. Afrique du Nord*, Alger, v, 223; Gendre, 1922, *Proc.-verb. Soc. Linn. Bordeaux*, lxxiii, 132.

7. *Schistorophus* Railliet, 1916.

Syn. *Tetracanthus* Hemprich & Ehrenberg, in Schneider, 1866, *nec* Hope, 1835.

Lips produced posteriorly into two lateral cuticular flanges, which are drawn out dorsally and ventrally into long points. A buccal capsule present. Tail of male with lateral alae and numerous preanal papillae. Spicules unequal. Vulva in middle or posterior region of body.

Hab. Beneath lining of gizzard of Birds.

Genotype : *S. [Ancyracanthus] longicornis* (Hemprich & Ehrenberg, in Schneider, 1866).

Hemprich & Ehrenberg, in Schneider, 1866, *Monographie der Nematoden*, Berlin, 104; Railliet, 1916, *Journ. Parasitol.*, ii, 102; Skrjabin, 1916, *Ann. Mus. Zool.*, Petrograd, xx, 524.

8. *Serticeps* Railliet, 1916.

Lips inconspicuous. Head ornamented with many and variable appendages or festoons. Tail of male blunt, with asymmetrical caudal alae and ten pairs of preanal papillae. Spicules very unequal. Vulva near anus.

Hab. Between coats of gizzard of a Bird (one species known).

Genotype : *S. [Spiroptera] vulvoinflatus* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xxxviii, 969; Railliet, 1916, *Journ. Parasitol.*, ii, 103.

APPENDIX TO THELAZIINAE.

We place here several forms whose relationships are very uncertain. It is possible that the presence in all these genera of an external armature of spines has led to their being erroneously classified together by a number of authors, and that in reality they are not at all closely related to each other. The peculiar form of the buccal capsule in *Rictularia* has not unnaturally suggested Strongyloid affinities, and Hall has even referred this genus and *Rictularioides* to a subfamily Rictulariinae of the family Metastrongylidae. We feel, however, that the general characters of *Rictularia* indicate Spirurid relationships, and the Thelaziinae appear to be the group to which it approaches most closely.

9. *Spinitectus* Fourment, 1883.

Body armed with transverse rings, closer together anteriorly, bearing backwardly-directed spines. Head retractile. Lips small and pointed. A short buccal capsule present. Tail of male bluntly rounded, with narrow alae. Caudal papillae in one species four pairs preanal and five or six pairs postanal; in another species papillae said to be absent. (Male of genotype unknown). "Denticulate crests" sometimes present in front of the cloaca. Spicules very unequal. Vulva in middle or posterior region of body. Uterine branches opposed. Eggs in genotype with polar filaments.

Hab. Alimentary canal of Fishes.

Genotype: *S. oviflagellis* Fourment, 1883.

Fourment, 1883, *Compt. rend. Soc. Biol.*, Paris, xxxv, 578; 1884, *Ann. Sci. nat.*, Paris, Zool., xvii, 1; Railliet & Henry, 1915, *Bull. Soc. Path. exot.*, Paris, viii, 274; Ward & Magath, 1917, *Journ. Parasitol.*, iii, 61.

In the absence of a full description of the genotype the position of this genus remains doubtful.

10. *Rictularia* Frölich, 1802.

Syn. *Laphyctes* Dujardin, 1845; *Pterygodermatites* Wedl, 1861.

Cuticle of body armed on each side with two longitudinal subventral rows of large, flattened, comb-like spines, at least in the anterior region, the spines becoming scarcer and diminishing in size posteriorly. Mouth subterminal, opening dorsally by a transversely elongated aperture bordered by small denticles. A small, well-chitinized buccal capsule present, armed at its base with teeth and spines. Oesophagus simple, slightly club-shaped. Caudal end of male conical, with or without somewhat bursa-like alae. Several pairs of preanal and postanal papillae present. Spicules short, equal or unequal. An accessory piece present. Vulva near the posterior end of the oesophagus. Uterine branches parallel, running posteriorly. Oviparous. Eggs contain embryos when laid.

Hab. Small intestine of Carnivores, Bats and Rodents. A single species recorded from a Lizard.

Genotype: *R. cristata* Frölich, 1802.

Frölich, 1802, *Naturforscher*, Halle, xxix, 7; Jägerskiöld, 1909, *Res. Swed. Zool. Exp. Egypt*, No. 25, 41; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 168.

11. *Rictularioides* Hall, 1916.

Mouth terminal, surrounded by four conical anterior projections, united in pairs by membranes so as to form two

lips. Male unknown. Body of female tapering anteriorly, thickened posteriorly, rounded behind, with a terminal caudal spike. Cuticle bears three longitudinal series of large, posteriorly-directed hooks. Internal anatomy undescribed.

Hab. Small intestine of a Rodent (one species known).

Genotype: *R. [Ophiostomum] amphiacanthum* (Diesing, 1851).

Diesing, 1851, *Systema Helminthum*, ii, 246; v. Drasche, 1883, *Verh. k. k. Zool.-bot. Ges.*, Wien, xxxii, 123; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 175.

12. *Pneumonema* Johnston, 1916.

Anterior end curved slightly dorsally. Lips trilobed. Buccal capsule greatly reduced or absent. Two successive pairs of short cervical alae present, followed on each side by two longitudinal rows of backwardly-directed, thorn-like spines, extending backwards for about one-third of the length of the body, the spines becoming smaller posteriorly. Oesophagus with a short, anterior, muscular portion and a longer, glandular posterior portion. Male unknown. Tail of female tapering. Vulva near the middle of the body. Uterine branches opposed. Oviparous. Eggs thin-shelled, containing embryos when laid.

Hab. Lungs of a Lizard (*Tiliqua*).

Genotype: *P. tiliquae* Johnston, 1916.

Breinl, 1913, *Rep. Austr. Inst. Trop. Med.* (1911), 39-46; Johnston, 1916, *Proc. Roy. Soc. Queensland*, Brisbane, xxviii, 58; and 1918, xxx, 214; Yorke & Maplestone, 1926, *The Nematode Parasites of Vertebrates*, London, 346.

13. *Echinonema* v. Linstow, 1898.

Syn. *Hoplocephalus* v. Linstow, 1898, *nec* Cuvier, 1829.

Cuticle of head somewhat dilated, bearing three circles of long, posteriorly-directed spines. Cuticle of body, in anterior region, also bears numerous spines, arranged in transverse rings and also forming longitudinal rows, and decreasing in size posteriorly. Mouth subterminal. Buccal cavity greatly reduced. Oesophagus relatively short, not distinctly divided into two portions. Tail of male short, conical, without caudal alae. Three pairs of preanal and three of postanal, sessile, subventral papillae, and a more lateral pair at the level of the cloaca. There is also a group of very small papillae near the tip of the tail. Spicules equal, simple, tubular. An accessory piece present. Tail of female pointed. Vulva at about the anterior third or fourth of the body. Oviparous. Eggs spherical, containing embryos when laid.

Hab. Small intestine of a Marsupial (*Perameles*).

Genotype : *E. [Hoplocephalus] cinctum* (v. Linstow, 1898).

v. Linstow, 1898, *Denkschr. med.-nat. Ges. Jena*, (12) viii, 469; 1898, *Zool. Centralbl.*, v, 672; Yorke & Maplestone, 1926, *The Nematode Parasites of Vertebrates*, London, 347.

APPENDIX TO SPIRURIDAE.

a. *Oslerus* Hall, 1921.

Lips very inconspicuous. Structure of anterior end not definitely known. Two unequal spicules present. Tail of female rounded. Vulva near anus. Ovoviviparous.

Hab. Air-passages of Canidae (one species known).

Genotype : *O. [Filaria] osleri* (Cobbold, 1879).

Cobbold, 1879, *Parasites*, London, 304; Hall, 1921, *Proc. U.S. Nat. Mus.*, lix, 541.

This genus is very imperfectly known. Hall (1921) has suggested that it belongs to the Spiruridae, and is more or less closely related to *Gongylonema*. This opinion appears to be based on the position of the vulva.

b. *Ascarops* van Beneden, 1873.

This name was given by van Beneden to a larval worm, *A. minuta* van Beneden, found encapsuled in the stomach-wall of a Bat. The worm was subsequently referred by von Linstow to *Spiroptera*, and appears to be a larval Spirurid.

van Beneden, 1873, *Mém. Acad. Roy. Sci. Belg.*, xl, 22; v. Linstow, 1873, *Compendium der Helminthologie*, 13; 1909, in Brauer, *Süsswasserfauna Deutschlands*, Heft 15, 65.

c. *Cephalacanthus* Diesing, 1853, *nec* Lacépède, 1802.

The two species referred to this genus by Diesing are larval Spiruridae, one of them being, according to Seurat, the larva of *Protospirura muris*, the other probably that of *Physocephalus sexalatus*.

Diesing, 1853, *Sitz. k. Akad. Wiss.*, Wien, x, 34; Seurat, 1916, *Bull. Sci. France et Belg.*, (7) xlix, 354.

d. *Mastophorus* Diesing, 1853.

The two forms referred to this genus by Diesing are apparently larval Spiruridae. One of them, according to Seurat, is the larva of *Protospirura muris*, the other perhaps that of *Physocephalus sexalatus*.

Diesing, 1853, *Sitz. k. Akad. Wiss.*, Wien, x, 34; Seurat, 1916, *Bull. Sci. France et Belg.*, (7) xlix, 358.

Fam. 4. CAMALLANIDAE Raillet & Henry, 1915.

Lips absent. Mouth a dorso-ventral slit. A large buccal capsule present, whose wall is either separated into two lateral scallop-shell-like valves or is continuous. Tail of male alate. Spicules unequal and dissimilar. Vulva prominent, in middle region of body. Vagina runs posteriorly from the vulva. Uterine branches opposed; the posterior branch ending blindly, without an ovary.

1. *Camallanus* Raillet & Henry, 1915.

Syn. *Cucullanus* auett., nec Müller, 1777.

Buccal valves paired, simple, with longitudinal rib-like thickenings internally. A chitinous ring at the junction of the buccal valves and the oesophagus, and opposite to the dorsal and ventral edges of the valves a pair of trident-shaped chitinous structures. Right spicule filiform. Accessory piece absent. Lips of vulva prominent, but not forming a tubular appendage.

Hab. Alimentary canal of Reptiles, Amphibians and Fishes.

Genotype: *C. [Echinorhynchus] lacustris* (Zoega, in Müller, 1777) (= *Cucullanus elegans* Zeder, 1800).

Zoega, in Müller, 1777, *Zoologiae Danicae Prodrömus*, 214; Zeder, 1800, *Erster Nachtrag zur Naturg. d. Eingeweidewürmer*, 91; Magath, 1919, *Trans. Amer. Microsc. Soc.*, xxxviii, 139; Raillet & Henry, 1915, *Bull. Soc. Path. exot.*, Paris, viii, 446; Baylis, 1923, *Parasitol.*, xv, 30.

2. *Camallanides* Baylis & Daubney, 1922.

Buccal valves as in *Camallanus*, but each with two large swellings externally. Trident-shaped structures reduced to simple rods. Right spicule alate. An accessory piece present. Vulva carried on a tubular appendage.

Hab. Alimentary canal of Snakes (one species known).

Genotype: *C. prashadi* Baylis & Daubney, 1922.

Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 325; Baylis, 1923, *Parasitol.*, xv, 34.

3. *Procamallanus* Baylis, 1923.

Buccal armature a continuous chitinous capsule, not separated into paired lateral valves. Its wall may be smooth or provided with spiral thickenings internally. No accessory piece. Vulva with prominent anterior lip.

Hab. Alimentary canal of Siluroid fishes.

Genotype: *P. [Cucullanus] laeviconchus* (Wedl, 1862).

Wedl, 1862, *Sitz. k. Akad. Wiss.*, Wien, xvi, 463; Baylis, 1923, *Parasitol.*, xv, 26, 137.

Fam. 5. CUCULLANIDAE (s.s.) Barreto, 1916.

Lips large. Mouth a dorso-ventral slit. Oesophagus in two portions, but without a distinct glandular portion, and usually dilated anteriorly to form a large, muscular "false buccal cavity," without a chitinoid lining. Spicules equal. An accessory piece usually present. A preanal sucker-like organ typically present in the male. Vulva in middle region of body, or posterior. Vagina runs forward from vulva.

1. *Cucullanus* Müller, 1777.

Syn. *Pleurorinchus* Nau, 1787; *Pleurorhynchus* Rudolphi, 1801; *Dacnitis* Dujardin, 1845; *Stelmus* Dujardin, 1845; *Dichelyne* Jägerskiöld, 1902; *Bulbodacnitis* Lane, 1916; *Serradacnitis* Lane, 1916.

Anterior end usually bent dorsally. Lips with denticulate border. Preanal "sucker" of male small and fusiform. Caudal alae rudimentary or absent. Vulva very prominent, in posterior half of body.

Hab. Alimentary canal of Fishes and Turtles.

Genotype: *C. cirratus* Müller, 1777.

Müller, 1777, *Zoologiae Danicae Prodrromus*, i, 4; Railliet & Henry, 1915, *Bull. Soc. Path. exot.*, Paris, viii, 446; Barreto, 1922, *Mem. Inst. Oswaldo Cruz*, Rio de Janeiro, xiv, 69; Baylis, 1923, *Parasitol.*, xv, 33; 1923, *Ann. Mag. Nat. Hist.*, xii, 233.

The genus *Serradacnitis* Lane differs only from *Cucullanus* in possessing "cuticular serration distinct from and in addition to cuticular striation." *Bulbodacnitis* Lane is defined as "possessing a node or tubercle on the dorsal aspect of the head" (Lane, 1916, *Ind. Journ. Med. Res.*, iv, 97). We do not consider that the characters mentioned warrant the retention of these genera.

2. *Dacnitoides* Ward & Magath, 1917.

Differs from *Cucullanus* in having no accessory piece, in the form of the uterus and in the presence of an intestinal caecum. The posterior uterine branch ends blindly (as in the family Camallanidae) and is without an ovary.

Hab. Intestine of fresh-water Fishes.

Genotype: *D. cotylophora* Ward & Magath, 1917.

Ward & Magath, 1917 (1916), *Journ. Parasitol.*, iii, 60; Baylis, 1923, *Parasitol.*, xv, 31.

3. *Seuratum* Hall, 1916.

Syn. *Ophistomum* Creplin, 1839, of Seurat, 1915.

Mouth with two lips. No oesophageal bulb. Tail of male with narrow alae. Spicules short, equal or subequal. An

accessory piece present. Four pairs of preanal and six pairs of postanal papillae present. Vulva in middle region of body. Uterine branches opposed. Eggs contain embryos when laid.

Hab. Intestine of a Rodent (one species known).

Genotype: *S. [Ophiostomum] tacapense* (Seurat, 1915).

Seurat, 1915, *Compt. rend. Soc. Biol.*, Paris, lxxviii, 20; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 62; Baylis, 1923, *Parasitol.*, xv, 32.

Hall (1916) has suggested a subfamily Seuratinae for the reception of *Seuratium*. He considers that this subfamily should be included in the Heterakidae, although admitting that the affinities of the genus are perhaps closer with *Dacnitis*, now recognised as a synonym of *Cucullanus*. It differs from *Cucullanus* in the absence of a sucker-like organ in the male, and in the absence of a marked dilatation of the anterior end of the oesophagus. It is, however, insufficiently described.

Fam. 6. GNATHOSTOMIDAE Railliet, 1895.

Lips large, trilobed, having the cuticle of their inner surfaces thickened and usually raised into longitudinal tooth-like ridges which meet or interlock. Vagina runs forward from vulva. Two or four uterine branches. Eggs with thin shells, ornamented with fine granulations.

Subfam. 1. GNATHOSTOMINAE Baylis & Lane, 1920.

Lips followed by a cuticular head-bulb provided either with marked transverse striations or with rows of backwardly-directed hooks, and containing four membranous submedian "ballonets," the cavity of each of which is in communication with one of four elongated, blind cervical sacs.

1. *Gnathostoma* Owen, 1836.

Syn. *Cheiracanthus* Diesing, 1838.

Head-bulb armed with simple hooks, and showing no external evidence of the presence of the "ballonets." No cuticular collar behind the head-bulb. Body with cuticular spines, anteriorly scale-like, with their free edges dentate, and posteriorly becoming less subdivided until finally they appear as simple spines or disappear altogether. Tail of male with four pairs of large lateral and two pairs of small ventral papillae. Spicules unequal. Vulva behind middle of body. Two uterine branches.

Hab. Gastric wall of Mammals (usually of Carnivores).

Genotype: *G. spinigerum* Owen, 1836.

Owen, 1836, *Proc. Zool. Soc.*, London, 123; Diesing, 1838, *Ber. Versamml. deutsch. Naturf. u. Aerzte in Prag*, 189; 1839, *Ann. Wien. Mus. Naturg.*, ii, 222; Baylis & Lane, 1920, *Proc. Zool. Soc.*, London, 292.

2. *Echinocephalus* Molin, 1858.

Head-bulb armed with transverse rows of hooks. No external evidence of "ballonets." Body unarmed. No cuticular collar behind the head-bulb. Tail of male slightly alate. Eight pairs of caudal papillae present, the most anterior pair always separated by a long interval from the rest. Spicules slightly unequal. Vulva near posterior end of body. Two uterine branches.

Hab. Intestine (usually in spiral valve region) of Elasmobranch Fishes.

Genotype: *E. uncinatus* Molin, 1858, *emend.* Baylis & Lane, 1920.

Molin, 1858, *Sitz. k. Akad. Wiss.*, Wien, xxviii, 154; v. Linstow, in Shipley & Hornell, 1904, *Rep. Ceylon Pearl Oyster Fisheries*, Royal Society, London, 100; Shipley & Hornell, 1905, *op. cit.*, 54; Baylis & Lane, 1920, *Proc. Zool. Soc.*, London, 275.

3. *Tanqua* R. Blanchard, 1904.

Syn. *Ctenocephalus* v. Linstow, 1904, *nec* Kolenati, 1857; *Tetradenos* v. Linstow, 1904; *Anomala* Travassos, 1920.

Head-bulb coarsely striated transversely, unarmed. Two or four "ballonets," visible externally. Body unarmed. A cuticular collar present behind the head-bulb. Tail of male with well-developed alae. Eight pairs of caudal papillae present, some of which have large swellings on their pulps. Spicules equal. Vulva in posterior half of body. Either two opposed uterine branches, or three anterior and one posterior.

Hab. Stomach of semi-aquatic Lizards and Snakes.

Genotype: *T. [Ascaris] tiara* (v. Linstow, 1879).

v. Linstow, 1879, *Jahresh. Ver. Vater. Naturk. in Wurttemb.*, Stuttgart, xxxv, 320; R. Blanchard, 1904, *Arch. Parasitol.*, Paris, viii, 478; Baylis & Lane, 1920, *Proc. Zool. Soc.*, London, 258.

Subfam. 2. SPIROXYINAE Baylis & Lane, 1920.

No head-bulb, "ballonets" or cervical sacs. Lips wide, with narrowed base and trefoil-shaped pulp. The thickened portion of the internal cuticle of each lip projects anteriorly as a sharp tooth.

1. *Spiroxys* Schneider, 1866.

Lips wide, with thickened internal cuticle and a sharp anteriorly directed tooth. Cuticular collar rudimentary or absent. Body unarmed. Tail of male alate, with a preanal vesicular swelling and sometimes a preanal sucker-like depression. Eleven pairs of caudal papillae present, of which four are preanal. Spicules subequal. Vulva in middle region of body. Two opposed uterine branches.

Hab. Stomach of Tortoises.

Genotype: *S.* [*Spiroptera*] *contorta* (Rudolphi, 1819).

Rudolphi, 1819, *Entozoorum Synopsis*, 25, 242; Schneider, 1866, *Monographie der Nematoden*, 125; Baylis & Lane, 1920, *Proc. Zool. Soc.*, London, 248; Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 328.

APPENDIX TO GNATHOSTOMIDAE.

The following imperfectly-known genera are provisionally referred to this family.

a. *Ancyracanthus* Diesing, 1838.

Two lateral lips, each bearing a pair of pinnate appendages. Each appendage is connected with an internal cervical sac. Tail of male with two pairs of large preanal and one pair of small postanal papillae. Spicules long, equal.

Hab. Alimentary canal of Tortoises.

Genotype: *A. pectinatus* Diesing, 1838 (= *A. pinnatifidus* Diesing, 1839).

Diesing, 1838, *Ber. Versamml. deutsch. Naturf. u. Aerzte in Prag*, 189; 1839, *Ann. Wien. Mus. Naturg.*, ii, 227; v. Drasche, 1884, *Verh. k. k. Zool.-Bot. Ges.*, Wien, xxxiii, 111; Baylis & Lane, 1920, *Proc. Zool. Soc.*, London, 305.

b. *Ancyracanthopsis* Diesing, 1861.

Each lip with a large outer and a small inner tooth. Tail of male with six to seven pairs of papillae.

Hab. Beneath lining of proventriculus of a Bird.

Genotype: *A.* [*Ancyracanthus*] *bilabiata* (Molin, 1860).

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xl, 343; Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 670; v. Drasche, 1884, *Verh. k. k. Zool.-Bot. Ges.*, Wien, xxxiii, 112; Railliet, 1916, *Journ. Parasitol.*, ii, 99.

This genus is insufficiently described. The characters mentioned are scarcely sufficient to differentiate it from

Ancyracanthus. Railliet (1916) suggests placing *Ancyracanthopsis* and *Ancyracanthus* in a family *Ancyracanthidae*. No diagnosis is given either of the family or of the genera.

c. Elaphocephalus Molin, 1860.

Cuticle of body spiny. Four external cephalic appendages present, as in *Ancyracanthus*, but each with a shorter subsidiary process. Four cervical sacs present.

Hab. At base of toes of a Macaw (one species known).

Genotype: *E. octocornutus* Molin, 1860.

Molin, 1860, *Sitz. k. Akad. Wiss.*, Wien, xl, 343; v. Drasche, 1884, *Verh. k. k. Zool.-Bot. Ges.*, Wien, xxxiii, 113; Baylis & Lane, 1920, *Proc. Zool. Soc.*, London, 306.

APPENDIX TO FILARIOIDEA.

a. Haplonema Ward & Magath, 1917.

Head without lips or papillae. Cervical alae present. No buccal capsule. Oesophagus in two portions. Tail of male without alae. Two pairs of preanal and three pairs of postanal papillae present. Spicules equal. Apparently no accessory piece. Vulva in middle region of body. Uterine branches opposed. Oviparous.

Hab. Intestine of a fresh-water Fish (one species known).

Genotype: *H. immutatum* Ward & Magath, 1917.

Ward & Magath, 1917 (1916), *Journ. Parasitol.*, iii, 61.

b. Ascarophis van Beneden, 1871.

Syn. *Ascaropsis* Power & Sedgwick, 1880.

Body relatively elongate, of uniform girth. Cuticle, except at extremities, with prominent annulations. Head with two small, forwardly-projecting spines. Lips paired, small. Oesophagus long. Male undescribed. Anus of female in a ventral depression. Tail short and conical. Vulva apparently anterior. Genital tube apparently single, posterior. Oviparous. Eggs with two filaments at one pole.

Hab. Intestine and pyloric caeca of marine Fishes.

Genotype: *A. morrhuae* van Beneden, 1871.

van Beneden, 1871, *Mém. Acad. Roy. Sci. Belg.*, xxxviii, (4), 92; Nicoll, 1907, *Ann. Mag. Nat. Hist.*, (7) xix, 92.

ORDER IV. **DIOCTOPHYMOIDEA** Railliet, 1916.

Body sometimes spiny. Each of the four muscular fields divided longitudinally into two by the insertion of extremely well-developed suspensory muscles of the alimentary canal.

Mouth hexagonal, surrounded by one, two or three circles each of six papillae. Oesophagus relatively long, simple or club-shaped. Tail of male furnished with a "bursa," without rays. A single long spicule present. Anus of female terminal. Female genital tube single. Eggs barrel-shaped, with thick, pitted, albuminous coating and not containing embryos when laid. Adults parasitic in Mammals and Birds. Larval forms in an intermediate host.

Fam. 1. DIOCTOPHYMIDAE Railliet, 1916.

Syn. Eustrongylidae Leiper, 1908; Jägerskiöld, 1909.

With the characters of the Order.

1. *Dioctophyme* Collet-Meygret, 1802.

Syn. *Eustrongylus* Diesing, 1851.

Extremely large forms (up to 1 m. in length in female). Male little more than one-third of the length of the female. Cuticle relatively thin and transparent. Body blood-red during life. Each lateral line with a row of papillae, which become closer together at the extremities. Body truncate posteriorly, somewhat tapering anteriorly. Mouth surrounded by two circles each of six papillae, the anterior small, the posterior large. The transversely-elongated, oval "bursa" is indented on its anterior margin, without rays proper, but supported by a triradiate structure in the centre of which is the cloacal opening. The entire margin of the "bursa" is bordered by papillae. Spicule bristle-like. Tail of female bears a number of small papillae near the anus, which is crescentic. Vulva towards the anterior end of the body, but postoesophageal.

Hab. Adult: kidney and peritoneal cavity of Mammals. Larva: in musculature of fresh-water Fishes.

Genotype: *D. [Ascaris] renalis* (Goeze, 1782).

Goeze, 1782, *Naturg. d. Eingeweidewürmer*, 39, 73; Collet-Meygret, 1802, *Journ. Phys.*, etc., Paris, lxxv, 458; Stiles, 1901, *Zool. Jahrb., Syst.*, xv, 167; Leuckart, 1868, *Die Menschlichen Parasiten*, Leipzig and Heidelberg, ii, 353; Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 113; Schneider, 1866, *Monographie der Nematoden*, Berlin, 49.

2. *Eustrongylides* Jägerskiöld, 1909.

Forms of medium or rather large size. Body cylindrical, or sometimes swollen in its middle. Cuticle coarsely striated, at least towards the extremities, but without spines. Mouth surrounded by twelve or eighteen papillae, arranged in two or three circles. Vulva close to anus.

Hab. Adults in glands of proventriculus of Birds, mostly fish-eaters. Larvae in connective tissue of Fishes and (?) Crustacea.

Genotype : *E. [Strongylus] tubifex* (Nitzsch, 1819).

Nitzsch, in Rudolphi, 1819, *Entozoorum Synopsis*, 31; Jägerskiöld, 1909, *Nov. Act. Reg. Soc. Sci. Upsala*, ii, No. 3, 45; Ciurea, 1924, *Zeitschr. f. Fleisch-und-Milchhyg.*, Berlin, xxxiv, 134.

3. *Hystrichis* Dujardin, 1845.

Forms of medium or rather large size. Head usually more or less swollen, sometimes subspherical. Body cylindrical, or swollen in its middle portion. Cuticle coarsely striated towards the extremities and bearing spines, which may be confined to the anterior region of the body, or to the swollen head. Mouth surrounded by a single circle of six papillae. Vulva close to anus.

Hab. In glands of proventriculus of aquatic or semi-aquatic Birds.

Genotype : *H. tricolor* Dujardin, 1845.*

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 290; Jägerskiöld, 1909, *Nov. Act. Reg. Soc. Sci. Upsala*, ii, No. 3, 46.

ORDER V. TRICHINELLOIDEA Hall, 1916.

Body more or less clearly divided into an oesophageal portion and a posterior portion which contains the other organs. Oesophagus a cuticular tube embedded in a single chain of cells. Anus terminal or subterminal in both sexes. Male with a single spicule or none. Vulva at junction of oesophageal and posterior portions of body. A single ovary and uterus.

This group, although it contains only a small number of genera, consists of very highly-specialized forms. The sub-families are necessitated by the wide divergences between the genera.

Fam. 1. TRICHINELLIDAE Stiles & Crane, 1910.

With the characters of the Order.

Subfam. 1. TRICHINELLINAE Ransom, 1911.

Male without spicule or spicule-sheath. Female ovoviviparous. Egg spherical, without true shell but surrounded by a

* Jägerskiöld (1909) designates *H. acanthocephalicus* (Molin) as genotype. Dujardin's genus contained only one species, *H. tricolor*, which therefore must be the type.

delicate membrane. Adults in the intestine give rise to larvae which become encapsuled in the musculature of the same host.

1. *Trichinella* Railliet, 1895.

Syn. *Trichina* Owen, 1835, *nec* Meigen, 1830.

With the characters of the Subfamily.

Hab. Adult in intestine of Mammals. Larvae encapsuled in museles of same host.

Genotype: *T. [Trichina] spiralis* (Owen, 1835).

Owen, 1835, *Trans. Zool. Soc.*, London, i, 315; Railliet, 1895, *Traité de Zoologie médicale et agricole*, Paris, 1303; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 10.

Subfam. 2. **TRICHURINAE** Ransom, 1911.

Male with one spicule or, exceptionally, with only a spicule-sheath. Eggs lemon-shaped, with thick shell and polar opercula; their contents unsegmented when laid. Development, so far as known, direct.

1. *Trichuris* Roederer, 1761.

Syn. *Trichocephalos* Goeze, 1782; *Trichocephalus* Schrank, 1788; *Mastigodes* Zeder, 1800, *nec* de Blainville, 1828.

Oesophageal portion of body very slender, and longer than the thicker posterior portion. Posterior extremity blunt and rounded in both sexes. On the ventral surface of the oesophageal portion there is a longitudinal "bacillary band." Posterior portion of body of male curled dorsally. Spicule in a protrusible prepuce-like sheath, of which the external surface, when protruded, may be smooth or spiny. Vulva in posterior portion of body, near its junction with the oesophageal portion. Eggs lemon-shaped, with thick, usually brown, shells and polar opercula.

Hab. Caecum of Mammals, forming burrows in the epithelium, in which the anterior end is inserted.

Genotype: *T. [Ascaris] trichiura* (L., 1771).

Roederer, 1761, *Götting. Anz. v. gelehrt. Sachen*, i, 243; and 1762, ii, 41; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 20.

2. *Capillaria* Zeder, 1800.

Syn. *Trichosoma* Rudolphi, 1819; *Trichosomum* Creplin, 1839; *Calodium* Dujardin, 1845; *Thominx* Dujardin, 1845; *Liniscus* Dujardin, 1845; *Eucoleus* Dujardin, 1845.

Body very slender. Oesophageal portion shorter than, or rarely equal in length to, the posterior portion. A longi-

tudinal "bacillary band" may be present. Spicule long and slender, with a protrusible sheath, the outer surface of which, when protruded, may be smooth or spiny. Tail of male may be faintly alate. Eggs lemon-shaped, with polar opercula.

Hab. Alimentary canal of Vertebrates.

Genotype: *C. tumida* Zeder, 1803 (= *capillaris* Rudolphi, 1809).

Zeder, 1800, *Erster Nachtrag zur Naturg. der Eingeweidewürmer*, Leipzig, 5; 1803, *Anleitung zur Naturg. der Eingeweidewürmer*, Hamburg, 61; Rudolphi, 1809, *Entozoorum . . . Historia Naturalis*, i, 86; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 33.

3. *Hepaticola* Hall, 1916.

Oesophageal portion of body shorter than posterior portion, which is only slightly thicker. "Bacillary band" apparently absent. Spicule absent, but a membranous sheath present. Eggs with polar opercula, and shell (in genotype) apparently striated in optical section.

Hab. Liver of Mammals.

Genotype: *H. [Trichocephalus] hepatica* (Bancroft, 1893).

Bancroft, 1893, *Journ. & Proc. R. Soc. N.S.W.*, Sydney, xxvii, 86; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 30.

Subfam. 3. TRICHOSOMOIDINAE Hall, 1916.

Male without spicule or spicule-sheath, and parasitic in the vagina or uterus of the female. Eggs thick-shelled, with polar opercula, and containing embryos when laid. Development direct.

1. *Trichosomoides* Railliet, 1895.

Syn. *Trichodes* v. Linstow, 1874, *nec* Herbst, 1792.

Oesophageal region of body not markedly more slender than posterior region. "Bacillary band" apparently absent.

Hab. Urinary organs of Rodents (one species known).

Genotype: *T. [Trichosoma] crassicauda* (Bellingham, 1840).

Bellingham, 1840, *Mag. Nat. Hist.*, London, iv, 349; Railliet, 1895, *Traité de Zoologie médicale et agricole*, Paris, 1302; Hall, 1916, *Proc. U.S. Nat. Mus.*, 1, 12.

APPENDIX TO NEMATODA.

A. Fam. DRILONEMIDAE Pierantoni, 1916.

We place here five aberrant and little-known genera parasitic in Earthworms, whose organization is so modified that their position in the system is very uncertain. They have been made into three separate families—Onycidae, Cephalonemidae and Drilonemidae—by Pierantoni, but several of the genera appear to be based on unsatisfactory characters, and we regard them as synonyms. All the remaining genera seem to us to have certain characters in common, and it appears possible to regard them as all belonging to a single family, for which Pierantoni's name Drilonemidae may be retained.

The family may be defined as follows:—Small forms with or without a pair of chitinoid hooks overhanging the mouth. Oesophagus short and simple, or absent. Male with two spicules and an accessory piece, or without any such organs. Female genital tube single, running anteriorly from the vulva, then turning posteriorly and extending to the hinder part of the body. Oviparous. Parasitic in the coelomic cavity or musculature of Earthworms.

1. *Drilonema* Pierantoni, 1916.

Syn. *Mesonema* Pierantoni, 1916; *Opistonema* Pierantoni, 1916.

Head narrower than neck. Mouth unarmed, terminal. Oesophagus short, cylindrical or slightly club-shaped, apparently muscular, followed by a much wider intestine. Male much smaller than female, with a blunt tail which may be of great relative length. Spicules absent. Testis reflexed. Vulva in front of or behind the middle of the body.

Hab. Free in coelomic cavity of Earthworms.

Genotype: *D. wendessianum* Pierantoni, 1916.

Pierantoni, 1916, *Boll. Soc. Nat. Napoli*, xxviii, 152, 154, 155.

The generic separation of *Mesonema* and *Opistonema* from *Drilonema* does not appear to be justifiable. *Mesonema* includes, according to Pierantoni, two species of which the males are unknown, and the females differ from those of the species of *Drilonema* almost solely in having the vulva situated somewhat further back. In the three species of *Opistonema* the vulva is still further back, but there appears to be no other ground for the erection of a separate genus.

2. *Pierantonia* nom. nov.

Syn. *Cephalonema* Pierantoni, 1916, nec Cobb, 1893.

Head distinct, composed of two lateral thickenings, between which is the mouth. Mouth unarmed, without papillae. Oesophagus non-muscular, not distinct from intestine. Sexes constantly found *in copula*. Male much smaller than female. Spicules absent. Tail of female suddenly constricted, with terminal spike. Vulva at about the posterior fourth of the body, or behind it.

Hab. Coelomic cavity of Earthworms.

Genotype: (by page precedence) *C. microcephalum* Peirantoni, 1916.

Pierantoni, 1916, *Boll. Soc. Nat. Napoli*, xxviii, 149.

3. *Pharyngonema* Pierantoni, 1923.

Neck region swollen. Anterior end with minute bristles. An ovoid, muscular pharyngeal bulb present, followed immediately by the intestine. Male unknown. Tail of female short, acutely pointed. Vulva at about the middle of the body.

Hab. Coelomic cavity of Earthworms.

Genotype: *P. mekongianus* Pierantoni, 1923.

Pierantoni, 1923, *Boll. Mus. Zool. Torino*, xxxviii, (1) 2.

4. *Dicelis* Dujardin, 1845.

Mouth round, unarmed. Oesophagus short, muscular, club-shaped, followed by a wider intestine. Tail, in both sexes, blunt, carrying a pair of large, lateral sucker-like organs surrounded by radiating fibres. Male with a pair of slightly-curved spicules and an accessory piece.

Hab. Sperm-sacs of Earthworms.

Genotype: *D. filaria* Dujardin, 1845.

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 107; Johnson, 1913, *Quart. Journ. Micr. Sci.*, lviii, 606, 608; Pierantoni, 1916, *Boll. Soc. Nat. Napoli*, xxviii, 157.

According to Johnson (1913), *Dicelis* is simply a new name for larvae of *Rhabditis* inhabiting the nephridia and spermiducal canals of earthworms. This, however, cannot very well be the case, since Dujardin was evidently dealing with adult worms and not larvae.

5. *Synoechnema* Magalhães, 1905.

Syn. *Dionyx* Perrier, 1881, *nec* Le Peletier & Serville, 1825.

Mouth subterminal, apparently usually turned dorsally, and overhung by two lateral, recurved, chitinous hooks springing from its anterior (ventral) margin. Oesophagus club-shaped. Tail of male relatively long and tapering. Two short, stout spicules and a broad, triangular accessory piece usually present. Vulva in the anterior half of the body. Sexes sometimes permanently *in copula*.

Hab. In cysts in the musculature, or free in the coelomic cavity, of Earthworms.

Genotype: *S. [Dionyx] lacazii* (Perrier, 1881).

Perrier, 1881, *Arch. Zool. exp. et gén.*, Paris, ix, 242; Magalhães, 1905, *Arch. Parasitol.*, Paris, ix, 315; Pierantoni, 1916, *Boll. Soc. Nat. Napoli*, xxviii, 148.

The name *Dionyx* being preoccupied, it seems legitimate to adopt *Synoechnema* Magalhães as the generic name. We have, however, retained *Dionyx lacazii* Perrier as the genotype.

B. GENERA INCERTAE SEDIS.

The following genera are either so anomalous in structure or so imperfectly described that it is impossible at present to determine their affinities.

1. *Agamonematoideum* Diesing, 1853.

This name was given by Diesing (*Sitz. k. Akad. Wiss.*, Wien, x, 35) to a larval form found in a beetle (*Blaps mortisaga*). According to Seurat (1916, *Bull. Sci. France et Belg.*, xlix, 351) this is probably the second-stage larva of a species of *Gongylonema*.

2. *Amblyura* Ehrenberg, in Hemprich & Ehrenberg [1828], 1831.

Body filiform, smooth. Head not distinct, truncate. Mouth circular, surrounded by bristles. Tail tapering, slightly swollen at the tip by the presence of a spinneret. Male with a single spicule. Vulva in the middle of the body. Female genital tubes paired.

Hab. Fresh water (?).

Genotype: Probably *A. [Vibrio] serpentulus* (Müller, 1773).

Müller, 1773, *Vermium terrestrium . . . Historia*, 42; 1786, *Animalcula Infusoria*, etc., 61; Hemprich & Ehrenberg [1828], 1831, *Symbolae Physicae* (Evertebrata), Ser. Prima, sig. a (unp.).

The characters mentioned above are all of any importance that we can find in the original account of the genus and its presumed genotype. The genus is probably unrecognizable. It is placed by Schneider among the synonyms of *Enoplus*.

3. Anguillina Hammerschmidt, 1838.

Under the name of *Anguillina monilis* Hammerschmidt (1838, *Isis* (5), 358) describes a worm found in the intestine of a beetle (*Aphodius conspurcatus*). The description and figures are insufficient to enable the position of the worm to be determined.

4. Aphelenchoides Fischer, 1894.

The description of *A. kühnii* Fischer, the sole species of this genus, is not accessible to us.

Hab. Parasitic in stems of *Clematis*.

Fischer, 1894, *Ber. d. phys. Lab. d. landw. Inst. Halle*, Dresden, iii (1), 1.

5. Buddenbrockia Schröder, 1910.

This generic name is applied to certain worm-like parasites occurring in the body-cavity of *Plumatella*. It is included here because, although Schröder originally described *Buddenbrockia* as a Mezozoan form, he subsequently regarded it as a Nematode. This later opinion does not, however, seem to be borne out by the description. The absence of a cuticle and the presence of an external epithelium appear to exclude this genus from the Nematoda, apart from the entirely anomalous nature of its anatomy and the mode of origin of its eggs.

Genotype : *B. plumatellae* Schröder, 1910.

Schröder, 1910, *Zeitschr. f. wiss. Zool.*, xcvi, 527; 1912, *Verh. naturh.-med. Ver. Heidelberg*, N.F., xi, 230; 1912, *Zeitschr. f. wiss. Zool.*, cii, 79.

6. Calyptonema Marion, 1870.

Body elongate. Buccal cavity carried on a protrusible oesophageal tube and situated in the middle of a sort of membranous collar, which ordinarily surrounds the head-region, but is capable of being projected forward. Male with two long and slender spicules. Accessory piece absent.

Hab. Marine.

Genotype : *C. paradoxum* Marion, 1870.

Marion, 1870, *Ann. Sci. nat.*, Paris, Zool., (5) xiii, Art. 14, 12.

We quote the main characters mentioned by Marion. The genus, however, appears to be quite unrecognizable, and the

figures suggest that the "protrusible oesophageal tube" was a moulted cuticle, carrying with it the oesophageal lining.

7. *Choronema* Cobb, 1920.

Cutical thin, finely striated, without bristles. Lateral alae present. Head not distinct, without lips, papillae or bristles. Lateral organs uncertain. Pharynx "absent or obscure." Oesophagus cylindroid, slightly swollen behind. Tail with two sublateral papillae. Spinneret absent. Description based on an immature, moulting specimen.

Hab. Soil.

Genotype: *C. simplex* Cobb, 1920.

Cobb, 1920, *Contr. Sci. Nematol.*, ix, 238 and key; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 570.

Micoletzky (1922) believes *C. simplex* to be closely related to a larval *Tylenchus* described by him, and it seems possible that *Choronema* should be regarded as a synonym of *Anguil-lulina*. Cobb, however, compares it with "a deteriorated *Cephalobus* or *Diplogaster*."

8. *Cystoopsis* Wagner, 1867.

Male very small, cylindrical. Female with anterior portion of body cylindrical and posterior portion swollen into a globular sac. Cuticle finely striated. Mouth surrounded by a low cuticular ring. Buccal cavity funnel-shaped. Alimentary canal without posterior opening, the cylindrical oesophagus ending in a blind sac or bladder-like enlargement. Caudal end of male rounded, with a tubular terminal projection upon which the genital tube appears to open, and which is regarded by v. Linstow as a "penis." Spicules absent. Vulva in the slender anterior portion of the body, near the head. Female genital tube apparently single. Oviparous. Egg-shells thick, with polar plugs. Eggs embryonated when laid.

Hab. Subcutaneous nodules in a Fish (*Acipenser*).

Genotype: *C. acipenseris* Wagner, 1867.

Wagner, 1867, *Arb. 1. Kongr. russ. Naturf., Sitz. zool. Sekt.*, 6 [quoted by v. Linstow]; Zykov, 1902, *Biol. Centralbl.*, Leipzig, xxii, 229; v. Linstow, 1904, *Arch. f. Naturg.*, lxx, i, 297.

9. *Dikentrocephalus* Wedl, 1855.

Syn. *Dicentrocephalus* Diesing, 1861.

Small worms with the head-end truncate and having two rounded lips, between which are two processes which, when extruded, appear as a fused "stylet." Oesophagus short. Posterior end rounded, with two distinct lateral ridges and four papillae.

Hab. Parasitic in a Fish (*Lophius piscatorius*).

Genotype : *D. crinalis* Wedl, 1855.

Wedl, 1855, *Sitz. k. Akad. Wiss.*, Wien, xvi, 384.

Wedl's description of this worm is very inadequate, and he makes no distinction between the sexes. It may be a larval form, but it seems possible that the orientation of the worm was mistaken, and that the protrusible processes of the "head" were in reality the spicules of the male.

10. Diplolaimus v. Linstow, 1876.

Cuticle unstriated. Head with a hemispherical expansion, which has fine bristles on its periphery, is divided by longitudinal furrows and shows internally several chitinoid rings. The lumen of the anterior fifth of the oesophagus is funnel-shaped, with chitinized walls. The oesophagus is greatly thickened behind this funnel, and is also somewhat swollen behind, but has no bulb. The tail is finely pointed, and a caudal gland is present.

Hab. Fresh water.

Genotype : *D. gracilis* v. Linstow, 1876.

v. Linstow, 1876, *Arch. f. Naturg.*, xlii, i, 16.

It appears quite impossible to determine the relationships of this genus. According to Micoletzky, the genotype is probably the larval form of a parasitic species.

11. Eubostrichus Greeff, 1869.

Body long and filiform, enclosed in a peculiar covering of closely entangled or cemented hairs. This covering is apparently not a part of the cuticle, and may be a secretion. Head not distinct, with bristles. Mouth-opening funnel-shaped. "Oesophagus" cylindrical, narrow, without bulb or with a posterior muscular bulb. Male unknown. Anus of female terminal.

Hab. Marine.

Genotype : *E. filiformis* Greeff, 1869 (by page precedence).

Greeff, 1869, *Arch. f. Naturg.*, xxxv, i, 117.

The anatomy and systematic position of this genus are very uncertain. From Greeff's figures it seems possible that the organ described as the oesophagus may in reality be a long, tubular buccal capsule, or even a stylet like that of the Anguilluliniidae, and that the true oesophagus may have been mistaken for the beginning of the intestine. In *E. filiformis* the "oesophagus" is figured as a simple, cylindrical tube, while in the other species, *E. phalacrus* Greeff, it has a muscular (?) bulb at its posterior end.

12. Eustoma van Beneden, 1871.

van Beneden (1871, *Mém. Acad. Roy. Belg.*, xxxviii, 19, 92) gives no description of the worm named by him *Eustoma truncatum*, which was found in *Raja clavata*. He gives two figures (Pl. III, fig. 9) which apparently represent two views of the head, but its characters are very vaguely indicated.

13. Filarina Hammerschmidt, 1838.

The worm named *Filarina vitrea* by Hammerschmidt (1838, *Isis* (5), 358), and found by him in the intestine of a beetle (*Trichius hemipterus*), is unrecognizable. Possibly it was a larval Spirurid.

14. Labyrinthostoma Cobb, 1898.

This name occurs in the legend to a figure, thus:—"Fig. 65.—Head of a species for the reception of which the author proposes the new genus *Labyrinthostoma*. The pharyngeal bulb is here well developed." There is no further description, and the species is apparently not named or otherwise indicated.

Cobb, 1898, *Agric. Gaz. N.S.W.*, Sydney, ix, 421.

15. Lineola Kölliker, 1845, *nec* Baer, 1827.

Body thread-like, tapering at each end. Mouth "anständig," surrounded by six small feelers. Oesophagus long, somewhat thickened behind. Testis single, moniliform. Two spicules present. Ovaries paired, short and broad. Vulva in middle of body.

Hab. Marine (among sea-weed).

Genotype: *L. sieboldii* Kölliker, 1845 (by page precedence).

Kölliker, 1845, *Verh. schweiz. naturf. Ges.*, xxix, 86.

16. Lumbricicola Friedländer, 1895.

The name *Lumbricicola vasorum* was given by Friedländer (1895, *Zeitschr. f. wiss. Zool.*, lx, 278) to some small Nematodes found by him in the blood-vessels of an Earthworm. The worms were only studied in sections, and the description given of them does not enable us to form any opinion as to their systematic position.

17. Mitrephorus v. Linstow, 1877, *nec* Schoenherr, 1837.

Slender forms with smooth cuticle. Head hemispherical, distinct, with two rows of "openings," each with a swollen border, running up into a small stalk. The anterior row consists of four such "openings," the posterior of eight. Oesophagus swollen behind into a slight bulb, containing a

heart-shaped chitinoid body. Male unknown. Vulva a little behind the middle of the body. A caudal gland present.

Hab. Fresh water.

Genotype : *M. haemisphaericus* v. Linstow, 1877.

v. Linstow, 1877, *Arch. f. Naturg.*, xliii, i, 2.

According to Micoletzky (1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 620) this is probably the larva of a parasitic form. The fact that, although he only saw "undeveloped" females, v. Linstow mentions the presence of a vulva, is somewhat opposed to this view. In any case, the description is such that it is impossible to determine the systematic position of the worm.

18. *Nema* Leidy, 1856.

"Body ascaridiform. Head without appendages. Mouth unarmed, large, infundibuliform, oesophagus tubular, membranous, expanding into a simple straight intestine; anus ventral. Tail conical, acute, recurved. Generative aperture near the middle of the body."

Hab. About dead specimens of a *Phryganea*.

Genotype : *N. vacilans* Leidy, 1856.

Leidy, 1856, *Proc. Acad. Nat. Sci. Philadelphia*, viii, 49.

19. *Phacelura* Ehrenberg, in Hemprich & Ehrenberg, 1831.

Head not distinct. Tail with rounded tip, bearing four to eight styliform appendages.

Hab. Parasitic in fresh-water Snails.

Genotype : *P. paludinae* Ehrenberg, 1831.

Ehrenberg, in Hemprich & Ehrenberg, 1831, *Symbolae Physicae*, Pars Zool., Decas I, Appendix, Phytozoa Entozoa, sig. a; Diesing, 1851, *Systema Helminthum*, ii, 137.

20. *Phanoglene* Nordmann, 1840, nec Eberth, 1863.

Body filiform, smooth, pointed behind. Mouth truncate, bilabiate, provided with cirri. Neck marked with very red eyes. Penis of male single.

Hab. Genotype in the larva of a Neuropterous insect.

Genotype : *P. micans* Nordmann, 1840.

Nordmann, in Lamarck, 1840, *Hist. nat. des Animaux sans Vertèbres*, 2nd ed., Paris, iii, 664.

21. *Phlyctainophora* Steiner, 1921.

Body stout, in the shape of an irregular, curled cylinder. Cuticle with about fifteen more or less spherical vesicles, almost symmetrically placed on the two sides of the body,

and an unpaired vesicle at the head-end. The tail-end bears a pair of vesicles. Mouth in a shallow depression on the anterior surface of the head-vesicle. Anus in front of the posterior pair of vesicles. Body-wall apparently without musculature. Male unknown. Body of female contains a uterus and a thin-walled gut. The body-cavity is filled with embryos, which extend even into the vesicles, by the rupture of which they probably escape. Vulva apparently absent.

Hab. Connective tissue of a Shark (*Lamna*), between the hyomandibular arch and the skull.

Genotype: *P. lamnae* Steiner, 1921.

Steiner, 1921, *Centralbl. f. Bakt.*, (1), lxxxvi, 590.

22. *Piguris* Schlotthauber, 1860.

The description of *P. reticulata* Schotthauber, 1860, from the colon of the horse, does not enable its systematic position to be determined.

Schlotthauber, 1860, *Versamml. deutsch. Naturf. u. Aerzt.*, xxxi, 126.

23. *Pontonema* Leidy, 1855.

"Body capillary, narrowing towards the extremities. Head continuous with the body, truncated, or obtuse and surmounted with angular papillae, ciliated. Eyes none. Tail obtuse. Generative aperture ventral, near the middle of the body. Oesophagus long, cylindroclavate; gizzard none, intestine straight, capacious; anus ventral and posterior."

Hab. Marine.

Genotype: *P. vacillatum* Leidy, 1855.

Leidy, 1855, *Journ. Acad. Nat. Sci. Philadelphia*, (2) iii, 144; 1856, *Proc. Acad. Nat. Sci. Philadelphia*, viii, 49.

24. *Potamonema* Leidy, 1856.

"Body filiform, narrowing towards the extremities. Head continuous with the body, slightly dilated, obtuse. Mouth large, infundibuliform, unarmed; oesophagus narrow, flexuous, membranous, gradually expanding into a capacious, straight, cylindrical intestine; anus none (?) or exceedingly indistinct. Caudal extremity obtuse. Generative aperture of the female near the middle of the body."

Hab. Fresh water.

Genotype: *P. nitidum* Leidy, 1856.

Leidy, 1856, *Proc. Acad. Nat. Sci. Philadelphia*, viii, 49.

25. *Prothelmins* v. Linstow, 1888.

An elongate form, of large size for a free-living Nematode, rounded at both extremities, the posterior end being the thicker.

Cuticle firm and thick, containing two systems of fibres crossing each other. Musculature holomyarian, not interrupted by longitudinal fields. Oesophagus relatively short. Tail very short. Reproductive organs unknown.

Hab. Marine (1,950 fathoms).

Genotype : *P. profundissima* v. Linstow, 1888.

v. Linstow, 1888, *Challenger Exp.*, *Zool.*, lxxi, 11.

The description is based on two immature specimens.

26. Pseudochromadora Daday, 1901.

Body of uniform thickness, except posteriorly, where it tapers gradually. Cuticle thick, with well-marked striations. No cephalic papillae or bristles, but near the anterior end there are four conspicuous sucker-like "warts." Buccal cavity without cuticular structures. Oesophagus with a more or less oval posterior bulb, having an oval lumen thickly lined with cuticle. Male unknown. Tail of female relatively short, with a short, "leaf-shaped" terminal point. Vulva in middle of body. Female genital tubes paired. A single (?) caudal gland present.

Hab. Fresh water.

Genotype : *P. quadripapillata* Daday, 1901.

Daday, 1901, *Termès. Füzetek*, Budapest, xxiv, 7; Micoletzky, 1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 620.

27. Pterygifer v. Linstow, 1907.

Cuticle transversely striated. Head rounded, with four movable, wing-like plates, which are attached in front, concave behind. Each plate has at its posterior end an inwardly-projecting hook-like process. Oesophagus one-fifth of the total length. Male unknown. Tail of female rounded. Vulva somewhat behind the middle of the body. Oviparous.

Hab. Parasitic in a Fish (*Symbranchus*).

Genotype : *P. tetrapteryx* v. Linstow, 1907.

v. Linstow, 1907, *Mitt. Zool. Mus. Berlin*, iii, 255.

v. Linstow's description and figure of this worm are practically unintelligible, and though the structure of the head, as described, is somewhat reminiscent of *Habronema* and *Hedruris* among the Spiruridae, we are quite unable to assign the worm to a definite position.

28. Scolecophilus Baylis & Daubney, 1922.

Body short and stout, tapering more gradually in front than behind. Cuticle thin and smooth. Lateral fields very conspicuous, broad, granular, increasing in width posteriorly

and bending towards the ventral surface near the tail. Head truncate, without recognizable lips or papillae. Oesophagus slender, with a large, oblong, glandular posterior bulb, connected with the intestine by a narrow neck containing some kind of valves. Intestine modified into a fat-body. Anus absent. Tail of male blunt, strongly curled ventrally. Caudal papillae apparently absent. Two equal spicules present, broad at the base and bent outwards at right angles in the middle, with their tips deeply bifurcate. An accessory piece present, with a triangular dorsal portion and two lateral processes. Vulva near the anterior end of the body. No muscular vagina. A single functional uterine branch, with ovary, present, running posteriorly. A blind sac, lying parallel to the anterior portion of this, and acting as an egg-reservoir, probably represents the second uterine branch. Eggs oval, with thin shell, containing a crescentic embryo *in utero*.

Hab. Body-cavity of an Earthworm (*Perionyx*).

Genotype: *S. lumbricicola* Baylis & Daubney, 1922.

Baylis & Daubney, 1922, *Mem. Ind. Mus.*, vii, 338.

The affinities of this curious genus are at present impossible to determine. It appears to have no close relationship with the parasites of earthworms which have been referred to the family Drilonemidae (*supra*, p. 240).

29. *Stenodes* Dujardin, 1845.

Slender, elongate worms. Cuticle finely striated. Two slight lateral alae present. Head small, distinct, truncate, followed by a narrower neck. An imperfect buccal capsule or horny disc present, in the middle of which is the circular mouth. Oesophagus club-shaped, followed by a distinct "ventriculus." Tail of male pointed, curled. Two long, equal spicules present. Two pairs of small preanal "suckers" [? large papillae] present. Tail of female straight, acute. Vulva at anterior third of body. A single uterus present. Oviparous. Eggs with reticulate or alveolate shell, and containing embryos when laid.

Hab. Unknown—presumed to have been parasitic in a foreign Mammal which had been kept in captivity in Paris.

Genotype: *S. acus* Dujardin, 1845.

Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 264.

30. *Uracanthus* Diesing, 1861.

Uracanthus brevispinosus Diesing, 1861, is Leidy's "Nematoideum cavitatis abdominis Passali cornuti" renamed. The worm described by Leidy was a larval form found in the body-

cavity of the beetle, *Passalus*. In all probability it is a Spirurid larva, but Leidy's description and figures do not enable us to determine its position.

Leidy, 1852, *Trans. Amer. Phil. Soc.*, Philadelphia, n.s., X, 241; Diesing, 1861, *Sitz. k. Akad. Wiss.*, Wien, xlii, 728.

31. *Urolabes* Carter, 1858.

"The largest specimens are one-sixth of an inch long, bilabiate, with an exsertile, sharp-pointed oesophagus; the hepatic sheath ending some distance from the termination of the intestine; the vulva opens in the female a little in front of the middle of the body, and the anus posteriorly, just before the body terminates suddenly in a whip-like tail. The penis in the male is exsertile from the anus, *very nearly close* to the posterior extremity of the body, which is so obtuse as to be almost truncated."

Hab. Fresh water.

Genotype: *U. palustris* Carter, 1858.

Carter, 1858, *Ann. Mag. Nat. Hist.*, London, (3) i, 414.

According to Micoletzky (1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 442), the genotype of *Urolabes* is doubtfully referable to *Dorylaimus*, all the other species being unrecognizable.

C. UNRECOGNIZABLE FORMS.

The following names occur in the literature of the Nematoda, but cannot be recognized as valid genera. Some of them are *nomina nuda*, while others refer to objects which do not appear to have been Nematodes.

1. *Chaos* Linnaeus, 1767.

Although this genus included the worm known as *Anguillula rediviva*, it has as its type a Protozoan form, and cannot therefore be recognized as a genus of Nematoda.

2. *Crinon* Chabert, 1782.

Syn. *Crino* Lamarek, 1801; *Crinola* Rafinesque, 1815.

This is unrecognizable as a genus of Nematoda, but is possibly in part a synonym of *Setaria*.

Chabert, 1782, *Traité des maladies vermineuses*, Paris, 21; Lamarck, 1801, *Système des Animaux sans Vertèbres*, Paris, 339.

3. *Diplasia* von Holten, 1802.

The name *Diplasia trichiuri* was given by von Holten (1802, *Skr. af Naturh.-Selsk.*, Copenhagen, v, 27) to a worm found in the abdominal cavity of a fish. As Stiles & Hassall (1920)

suggest, the worm does not appear from the figure to have been a Nematode. It has rather the appearance of a Cestode, and may have been a larval *Tetrarhynchus*.

4. *Discophorus* Mehlis, in Creplin, 1844.

Discophorus tenax Mehlis (in Creplin, 1844, *Arch. f. Naturg.*, x, 125) is a *nomen nudum* except for the mention of the host (*Raja clavata*). Writing again in 1846, Creplin (*Arch. f. Naturg.*, xii, 149) mentions *D. tenax* Mehlis as "*nematoideum non descriptum*."

5. *Ditrachyceros* Hermann, in Sultzer, 1801.

Syn. *Ditrachyceras* Sultzer; *Ditrachycerosoma* Brera, 1809; *Diceras* Rudolphi, 1810, *nec* Lamarck, 1805; *Dirhynchus* Rudolphi, 1810.

The human "parasites" named *Ditrachyceros* by Hermann (in Sultzer, 1801, *Dissertation sur un ver intestinal*, etc., Strasbourg), and subsequently renamed *Diceras rude* by Rudolphi (1810, *Eutozoorum . . . Historia Naturalis*, ii (2), 258), appear not to have been worms at all, but the seeds of a plant, as was suggested by Bremser (1819, *Über lebende Würmer im lebenden Menschen*, Wien, 261).

6. *Liorhynchus* Rudolphi, 1801.

The type of this genus is indeterminable, and the name must therefore lapse. It is a partial synonym of *Spinitectus* and perhaps of other genera.

7. *Needhamia* Carus, 1839.

The objects found in the vas deferens of *Sepia*, and described by Carus (1839, *Nov. Act. Acad. Caes. Leop.-Car.*, Breslau and Bonn, xix, i, 1) under the name of *Needhamia expulsoria*, appear to have been simply the spermatophores of the *Sepia* itself.

8. *Onchophora* Kroyer, 1840.

Syn. *Oncophora* Diesing, 1851.

Body divided into two portions, of which the anterior is very long and slender. Posterior portion thicker, shorter, and bearing a hump* near the junction of the two portions. Male unknown. Tail of female pointed. Viviparous.

* This hump, according to Rudolphi, may perhaps represent the vulva. The description was based on two females, of which the anterior ends appear to have been missing. If the animal is a Nematode (which seems uncertain), its shape suggests affinities with the Trihinnellidae, subfamily Trichurinae. The fact that it is stated to be viviparous, however, is against this, and nothing whatever is known of the internal anatomy. Diesing is referred to by Kroyer (1840), and possibly is the author of the name *Onchophora*, in a personal communication. So far as Kroyer is concerned, the name is a *nomen nudum* except for the mention of the host.

Hab. Gall-bladder of a Fish (*Thynnus*).

Genotype: *O. [Trichocephalus] gibbosa* (Rudolphi, 1819) (= *O. neglecta* Diesing, 1851).

Rudolphi, 1819, *Entozoorum Synopsis*, 639; Krøyer, 1840, *Danmark's Fiske*, Copenhagen, i, 596; Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 41; Diesing, 1851, *Systema Helminthum*, ii, 81, 296.

9. Pontamonema v. Linstow, 1878.

This name appears to be due to a confusion between *Pontonema* and *Potamonema* Leidy, and species of both genera are mentioned under it.

v. Linstow, 1878, *Compendium der Helminthologie*, Hanover, 349.

10. Proboscidea (Bruguière, 1791) Cuvier, 1798.

According to Stiles & Hassall, the genotype of this genus is indeterminable. In any case it appears to be a composite group, including species not only of Nematoda but also of Acanthocephala.

11. Protostrongylus Leiper, 1908.

This name is mentioned by Leiper (1908, *Rep. Wellcome Res. Lab.*, Khartoum, iii, 191) among genera attributed to his subfamily Metastrongylinae. No species is mentioned, and the name appears to be a *nomen nudum*.

12. Rhytis Mayer, 1839, nec Zeder, 1803.

Under the name of *Rhytis paradoxa*, Mayer (1839, *Analect. f. vergl. Anat.*, Bonn, ii, 67) described a remarkable object, ten feet or more in length, said to have been passed [*per anum* (?)] by a cow. It is described as unsegmented and having a mouth, an anus and an alimentary canal, but no other organs were made out. Mayer considered it to be a worm closely related to the Nemathelminthi (including the Nematoidea and Acanthocephala of Rudolphi), but placed it in a separate "Order," Rhytelminthi. According to Tschudi, Miescher and Nordmann (1839, *Arch. f. Anat., Phys. u. wiss. Med.*, Berlin, 220), the object described by Mayer was not a parasitic worm at all.

13. Sclerotrichum Rudolphi, 1819.

Syn. *Mastigodes* de Blainville, 1828, nec Zeder, 1800.

Body elongate, stiff, composed of two portions, of which the anterior is very slender, ending anteriorly in a disc bordered with fifteen recurved spines, in the centre of which is the mouth. The posterior portion of the body is stout and bears a series of moniliform swellings at its more anterior end.

Hab. Stomach of a Reptile (*Pseudopus*).

Genotype : *S. [Tacnia] spirillum* (Pallas, 1781).

Pallas, 1781, *N. nord. Beytr. z. phys. u. geogr. Erd.-u. Völkerbeschr.*, etc., St. Petersburg & Leipzig, i, 111; Rudolphi, 1809, *Entozoorum . . . Historia Naturalis*, ii (1), 98; 1819, *Entozoorum Synopsis*, 227; de Blainville, 1828, *Dict. Sci. nat.*, Paris & Strasburg, lii, 539; Nordmann, in Lamareck, 1840, *Hist. nat. des. Anim. sans Vert.*, Paris, 660; Dujardin, 1845, *Hist. nat. des Helminthes*, Paris, 40.

This worm, if indeed it be a worm at all, appears possibly to have some affinity with the Trichinellidae, and may be a member of the subfamily Trichurinae. It seems, however, extremely doubtful whether it is a Nematode. Rudolphi (1809) mentions its curious rigidity and compares its consistency with that of horn or of the chitin of insects. Nothing is known of the internal anatomy, and we do not feel justified in referring the genus to a definite systematic position.

14. *Spherurus* Rafinesque, 1815.

This is a *nomen nudum*, the genus being proposed for the reception of species of *Ascaris* (sens. lat.), but no species being named.

Rafinesque, 1815, *Analyse de la Nature*, Palermo, 151.

15. *Trachynema* Cobb, 1920 (?).

We have been unable to find any reference to this name except that of Cobb (1920, *Contr. Sci. Nematol.*, ix, 250), where the oesophagus of *Xenolaimus* is compared with that of "*Trachynema*." No species is mentioned, and the name appears to be a *nomen nudum*.

16. *Vetteria* Jägerskiöld, 1915.

We have been unable to trace the original reference to this genus. According to Micoletzky (1922, *Arch. f. Naturg.*, Abt. A, lxxxvii, 120) it has a single species, *V. robusta*, which is a *nomen nudum*.

17. *Vibrio* Müller, 1773.

This genus included not only Nematodes but several Protozoa. The genotype is, according to Stiles & Hassall, very doubtful. The name is a partial synonym of *Anguillula* and possibly of other genera.

Müller, 1773, *Vermium terrestrium . . . Historia*, i (1), 39.

The following names also occur in the literature of the Nematoda, but appear to have been applied to objects that cannot be recognized as Nematodes :—

18. *Dyacanthos* Stiebel, 1817.
19. *Fictitium* Diesing, 1851.
20. *Furia* Linnaeus, 1758.

D. COLLECTIVE NAMES.

The following names, in addition to those already mentioned elsewhere, have been proposed as collective groups, chiefly for larval Nematodes, and are without generic status or genotype :—

1. *Agamoflaria* Stiles, 1907.
2. *Agamonema* Diesing, 1851.
3. *Agamonematodum* Diesing, 1861.
4. *Agamospirura* Henry & Sisoff, 1913.
5. *Capsularia* Zeder, 1800.
6. *Dubium* Rudolphi, 1819.
7. *Filocapsularia* Deslongchamps, 1824.
8. *Helmins* Schlotthauber, 1860.
9. *Merinthoidum* Kraemer, 1853.
10. *Nematodum* Diesing, 1861.
11. *Nematoideum* Diesing, 1851.



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[*Synonyms in italics. Numbers in clarendon type refer to the main account.*]

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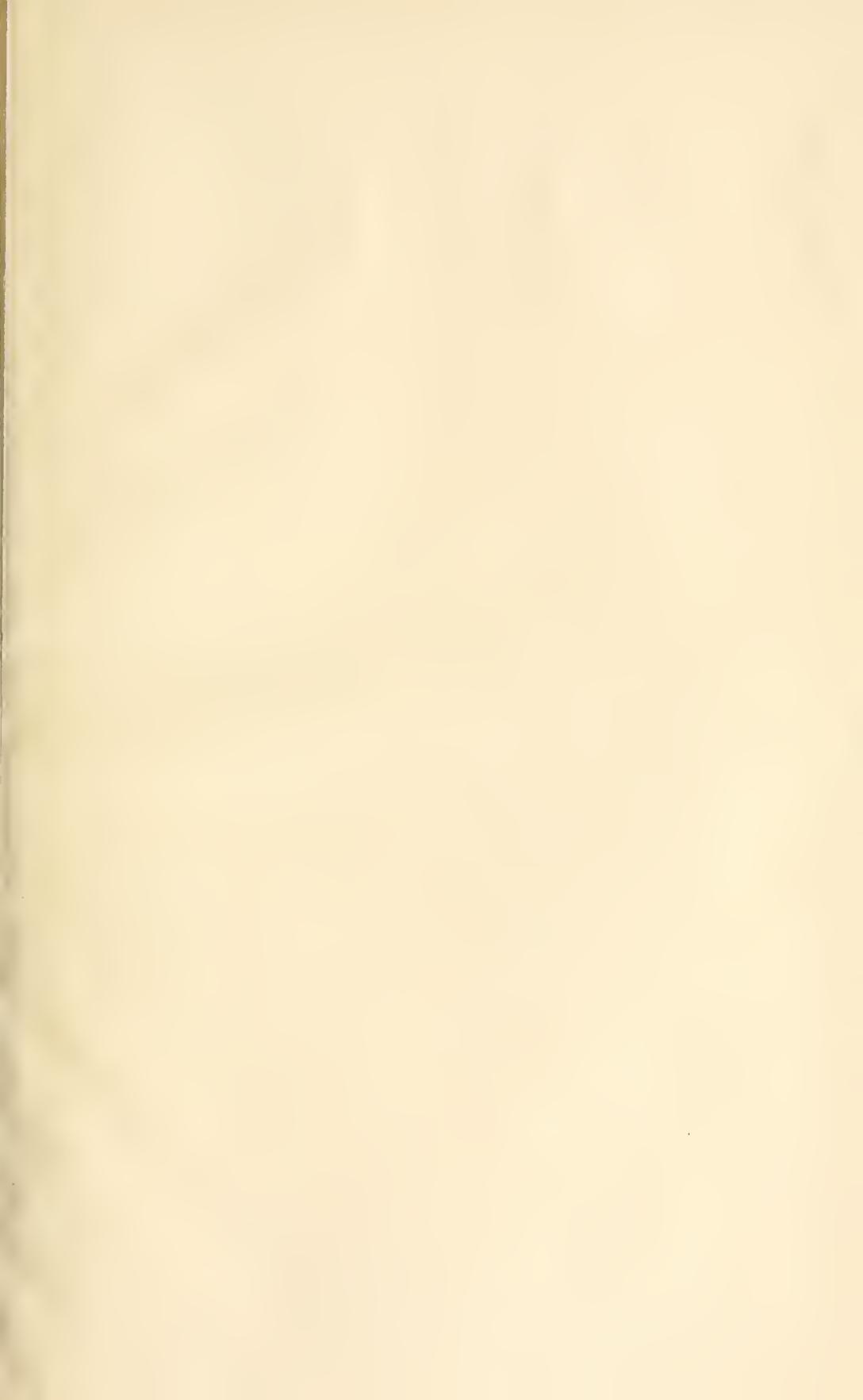
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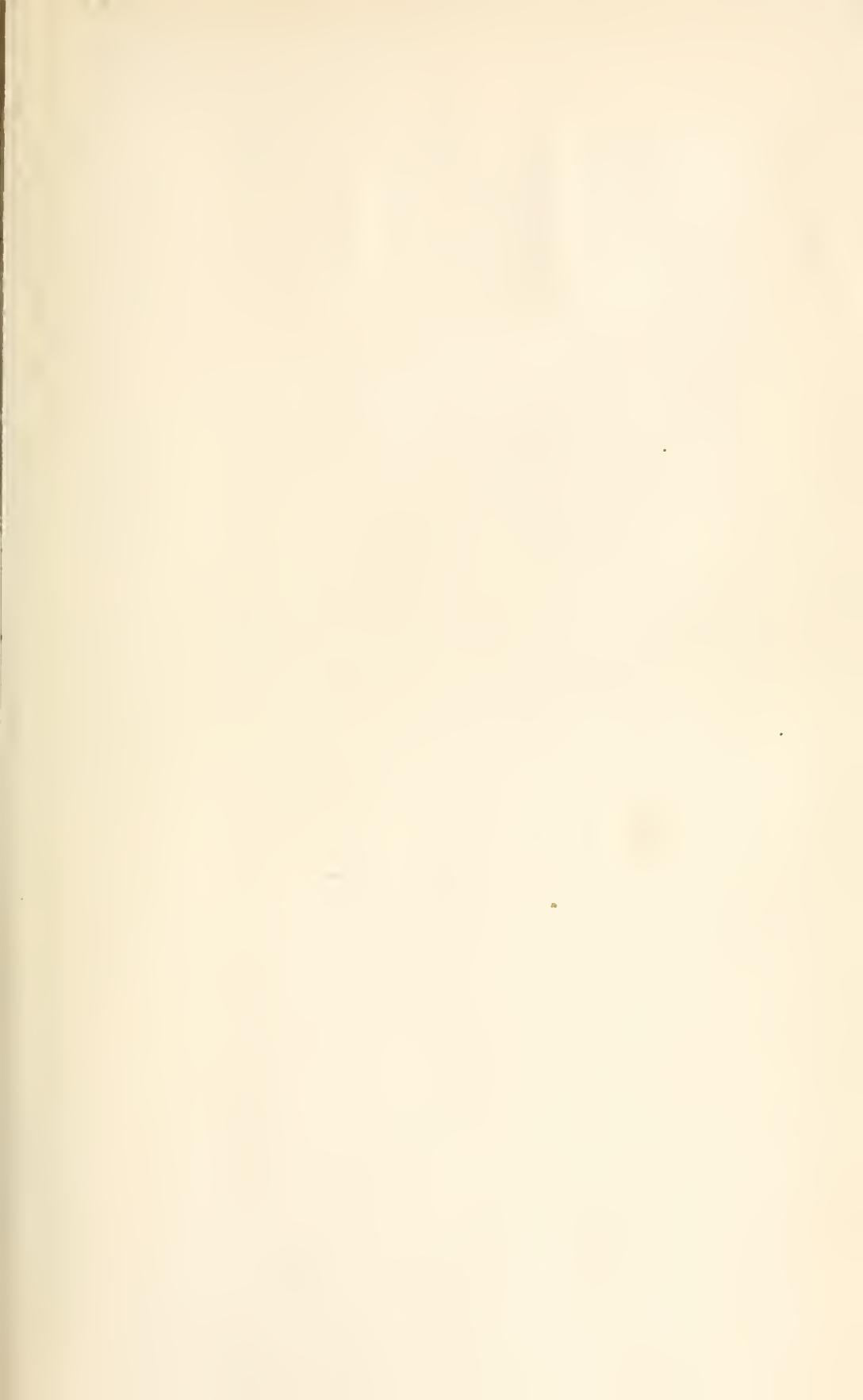
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PRINTED IN GREAT BRITAIN BY
RICHARD CLAY & SONS, LIMITED,
BUNGAY, SUFFOLK.







1940-45
J. R.

