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Historical Sketch of Gordiaceæ.

By Charles Girard.

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I.

There are groups, amongst the invertebrates of the animal kingdom, whose natural history has made but little progress, although known to science for more than half a century.

The animals of which they are composed being generally of a diminutive size, modest in form, modest in colors, have been looked at with indifference, thought unworthy of a careful investigation, and deemed of too small an importance in a general system of classification.

Every living being, however, is entitled to occupy a rank in the creation; every one has its place, its aim, and its design.

Yet some are called enigmatic, paradoxical, doubtful,—as if to the Creator's mind, any thing or any being could be either an enigma, a paradox, or a doubt. Such groups, we must acknowledge, present great difficulties to investigators: but let investigators be patient and laborious, and they will gradually sweep away the enigmas, the paradoxes, and the doubts.

When the researches on a group are slow, and embrace a long period, then it becomes necessary, for the safe and future advancement of its natural history, to recapitulate all the data in their chronology. These data will become a guide into the various desiderata for new observations.

Most diverse opinions are still entertained concerning Gordiaceæ, and important zoological questions are still waiting the results of further investigations.

Are Gordiaceæ indigenous in America, or introduced from abroad? If they are indigenous amongst us, are they identical with, or specifically different from, the European species?

Here commences a labor of comparison between the internal structure and external appearance of specimens from both countries. Besides, specimens from all the localities of one country should be compared, in order to ascertain the number of species. Their embryology and metamorphosis must be traced; their habits recorded, in order to enable us to assign a natural position to that family in the class of worms.

If they are introduced on this continent, how, where, and how long since, did that event take place? What is their geographical distribution and progressive migration to the places where they are now found?

Some facts, which we already possess, and which are related hereafter, rather enforce the belief of their aboriginal nature, than that of their introduction. Even in the case of an identity between the American and European Gordiaceæ, these worms still deserve special attention from American anatomists, as the latter might be successful in elucidating the controverted anatomical questions which divide the naturalists of the old world.

II.

The genus *Gordius* was established by O. F. Müller during the last century.* Under that name were included aquatic worms, others living in moist grounds,

* Vermium terrestrium et fluviatilium historia, 1773.

and still others, more numerous, found as parasites in the body of other animals. Those which lead a permanent parasitical life, constitute now the genus *Filaria*, of the same author,* which has been admitted by all subsequent naturalists, and more than forty species of these are described by Rudolphi.† But there has been a general belief, that the only difference between Gordius and Filaria consisted in their habits, no zoological characters having as yet been detected.

Lamarck‡ even says, that the species of Gordius were probably Filariæ; and if he has kept those two genera, it was merely in accordance with a prevailing practice.

Cuvier‖ places Gordii at the end of the annelids, thus made to follow the leeches, remarking, however, that they might perhaps come nearer the intestinal worms. He was unacquainted with the fact, since ascertained, that several species of true Gordius may be found, at a certain season of the year, within the body of other animals.

The genus Filaria is placed, by the same author, at the head of intestinal worms. Its characters are derived from the external appearance, which, however, he (Cuvier) acknowledges, resembles closely that of Gordius.

Should a generic difference hereafter be found between Gordius and Filaria, in their anatomical structure, and we think it very likely to be the case, besides the difference of embryonic development which already distinguishes them, we shall have that peculiarity in their habits which makes Filaria to occur in such cavities of the body of other animals having no communication with the exterior, whilst Gordii, when occasionally found within other animals, occur in the intestinal canal; that is to say, in a cavity which communicates directly with the surrounding medium. This fact is of no small importance.

The letter of Mr. Jacobson, to de Blainville,§ relates to Filaria, and not to Gordius, as its title would lead any one to believe.

Mr. Charvet,¶ in describing two species of true Gordius, thinks that these worms are indifferently external and internal, and that the distinction made between Filaria and Gordius becomes thus insignificant. But he is inclined to believe that, if it can be proved that Filariæ have a mouth provided with a sucking apparatus, the character would be generic. He was not prepared, by direct observations, to decide upon this fact.

Leon Dufour** alludes to Gordii, and rejects the idea of an identity between them and Filariæ, considering the first as true Annelids, and the second as true Entozoa; there existing, he says, a mere external resemblance, which can only be proved to depend on identity of structure by anatomical investigations.

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* *O. F. Müller*, in Naturforscher. Vol. xxii., 1787.

† Entozoorum sive vermium intestinalium Historia Naturalis. (3 vol. 8vo., 1808—1811), Vol. ii. p. 55 et seq.

‡ Histoire naturelle des Animaux sans vertèbres. Vol. iii., 1809, p. 670.

‖ Le Règne Animal distribué d'après son organisation, vol. iv., 1817, and 2d ed. vol. iii., 1829.

§ Extrait d'une lettre adressée à Mr. de Blainville sur le dragonneau. Ann. Sc. Nat. 2de série i. 1834, p. 320.

¶ Nouvelles Annales du Muséum d'histoire naturelle. Vol. iii. 1834, p. 37.

** Annales des Sciences Naturelles, 2de série, vol. vii., 1837, p. 7.

Prof. Siebold* speaks of Filariæ of various kinds of insects, resembling Gordii, which lived for some time in clear water, in which they had been placed. He afterwards discovered the fact† that sexes of Gordii were individualised, and males more numerous than females; and, withdrawing Gordii from Entozoa, he places them actually among Annelids. Subsequently‡ he makes of Gordii a separate family, including also, the genus *Mermis* of Dujardin; the family he calls Gordiaceæ, differing chiefly from that of *Nematoidea* in its embryonic development.

Entozoa have that peculiar mode of generation, in which several broods follow each other, without resembling each other; nor will they resemble their parent stock before the third, fourth, or fifth generation, according to the species.

The young Gordiaceæ resemble their parents as soon as hatched. There is, however, not yet a single species of that family whose eggs have been made the subject of a careful and complete study. Isolated facts only are known, and to these we shall devote a few lines further on.

There is a phenomenon, with which the naturalists of the old world are well acquainted, which takes place during the existence of Gordiaceæ, (in Mermis as well as in Gordius), it is the fact that they pass one part of their life within the body of other animals,—of Grasshoppers and Crickets, for example. They are found in the clear running waters of the meadows and fountains, early in the spring and summer; they enter the body of grasshoppers in the fall, where they deposit their eggs. These insects die, and their bodies afford to these eggs a convenient shelter during the winter, when the next spring they will hatch, and become free again.‖ Eggs, however, are sometimes found without any such nidus; whether naturally or accidentally, remains to be ascertained.

A. S. Œrsted§ agrees with Prof. Siebold in making of Gordiaceæ a separate group amongst Nematoidea, on the ground of their embryonic development.

Mr. Dujardin¶ is remarkably short, and adds nothing to our knowledge on these worms, which he still calls enigmatic.

The manner in which Mr. Emile Blanchard** has illustrated the anatomical structure of the other families of the intestinal worms, would lead us to expect from that observer, more precise facts respecting Gordiaceæ, than those we had before. But the author, at the outset, tells us that he was unable to fulfil the task he had undertaken, that is, a complete history of that family. The want of materials in such researches, added to the difficulty of experimenting, are the reasons advanced to account for the deficiency in this part of his investigations. The subject, therefore, stands precisely as it did before Mr. Blanchard undertook his anatomical researches on the class of worms.

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* *Wiegman's* Archiv für Naturgeschichte, 1837, ii., p. 254.

† *Wiegman's* Archiv, &c., 1838, ii. p. 292, (*on the progress of Helminthology*); and 1838, i., p. 302, (*Helminthologische Beiträge*).

‡ In *Germar's* Entomologische Zeitung, 1842.

‖ *Wiegman's* Archiv, &c., 1843, ii., pp. 302 and 307.

§ Entwurf einer systematischen Eintheilung und speciellen Beschreibung der Plattwürmer, &c., 1844, pp. 28, 35.

¶ Histoire Naturelle des Helminthes ou vers Intestinaux. Paris, 1845, 8vo.

** Recherches sur l'organisation des vers. *Gordiaceæ*. Annales des Sciences Naturelles, 3d ser. Vol. xii., 1839, p. 5.

The last European writer on this subject is Mr. Ed. Grube,* who has made some observations on the development of the eggs of *Gordius aquaticus*, and described a new species from Africa. His paper bears chiefly on minute parasitical nematoids. He also alludes to the great resemblance there is between *Mermis albicans* and *Ascaris acuminata*.

III.

The anatomical structure of Gordiaceæ is also a matter of much controversy amongst anatomists.

Prof Siebold,† in giving an account of the difference between intestinal worms and Gordii, again calls the latter enigmatic.

Berthold‡ describes a system of circulation, neither seen nor acknowledged by the authors that came after him. He likewise mentions a nervous system; but giving no further account of it, its characters and distribution in the body of these worms remain to be investigated.

Dujardin‖ is in a complete doubt.

Prof. Siebold,§ in resuming Berthold's and Dujardin's investigation, says that the organs which Berthold took for veins and arteries, are contracted fibres, and that he has failed of seeing any organs which he could confidently call nervous or vascular systems.

We do not know yet the digestive tube of any Gordiaceæ. One fact, however, is ascertained with regard to that organ: it atrophies in full grown individuals. Even the structure of the skin, or external envelope of the body, deserves a more full comparative study.

Although Charvet and Berthold agree in saying that Gordiaceæ are androgynous, it has been plainly ascertained since, that the sexes are distinct. But the structure of the sexual organs is not known. Prof. Siebold found an external character by which males differ from the females, the former, in *G. aquaticus*, having a bifurcated tail.

IV.

Some observations on the development of the eggs of *Gordius aquaticus* have been made by Ed. Grube.¶ Dr. Joseph Leidy had made similar investigations in 1846, and published only in 1850.** The eggs are laid in strings, nearly of the length, and sometimes the color, of the worm itself. Within those whitish strings or cords are found the eggs. The division of the yolk takes place, according to the general law of division of that substance, previous to the formation of the embryo. The embryo itself is gradually formed out of the yolk's substance, in a manner similar to that in Clepsinæ, and leeches in general. The young resemble their parents as soon as hatched.

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* Uber einigen Anguilulen und die Entwicklungs. von *Gordius aquaticus*. *Trosch*. Archiv für Naturgeschichte 1849, vol. i. p. 358. Pl. vii.

† *Wiegman's* Archiv, 1838, vol. iv., i. p. 302.

‡ Ueber das Bau das Wasserkalbs, 1842, in 12.

‖ Annales des Sciences Naturelles. 2de serie, vol. xviii., 1842, p. 142.

§ *Wiegman's* Archiv, 1843, ii. pp. 302 and 307.

¶ *Troschel* für Naturgeschichte, 1849, i. p. 358. Pl. vii.

** Notes on the development of *Gordius aquaticus*. Proc. Acad. Nat. Sci., Philad., 1850, p. 89.

Young Gordii possess two circles of filamentary appendages around the proboscis, which, at this early period, is alternately protruded and retracted. Whether the same motion, and the same appendages, are still present in the adult state, is yet to be examined. Many worms are known to be provided with a retractile proboscis, which they use in perforating the sand and mud in which they live. Gordii might require it to introduce themselves into the living bodies where they are sometimes found. As to the circles of tentacles, they very likely disappear in the adult, while the alimentary canal atrophies, their function being intimately connected with the functions of the latter organ.

V.

With regard to the species of Gordiaceæ to be admitted, naturalists do not any more agree.

The most common in Europe is *Gordius aquaticus*, L.* The *G. marinus* and *G. annulatus* of Montague,† are Nemerteæ.

Mr. Charvet‡ describes two others, from the vicinity of Grenoble, (France,) under two trivial names.

Mr. Dujardin‖ considers as distinct, from the above, a species from the vicinity of Toulouse, his *Gordius Tolosanus*, and describes another species, proposing for it the genus Mermis, calling the species *M. nigrescens*.

Prof. Siebold§ has made us acquainted with a second species of Mermis, his *M. albicans*.

Mr. Blanchard¶ has described one species from Chili, under the name of *G. Chilensis*.

Finally, Mr. Ed. Grube** describes another from Africa, which he calls *Gordius crassus*.

Before we identify the North American Gordii with any of the above mentioned ones, we must be prepared to account for many objections which can be made, respecting their having been created identical over such an extensive area, or else of their having migrated naturally, or having been accidentally transported.

VI.

We have in the United States one species, which seems quite common in fresh water, and referred by some to *G. aquaticus*. Rev. Z. Thompson, of Burlington, (Vt.), expresses himself in the following terms: "The little animal called the *Hair snake* also belongs to this order, (annulata,) and to the genus Gordius.

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* Systema Naturæ ed. xii. 1767, p. 1075.

† Transactions of the Linnean Society of London, vii. 1804, p. 72 and 74.

‡ Observations sur deux espèces du genre dragoneau qui habitent dans quelques eaux courantes aux environs de Grenobles. Nouv. Ann. du Mus. d'hist. Nat. iii. 1836, p. 37. Ann. Sc. Nat. 2de ser. ii. 1834, p. 123. *Wiegm.* Archiv i., i. 1835, p. 341.

‖ Mémoire sur la structure anatomique des Gordius et d'une autre Helminthe qu'on a confondu avec lui. Ann. Sc. Nat. 2de ser. xviii., 1842, p. 129 and 146. Institut., 1842, p. 256. Archives gén. de Médec. xii., 1842, p. 488.

§ Entomologische Zeitung, 1843, p. 80.

¶ Historia fisica y politica de Chile, por Claudio Gay. Zoologia iii., 1848, p. 109.

** *Troschel* Archiv, &c., 1849, i., p. 370.

These are very common in the still waters, and mud, in all parts of the State. They are usually about the size of a large horse hair, and are from one to six or eight inches in length. In color they vary from pure white to nearly black, and hence we probably have several species. The vulgar notion that they originate from hairs which fall from horses and cattle, and become animated in the water, would seem to be too absurd for contradiction; and yet, absurd as it is, people are to be found who believe it."*

The same popular opinion is prevailing in Europe. Gordii have been noticed in the body of insects, also, by an American entomologist, Dr. Th. Wm. Harris, who says: "I have taken three or four of these animals out of the body of a single locust."† They have been found, by others, within the cricket, (*Acheta abbreviata*).

We saw a specimen, six or seven inches in length, caught in the clear waters in the vicinity of Richmond, (Va.) Several others were detected by Dr. Leidy in the neighborhood of Philadelphia.

Finally, we may mention several specimens of Gordii from Oregon, brought home by the U. S. Exploring Expedition.

Gordii, therefore, are spread all over the Western hemisphere.

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* Natural History of Vermont, 1842, 8vo., p. 170.

† Report on the Insects injurious to vegetation, 1842, p. 155.