A Monograph of the Genus Macrostomum O. Schmidt 1848. Part I.

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(With 2 Figures and 4 Maps.)

Eingeg. 12. Dezember 1938.

Preface.

This work has been undertaken with a certain degree of temerity for the author of this volume is sure that there are many taxonomists who could have accomplished this research with less error, fewer omissions and more clarity. The monograph was prompted by the desire to place the taxonomy of the genus *Macrostomum* upon a scientific basis which may stimulate further research upon an interesting group of animals. The text is divided in such a manner that the future interests of many types of research may be served. The references have been presented in as compact and chronological form as possible.

I should like to express my sincere thanks to the many agencies and friends which have combined to produce this volume. Dr. Ivey F. Lewis has been most gracious in making the laboratory facilities of the Miller School of Biology available and in granting several fellowships at the Mountain Lake Biological Station which have greatly accelerated the progress of the work. My thanks are extended to the Research Committee of the Virginia Academy of Science whose grant of 1937—38 has greatly increased the amount of material made available to me from the Shenandoah National Park. I wish especially to thank Dr. Edwin Powers who kindly placed the excellent facilities of the Zoology Department, University of Tennessee at my disposal during the summer of 1937 and to Mr. Carl McFalls who patiently drove me hundreds of miles in the mountains of East Tennessee in search of material. Dr. Herbert Prytherch has been most kind in furthering my research at the U. S. Fisheries Biological Station, Beaufort, N. C. I am indebted to Mr. Deweese Runk of this laboratory for the photographing of all the drawings used in the text. The very excellent Fig. 1 is an expression of the art of Mr. J. D. Chaffin of the Department of the Interior who has kindly allowed me to use it. Dr. B. D. Reynolds has saved me from numerous errors in his criticism of parts of the manuscript. Dr. Chauncey Gilbert has been most helpful in giving criticism of methods and technique. Dr. T. K. Ruebush has sent at numerous times interesting material from New Haven, Connecticut and has been persistant in his friendly criticism of my efforts. Finally, I take great pleasure in extending my sincere gratitude to my co-worker and critic, Dr. W. A. Kepner, who has consistently inspired me with his valuable suggestions and has lessened the tedium of a seemingly interminable task.

Introduction.

The members of the genus *Macrostomum* have been intermittently studied since the work of Dugès in 1828. Thus, for more than a century the information upon these interesting forms has

been accumulating in many languages and under conditions which made for varying degrees of accuracy, until at present it is an al-

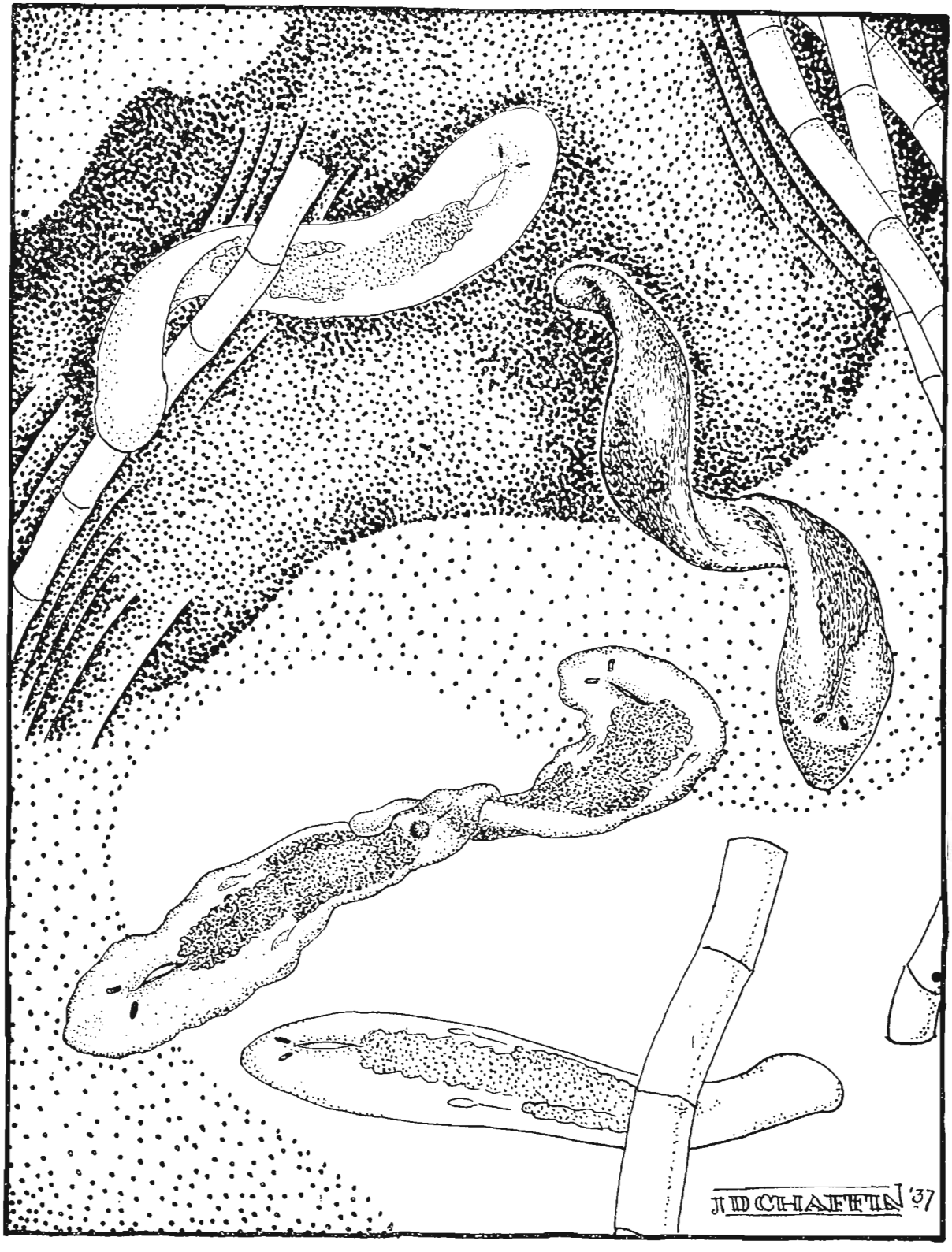
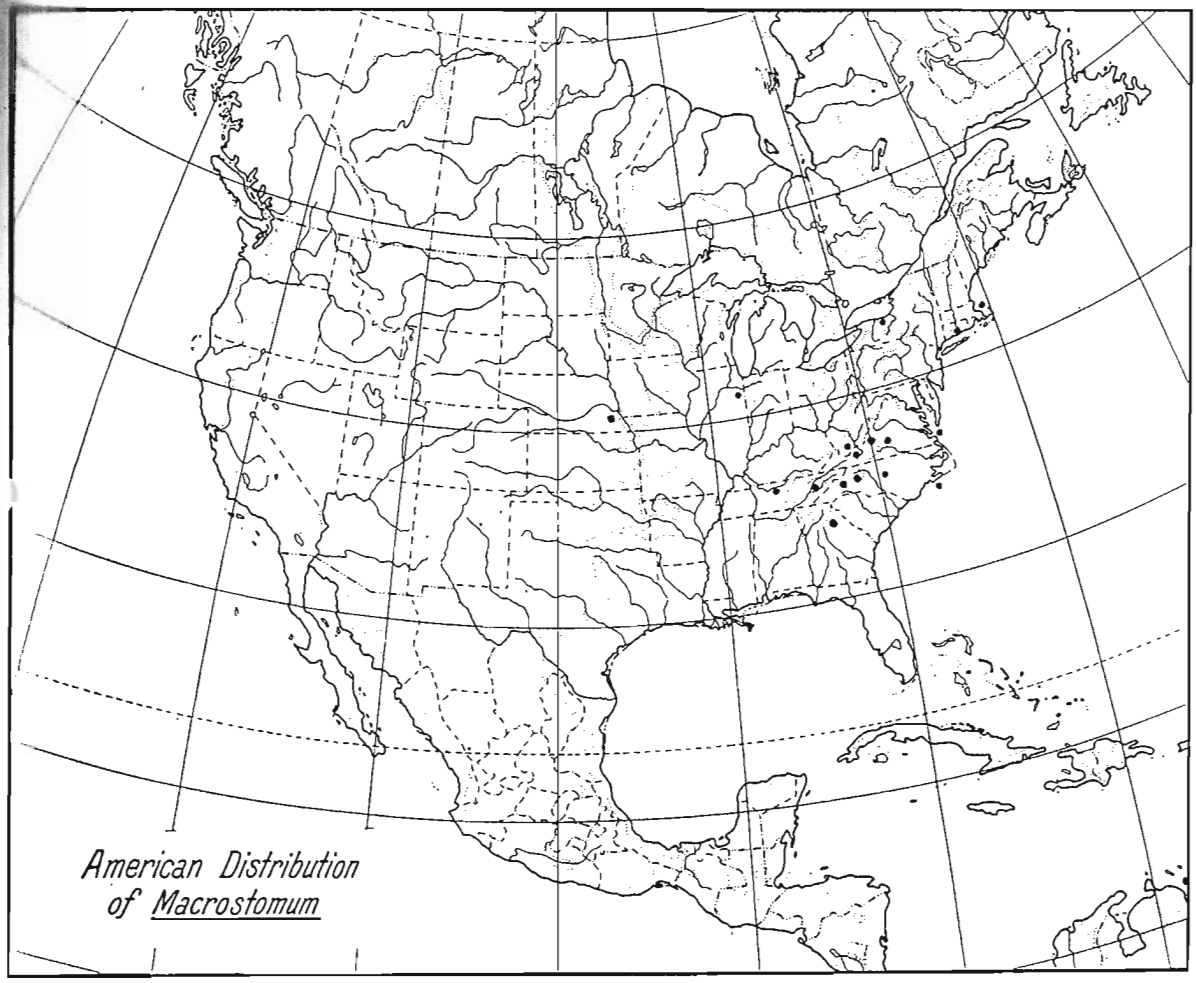


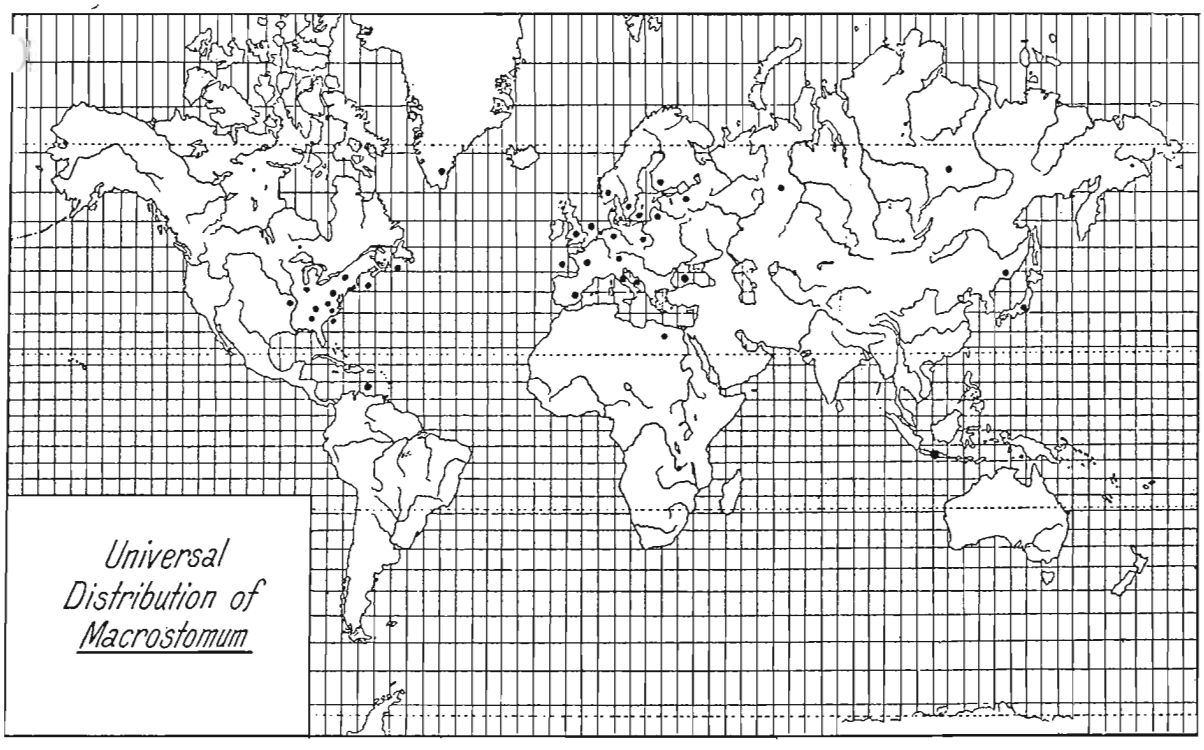
Fig. 1.

most impossible task safely to describe a new form or to be certain as to what form is being used experimentally. In order to facilitate research, both in the taxonomy and experimentation, this mono-

graph has been prepared. The field has almost unlimited potentialities for further research. It is earnestly suggested that most



Map 1.



Map 2.

of the presently accepted European species be redescribed in the present light of new techniques and methods of approach. Here in the United States, no work of an acceptable nature has been performed west of Tennessee and the whole of South America and Canada has not been touched. The distribution maps will show that only sporadic efforts have been made in the study of *Macrostomum* the world over.

History.

The author has adopted a form of historical résumé, which, it is believed, will meet the needs of workers in this field. An effort has been made to give a chronological development of the history of *Macrostomum* which readily shows the interesting fashion in which both the generic and family names have been shuffled back and forth by the various authors.

The name Macrostomidae has followed a devious route since the family Macrostomida was first proposed by BENEDEN in 1870. In 1882 von GRAFF saw fit to include family III Macrostomida BENEDEN under the Tribus Rhabdocoela. Von GRAFF included *Mecynostomum* BENEDEN, *Macrostoma* OERSTED. and *Omalostomum* BENEDEN under the family Macrostomida.

The genus name after having suffered sundry changes was finally made *Macrostomum* by O. SCHMIDT in 1848. This name has been accepted as a standard. With the exception of a very few authors, its use up to the present has been consistent.

Modern references to Macrostomida have been made by MEIXNER and RIEDEL; the former in MEIXNER (1924, p. 19) who gave it as Section B of the order Rhabdocoela and the latter in RIEDEL (1932, p. 35) who retained the classification of MEIXNER (1924) in her work.

BRESSLAU (1933) in his monumental tome, which is so expressive of his rare taxonomic insight, chose to revert to von GRAFF's (1882) division of the families Macrostomidae and Microstomidae and to give to all future workers this proper classification of the genus. Under this family grouping were included *Mecynostomum* BENEDEN 1870, *Omalostomum* BENEDEN 1870, *Macrostomum* O. SCHMIDT 1848, and *Paramacrostomum* RIEDEL 1932. The recently added *Protomacrostomum* STEINBÖCK 1935 is not a valid taxonomic division of the family Macrostomidae[1].

Family Microstomidae.

1882. Fam. Microstomida (parte) (Gen. *Microstoma* + Gen. *Alaurina*). + Fam. Macrostomida, L. v. GRAFF, Monogr. Turbell. **1**, pp. 236, 247, 260.

1907. Fam. Microstomidae, LUTHER in: Zool. Anz. **31**, p. 723.

1908. Fam. Microstomidae. L. v. GRAFF in: Bronn's Kl. Ordn., **4** (I c), p. 2518.

1909. Fam. Microstomidae, L. v. GRAFF in: BRAUER, Süßw., **19**, p. 72.

To add to the confusion, the terminology has been loosely handled. For example, in the following list the ending for section name has been used twice

[1] See foot note chapter on classification.

for a family reference, BRESSLAU being the only one to have used the recognized terminology for a family.

Family Macrostomidae.

1870. Macrostomida, E. BENEDEN in: Bull. Ac. Belg., sér. 2, **30**, p. 131.

1882. Macrostomida, L. v. GRAFF, Monogr. Turbell. **1**, p. 236.

1924. Macrostomida (sect.), J. MEIXNER in: Zool. Anz. **60**, p. 19.

1932. Macrostomida (sect.), G. RIEDEL in: Vidensk. Meddel. Dansk naturh. Foren **94**, p. 35.

1933. Macrostomidae, E. BRESSLAU in: E. KÜKENTHAL and T. KRUMBACH, Handbuch der Zoologie, **2**, 1st half. W. de Gruyter, Berlin-Leipzig, p. (1), 201, 264.

Sub-family Macrostominae.

1828. Gen. *Derostoma* (parte), ANT. DUGÈS in Ann. Sci. nat., **15**, p. 141.

1831. Gen. *Turbella* (parte), (HEMPRICH and) EHRENBERG, Symb. phys., Phytoz. Turbell. fol. a.

1843. Gen. *Macrostoma* (e Sect. Mesostomeae), A. ÖRSTED in: Naturh. Tidsskr. **4**, p. 548, 563.

1844. Gen. *Macrostoma* (e Sub-fam. Mesostomeae), A. ÖRSTED, Plattwürmer, p. 60, 72.

1848. Gen. *Macrostomum* (e Fam. Schizostomeae), O. SCHMIDT, Rhabd. Strudelw. süß. Wass., p. 54.

1850. *Turbella* (parte), DIESING, Syst. Helm., **1**, p. 223.

1859. Fam. Rhochmostoma (parte), SCHMARDA, Neue wirbell. Th., **1**, I, p. 7.

1862. Gen. *Turbella* (parte); + Gen. *Spiroclytus* (parte). DIESING in: SB. Ak. Wiss. Wien **45**, I, p. 211, 215, 224.

1870. »*Macrostomicus*«, E. BENEDEN in: Bull. Ac. Belg., sér. 2, **30**, p. 129.

1870. Gen. *Macrostomum*, ULJANIN in: Syezda Russ. Est., Syezda 2, **2**, p. 9.

1882. Fam. Macrostomida, L. v. GRAFF, Monogr. Turbell., **1**, p. 203, 236.

1894. Fam. Macrostomidae, HALLEZ, Cat. Turbell., ed. 2, p. 64.

1905. Macrostominae, L. v. GRAFF in: Z. wiss. Zool. **83**, p. 79.

1906. Macrostominae, FUHRMANN in: Rev. Suisse Zool. **4**, p. 720.

1907. Sub-fam. Macrostominae, LUTHER in: Zool. Anz. **31**, p. 723.

1908. Sub-fam. Macrostominae, L. v. GRAFF in: Bronns Kl. Ordn. **4** (I c), p. 2517.

1909. Sub-fam. Macrostominae, L. v. GRAFF in: BRAUER, Süßw. **19**, p. 75.

Genus *Macrostomum* O. SCHMIDT.

1828. *Derostoma* (parte: *D. platurus*), ANT. DUGÈS: Ann. Sci. nat. **15**, p. 142.

1831. *Turbella* (parte: *T. platyura*), (HEMPRICH and) EHRENBERG, Symb. phys., Phytoz. Turbell. fol. a.

1843. *Macrostoma* (non RISSO 1826), ÖRSTED in: Naturh. Tidsskr. **4**, p. 548, 565.

1844. *Macrostoma*, A. ÖRSTED, Plattwürmer, p. 72.

1848. *Macrostomum*, O. SCHMIDT, Rhabd. Strudelw. süß. Wass., p. 54.

1850. *Turbella* (parte: *T. platyura*, *T. appendiculata*, *T. hystrix*), Diesing, Syst. Helm. 1, p. 223.

1859. *Macrostomum* (*M. setosum*), Schmarda, Neue wirbell. Th., 1, I, p. 7

1862. *Turbella* (parte: *T. platyura*, *T. appendiculata*, *T. hystrix*) + *Spiroclytus* (*S. setosus*), Diesing in: SB. Ak. Wiss. Wien **45**, I, p. 215, 224.

1870. *Macrostomum*, E. Beneden in: Bull. Ac. Belg., sér. 2, **30**, p. 131.

1870. *Macrostomum* (parte: *M. lineare*), Uljanin in: Syezda, Russ. Est., Syezda 2, **2**, p. 9.

1882. *Macrostoma*, L. v. Graff, Monogr. Turbell., **1**, p. 239.

1905. *Macrostomum*, L. v. Graff in: Z. wiss. Zool. **83**, p. 80.

1905. *Macrostomum*, Luther in: Festschr. Palmén, **1**, Nr. 5 (Anat., Histol.).

1908. *Macrostomum*, L. v. Graff in: Bronn's Kl. Ord., **4**, I c, p. 2518.

1909. *Macrostomum*, L. v. Graff in: Brauer, Süßw., **19**, p. 75.

The above is the system of historical reference that has been used by von Graff (1913) who presented this phase of the work in a remarkably fine manner[2]. The type of work, in which Dr. Ludwig von Graff excelled, is best exemplified in the study of the development of the genus *Macrostomum* O. Schm. found in Bronn, H. G. (1904—1908, p. 2484 etc., Rhabdocoelida. Geschichte des Systems). Since von Graff's 1913 publication there have been only two noteworthy changes in the taxonomic position of the genus. These changes are found in the above described use of Sect. Macrostomida by Meixner and Riedel, and the subsequent proper deletion of this classification, and the adoption of the family Macrostomidae by Bresslau.

1924. *Macrostomum*, J. Meixner in: Zool. Anz. **60**, p. 19. This development of the Section Macrostomida (+ Microstomidae, Luther 1907, L. v. Graff 1913) is a forerunner of the presently accepted classification of;

1933. *Macrostomum*, E. Bresslau in: E. Kükenthal and T. Krumbach, Handbuch der Zoologie **2**, 1st half. W. de Gruyter, Berlin-Leipzig, p. (2) ,6, (1) 25, (1) 104, (1) 118, (1) 165, (1) 203, (1) 221, (1) 233, (1) 234, (1) 235.

Classification.

Turbellaria:

- Acoela.
- Rhabdocoela . . . . { Notandropora; Opisthandropora . { Macrostomidae. Microstomidae.; Lecithophora }
- Alloecoela.
- Tricladida.
- Polycladida.
- Temnocephalida.

[2] The present author wishes to avoid duplication of references by only giving in full those references which established the validity of the particular taxonomic division (including species references) and giving in an abbreviated form later incidental references. For complete reference see bibliography.

Macrostomidae:

Opisthandropora without preoral enteric blind sack, posterior end of body generally broadened into an adhesive disk, ovaries paired (with exception of genus *Omalostomum*), sexual development.

Genera: *Mecynostomum* E. Beneden, with statocyst and two ovaries.

Omalostomum E. Beneden, with one ovary.

Macrostomum O. Schmidt, with two ovaries.

Paramacrostomum G. Riedel, with two ovaries and typical triclad-type enteron, without adhesive disk.

Protomacrostomum O. Steinböck[3]. Mouth opening in fore end of body.

The author adopts with reservation the above excellent system of classification as advanced by Dr. E. Bresslau in: Kükenthal and Krumbach, Bd. I, 1st pt., p. 264.

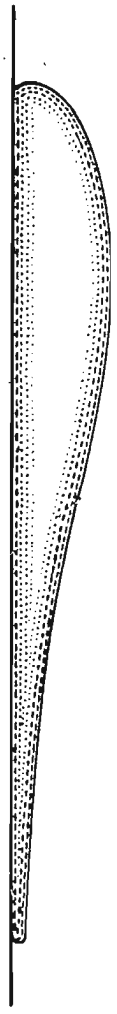


Fig. 2.

Ecology.

Macrostomum has elected to live in a medium "whose movement in the inorganic and in the organic world constitutes the first, the most fundamentally important activity in the world that we live in" (Henderson, 1922). The body shape, size and structure of this flatworm lends itself admirably with respect to fitness in such an environment. The shape of the animal is such that it very easily resists the flow of water. Modern race cars, in their stream-lines embody much the same idea expressed in the streamlined body of *Macrostomum* (Fig. 2) which allows a current of water to flow over the animal without dislodging it from the substrate. Species of *Macrostomum* are developed to withstand the rushing waters of mountain streams and waterfalls, the ebb and flow of ocean currents and the steady flowing action of ordinary creeks. Smaller, faster moving species occupy moving waters while the larger, more sedentary forms inhabit still waters.

The literature shows *Macrostomum* to have a wide distribu-

[3] The author relegates the genus *Protomacrostomum* O. Steinböck to genera dubia of the family Macrostomidae until proper taxonomic work justifies its position.

tion[4]. The species, location, and authority are outlined in the following pages to give an idea as to the various types of habitats in which *Macrostomum* may be found. There are fresh water, marine and brackish water species. The occurrence is probably more frequent in the temperate regions, with reports in sub-arctic and sub-tropical regions being less numerous. There is a specificity for the various types of waters among the species ranging through lakes, rivers, creeks, rivulets, swamps, springs, waterfalls and the differing marine waters.

The usual food for *Macrostomum* consists in the general run of smaller organisms which occupy the same habitat, including annelids, nemerteans, protozoa, and filamentous and unicellular algae. The large, ventrally disposed mouth, coupled with the highly distensible enteric sac, enables the animal to ingest others almost as large as itself. When in such a gastronomic dilemma, the animal lies quietly, while the large irregular bulk of food is reduced to a convenient size by enzymic action. Insect larvae, tough-shelled rotifers, and, above all, squirming, wire-like nematodes are taken in, subdued and digested with amazing facility. Indigestible foods lacking the proper composition are regurgitated through the mouth.

A prolonged study of *Macrostomum* brings out many interesting facts concerning its behavior. The biganglionic "brain" with its extensions and epithelial nerve endings is well suited to care for the simple type of stimulus-response activity which confronts the animal in such an environment. Most of its actions are essentially reflexive or instinctive in nature.

The eyes appear to be light perceiving but not image perceiving organs. Species are known which live successfully without eyes.

A sense of taste is present to a limited degree. Often objects of food when hastily engulfed will be found unsuited to the taste and forthwith ejected. From an experimental study it has been found that hungry animals may "smell" chopped bits of food at about the distance of their body lengths. Sound does not seem to affect them and sudden vibrations will only cause them to slow down slightly.

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[4] Noticeable to American readers is the fact that the genus has not been reported in western United States. (HIGLEY [1918, p. 39] in a discredited work upon *Macrostomum* reports the finding of *M. appendiculatum* at Lincoln, Nebraska.)

The epidermis plays an important part in the reception of stimuli. This sensitivity is aided by semi-rigid spines and the sensory hairs with which the epidermis is supplied. When these elongated slender processes are stimulated tactually by a needle held in front of the animal it recoils and pushes off in a lateral direction; when stimulated on the side the animal increases its speed, and when stimulated in the posterior region the animal very quickly draws this part of the body up under itself and scurries to safety much as a struck dog. If the animal is touched anteriorly while swimming it may immediately stick to the needle and move upward upon it. This indicates a thigmotactic response.

Sensory hairs aid in the detection of the presence of enemies. Remarkably quick avoidance reactions, considering the viscosity of the medium, are exhibited. When confronted they are able to bend over backwards, and escape swimming off upside down for a short way. This peculiar movement is facilitated by the adhesion of the tail to the substrate until the body has been completely flipped over.

Generally *Macrostomum* move by means of ciliary motion, adhering flatly to the substrate over which they pass. Swimming motions are of two kinds: one in which they move up or down by spiralling motions of the body (Fig. 1), which is usually held in a perpendicular manner, and one in which they reach the bottom by the use of long, soaring movements, taking advantage of the resistance of the water against their flattened ventral sides, much as a bird does as it gradually floats in to rest.

With respect to the animal in a resting condition, ciliary movement has a definite pattern. This may be ascertained by placing an animal in a very weak India ink solution. Figure in Part III., shows that three longitudinal currents with deflective variations are produced. If the spatulate condition of the tail at the moment happens to be pronounced, then the current is deflected outwardly; if not, it is turned inward producing a vortex. The current down the mid-dorsal crest of the body terminates in the posterior end in an upward whirl. It seems that ventro-stomatal currents have no effect in driving food into the mouth as WESTBLAD (1923, p. 55) has suggested for Rhabdocoeles having the pharynx simplex.

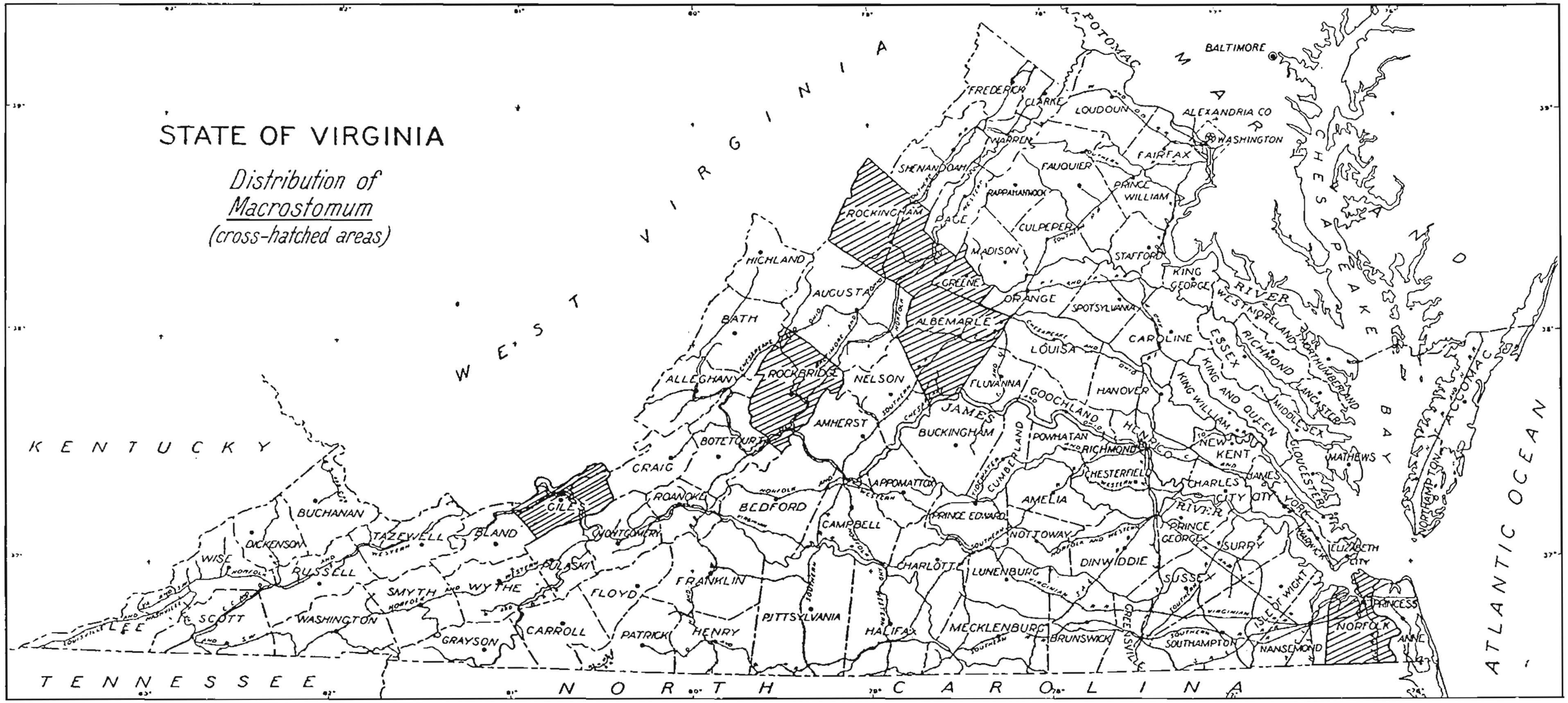
Coupled with the factor of body-shape is the interesting production of rhabdites (Fig. in Part III.) with which the epidermis is studded. These rod-shaped adhesive structures occur singly and in groups. Those of the tail region are the most efficient as struct-

ures of adhesion. As an example of their adhesive ability it may be shown that if a stream of water be directed at the anterior end of the animal it will be completely flipped over on its dorsal side and its hold will be retained until a marginal part of the tail is torn off. Whether or not the action of the protruding rhabdites is entirely adhesive is questionable; for they may possess a degree of vacuum cup action, as shown by their method of attachment to a cover glass (Fig. in Part V.). It is next to impossible to take a specimen up with a pipette without first loosening the attachment of its spatulate tail. Long practice is necessary before the pipette method of handling such an adhesive animal becomes successful. This adhesive ability might be used in resisting sudden current movements or certain types of feeders like *Hydra*, which make an effort to pull their prey from their mooring places. The rhabdites of the tail have a peculiar braking action, used when the animal slides to a halt by dropping down the adhesive rim of the tail against the water's action.

Intervals of rest, comparable to our sleep, are manifest when an animal, gorged with food, will remain absolutely still for long periods, with nothing moving except cilia. Hungry animals with empty enterons move with a noticeable increase in speed over those whose enterons are darkened with food materials.

The relation of *Macrostomum* to the plant world is based upon the food furnished by the smaller plant life. *Macrostomum* is not directly dependent upon adequate plants though they may furnish a degree of protection. Splendid collections have been made from water the shore and bottom of which were practically devoid of plan life. This station, however, was well supplied with invertebrate life. Animals may be successfully cultured in Petri dishes lacking plants, and only containing food at regular feeding time.

As a rule, it is found that only one species will occupy a single habitat at a time, yet there are cases in which as many as three different species live in apparent harmony within the confines of a very small lake. Cannibalism may be the factor which tends to prevent aggregation of the different species. I have seen members of *M. bulbostylum* mihi indulge in cannibalism. It will be noted that the relation between the various genera of Rhabdocoelida is one of cannibalism. *Stenostomum* and *Dalyellia* are particularly guilty in this respect.

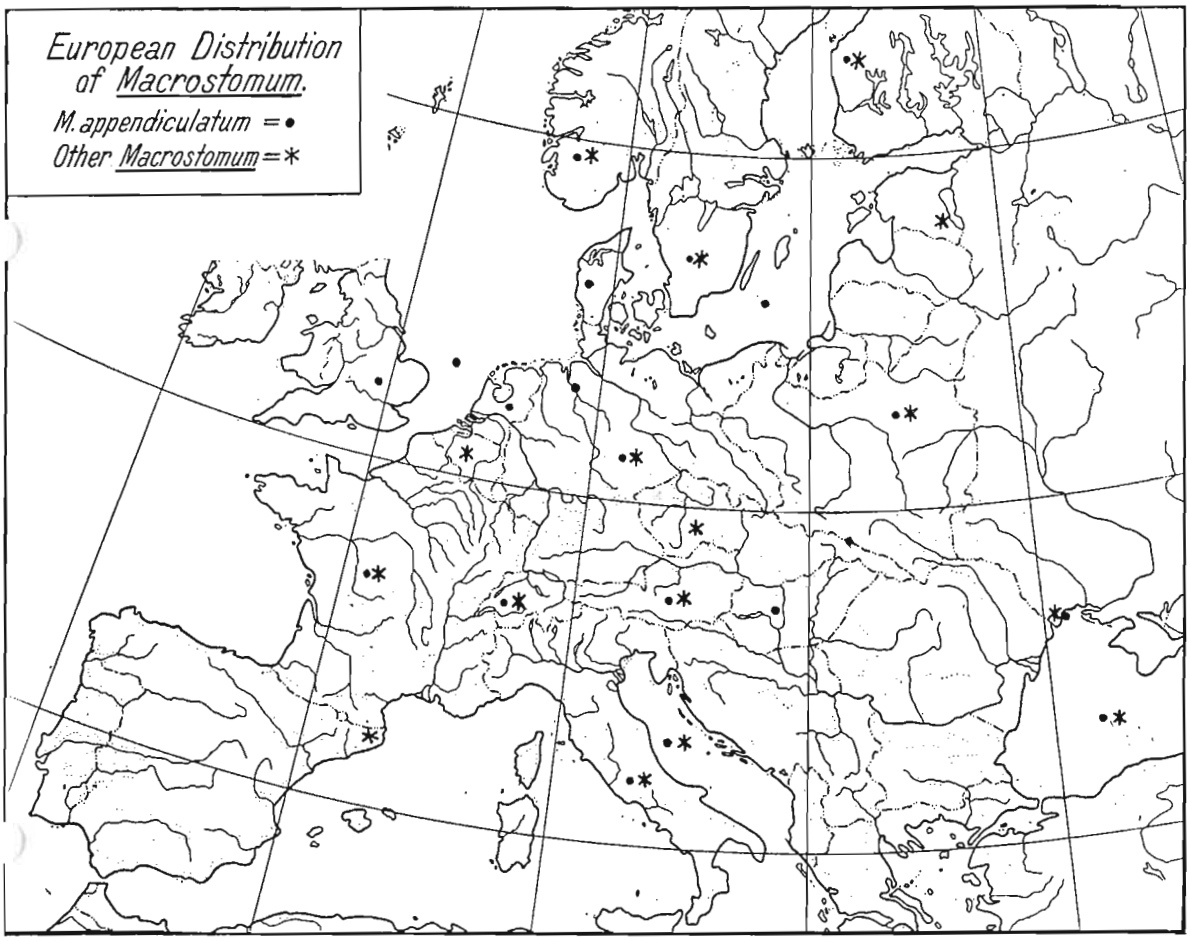

STATE OF VIRGINIA
Distribution of
Macrostomum
(cross-hatched areas)
WEST VIRGINIA
KENTUCKY
TENNESSEE
NORTH CAROLINA
MARYLAND
CHESAPEAKE BAY
ATLANTIC OCEAN
POTOMAC
BALTIMORE
WASHINGTON
ALEXANDRIA CO
FREDERICK
CLARKE
LOUDOUN
WARREN
FAIRFAX
SHENANDOAH
FAUQUIER
PRINCE WILLIAM
RAPPAHANNOCK
ROCKINGHAM
PAGE
CULPEPER
MADISON
STAFFORD
HIGHLAND
AUGUSTA
GREENE
ORANGE
SPOTSYLVANIA
KING GEORGE
BATH
ALBEMARLE
LOUISA
CAROLINE
WESTMORELAND
RICHMOND
NORTHUMBERLAND
ESSEX
KING AND QUEEN
KING WILLIAM
LANCASTER
MIDDLESEX
ALLEGHANY
ROCKBRIDGE
NELSON
FLUVANNA
GOOCHLAND
HANOVER
AMHERST
JAMES
BUCKINGHAM
POWHATAN
HENRICO
RICHMOND
NEW KENT
GLOUCESTER
MATHEWS
BOTETOURT
CRAIG
APPOMATTOX
CUMBERLAND
CHESTERFIELD
CHARLES CITY
JAMES CITY
YORK
ROANOKE
BEDFORD
AMELIA
PRINCE EDWARD
GILES
BUCHANAN
TAZEWELL
BLAND
MONTGOMERY
CAMPBELL
NOTTOWAY
PRINCE GEORGE
SURRY
ELIZABETH CITY
DICKENSON
WISE
RUSSELL
PULASKI
FRANKLIN
CHARLOTTE
LUNENBURG
DINWIDDIE
SUSSEX
ISLE OF WIGHT
SMYTH
WYTHE
FLOYD
SCOTT
LEE
WASHINGTON
PITTSYLVANIA
HALIFAX
MECKLENBURG
BRUNSWICK
GREENSVILLE
SOUTHAMPTON
NANSEMOND
NORFOLK
PRINCESS ANNE
GRAYSON
CARROLL
PATRICK
HENRY
NORTHAMPTON
ACCOMAC

Map 3.

Universal Distribution Chart of the genus *Macrostomum*.

Species	Variety	Location	Habitat
M. appendiculatum O. Fabr. . .		Atlantic Ocean	Marine and brackish waters
		Lower Elbe	
		North Sea	
		Baltic Sea	
		Adriatic Sea	
		Black Sea	
		Odessa	Marine waters
		Slawiansk	
		Norway	Standing and flowing fresh water
		England	
		Denmark	
		Holland	
		France	
		Switzerland	
		Germany	
		Finnland	
		Austria	
		Hungary	
		Italy	
		Asia	
		Virginia	
M. appendiculatum var. *sillimani* mihi		New York	Fresh water
		Massachusetts	Brackish water
M. beauchampi mihi		Uganda	Fresh water
M. beaufortensis Ferguson . . .		Pivers Island	Marine waters
		Beaufort, N C.	
M. boreale Riedel.		Greenland	Marine waters
M. bulbostylum mihi		Virginia	Standing fresh waters
		West Virginia	
		Tennessee	
M. collistylum mihi		Tennessee	Standing and flowing fresh waters
M. curvistylum mihi		Virginia	Flowing fresh waters
M. gieysztori mihi		Spain	Standing fresh waters
M. gilberti mihi		Tennessee	Standing and flowing fresh waters
M. glochostylum mihi.		Virginia	Flowing fresh waters
M. gracile Pereyaslawzewa . .		Black Sea	Marine waters
M. graffi mihi.		Black Sea	Marine waters
M. infundibuliferum Plotnikow		Tomsk	Fresh waters
M. intermedium Tu		China	Fresh waters
M. japonicum Okugawa		Japan	Fresh waters
M. lineare Uljanin		Black Sea	Marine waters
M. nassonovi mihi		Russia	Fresh waters
M. obtusum Vejdovský		Bohemia	Fresh waters

Species	Variety	Location	Habitat
M. orthostylum BRAUN.		Dorpat Switzerland	Flowing fresh waters Fresh water lakes
M. reynoldsi mihi		Virginia	Flowing fresh waters
M. rhabdophorum BEKLEMISCHEFF		Odessa	Fresh waters
M. riedeli mihi		Virginia	Flowing fresh waters
M. ruebushi mihi		Tennessee	Flowing fresh waters
M. ruebushi var. *carolinensis* mihi		North Carolina	Standing fresh waters



Map 4.

M. ruebushi var. *crenatostylum* mihi	Tennessee	Standing and flowing fresh waters
M. ruebushi var. *finnlandensis* mihi	Finnland	Fresh waters
M. ruebushi var. *frigorophilum* mihi	Virginia	Flowing fresh waters
M. ruebushi var. *granulophorum* mihi	Connecticut	Standing fresh waters
M. ruebushi var. *recurvostylum* mihi	Connecticut	Standing fresh waters
M. ruebushi var. *shenandoahensis* mihi	Virginia	Flowing fresh waters
M. ruebushi var. *truncatum* mihi.	Virginia	Standing fresh waters
M. stylopencillum JONES	North Carolina	Brackish waters

Species	Variety	Location	Habitat
M. saifunicum Nassonov. . . .		Russia, Japan	Fresh waters
M. tennesseensis mihi.		Tennessee	Standing fresh waters
M. lewisi mihi		Virginia	Standing fresh waters
M. thermale Reisinger.		Java	Flowing calcium waters
M. timavi v. Graff		Adriatic Sea	Brackish waters
M. tuba v. Graff		France, Germany, Austria, Russia	Fresh waters
M. tuba var. *gigas* Okugawa . .		Japan	Standing fresh waters
M. vejovskyi mihi		Connecticut	Standing fresh waters
M. virginianum Ferguson . . .		Virginia	Flowing fresh waters
M. viride Beneden		Sweden, Denmark, Germany, Switzerland, Italy, Belgium, France, Russia, Siberia	Fresh waters

Neue Funde auf dem Gebiete der Systematik und der Nomenclatur der Acari. III[1].

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Eingeg. 24. Februar 1939.

Zu den Acari rechne ich nicht mehr die Notostigmata With 1903, Holothyroidae Thorell 1882, Mesostigmata Can. 1891, Spinturnicidae Oudms. 1901 und Ixodides Leach 1815 (5, 6, 7).

Acari (sensu ante Okt. 1936). — Im Jahre 1899 schlug Berlese vor, die Mesostigmata Can. 1891 und die Ixodides Leach 1815 in eine Gruppe zu vereinigen unter dem Namen Mesostigmata. — Im Jahre 1877 vereinigte Kramer die Acari mit dorsalen Stigmata hinter dem Gnathosoma in eine Gruppe, die Prostigmata. — Im Jahre 1896 brachte Berlese die Acaridiae Latr. 1806 und die Oribatei Dug. 1834 zusammen unter dem Namen Cryptostigmata. Diesé drei Hauptgruppen wurden schon im März 1877 von Mégnin (4) instinktmäßig gefühlt. Er zitiert dort die Einteilung Gervais' (1859) der Acari in 9 Familien: 1. Sciridés, 2. Trombidiés, 3. Hydrachnidés, 4. Gamasidés, 5. Ixodidés, 6. Oribatidés, 7. Sarcoptidés, 8. Demodicidés und 9. Arctisconidés. — Von diesen Familien nun sagt Mégnin: »Il est évident que les trois premières familles ont de grands rapports entre elles et forment

[1] I. In Tijdschr. Ent. 81, Verslagen, p. II—X, 28 April 1938. — II. In idem, Verslagen, p. LXX—LXXX, 26 Sept. 1938.