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Gastrotricha of Kettle Moraine State Park

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GASTROTRICHA OF KETTLE MORAINE STATE PARK

by

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I. INTRODUCTION

The Gastrotricha are an abundant but little known group of micrometazoans. The anatomical and taxonomic work of Zelinka (1889) was the basis for most later work. The first of the major investigations were performed by Europeans. The works of Greuter (1917), Grunspan (1908, 1910), Voigt (1901, 1902, 1903, 1904, 1909) and Remane (1927a, 1927b, 1936) were the most noteworthy. Saito (1937) in Japan, Naidu (1962) and Visvesvara (1963, 1964) have shown similarities between the Asian, European and North American fauna. Since Remane's monograph of 1936, European work on Gastrotricha has, for all practical purposes, ended.

Stokes (1887a, 1887b, 1918) did the first major taxonomic work in the United States. Other noteworthy investigations in the United States were performed by Davison (1938), Packard (1936, 1958a, 1958b, 1958c, 1958f, 1959, 1960, 1962), Brunson (1947, 1948, 1949, 1950, 1963), the Krivaneks (1958a, 1958b, 1959, 1960), Robbins (1963, 1965, 1966), Hawkes (1965), and Horlick (1969).

The Gastrotricha are a neglected group of microscopic animals. The European studies are most comprehensive, but are far from complete. There has not been a detailed study of Gastrotricha in Asia, Africa, or South America, and there are no studies reported from Australia. Studies are completely lacking from Canada and Mexico and have been performed in only twelve of the fifty United States. Most studies have uncovered new as well as known taxa, showing the similarities of gastrotricha fauna of diverse localities.

This paper is concerned with the taxonomy of fresh water gastrotricha in Kettle Moraine State Park in Wisconsin.

II. PHYLOGENETIC POSITION OF GASTROTRICHA

The first mention of gastrotricha was by Joblot in 1718. Descriptions of gastrotricha are found in the works of some of the notable early zoologists. O. F. Muller (1773) classified the two species he had found as Infusoria. Ehrenberg (1830) regarded them as rotifers. Metschnikoff (1864) proposed the name Gastrotricha because the group is ventrally ciliated. However, Metschnikoff believed that the gastrotrichs and the rotifers were similar enough to be put into a single class.

Zelinka's (1889) phylogenetic treatment of the Gastrotricha was the first to gain general acceptance. Zelinka thought that the morphology of both the gastrotrichs and the rotifers was similar to that of the trochophore larvae of the marine mollusks and annelids. He then chose the phylum name Trochelminthes to include both Rotifera and Gastrotricha as classes.

Since the Gastrotricha show similarities to groups other than rotifers, Remane (1927) placed Gastrotricha in the phylum Aschelminthes along with Nematoda, Kinorhyncha and

Rotifera as classes. Hyman (1951) seems to agree with the concept of class Gastrotricha being included in the phylum Aschelminthes. Hyman (1951, 1959) suggests the classes Priapulida and Nematomorpha be incorporated into this phylum. Hyman admits that so little is known about these classes that each may be able to stand alone as a separate phylum.

In this paper Gastrotricha is treated as a class in the phylum Aschelminthes.

III. SYSTEMS OF CLASSIFICATION

Ehrenberg (1830) separated all gastrotrichs into two groups on the basis of the texture of their cuticle. Ehrenberg's two genera: Ichthydium, those with a smooth cuticle: and Chaetonotus, those without a smooth cuticle, are still in use today.

Ehrenberg's system of classification soon proved inadequate and other systems were developed. Zelinka (1889), Daday (1905) and Cordero (1918) developed systems of classification, but they also proved inadequate and incomplete. Mola (1932) developed a complete system, but his system is based upon the work of other authors, not on new material. Remane's (1936) scheme of classification is complete and widely accepted, and will be followed throughout this paper. Remane's system, with some modification, is as follows:

Order Macrodasyoidea Remane, 1927

Genus Marinellina Ruttner-Kolisko, 1955

Order Chaetonotoidea Remane, 1927

Family Chaetonotidae Zelinka, 1889

Genus *Chaetonotus* Ehrenberg, 1830
Genus *Ichthydium* Ehrenberg, 1830
Genus *Leoidodermella* Zelinka, 1889
Genus *Aspidiophorus* Voigt, 1902
Genus *Heterolepidoderma* Remane, 1927
Genus *Polymerurus* Remane, 1927
Genus *Asperpellis* Horlick, 1969

Family Proichthydidae Remane, 1936

Genus *Proichthydium* Cordero, 1918

Family Dichaeturidae Remane, 1936

Genus *Dichaetura* Lauterborn, 1913

Family Neogosseidae Remane, 1936

Genus *Neogossea* Remane, 1927
Genus *Kijanebalola* Beauchamp, 1932

Family Dasydytidae Remane, 1936

Genus *Dasydytes* Gosse, 1851
Genus *Stylochaeta* Hlava, 1904

The application of the species concept to parthenogenetic organisms has been criticized by Dobzhansky (1951) and Mayr (1963). Their argument centers on the fact that gastrotricha are not sexually reproducing which automatically excludes this class from most definitions of species. Simpson (1961) on the other hand, argues that because there is a community inheritance, the formation of a gene pool and the inhibition of the spread of genes to other populations the species concept is valid in uniparental, as well as, biparental organisms. The taxonomy of the freshwater gastrotricha is approached here within the framework of the latter idea.

IV. DEFINITION OF THE CHAETONOTOID GASTROTRICHA

The class Gastrotricha is most commonly included in the phylum Aschelminthes. Aschelminthes are characterized as having a pseudocoelomate body, somewhat vermiform and unsegmented, with the anus terminating well posterior to mouth, and a cuticle of varying relative thickness. Gastrotricha is a distinct class in possessing adhesive glands and tubes, cilia in various and distinct arrangements, and a nematode-type pharynx (without trophi). Gastrotrichs lack a corona and a segmented cuticle. They are aquatic and microscopic (minute to 1.5 mm).

The class Gastrotricha is divided into orders: Macrodasyoidea and Chaetonoidia.

Members of the order Macrodasyoidea are all marine with one known exception, *Marinella flagellata* Ruttner-Kolisko (1955) from the Ybbs River, Austria. They are characterized as lacking protonephidia, being hermaphroditic, and possessing many lateral adhesive glands.

The members of the order Chaetonoidea are generally freshwater inhabitants with the exception of the Families Neodasyidae and Xenotrichuldae which are totally marine, and the Family Chaetonotidae which has a few marine members. With the exception of the marine genera, the Chaetonotids possess protonephidia and occur only as parthenogenic females and thereby showing no evidence of males in the population.

Adhesive glands are usually present as a single posterior pair, but a few species are lacking the glands altogether. Variations of the cuticular structure in the form of spines and scales is characteristic of this order.

V. DEFINITION OF CHAETONOTOID CHARACTERISTICS EMPLOYED IN TAXONOMY

A. Cuticular Structures

The size, type and arrangements of the cuticular features, as well as presence or absence, are important in all levels of classification from familiar to specific. Cuticular features are the most stable characteristic and are the least affected by fixation or mounting.

1. Spines

Classification of freshwater gastrotricha is dependent upon the determination of the type, placement, attachment, and relative lengths of the spines that may be present. The spines may be direct outcroppings of the cuticle, or they may originate in scales. The degree of movability is a further distinction made between the types of spines. For the most part, the spines are rigid, but some species can erect or move the spines. Only two species are known to move spines; _Chaetonotus quintispinosus_ and _Chaetonotus trichodrymodes_. Refer to plate 2.

Spines are measured from tip to scale (or cuticle) and any curvature is ignored.

2. Scales

The only freshwater gastrotricha known to possess scales are of the Family Chaetonotidae. The scales can be of four types; scales bearing a spine, flat and unornamented scales, scales with a low median keel, or scales with a short stalk and broadened end plate. Refer to plate 3.

3. Tactile Bristles

Tactile bristles are fine processes found in many species of Chaetonotoids. The term is misleading because no sensory function has been demonstrated for these structures. The reliability of tactile bristles as a taxonomic tool has been questioned strongly by Robbins (1963). Robbins found the presence of tactile bristles to be variable within a species. Robbins explains that the possibility exists that the spines are lost in handling of the organisms, or are lost regularly under natural conditions.

B. Body Form

The total body length, size and shape of the head, neck, trunk, and caudal furca are important in classifying chaetonotoids.

1. Head

The head of most freshwater gastrotrichs is formed into either one, three, or five distinct lobes. The width of the head is the widest dimension anterior to the intestine. Another morphological characteristic of the head is the cephalic shield. The cephalic shield is a thin sheet of cuticle which extends from above the mouth posteriorly out over the anterior part of the head. The cephalic shield is taxonomically significant by its presence or absence in a species. Refer to plate 4.

2. Neck

The neck is the region of constriction posterior to the head and anterior to the intestine. The neck width is the narrowest dimension between the head and intestine.

3. Trunk

The trunk is the entire portion of the body posterior to the pharynx. The width of the trunk is the widest dimension of this area. Zelinka (1889) and Sacks (1953) maintain that the trunk is narrower than the head in newly hatched gastrotrichs; also, the presence of a developing egg within the animal will change the width of the trunk by as much as fifty percent.

4. Total Length

The total length is the dimension from the most anterior extent of the head to the tip of the caudal furca. Individuals of a species may vary as much as thirty percent, whereas, the other measurements remain more constant,

5. Caudal Furca

The caudal furca, when present, is formed by a dichotomous branching of the posterior end of the body. An adhesive gland is usually found in each branch of the furca. The length of the caudal furca is measured from the point of branching in the midline to the tip. Refer to plate 5.

6. Pharynx

The pharynx is a muscular tube similar to that of the Nematoda in form and histological structure (Remane, 1936). The pharynx can be a straight cylinder; it may possess an anterior bulb, a posterior bulb or both, or it may be nearly round as in the genus Kijanebalola.

7. Other Internal Features

The only other internal features of taxonomic note are the intestine and the cement glands and neither of these organs seem to be distinctive. The presence and number of refractive granules in the intestine have been used in taxonomic descriptions of certain species (Brunson, 1950). The nature of the granules is not clear. Robbins (1963) has stated that in his observations these granules were transitory features. Therefore, refractive granules do not seem to be a good basis of description.

8. Ciliary Tracts

The ciliary tracts constitute the ventral ciliation that is characteristic of the class. Different ciliary patterns characterize different genera. *Chaetonotus* has a double row of cilia; *Dasdytes* has a double row of small patches; and *Priochthydium* has a single band across the ventral surface of the head. Ciliary tracts are unknown for the several species and genera.

The purpose of the trunk cilia is locomotion while the long tufts of cilia on the head are probably of a sensory nature (Robbins, 1963). Because cilia beat in only one direction, gastrotricha are unable to back up.

They must go over or around an object.

9. Eggs

The freshwater gastrotricha lay both summer and winter eggs. Summer eggs usually start developing upon being laid. Winter eggs will experience a period of dormancy before development starts; this allows the species to survive adverse conditions such as freezing or dessication. Winter eggs are covered with spines, papilla, or pits, in various patterns and have a thick shell. Summer eggs usually have a smooth membranous covering that is thin and fragile. Winter eggs have been observed for only a few species; however, with greater study they could be an important taxonomic characteristic.

VI. FRESHWATER GASTROTRICHA OF NORTH AMERICA

A. Distribution

The first species of gastrotricha reported from North America was identified as Chaetonotus larus by Fernald (1883). In 1887, Stokes described eleven new species and redescribed ten species originally described from Europe. Since Stoke's work, North American studies are widely scattered. Some of the more important works can be summarized as follows; Packard (1936, 1958a, 1958b, 1958c, 1958d, 1958e, 1958f, 1959, 1960, 1962) with nine redescribed species from Maine, New York, New Hampshire, and Virginia; Brunson (1947, 1948, 1949, 1950, 1963) with six redescribed and twelve new species from Michigan; Robbins (1963, 1965, 1966, 1973) with two new and ten redescribed species from Illinois; the Krivaneks (1958a, 1958b, 1959, 1960) with two new species and reported species from two families not previously found in North America, the work being done in Louisiana; Hawkes (1965) with seven redescribed species from North Carolina and South Carolina; and, Horlick (1969) with one new and fourteen redescribed species from Illinois.

B. The following table is a distribution list of the fresh-water Gastrotricha of North America.

Species	State found	Authority	Date
Asperpellis concinnus	New Jersey	Stokes	1887
	New Hampshire	Packard	1936
	Illinois	Horlick	1969
A. sulcatum	New Jersey	Stokes	1887
	Michigan	Brunson	1956
	Michigan	Packard	1962
	Illinois	Horlick	1969
Aspidiophorus paradoxus	New Jersey	Davison	1938
	North Carolina	Hawkes	1965
	South Carolina	Hawkes	1965
Chaetonotus acanthodes	New Jersey	Stokes	1887
C. acanthophorus	New Jersey	Stokes	1887
	New Hampshire	Packard	1936
	Michigan	Brunson	1950
	Virginia	Packard	1958
	Illinois	Robbins	1963
	Illinois	Horlick	1969
C. aculeatus	Illinois	Robbins	1963
C. brevispinosus	New Jersey	Stokes	1887
	New Hampshire	Packard	1936
C. chuni	Washington	Hatch	1939
C. elegans	North Carolina	Hawkes	1965
	South Carolina	Hawkes	1965
C. enormis	New Jersey	Stokes	1887
C. formosus	New Jersey	Stokes	1887
	Michigan	Brunson	1950
	Illinois	Horlick	1969

Species	State found	Authority	Date
Chaetonotus gastrocyaneus	Michigan	Brunson	1950
	Illinois	Horlick	1969
C. larus	Maine	Fernald	1883
	New Jersey	Stokes	1887
	Illinois	Horlick	1969
C. longispinosus	New Jersey	Stokes	1887
	Illinois	Robbins	1963
	Illinois	Horlick	1969
C. loricatus	New Jersey	Stokes	1887
C. machrochaetus	Illinois	Robbins	1963
	North Carolina	Hawkes	1965
C. octonarius	New Jersey	Stokes	1887
	New Hampshire	Packard	1936
	Michigan	Brunson	1950
	Illinois	Robbins	1963
	Illinois	Horlick	1969
C. quintespinosus	Illinois	Robbins	1963
C. robustus	New York	Davison	1938
	New Jersey	Davison	1938
	Illinois	Horlick	1969
C. similis	New Jersey	Stokes	1887
	New Hampshire	Packard	1936
C. spinifer	New Jersey	Stokes	1887
C. spinosulus	New Jersey	Stokes	1887
	Illinois	Robbins	1963
	Illinois	Horlick	1969
C. succinctus	Virginia	Packard	1958
C. tachyneusticus	Michigan	Brunson	1948
C. trichodrymodes	Michigan	Brunson	1950
	Illinois	Robbins	1963

Species	State found	Authority	Date
Chaetonotus trichostichodes	Michigan	Brunson	1958
	Virginia	Packard	1958
C. vulgaris	Michigan	Brunson	1950
C. Zelinkae	North Carolina	Hawkes	1965
	South Carolina	Hawkes	1965
Dasydytes ooeides	Michigan	Brunson	1950
D. saltitans	New Jersey	Stokes	1887
D. monile	Illinois	Horlick	1969
Heterolepidoderma gracile	Illinois	Robbins	1963
	Illinois	Horlick	1969
H. ocillatum	Illinois	Robbins	1963
H. illinoiensis	Illinois	Robbins	1963
Ichthydium auritum	Michigan	Brunson	1950
I. brachykolon	Michigan	Brunson	1947
I. leptum	Michigan	Brunson	1947
I. macropharyngistum	Michigan	Brunson	1947
I. minimum	Michigan	Brunson	1950
I. monolobum	Michigan	Brunson	1950
	North Carolina	Hawkes	1965
I. podura	New Jersey	Stokes	1887
	Illinois	Horlick	1969
Kijanebalola sp.	Louisiana	Krivanek	1960
Lepidodermella squamatum	Washington	Hatch	1939
	Illinois	Goldberg	1949
	Michigan	Brunson	1949
	Illinois	Sacks	1953
	Illinois	Robbins	1963
	North Carolina	Hawkes	1965
	South Carolina	Hawkes	1965
	Illinois	Horlick	1969

Species	State found	Authority	Date
Lepidodermella trilobum	Michigan	Brunson	1950
Neogossea fasiculata	Louisiana	Krivanek	1958
N. sexiseta	Louisiana	Krivanek	1958
Polymerurus callosus	Michigan	Brunson	1950
P. nodicaudus	North Dakota	Bryce	1924
	New Jersey	Davison	1938
P. rhomboides	New Jersey	Stokes	1887
	New Jersey	Davison	1938
	Pennsylvania	Whitney	1938
	Maine	Packard	1957
	Illinois	Horlick	1969
Stylochaeta curvisetta	Louisiana	Krivanek	1959
S. fusiformis	New Jersey	Davison	1938
S. scirteticus	Michigan	Brunson	1950

VII. AREA OF STUDY

The area of this study included Ottawa and Lagrange Counties in Southeastern Wisconsin (Refer to maps 1 and 2). A total of three collection sites were established. One of the collection sites was in Ottawa County, and the other two collection sites were in Lagrange County. The ponds involved in this study were glacial in nature and were formed during the last glaciation about 12,000 B.C. No formal names had been attached to them, therefore, for the purpose of this paper, they will be designated Ponds A, B, and C.

Site 1: Pond A, T. 6 N. - R. 17 E. - S. 35 - 1/4 S.W. This study was made on June 2, 1975. Pond A was a marshy area with one end having cattails (*Typha*) and duckweed (*Lemna*, *Wolffia*). The other end was deeper with no vegetation. Pond A was located within one hundred feet of Wisconsin State Road ZZ. Although the water was clear, pond A may have acquired some pollution from passing vehicles. The samples were taken from the marshy north end of pond A. One species of gastrotrich was found.

Site 2: Pond B, T. 4 N. - R. 16 E. - S. 10 - 1/4 N.E. This study was made on June 9, 1975. Pond B is a kettle type of pond, being about twenty feet in depth. The water level of pond B was approximately fifty feet below the height of the surrounding terrain. Pond B had extremely clear water and duckweed completely ringed the pond. The samples were taken from the bottom detritus and the duckweed on the southwest side of the pond. Four species of gastrotrich were found.

Site 3: Pond C, T. 4 N. - R. 16 E. - S. 10 - 1/4 S.E. This study was made on July 17, 1975. Pond C is a kettle type of pond, being about fifteen feet in depth. The water level of pond C was approximately twenty-five feet below the height of the surrounding terrain. Pond C was completely surrounded by thorn bushes about eight feet in height and which were approximately one hundred feet in width. The bushes extended from the ridge of the kettle all the way down to within five feet of the water level. Pond C was completely ringed with duckweed and had very clear water. Samples were taken on the northwest side of the pond from the bottom mud and duckweed. Five species of gastrotrichs were found.

All numbers regarding the water depth and the height below surrounding terrain were taken from an interview with Park Ranger Thomas Johnstone or from literature provided by the State of Wisconsin at the Scuppernong Ranger Station.

VIII. METHODS AND MATERIALS

A. Collection

The method of collection varied with the type of sample. If the sample was bottom detritus, the jar was used as a scoop to pick up some mud along with water. Floating or submerged plants were picked up by hand and put into the jar, and then some water was added. Cattails were cut into sections and added to water in the jar.

In the laboratory, any plant material was squeezed and rinsed in the water of the jar from which it came. This procedure helped dislodge any gastrotrichs present in the plant material. The jars were partially covered and stored in an area that was cool and had indirect sunlight. Samples that were stored in this manner produced gastrotrichs for up to five months.

B. Observation

Samples were obtained by using an eye dropper to transfer five to ten milliliters to one-half of a petri dish. The sample was then observed under a binocular dissecting scope at 40X for the presence of gastrotrichs. If a number of samples from one particular jar produced no gastrotricha, the sample was observed at a later date. This postponed observation allowed any winter eggs in the jar to hatch, and provide gastrotrichs for the study.

Individual gastrotrichs were transferred from the petri dish to a microscope slide with the aid of a fine tipped micropipette. Animals were anesthetized using two methods: menthol (Robbins, 1963) and sodium pyrophosphate (Robatli-Lovisolo, 1972). The menthol method involved adding a crystal of menthol to a drop of water containing a gastrotrich with the use of a fine Irwin loop. The size of the crystal added to the drop depended on the amount of water on the slide; this method was subjected to trial and error. The sodium pyrophosphate method was modified and a .1 M solution was used. The animals were left in the .1 M sodium pyrophosphate for one hour in a depression slide in a moist chamber. Both methods were equally but not completely successful. The desired result was a fully extended and relaxed animal.

Fixation of the animals was accomplished by inverting the slide for ten seconds over the mouth of a bottle containing a 2% solution of osmic acid (Brunson, 1950). After fixation the gastrotrichs were measured. Measurements of the gastrotrichs were taken using a binocular microscope at a power of 40X - 490X, that was equipped with a micrometer disc. This procedure is modeled after Horlick (1969) in that no distortions or changes in dimensions were significant (under 1%) if the animal was properly anesthetized prior to fixation. Measurement of the animals proved easier after fixation, in that the animals were immobile.

C. Preparation of Permanent Mounts (Robbins, 1963)

After measurements of the animals were completed, a drop of 15% glycerine solution was added to the drop of water containing the gastrotrich. The water was then allowed to evaporate in a dust free area until the animal was left in pure glycerine. Excess glycerine had to be removed in order to make a permanent mount. Glycerine removal was accomplished with a tissue wrapped around the tip of a blunt probe and moistened with 90% alcohol. The animal was placed in the desired position with the end of an Irwin loop. Glycerine jelly heated to 45° C (Pennak, 1953) was transferred to the droplet of glycerine on the slide with the help of a glass rod. An 18 mm square coverslip of 0 thinness was added and the preparation sealed with Turtox slide ringing cement.

D. Cuticular observations

During the classification of gastrotrichs it was often necessary to observe scales after separating them from the body. Saito's (1937) technique of adding a drop of 2% acetic acid to a drop of water containing the gastrotrich proved somewhat successful. Another technique used to dislodge scales was the smashing of a coverslip with a blunt probe before the ringing cement was used. This technique succeeded in dislodging scales but sometimes resulted in destruction of the slide. Most of the cuticular observations were made on permanently mounted, unstained animals under oil immersion magnification. Dark field and phase optics aided in many observations.

E. Photography

All the animals included in this paper have been photographed. The pictures were taken of the animals after they were permanently mounted in glycerine jelly. The instrument used for photography was a Nikon Phase-contrast Photomicroscope. The film was Kodak Panatomic X. The photographs were commercially enlarged and developed.

IX. THE OCCURRENCE OF GASTROTRICHS IN KETTLE MORAINE STATE PARK

The five species described in this section were found in Kettle Moraine State Park, Wisconsin; four are previously described and one is a new species. In each description attention is given to any variation which occurs between the original and subsequent descriptions of a species and members of that species identified elsewhere.

Following the description of each species are listed locus key, collection site, date of collection, and substrate from which the collection was made.

1. <u>Chaetonotus</u> <u>aculeatus</u> Robbins, 1963
(Plates 6 and A)

Description

Total length, 170-175u; head width, 26u; neck width, 21u; trunk width, 40u; pharynx length, 52u; furca length, 34u; spine length, 7-16u; head indistinctly five lobed; all spines non-bifurcate and originating in a scale; spines arranged in seven to nine alternating longitudinal rows of twelve to fifteen spines each.

Discussion

The specimens observed in this study were 60% larger than those found by Robbins (1963).

New Records

Pond B, T4N-R16E-S10-¼NE, June 9, 1975, typha and duckweed.

Pond C, T4N-R16E-S10-¼SE, July 17, 1975, bottom detritus.

2. *Chaetonotus octonarius* Stokes, 1887
(Plates 7 and B)

Description

Total length, 90-100u; pharynx length, 26-28u; head width, 18-20u; neck width, 13-15u; body width, 22-26u; caudal furca length, 14-15u; spine length, 20-24u; head distinctly five lobed; two pairs cephalic cilia; eight bifurcated spines; spines originate in scales and are arranged in three longitudinal rows of three, two and three spines respectively.

Discussion

The animals that were found in this study were approximately the same size as those found by Robbins (1963) and Brunson (1950).

New Records

Pond B, T4N-R16E-S10-$\frac{1}{4}$NE, June 9, 1975, duckweed.
Pond C, T4N-R16E-S10-$\frac{1}{4}$SE, July 17, 1975, bottom detritus.

3. <u>Chaetonotus tachyneusticus</u> Brunson, 1948
(Plates 8 and C)

Description

Total length, 139u; head width, 20u; neck width, 12u; trunk width, 22u; pharynx length, 40u; furca length, 20u; spine length 4u-11u; spines originate in distinct scales; entire scale attached to cuticle; spines with bifurcation near tip; spines increase in length gradually from anterior to posterior; head indistinctly five lobed.

Discussion

The animals found in this study were approximately the same size as those found by Brunson (1948).

New Record

Pond C, T4N-R16E-S10-¼SE, July 17, 1975, duckweed

4. <u>Lepidodermella</u> <u>squamatum</u> (DuJardin, 1841)
(Plates 9 and D)

Description

Total length, 140-145u; head width, 25u; neck width, 20u; trunk width, 33-44u; pharynx length, 46u; furca length, 26u; scale length, 5-11u; head distinctly five lobed; body distinctly scaled; scales occurring in alternating rows which project posteriorly.

Discussion

The animals found in this study were approximately the same size as those found by Robbins (1963) and Brunson (1950). Pregnant animals found in this study had a trunk width at least one-third larger than non-pregnant animals.

New Records

Pond A, T6N-R17E-S35-$\frac{1}{4}$SW, June 2, 1975, duckweed.

Pond B, T4N-R16E-S10-$\frac{1}{4}$NE, June 9, 1975, bottom detritus.

Pond C, T4N-R16E-S10-$\frac{1}{4}$SE-July 17, 1975, bottom detritus.

5. Polymerurus striatus n. sp.
(Plates 10 and E)

Description

Total length, 270-280u; head width, 36u; neck width, 24u; truck width, 39u; pharynx length, 60u; furca length, 98u; spine length, 8-11u; head shield length, 24u; number of caudal segments, 22-24; caudal furca width, 8u; head indistinctly three lobed; cephalic cilia present; dorsal and lateral sides covered with short spines occurring in dorsal-horizontal bands; spines originate from the cuticle.

Discussion

The bands of spines in Polymerurus striatus occur over the entire body and give the animal a striped appearance. This description is in sharp contrast to the discussion of Polymerurus rhomboides by Horlick (1969). In his discussion he implies that many species including all the known Polymerurus species (P. Naudicaudus, P. Rhomboides, P. Callosus) may be included in one Polymerurus species.. He suggests that species may be P. Rhomboides because of different observational techniques used by the investigators. These techniques involve the angle position of the scales in relation to the body surface. Horlick (1969) states that if the scales are slightly dislodged from the cuticle and point upward, they appear as spines. Polymerurus striatus was subjected to a number of techniques to try and dislodge scales. None of the techniques succeeded in dislodging scales, resulting in the conclusion that there were no scales present. The spines of Polymerurus striatus arise directly from the cuticle, and occur in dorsal-horizontal bands giving the organism a striped appearance.

Pond B, T4N-R16E-S10-¼NE, June 9, 1975, duckweed.
Pond C, T4N-R16E-S10-¼SE, July 17, 1975, duckweed.

X. SUMMARY

1. The Chaetonotoid Gastrotricha are defined and characteristics used in their classification are discussed and evaluated.
2. The most inclusive system of classification of freshwater gastrotrichs is that of Remane (1936) and this system is employed in this paper.
3. There has been little work done on the gastrotrichs in North America. A summary is given of all known North American species.
4. Methods and materials of collection, observation, mounting, and photography of gastrotrichs are discussed.
5. Five species of gastrotrichs are described from this study. Four of these species are previously described, but none have been previously reported from Wisconsin. The remaining species is previously undescribed, and is proposed as a new species, Polymerurus striatus.

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APPENDIX

Plate 1

Diagram of General Structure

M,	mouth
CT,	ciliary tuft
PHL,	posterior head lobe
P,	pharynx
ATB,	anterior tactile bristle
IN,	intestine
PTB,	posterior tactile bristle
CF,	caudal furca

PLATE 1 (after Robbins, 1963)

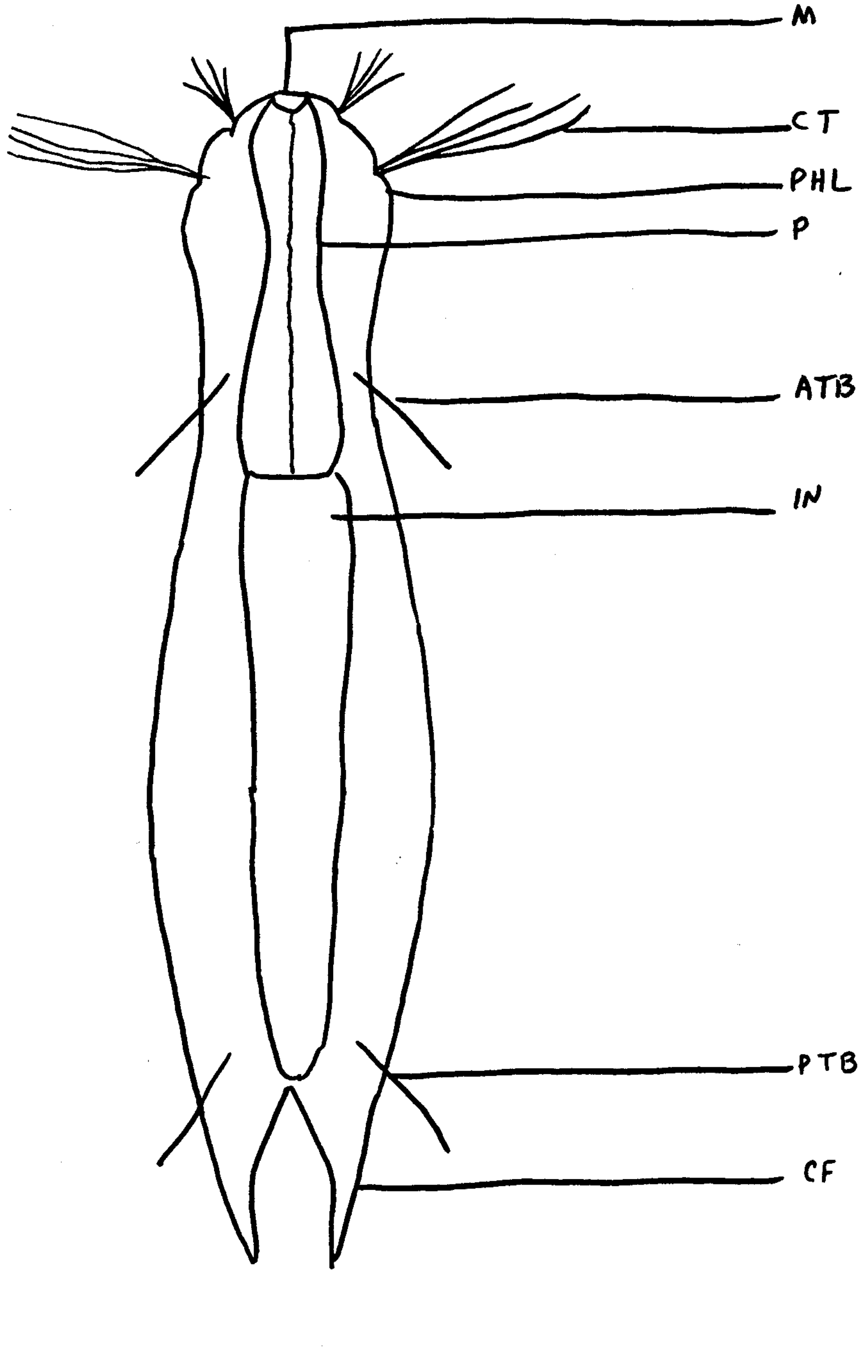


Plate 2

Spination of _Chaetonotus_ (modified after Brunson, 1950).

Fig. 1. Lateral view of a spine surrounded by a scale from _C_. _similis_.

Fig. 2. Lateral view of a spine on a three pronged scale from _C_. _gastrocyaneus_.

Fig. 3. Frontal view of a spine on a scale from _C_. _larus_.

Fig. 4. Frontal view of a spine on a scale from _C_. _brevispinonus_.

PLATE 2

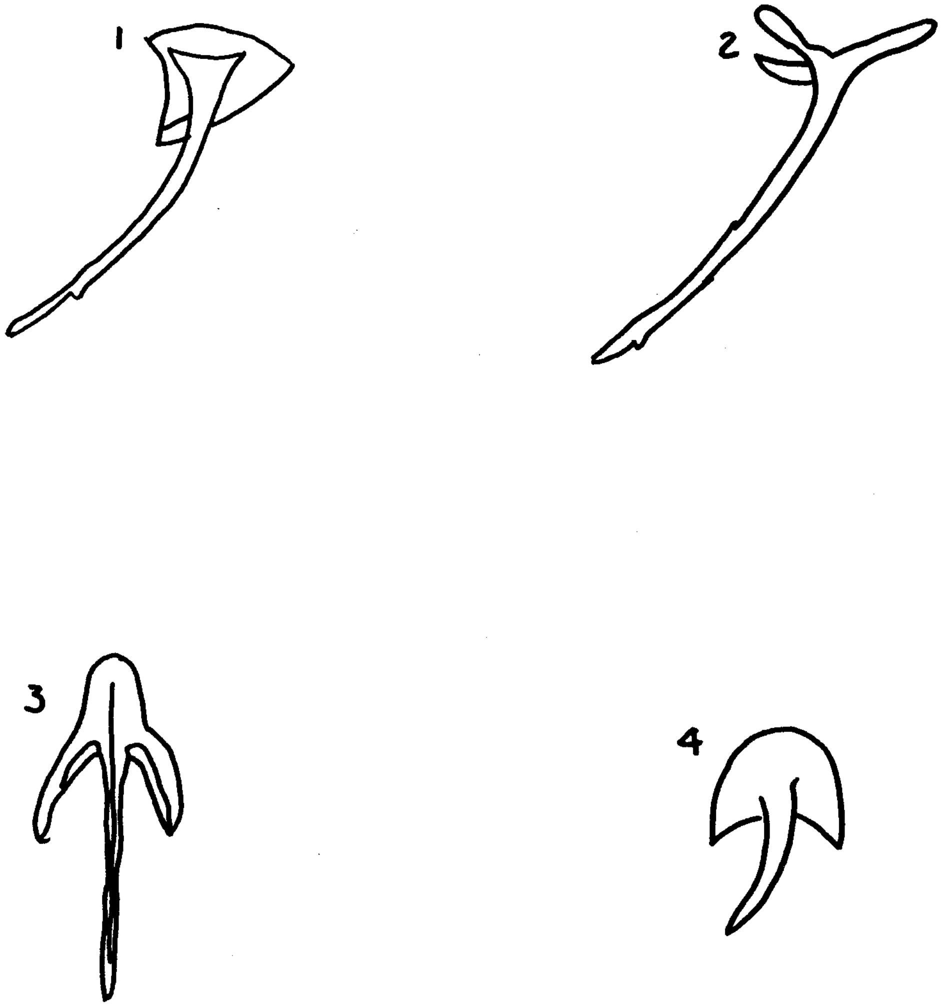


Plate 3

Scale types

Fig. 1. Scales of *Lepidodermella squamatum* (after Brunson, 1950).

Fig. 2. Scales of *L. trilobum* (after Brunson, 1950).

Fig. 3. Scales of *Heterolepidoderma gracile* (after Robbins, 1963).

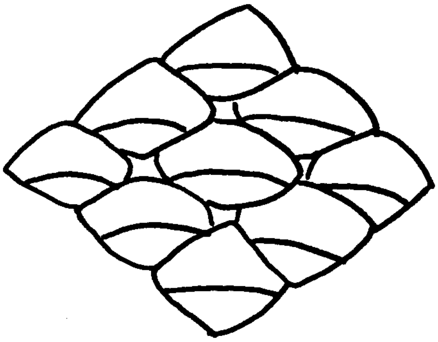
Fig. 4. Scales of *H. ocellatum* (after Robbins, 1963).

Fig. 5. Scales of *Polymerurus rhomboides* (after Stokes, 1887).

Fig. 6a. Scales of *Aspidiophorus paradoxus* (after Voigt, 1904).

Fig. 6b. Individual scale of *A. paradoxus* (after Voigt, 1904).

PLATE 3



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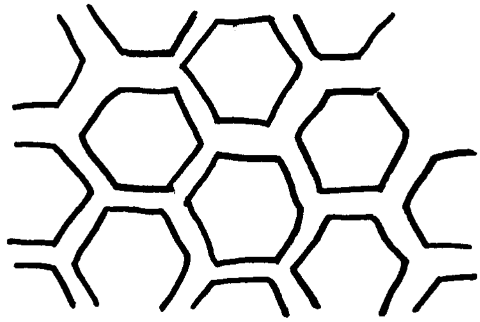

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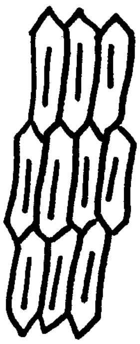

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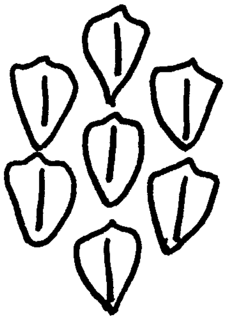

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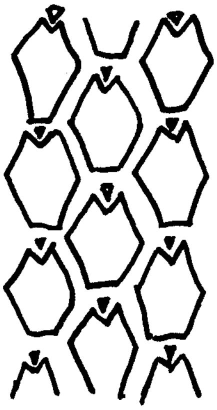

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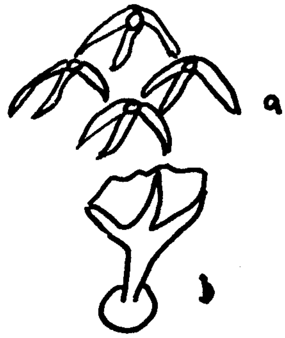

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Plate 4

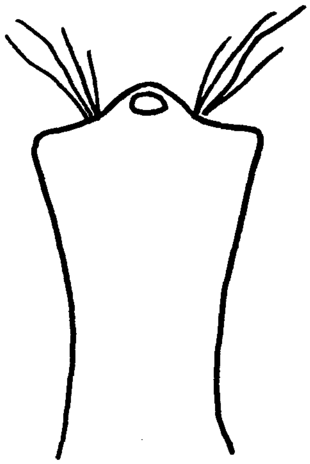
Head shapes

Fig. 1. Three lobed head

Fig. 2. Five lobed head

Fig. 3. Rounded head

PLATE 4



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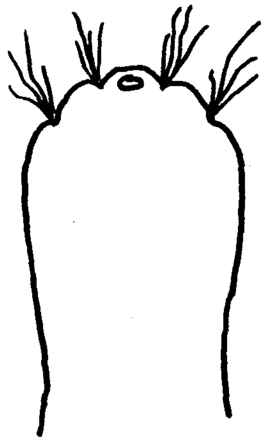

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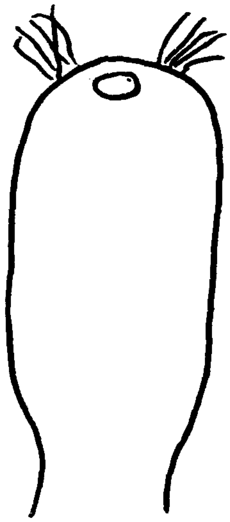

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Plate 5

Various caudal furcas

Fig. 1. Polymerurus callosus (after Brunson, 1956).

Fig. 2. Neogossea fasciculata (after Daday).

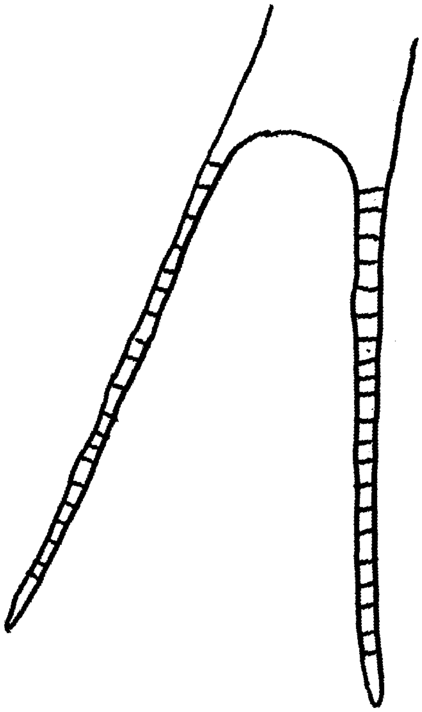
Fig. 3. Dasydytes oöedes (after Brunson, 1959).

Fig. 4. Stylochaeta scirteticus (after Brunson, 1959).

Fig. 5. Dichaetura capricornia (after Metchnikoff).

Fig. 6. Lepidoderma squamatum (after Brunson, 1950).

PLATE 5



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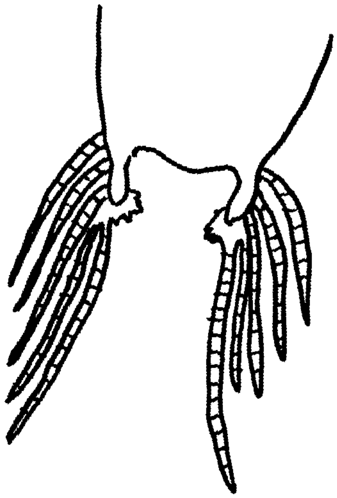

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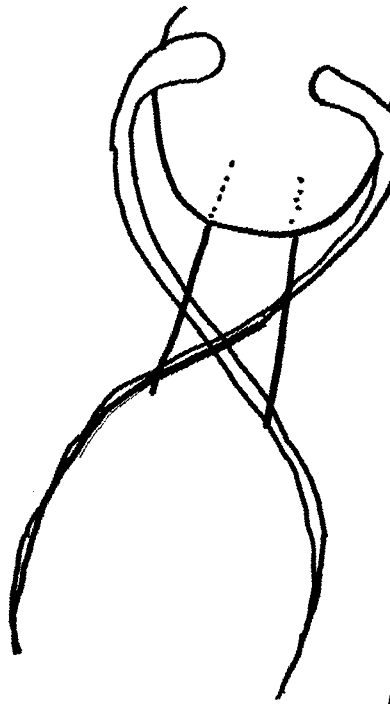

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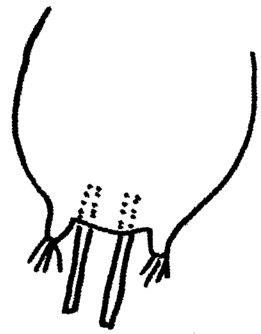

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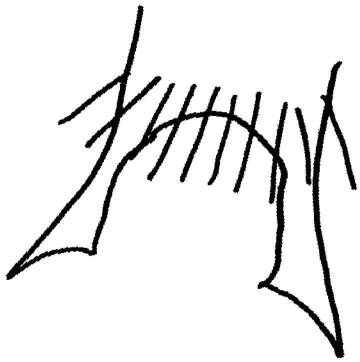

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Plate 6

Chaetonotus aculeatus (after Robbins, 1963)

Fig. 1 Entire animal, dorsal aspect

Fig. 2 Single scale and spine

PLATE 6

1

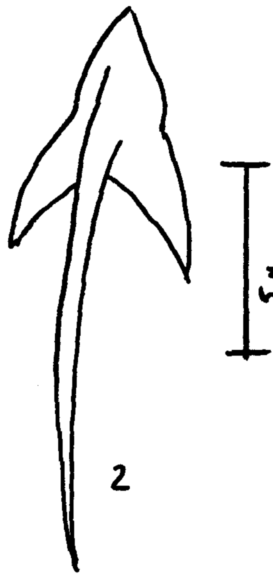

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Plate 7

Chaetonotus octonarius, dorsal aspect (after Robbins, 1963)

PLATE 7

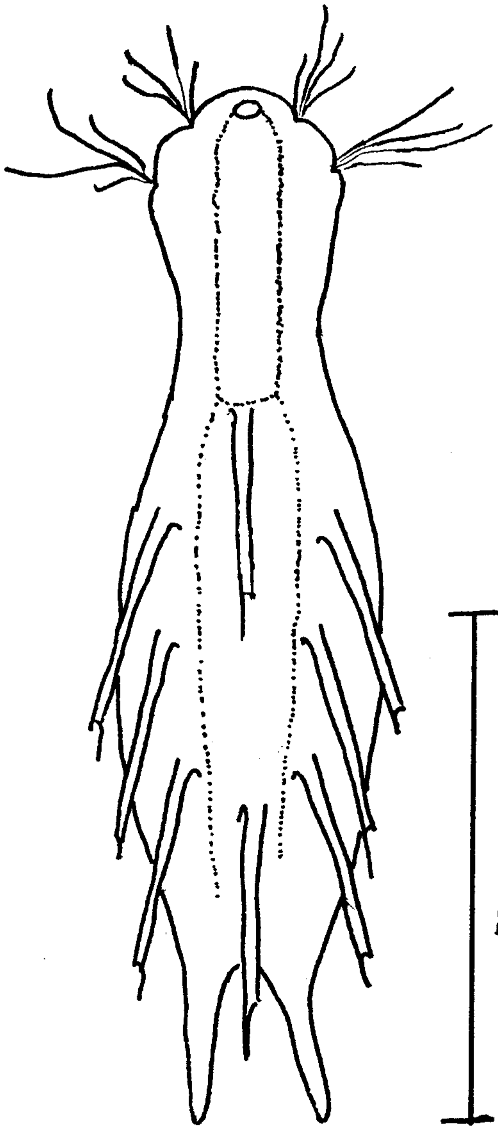


Plate 8

Chaetonotus tachyneusticus

Entire animal, dorsal aspect

PLATE 8

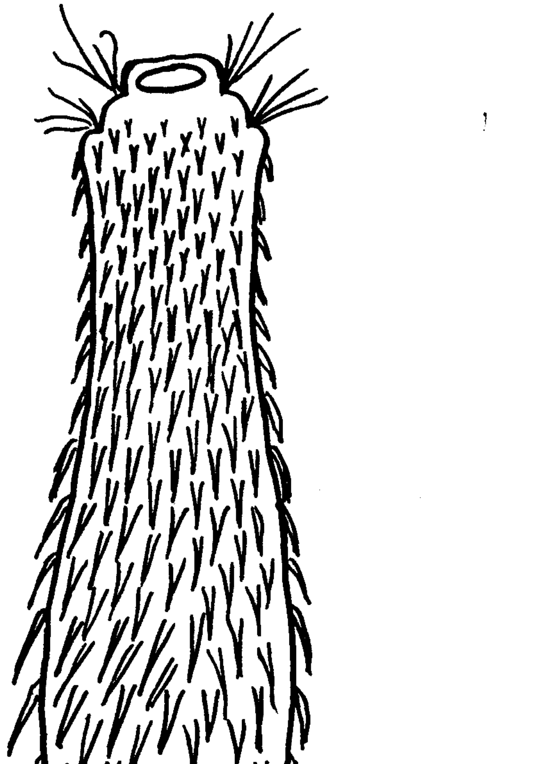


Plate 9

<u>Lepidodermella</u> <u>squamatum</u> (after Robbins, 1963)

Fig. 1 Entire animal, dorsal aspect

Fig. 2 Scale arrangement

Fig. 3a Anterior scale

Fig. 3b Posterior scale

PLATE 9

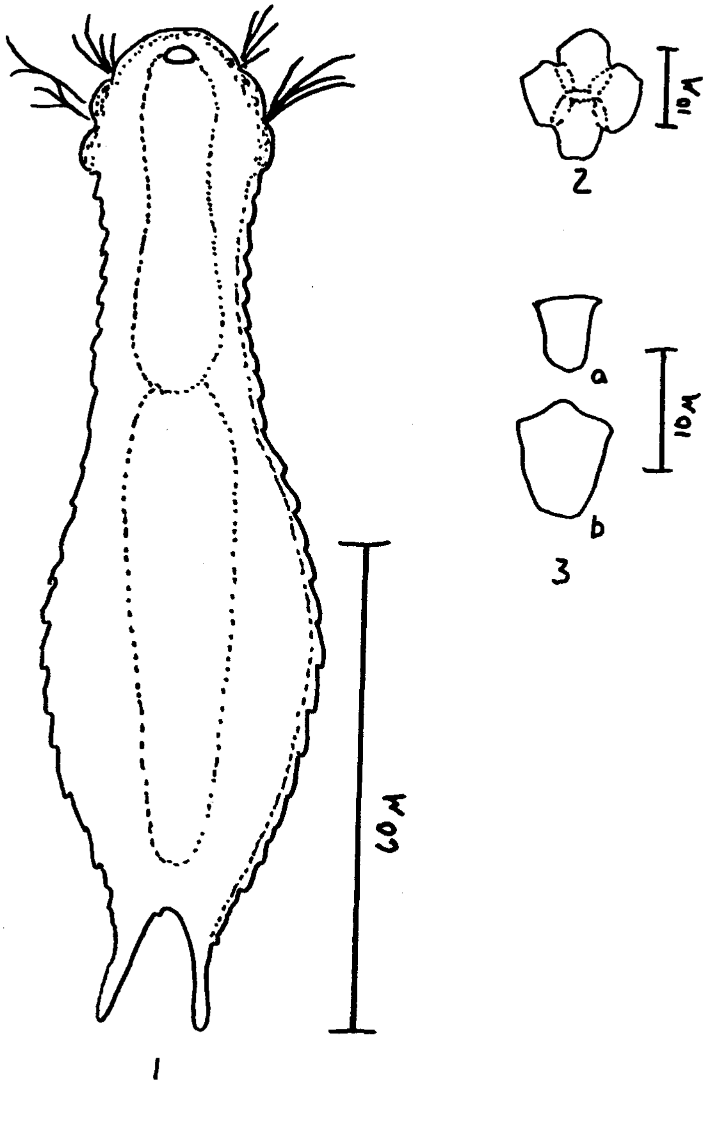


Plate 10

Polymerurus striatus, dorsal aspect

PLATE 10

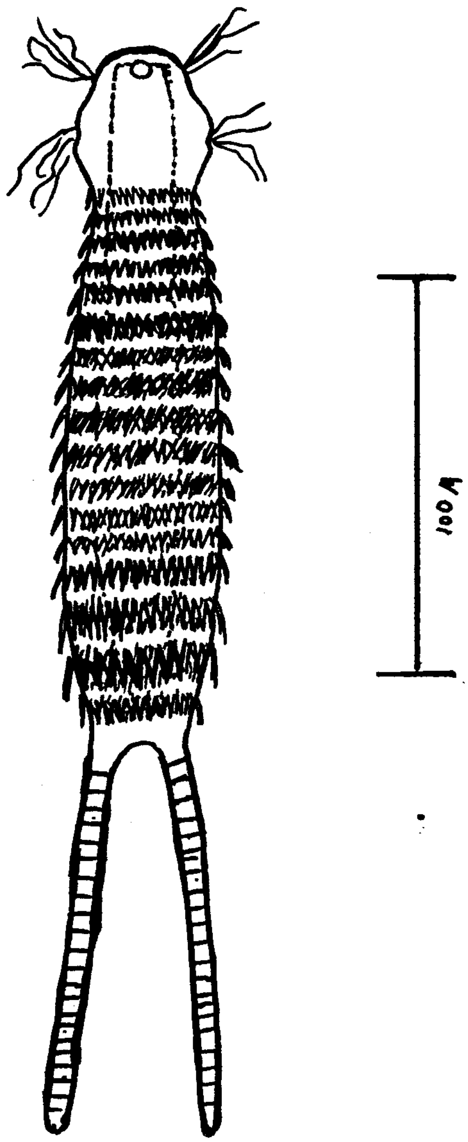


Plate A

<u>Chaetonotus</u> <u>aculeatus</u>

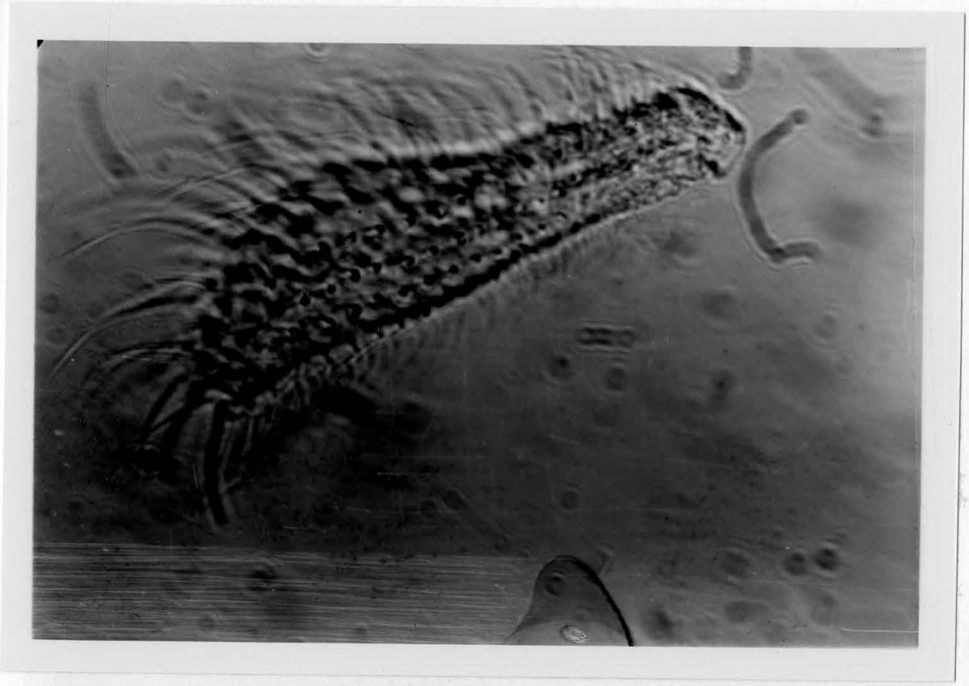


Plate B
Chaetonotus octonarius

Plate C

Chaetonotus tachyneusticus

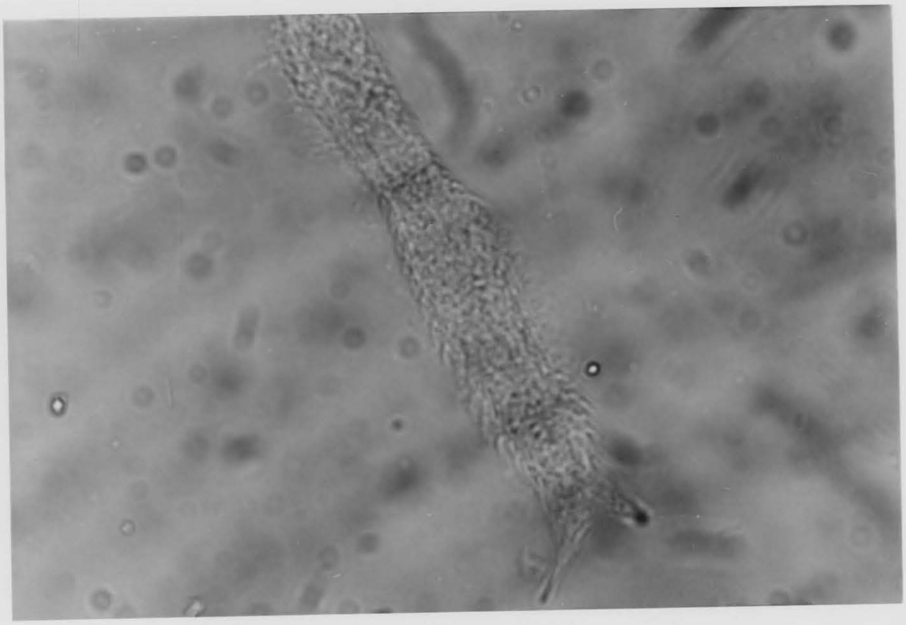


Plate D

<u>Lepidodermella</u> <u>squamatum</u>

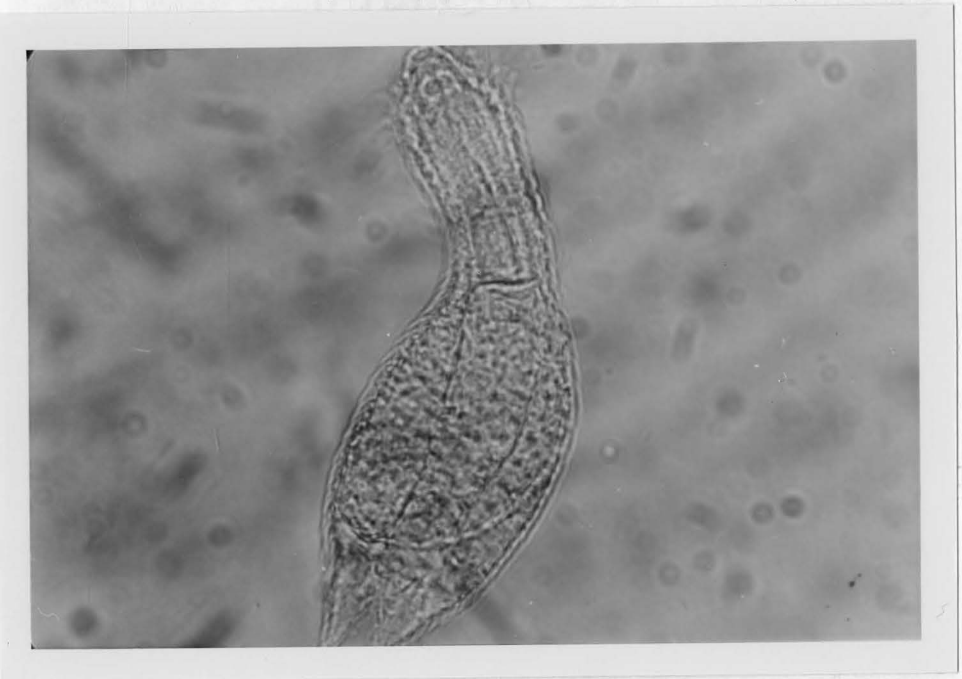


Plate E

Polymerurus striatus

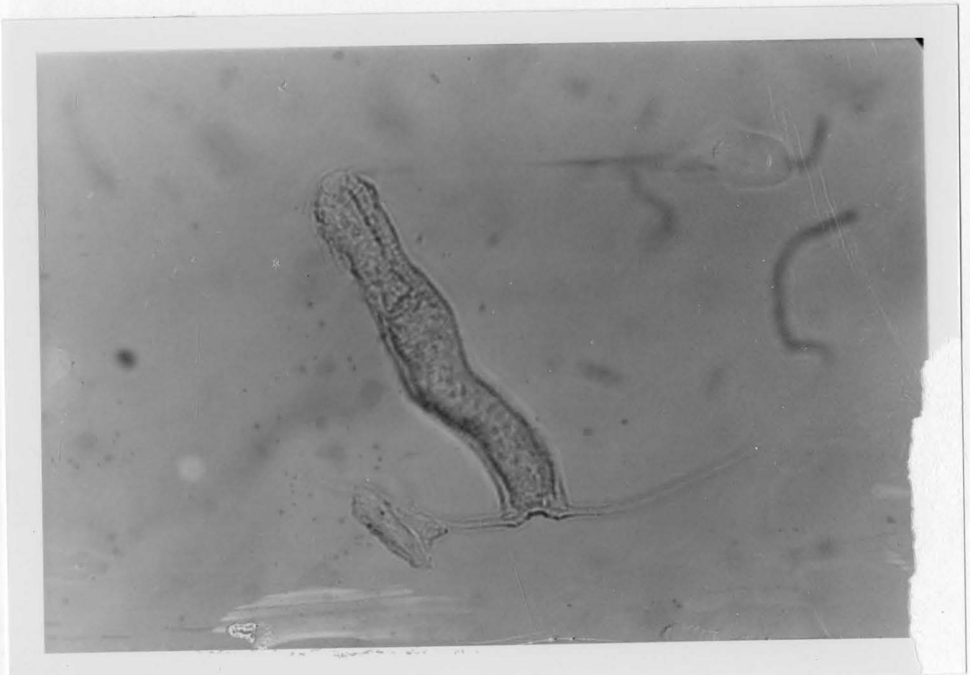
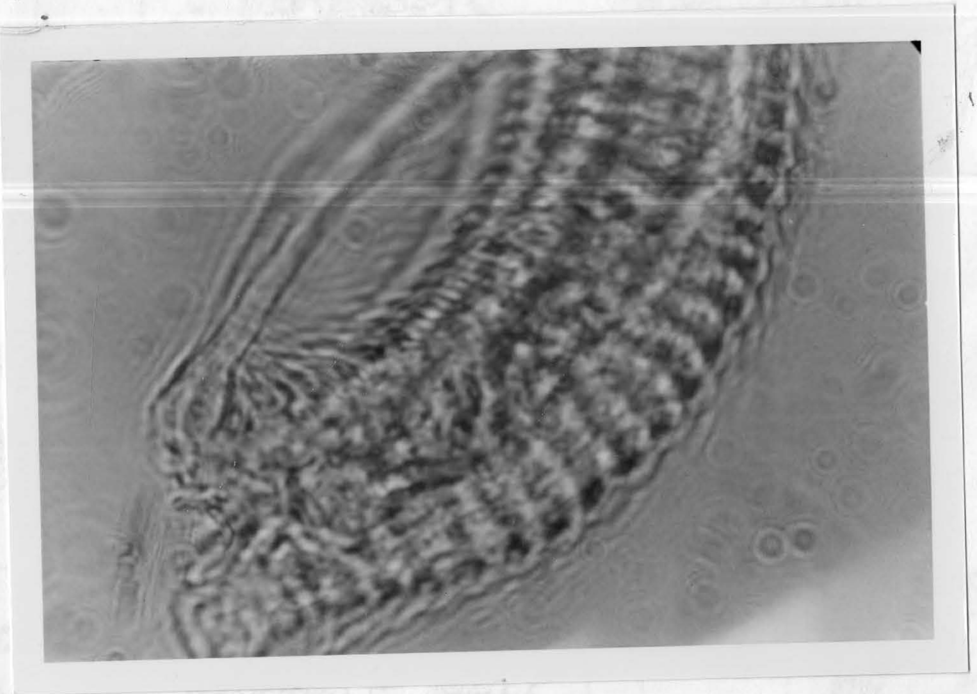


Plate E
(cont.)

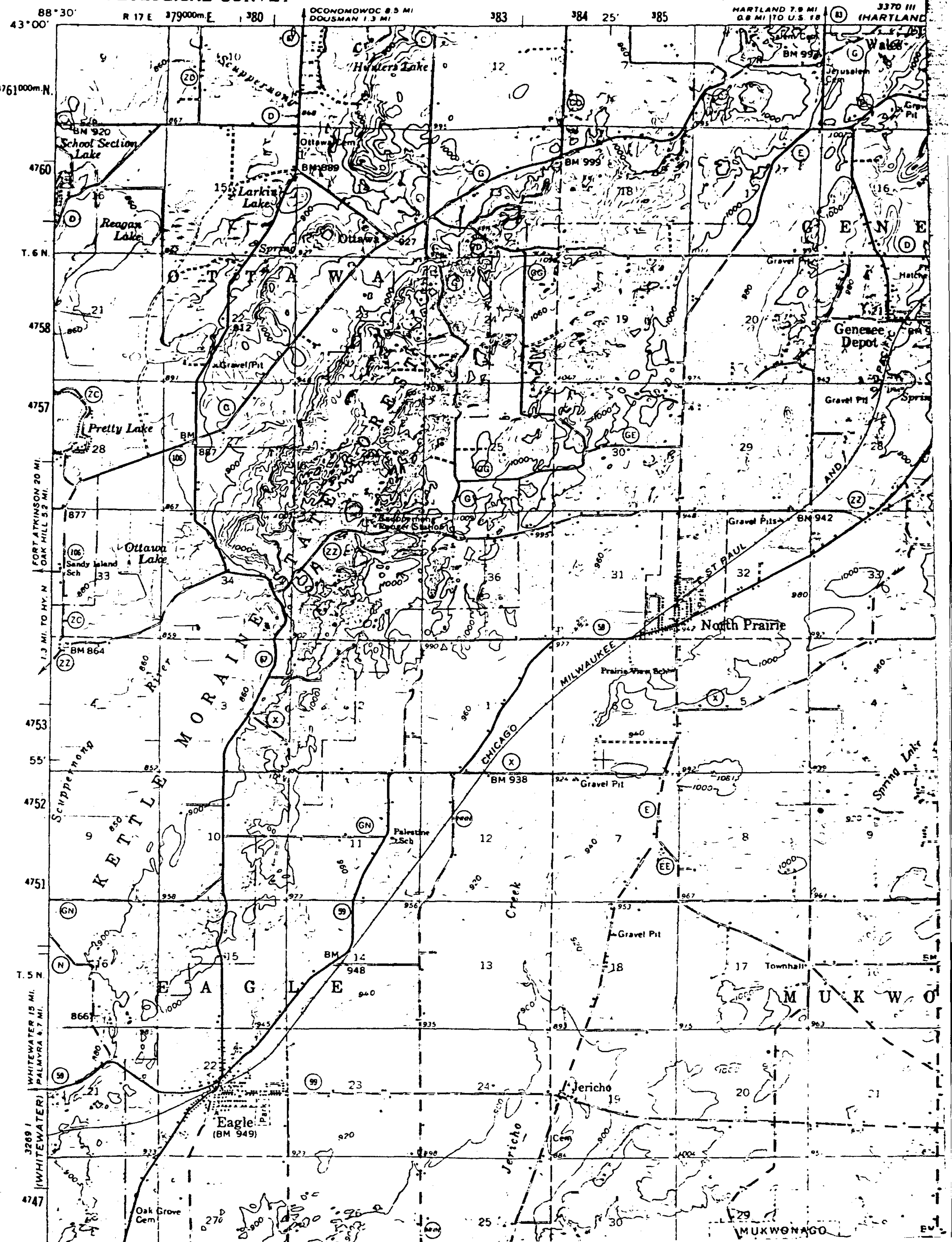
Polymerurus striatus

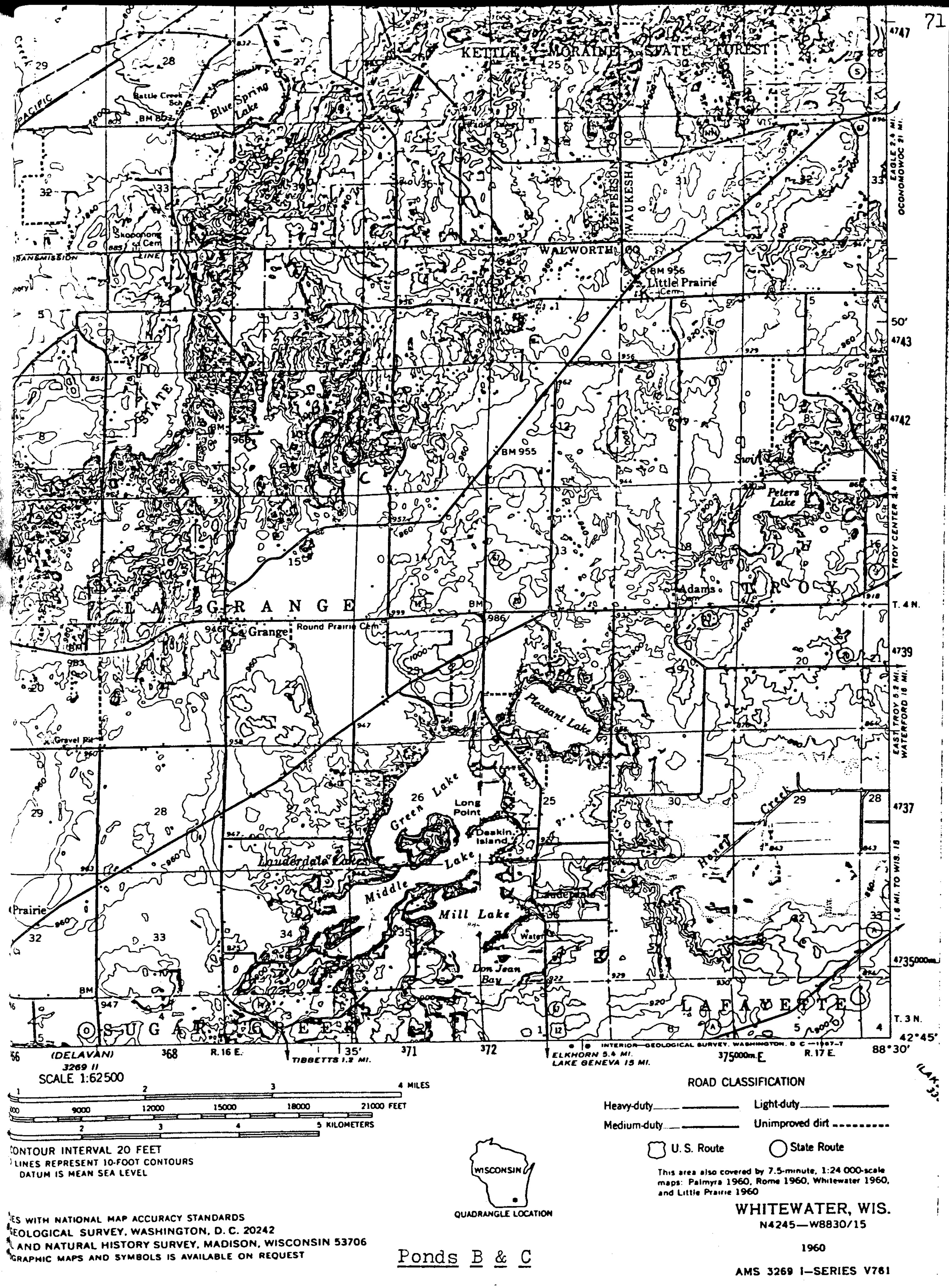


Eagle, Wis.
N4245-W8815/15
1960
AMS 3369 IV-Series V761

Pond A

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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STATE
BM 955
Peters Lake
L A G R A N G E
T R O Y
Adams Cem
La Grange
Round Prairie Cem
Pleasant Lake
Gravel Pit
Green Lake
Long Point
Deakin Island
Lauderdale Lake
Middle Lake
Mill Lake
Don Jean Bay
Honey Creek
Prairie
S U G A R C R E E K
L A F A Y E T T E
T. 4 N.
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42°45'
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R. 16 E.
R. 17 E.
(DELAVAN)
3269 II
TIBBETTS 1.2 MI.
ELKHORN 5.4 MI.
LAKE GENEVA 15 MI.
EAGLE 2.4 MI.
OCONOMOWOC 21 MI.
TROY CENTER 2.4 MI.
EAST TROY 5.2 MI.
WATERFORD 18 MI.
1.6 MI. TO WIS. 15
INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1967—T
SCALE 1:62500
4 MILES
21000 FEET
5 KILOMETERS
CONTOUR INTERVAL 20 FEET
LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL
ES WITH NATIONAL MAP ACCURACY STANDARDS
GEOLOGICAL SURVEY, WASHINGTON, D. C. 20242
AND NATURAL HISTORY SURVEY, MADISON, WISCONSIN 53706
GRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST
WISCONSIN
QUADRANGLE LOCATION
ROAD CLASSIFICATION
Heavy-duty
Light-duty
Medium-duty
Unimproved dirt
U. S. Route
State Route
This area also covered by 7.5-minute, 1:24 000-scale maps: Palmyra 1960, Rome 1960, Whitewater 1960, and Little Prairie 1960
WHITEWATER, WIS.
N4245—W8830/15
1960
AMS 3269 I—SERIES V761

Ponds B & C

APPROVAL SHEET

The thesis submitted by Garry J. Rossino has been read and approved by the following committee:

Dr. Clyde E. Robbins, Director
Associate Professor, Biology, Loyola University

Dr. Edward E. Palinscar
Professor, Biology, Loyola University

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The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Science.

April 19, 1979
Date

Clyde E. Robbins
Director's Signature