Ohio Sea Grant

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GREAT LAKES EDUCATION:
A Manual for Aquatic Ecology Studies at Franz Theodore Stone Laboratory

by

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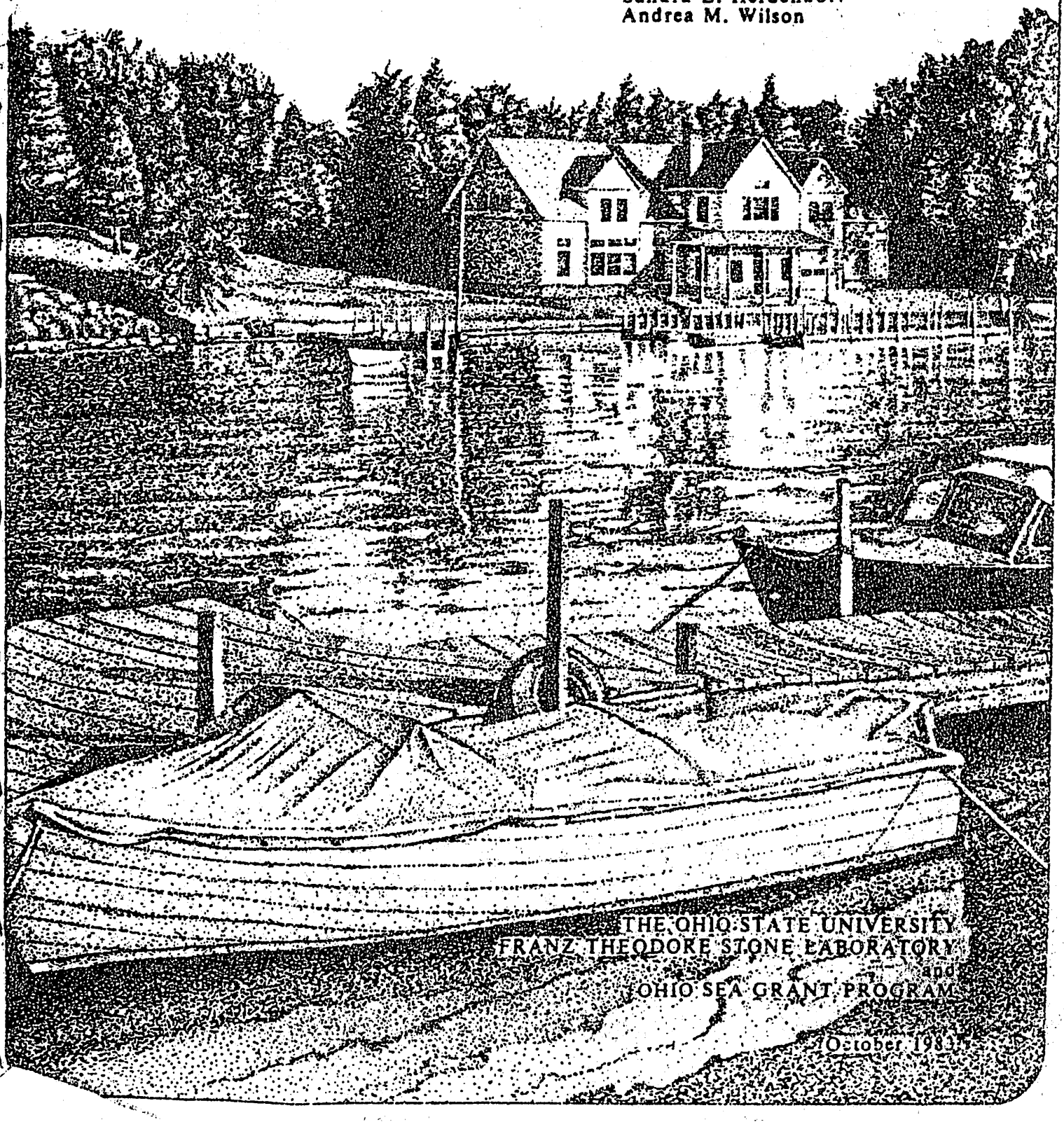

THE OHIO STATE UNIVERSITY
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VISITING CLASS AND WORKSHOP PROGRAM

VISITING CLASS AND WORKSHOP PROGRAMS

The visiting class and workshop program at the F. T. Stone Laboratory provides an opportunity for researchers, teachers, and students to study Great Lakes ecology and limnology. This includes hands-on collecting experience with marine and limnological equipment, as well as exercises in identification, enumeration, and interpretation of organisms and the collected data.

Other attractions on South Bass Island are: Perry's International Peace Memorial, South Bass Island State Park, Village of Put-in-Bay, Heineman Winery and Crystal Cave, Perry Cave, Viking Longhouse, State Salmon Fish Hatchery and various other places of interest. The North Coast of Ohio also offers a variety of habitats and ecological areas that are easily accessible from Stone Laboratory by boat or vehicle.

The Great Lakes Education Program is availabel to groups who are interested in the aquatic ecology of the Great Lakes region. It provides an opportunity for groups to participate in field and laboratory studies in an aquatic environment.

Visiting class and workshop programs are available from mid-April to mid-October. Summer workshop programs (mid-June to the end of August) are limited to small groups due to the Ohio State University instructional program which utilizes most of the facilities during this period.

Activities for individual groups may be based on independent projects formulated by the group prior to their arrival at Stone Laboratory and/or a program of scheduled activities presented by the Stone Laboratory staff. Each visiting class and workshop program is tailored to fit the individual needs of the group.

Housing accommodations and research facilities for scientists working on individual projects are also available on a year-round basis.

All visiting class and workshop program correspondence should be directed to:

Laboratory Secretary
The Franz Theodore Stone Laboratory
P. O. Box 119
Put-in-Bay, Ohio 43456

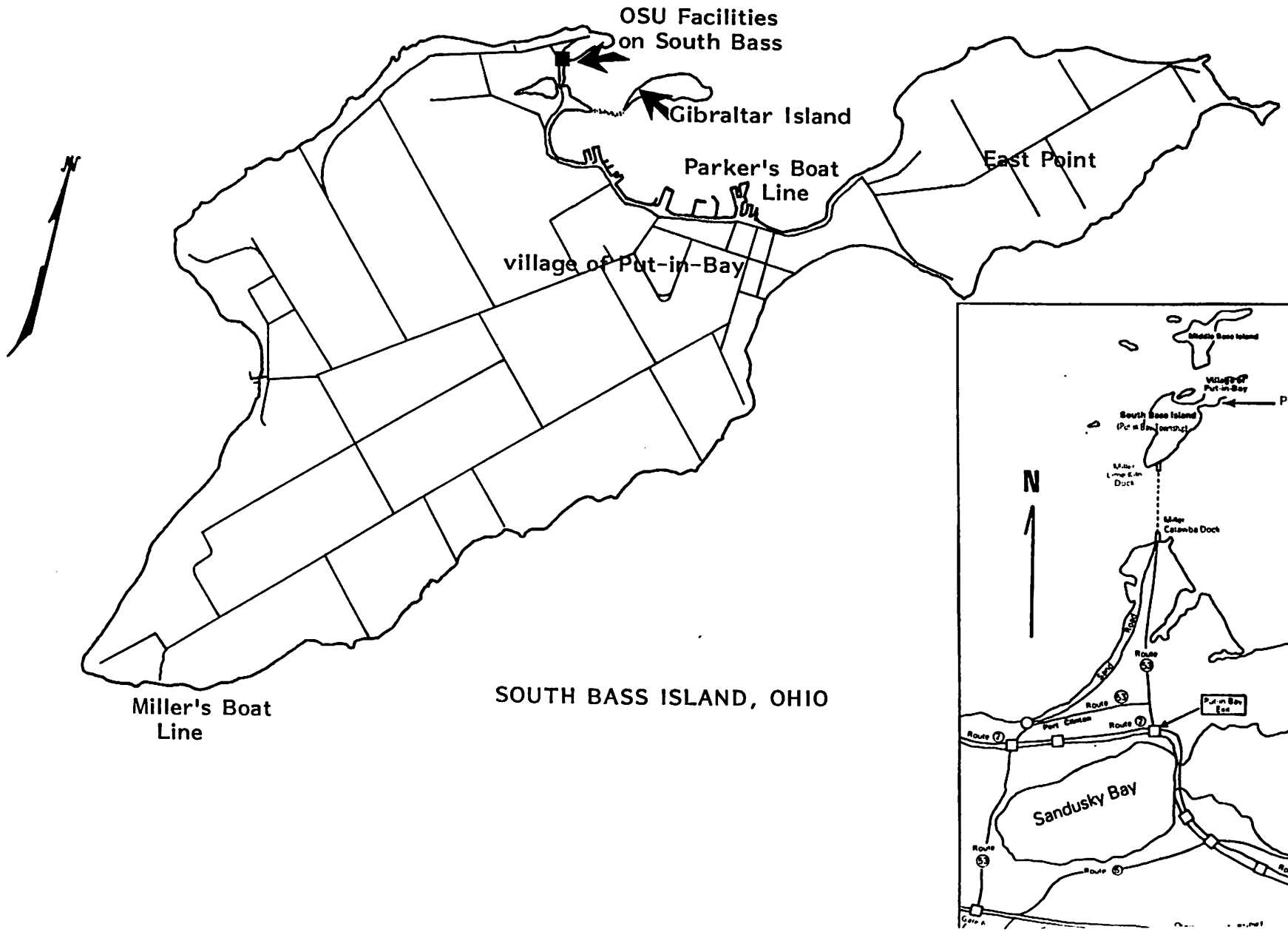
(419) 285-2341

Access and Transportation

South Bass Island is serviced by two private ferry lines and a small island airline. Private vehicles may be taken to South Bass Island via ferry, but a delay may be encountered during the tourist season (Memorial Day through Labor Day). Parking is available at the mainland ferry docks. Upon arriving at South Bass, workshop participants may drive their own vehicles to Stone Laboratory where parking is available. No transportation to and from the ferry dock is provided. Bus service is available from the ferry dock to downtown Put-in-Bay (75¢ per person, one-way - 1984 prices). The Bus Depot is approximately a 15-minute walk from the Stone Laboratory facilities.

The most direct ferry service is an 18-minute trip on the Miller Boat Line (419/285-2421) leaving from their dock at Catawba. Ferry service is also provided by the Parker Boat Line (419/732-2800) in Port Clinton, with a trip duration of about 1½ hours. Air service provided by Island Airlines (419/734-3149) departs from the Port Clinton airport.

Although rates are subject to change from year to year, a one-way fare from Catawba to South Bass Island on the Miller Boat Line is currently $3.00 per person and $6.00 per automobile (1984 prices). Groups may be eligible for reduced rates on round trip tickets. Further information can be obtained by contacting the Miller Boat Line Office. Maps of South Bass Island and north central Ohio are included in this manual to facilitate transportation.



SOUTH BASS ISLAND, OHIO

Boat Regulations

1. The following limits have been placed on research vessels:

   - 20 persons for transportation
   - 15 persons for science cruises with fish trawl

   It is important, for safety reasons, that passengers on the research vessels do not exceed these limits.

2. The following rules must be observed while using rowboats:

   - Each person must have a lifejacket.
   - Lifejackets must be removed from boats and stored neatly after use.
   - A flashlight is required at night for navigational lights; Rowboat use is not recommended after dark.
   - There is a limit of 6 passengers per boat.
   - Do not dock rowboats behind motorboats.
   - Remember to remove the oars from the oar locks when not in use.
   - Do not anchor off of navigational buoys.
   - Only one person should be rowing at a time.
   - "Boat pool" whenever it is possible.
   - Dock only at the state docks.

3. No small motorboat use is available.

It is important for groups to arrive on time and adhere closely to schedules in regards to research vessels and science cruises. Additional charges will be incurred for any time a research vessel is docked with an operator on duty and waiting for your group to arrive.

Housing/Cooking Facilities Rules

1. Prior to departure, all housing units are to be clean and left in an orderly fashion.
2. All cooking facilities are to be kept clean while in use and are to be clean and left in an orderly fashion with all items put away prior to departure.

3. If the Dining Hall facility is used, all appliances must be cleaned and put away, and the facility clean and left in an orderly fashion.

All group leaders and chaperones are responsible for their group members' conduct while visiting Stone Laboratory. It is important to stress safe conduct, particularly during the science cruise aboard the research vessel, Bio-Lab.

Each group will be responsible for any damages incurred during their visit to Stone Laboratory.

Exit Interview

For groups utilizing the laboratory for research and educational purposes, an exit interview will be conducted by the workshop program staff to discuss charges and inspect facilities. Please allow time in your planned itinerary to accommodate this interview.

Application Procedures

An application for the Great Lakes Education visiting class and workshop program must be submitted at the time of scheduling. Upon receipt of this application, the group leader will receive a letter of confirmation. It is recommended that applications be submitted as early as possible as available dates are taken quickly. A $50.00 deposit is required with the submission of the application for all groups. Your planned itinerary must be submitted to the Stone Laboratory Office one month prior to your scheduled workshop. This will aid the Stone Laboratory staff in planning for your workshop activities and making arrangements for your visit to the Laboratory.

It is important to fill out the application accurately and with as much detailed information as possible. The information contained in this application is critical in planning your group's scheduled activities. Any changes which occur prior to your group's arrival can be made by contacting the Laboratory Office.

Please use the following instructions when filling out your application:

1. Fill in the dates you wish to schedule your visiting class and workshop group. This will include your date and time of arrival and your date and time of departure. (If you do not have the exact times, please give approximate times and note this on the application.)

2. Fill in the full name of your group, including the name of the school, board of education, or professional group with which you are affiliated.

3. Fill in the full name of the group leader and his/her title (professional affiliation with the group).

4. Fill in the complete mailing address of your group. If you are applying for a Fall Workshop, please include an address where you can be reached during the summer. Also fill in a phone number where you can be reached, if necessary.

5. Fill in the total number of participants that you expect to have in your group. Please give a breakdown of the number of adults and students, and the number of males and females.

6. Please indicate if overnight housing will be needed. If yes, please indicate the number of nights you will be spending at Stone Laboratory with your group.

7. Please indicate if cooking facilities will be needed. If yes, please indicate the number of meals you will be using the facilities for and a breakdown of the number of breakfast, lunch and dinner meals.

8. Please indicate the number of science cruises you will need for your group. (Each science cruise is limited to 15 passengers.) Please indicate the dates and times that you would like to schedule these cruises for your group.

   Please indicate the number of shuttle ferry trips that your group will require. One round trip is provided for your group (transport of your group from South Bass Island to Gibraltar Island on the day of your arrival and transport of your group from Gibraltar Island to South Bass Island on the day of your departure) during normal working hours (Monday through Friday, 7:30 a.m. to 4:30 p.m.). There will be a charge for all other shuttle ferry service.

   Please indicate the number of rowboats your group will require (each rowboat is limited to 6 passengers).

9. Please indicate any special equipment that your group will require (microscopes, etc.) and include the number of each item.

   Please indicate any special services that your group will require (lectures, slide presentations, tours, etc.). These services will be provided by the resident scientist.

10. Fill in the objectives of your group's visit and your proposed activities, including details of any independent projects you wish to participate in during your workshop.

LAKE ERIE EDUCATION VISITING CLASS AND WORKSHOP PROGRAM APPLICATION

1. Date(s) Facilities Requested:

   From May 14, 1984 To May 18, 1984

   Time of Arrival 9:30 a.m. Time of Departure 4:00 p.m.

2. Name of Group Franz Theodore Stone Laboratory

3. Name of Group Leader F. T. Stone Title Laboratory Coordinator

4. Address P. O. Box 119, Put-in-Bay, Ohio 43456

   Telephone Number 419/285-2341

5. Number of Persons Expected: Adults 5 - 3 male, 2 female Students 20 - 10 male, 10 female Total 25

6. Is Overnight Housing Needed? Yes Number of Nights 4

7. Are Cooking Facilities Needed? Yes Number of Meals: B 4 L 5 D 4

8. Boat Requirements:

   Science Cruise: Number of Trips 2 Trip Dates/Times May 15 at 9:00 a.m. and 2:00 p.m.
   (Each trip is approximately 2 hours)

   Shuttle Ferry: Number of Trips 1 Trip Dates/Times 1 round trip South Bass - Gibraltar on May 16 at 1:00 p.m.
   (Ferry service between Gibraltar and South Bass is approximately 30 minutes round trip)

   Rowboats: Number of Boats 5

9. Special Equipment Needed (Microscopes, etc.): 20 microscopes; equipment for seining on Alligator Bar

   Special Services Needed (Lectures, Slide Presentation, Tours, etc.): Slide presentation on the "Geology of the Lake Erie Islands".

10. Objectives and Proposed Activities: Aquatic Ecology workshop for college level students to include all aspects of the Lake Erie Islands environment. Activities will include collecting trips, specimen examination and environmental history of the area. Proposed itinerary is attached.

A $50.00 deposit is required with the submission of this application.

F. T. Stone
Signature

GLOSSARY

GLOSSARY

Abiotic - without life; non-living component of the environment.

Autotroph - an organism capable of manufacturing its own food from inorganic raw materials and energy (e.g. photosynthetic plants).

Barrier beach or bar - long, narrow, sandy peninsulas, islands or submerged bars lying parallel to shore and built up by the action of the waves, currents, and winds.

Benthic - pertaining to the bottom of aquatic habitats and the organisms that inhabit the bottom.

Benthos - forms of aquatic life that are bottom-dwelling, both plant and animal life.

Biomass - weight of all life in a specific unit of the environment, for example, the mass per unit area of a wetland.

Biotic - living component of the environment; life.

Bloom - a dense concentration of phytoplankton which occurs in response to optimum growth conditions (e.g. nutrients, temperature, and sunlight).

Bog - a wetland usually developing in a depression, often with poor drainage; generally characterized by extensive peat deposits, acidic water, floating sedge or sphagnum mats, and heath shrubs and coniferous trees.

Carnivore - an animal which preys on other animals.

Compensation depth - the depth at which primary production equals plant respiration; depth at which light is 1% of surface intensity.

Delta - the low, nearly flat, alluvial tract of land deposited at or near the mouth of a river, commonly forming a fan-shaped plain of considerable area enclosed and crossed by many distributaries of the main river, often extending beyond the general trend of the coast, and resulting from the accumulation of sand and finer sediment in a wider body of water (usually a sea or lake).

Detritus - minute particles of the decaying remains of plants and animals.

Ecological niche - ecological role of an organism in its ecosystem; its relationship to its biotic and abiotic environment.

Ecosystem - biotic community and the non-living environment functioning together as a system where exchanges of materials and energy between living there and their physical environment take place.

Ecotone - transition zone that exists between two ecological communities in which organisms from both communities are present.

Emergent vegetation - various vascular aquatic plants usually rooted in shallow water and having most of their vegetative growth above water (e.g. cattails and bulrushes).

Epilimnion - the upper, warmer, well-mixed, well-illuminated, nearly isothermal region or layer of a stratified lake.

Ericaceous - low, much-branched evergreen shrub.

Eutrophication - the process by which a lake becomes rich in dissolved nutrients and deficient in oxygen, occurring either as a natural stage in lake or pond maturation or artificially induced by human activities (principally by the addition of fertilizers and organic wastes).

Fauna - animal life of a particular region or community.

Fen - a waterlogged, spongy groundmass containing alkaline, decaying vegetation characterized by reeds which may develop into peat.

Flats - low-lying, exposed, flat land of a lake delta or of a lake bottom, composed of unconsolidated sediments (usually mud or sand).

Floating-leaved plants - rooted, herbaceous hydrophytes with some leaves floating on water surface (e.g. white water lily and floating pondweed).

Floating plants - non-anchored plants that float freely in the water or on the surface (e.g. duckweeds).

Flora - plant life of a particular region or community.

Food chain - sequence of organisms, including producers (plants), herbivores (plant-eaters), and carnivores (meat-eaters), through which energy and materials move within an ecosystem; a series of ogranisms depending on one another for food.

Food web - a system of interlocking food chains in which energy and materials are passed through a series of plant-eating and animal-eating consumers.

Forage fish - fish species utilized as principal food sources for major sport and commercial fishes (e.g. gizzard shad and emerald shiner).

Freshwater estuary - a semienclosed coastal body of water which has a free connection with the open lake; estuaries are strongly affected by wind tides and seiches and they are mixing zones for lake water and tributaries from land drainage. Examples are drown river mouths, coastal embayments and bodies of water behind barrier beaches.

Habitat - place where a plant or animal species lives and grows; an organism's natural abode and immediate surroundings.

Herpetofauna - animals belonging to the vertebrate classes Amphibia and Reptilia.

Heterotroph - an organism which is unable to synthesize its own food from inorganic substances and must utilize other organisms for nourishment (e.g. fish, birds, and mammals).

Hydrophyte - any plant growing in water or on a substrate that is at least periodically saturated with water; aquatic plants.

Hypolimnion - the poorly illuminated, colder, denser, lower region or layer of a stratified lake; overlies the profundal zone.

Isothermal - having the same temperature.

Kettle - a steep-sided, bowl-shaped depression in glacial deposits, often containing a lake or wetland, formed by the melting of a large, detached block of ice left behind by a retreating glacier, that had been wholly or partly buried in the glacial drift.

Littoral zone - referring to the marginal region of a body of water; the shallow, nearshore region often defined by the zone from zero depth to the outer edge of the rooted plants.

Macroalgae - algal plants large enough, either as individuals or communities, to be readily visible without the aid of optical magnification.

Macrophyte - all macroscopic (visible without the aid of optical magnification) plants of lakes, streams and wetlands; primarily vascular plants that are usually, but not always, rooted and also included large algae and mosses.

Marsh - a wetland dominated by herbaceous or non-woody plants, often developing in shallow ponds or depressions, river margins and estuaries; vegetation is dominated by grasses and sedges.

Mesolimnion - the central stratum or layer between the epilimnion and hypolimnion in a stratified lake; the region of the thermocline; metalimnion.

Microalgae - algal plants that require optical magnification to be readily visible.

Nekton - large, actively swimming aquatic animals (e.g. fish).

Nutrients - chemical element, organic compound, or inorganic compound used to promote growth, such as nitrogen and phosphorus.

Photic zone - the portion of the lake where light intensity is sufficient to accommodate plant growth (1% of surface light or greater).

Photosynthesis - the process which takes place in green plants by which simple sugars are manufactured from CO_2, water and mineral nutrients with the aid of chlorophyll within the plant cells in the presence of light.

Phytoplankton - plant microorganisms, such as certain algae, floating in the water.

Plankton - free-floating, usually minute, aquatic organisms (e.g. diatoms and copepods).

Primary productivity - in a body of water, the rate of photosynthetic carbon fixation by palnts and bacteria forming the base of the food web.

Profundal zone - lake bottom offshore from the littoral zone.

Reheotaxis - referring to the response of organisms to flow, particularly water current; an organism with a positive reheotaxis tendency would be attracted to flowing water.

Rip-rap - a structure of large, durable, irregular rock placed in the water to prevent shore erosion, serve as breakwaters for harbors, or protect dikes.

Rookery - a group of nests or the breeding place of a colony of waterbirds (e.g. herons and egrets).

Secondary productivity - the rate at which animals produce organic matter (e.g. zooplankton feeding on algae).

Seiche - a period, rapid, and often violent fluctuation in water level within a lake or an embayment due to onshore or offshore winds and low barometric pressure.

Species - a group of closely related individuals which can and normally do interbreed to produce fertile offspring.

Spit - a small point of land consiting of sand or gravel deposited by alongshore currents, having one end attached to the mainland and the other terminating in open water.

Stratified lake - a lake which has become horizontally layered, typically due to temperature or density differences.

Submergent vegetation - various vascular aquatic plants usually rooted in shallow or moderate-depth water which lie entirely beneath the water surface, except for the flowering parts of some species (e.g. wild celery and stoneworts).

Swamp - a wetland dominated by woody plants, shrubs, and trees such as maples, cottonwood, and willows.

Thermocline - a subsurface zone in a lake of rapid temperature change with depth.

Trophic level - the position of an organism or species in a food chain.

Turbidity - a condition of opaqueness or reduced clarity of lake water caused by suspended sediment and/or plankton.

Turnover - a period (usually in the fall or spring) when a lake has uniform vertical temperature permitting vertical convective circulation or mixing to take place.

Water budget - an accounting of the inflow to, outflow from, and storage in a hydrologic unit such as a drainage basin, lake, reservoir or wetland; the relationship between evaporation, precipitation, runoff, and the change in water storage.

Wetlands - lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface.

Zooplankton - animal microorganisms, such as small crustacean (e.g. daphnia and cyclops), rotifers, and protozoans, floating in the water.

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APPENDIX

BIOLOGICAL NOMENCLATURE AND CLASSIFICATION

Biological Nomenclature

All recognized species of organisms have a two-part scientific name. The first part is the name of the genus to which the species belongs, and it is always capitalized. The second part is the name of the species and is not capitalized. Although two species may have the same genus name or the same species name, no two species have both in common. Species names are selected by the first person to publish a description of the organism, and they often refer to some physical property of the species, for example:

Populus deltoides - cotton wood tree (triangular-shaped leaves)

Leptodea fragilis - fragile papershell clam

Plethodon glutinosus - slimy salamander

Graptemys geographica - map turtle

Passerina cyanea - indigo bunting

or to the species' habitat, for example:

Bufo americanus - American toad

Petromyzon marinus - sea lamprey

Banta canadensis - Canada goose

or to some individual who is being honored, for example:

Juncus x stuckeyi - Stuckey's rush (x indicates the plant is a hybrid)

Natrix kirtlandi - Kirtland's water snake

Calidris bairdii - Baird's sandpiper

In formal usage, the name of the person who described the species and the date that the description was published follow the species name, for example:

Anodonta grandis Say, 1929 - common floater clam.

If the species is later moved to a different genus, the describer's name is enclosed in parentheses, for example:

Proptera alata (Say, 1817) - pink heel-splitter clam.

As a result of local geographical features, local populations tend to develop. Such populations may adapt to local conditions, and eventually become recognizable different from one another. Such differences are the basis for geographical variants of the species, called subspecies. Differences between subspecies are impermanent. If two subspecies are allowed to interbreed, distinguishing characteristics disappear rapidly. Once a local population has lost its innate ability to interbreed freely with the larger species population, it must be recognized as a separate species.

The subspecies name is written immediately after the species name, so the whole constitutes a trinomial. Stizostedion vitreum vitreum, the walleye of western Lake Erie, is subspecies of fish belonging to the species vitreum and genus Stizostedion. The formerly abundant blue pike of central Lake Erie, Stizostedion vitreum glaucum, is another subspecies of the species vitreum.

Animal families, which are groups of related genera, usually have names that end in the suffix "-idae." If no other common name exists, an abbreviation of the family name, formed by dropping the -ae, may be used. For example, an aquatic worm in the family Tubificidae may be called a tubificid worm.

Biological Classification

As we have seen above, plant and animals with similar characteristics and which "breed" together form a species. Species with many similarities are grouped together into a genus (plural, genera). Similar genera are grouped into a family, similar families into an order, similar orders into a class, similar classes into a phylum (plural, phyla), and similar phyla into a kingdom (Figure). These categories are called taxa (singular, taxon) and the science of classification is called taxonomy. The major taxa above genus can often be recognized by their endings. The following endings are commonly used: class - "-ceae", "-cetes", "-ea", or "-ia"; order - "-ales" or "-ida"; family - "-aceae" or "-idae". The name of a taxon above genus is usually derived from

the name of the genus that the higher taxon includes. Only species names may be used more than once throughout biologic classification; accordinly, a species name must be preceded by an indicator (name or initial) of the genus in which it is included.

Traditionally, organisms collected in the island region have been classified as wither plant or animals. Modern biologists have found that this two kingdom concept inadequately represents the evolutionary and nutritional relationshps of the higher forms to the lower, but biologically active and ecologically important microorganisms. During the last decade, the five kingdom concept (Figure 92) has been adopted by many biologists to overcome these deficiencies. A review of the biological literature indicates that approximately 7,000 species have been reported from the islands region of western Lake Erie, representing all five kingdoms. Table 14 provides a list of the 5 kingdoms, 30 phyla, and 59 classes of organisms (including common names) found in this region.

CLASSIFICATION OF THE CRAYFISH

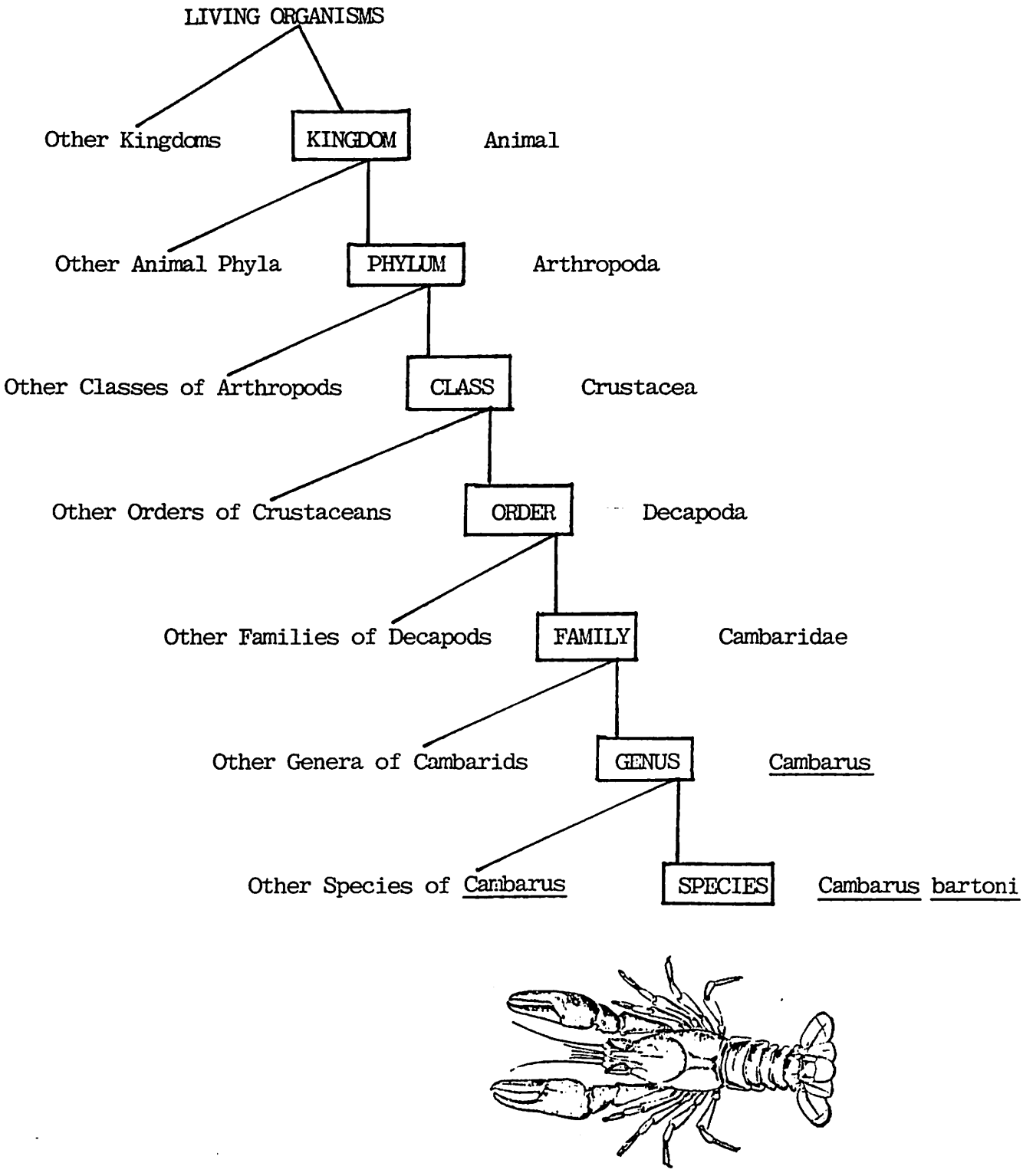


Figure 91. Classification of the crayfish, Cambarus bartoni.

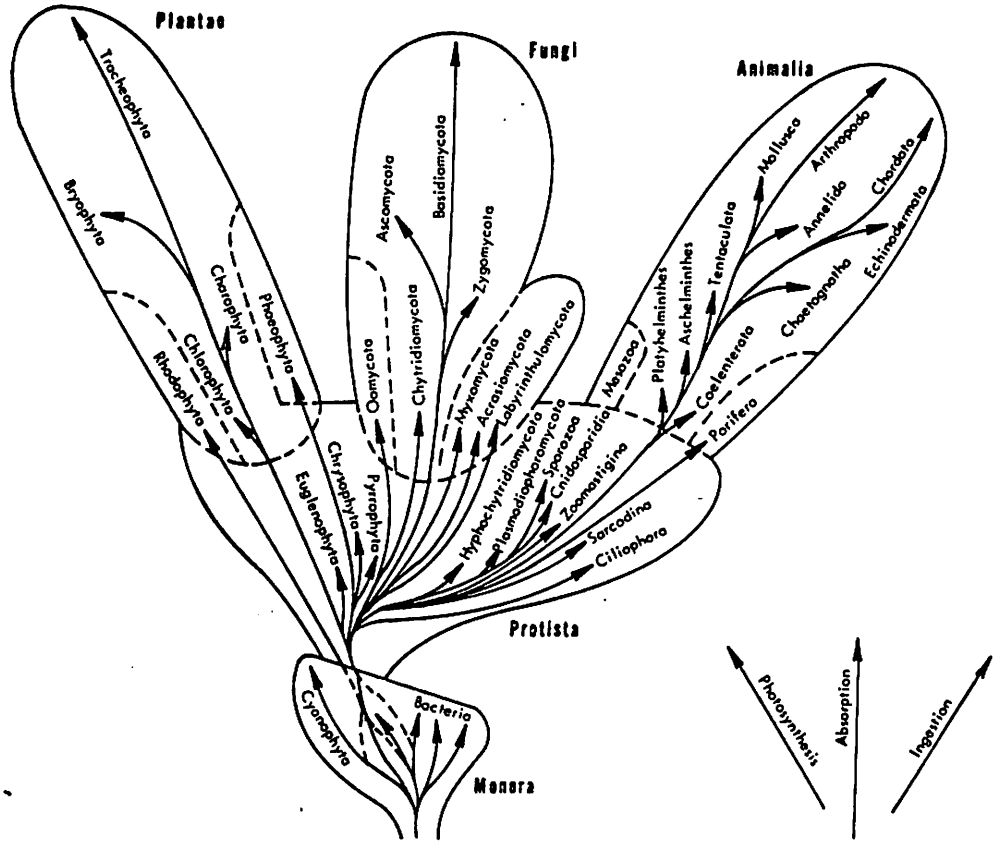


Figure 92. Five Kingdoms of Organisms (Whittaker, 1969).

TABLE 14

CLASSIFICATION OF ORGANISMS FOUND IN THE ISLANDS REGION OF WESTERN LAKE ERIE

KINGDOM MONERA
- PHYLUM SCHIZOMYCOTA (bacteria)
  - Class Schizomycetes (bacteria)
- PHYLUM CYANOPHYTA (blue-green algae)
  - Class Myxophyceae (blue-green algae)

KINGDOM PROTISTA
- PHYLUM EUGLENOPHYTA (euglenoids)
  - Class Euglenophyceae (euglenoids)
- PHYLUM CHRYSOPHYTA (golden-brown algae)
  - Class Xanthophyceae (yellow-green algae)
  - Class Chrysophyceae (golden algae)
  - Class Bacillariophyceae (diatoms)
- PHYLUM PYRRHOPHYTA (fire algae)
  - Class Dinophyceae (dinoflagellates)
- PHYLUM CRYPTOPHYTA (cryptomonads)
  - Class Cryptophyceae (cryptomonads)
- PHYLUM PROTOZOA (protozoans)
  - Class Sarcodina (amoeboids)
  - Class Mastigophora (flagellates)
  - Class Ciliphora (ciliates)
  - Class Sporozoa (spore formers)

KINGDOM FUNGI
- PHYLUM MYXOMYCOTA (slime mold)
  - Class Myxomycetes (slime mold)
- PHYLUM PHYCOMYCOTA (water mold)
  - Class Phycomycetes (aquatic fungi)
- PHYLUM ASCOMYCOTA (sac fungi)
  - Class Ascomycetes (yeasts)
  - Class Ascolichens (lichens)
- PHYLUM BASIDIOMYCOTA (club fungi)
  - Class Heterobasidiomycetes (rusts and smuts)
  - Class Homobasidiomycetes (mushrooms and rots)
- PHYLUM DEUTEROMYCOTA (fungi imperfecti)
  - Class Deuteromycetes (imperfect fungi)
  - Class Hyphomycetes (imperfect fungi)

KINGDOM PLANTAE
- PHYLUM CHLOROPHYTA (green algae)
  - Class Chlorophycea (green algae)
- PHYLUM CHAROPHYTA (stoneworts)
  - Class Charophyceae (stoneworts)
- PHYLUM RHODOPHYTA (red algae)
  - Class Rhodophyceae (red algae)
- PHYLUM BRYOPHYTA (moss plants)
  - Class Hepatopsida (liverworts)
  - Class Bryopsida (mosses)

PHYLUM TRACHEOPHYTES (vascular plants)
Class Equisetinae (horsetails)
Class Eusporongiopsida (ferns)
Class Leptosoprangiopsida (ferns)
Class Gymnospermae (conifers)
Class Angiospermae (flowering plants)

KINGDOM ANIMALIA
PHYLUM PORIFERA (sponges)
Class Demospongiae (horny sponges)
PHYLUM COELENTERATA (cnidarians)
Class Hydrozoa (hydrozoans)
PHYLUM PLATYHELMINTHES (flatworms)
Class Turbellaria (planarians)
Class Cestoda (tapeworms)
Class Trematoda (flukes)
PHYLUM ROTATORIA (rotifers)
Class Digononta (double ovary rotifers)
Class Monogononta (single ovary rotifers)
PHYLUM NEMATODA (hair worms)
Class Gordiodea (gordian worms)
PHYLUM ACANTHOCEPHALA (thorny-headed worms)
Class Metacanthocephala (thorny-headed worms)
Class Eoacanthocephala (thorny-headed worms)
PHYLUM BRYOZOA (bryozoans)
Class Entoprocta (noddingheads)
Class Ectoprocta (moss animals)
PHYLUM ANNELIDA (segmented worms)
Class Polychaeta (tube worms)
Class Oligochaeta (earthworms)
Class Hirudinea (leeches)
PHYLUM MOLLUSCA (soft-bodied animals)
Class Gastropoda (snails)
Class Pelecypoda (clams)
PHYLUM TARDIGRADA (water bears)
Class Eutardigrada (water bears)
PHYLUM ARTHROPODA (jointed-legged animals)
Class Arachnida (spiders, ticks, mites)
Class Crustacea (crustaceans)
Class Insecta (insects)
PHYLUM CHORDATA (chordates)
Class Agnatha (jawless fish)
Class Osteichthyes (bony fish)
Class Amphibia (amphibians)
Class Reptilia (reptiles)
Class Aves (birds)
Class Mammalia (mammals)

ALGAE

COMMON GOLDEN-BROWN ALGAE OF WESTERN LAKE ERIE

Phylum Chrysophyta (golden-brown algae)
- Class Chrysophyceae (golden algae)
  - Order Chrysomonadales
    - Family Mallomonadaceae
      1. Mallomonas
    - Family Isochrysidineae
      2. Synura
    - Family Ochromonadaceae
      3. Dinobryon
- Class Xanthopyceae (yellow-green algae)
  - Order Heterococcales
    - Family Chlorotheciaceae
      4. Ophiocytium
  - Order Heterotrichales
    - Family Tribonemataceae
      5. Tribonema
  - Order Heterophonales
    - Family Vaucheriaceae
      6. Vaucheria
- Class Bacillariophyceae (diatoms)
  - Order Centrales (centric diatoms)
    - Family Coscinodiscaceae
      7. Melosira
      8. Cyclotella
      9. Stephanodiscus
  - Order Pennales (pennate diatoms)
    - Family Fragilariaceae
      10. Tabellaria
      11. Diatoma
      12. Asterionella
      13. Fragilaria
      14. Synedra
    - Family Naviculaceae
      15. Gyrosigma
      16. Navicula
    - Family Gomphonemaceae
      17. Gomphonema
    - Family Cymbellacea
      18. Cymbella

Order Pennales (Continued)
Family Nitzschiaceae
19. Nitzschia

Family Surirellaceae
20. Surivella

COMMON FIRE ALGAE AND CRYPTOPHYTES IN WESTERN LAKE ERIE

Phylum Pyrrophyta (fire algae)
Class Dinophyceae (dinoflagellates)
Order Gymnodiniales
Family Gymnodiniaceae
1. Gymnodinium

Order Peridiniales
Family Peridiniaceae
2. Peridinium

Family Ceratiaceae
3. Ceratium

Phylum Cryptophyta (cryptophytes)
Class Cryptophyceae
Order Cryptomonadales (cryptomonads)
Family Cryptomonadineae
4. Cryptomonas
5. Rhodomonas

COMMON GREEN ALGAE OF WESTERN LAKE ERIE

Phylum Chlorophyta (green algae)
Class Chlorophyceae
Order Volvocales
Family Chlamydomonadaceae
1. *Chlamydomonas*

Family Volvocaceae
2. *Eudorina*
3. *Pandorina*
4. *Volvox*

Order Ulotrichales
Family Ulotrichaceae
5. *Ulothrix*

Order Microsporales
Family Microsporaceae
6. *Microspora*

Order Chaetophorales
Family Chaetophoraceae
7. *Chaetophora*
8. *Stigeoclonium*

Order Cladophorales
Family Cladophoraceae
9. *Cladophora*

Order Oedogoniales
Family Oedogoniaceae
10. *Oedogonium*

Order Chlorococcales
Family Hydrodictyaceae
11. *Hydrodictyon*
12. *Pediastrum*

Family Coelastraceae
13. *Coelastrum*

Family Oocystaceae
14. *Ankistrodesmus*
15. *Chlorella*
16. *Oocystis*
17. *Tetraedon*

Family Scenedesmaceae
18. *Actinostrum*
19. *Microactinium*
20. *Scenedesmus*

Class Chlorophyceae (Continued)
Order Zygnematales
Family Zygnemataceae (filamentous pond scum)
21. Mougeotia
22. Spirogyra
23. Zygnema

Family Desmidiaceae (desmids)
24. Closterium
25. Cosmarium
26. Desmidium
27. Euastrum
28. Staurastrum

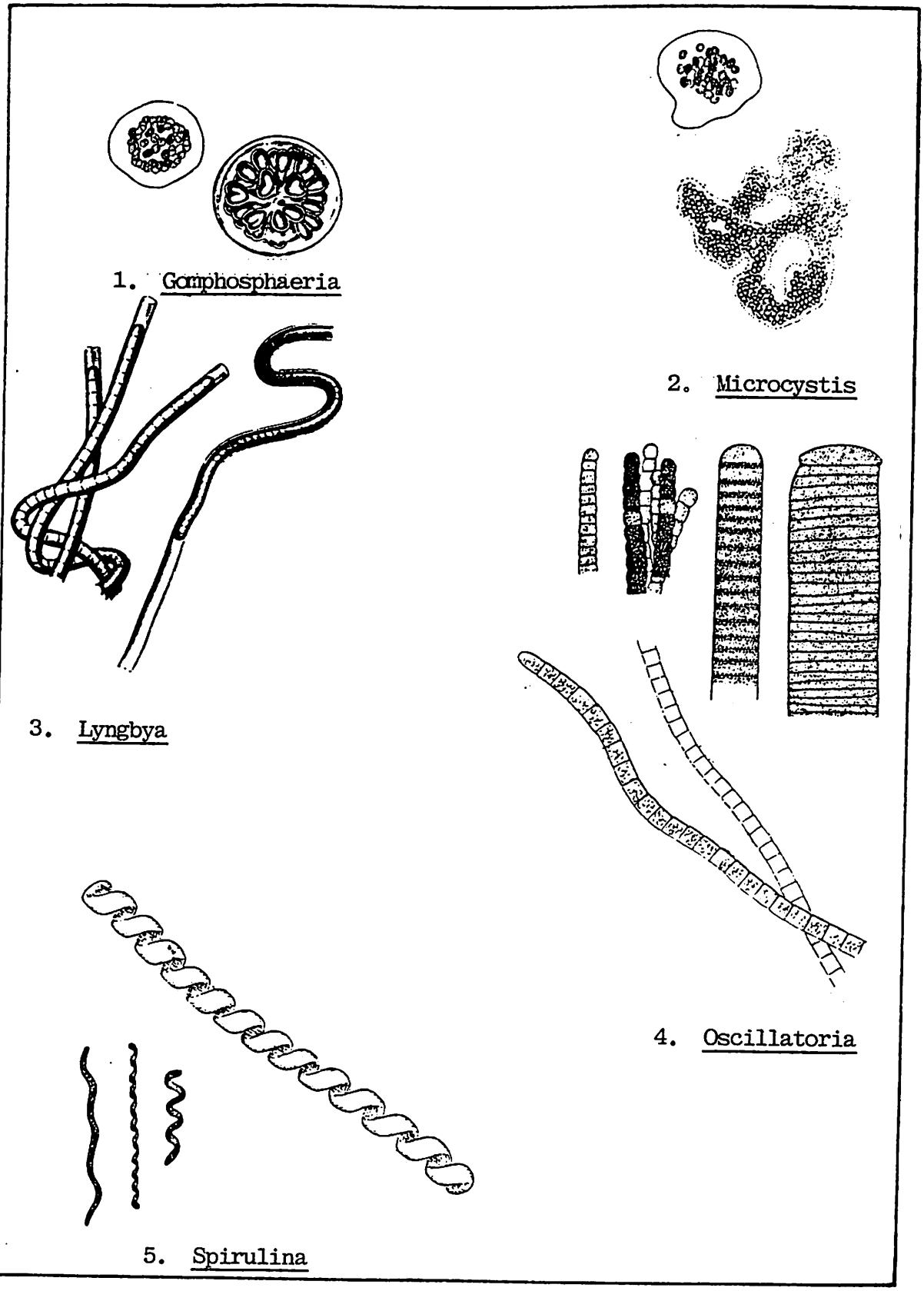
Phylum Charophyta (stoneworts)
Class Charophyceae
Order Charales
Family Characeae
29. Chara
30. Nitella

COMMON RED ALGAE OF WESTERN LAKE ERIE

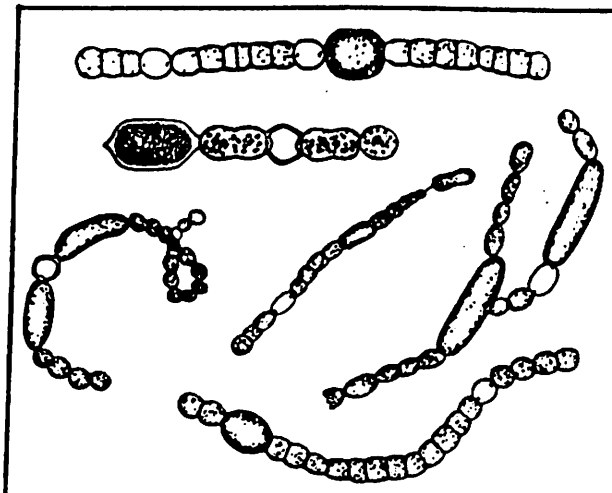
Phylum Rhodophyta (red algae)
Class Rhodophyceae
Subclass Bangioideae
Order Bangiales
Family Bangiaceae
1. Bangia atropurpurea

COMMON BLUE-GREEN ALGAE OF WESTERN LAKE ERIE

Phylum Cyanophyta (blue-green algae)
- Class Myxophyceae
  - Order Chroococcales
    - Family Chroococcaceae
      1. Gomphosphaeria
      2. Microcystis (=Anacystis)
  - Order Hormogonales
    - Family Oscillatoriaceae
      3. Lyngbya
      4. Oscillatoria
      5. Spirulina
    - Family Nostocaceae
      6. Anabaena
      7. Aphanizomenon
      8. Nostoc
    - Family Scytonemataceae
      9. Plectonema
    - Family Rivulariaceae
      10. Calothrix

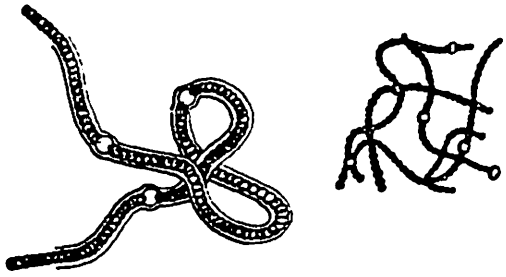


ALGAE - Blue-green Algae

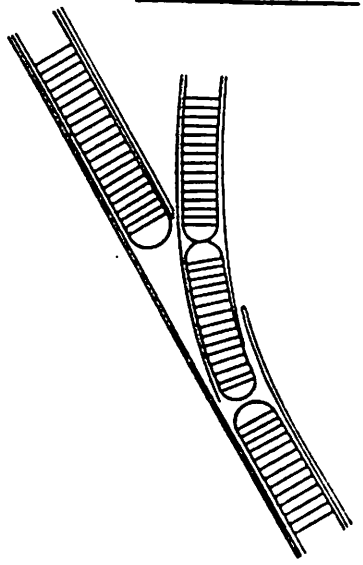


6. Anabaena

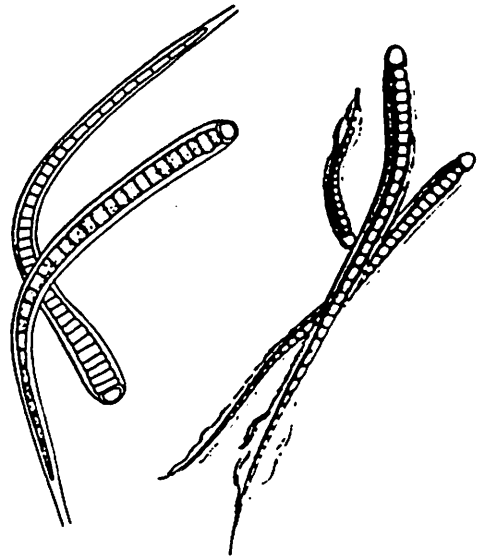
7. Aphanizomenon



8. Nostoc

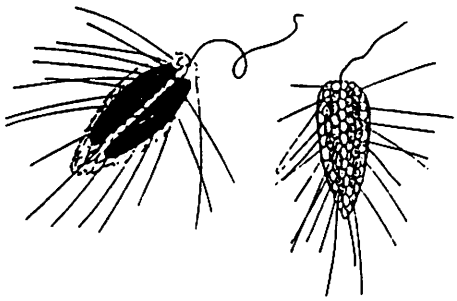


9. Plectonema

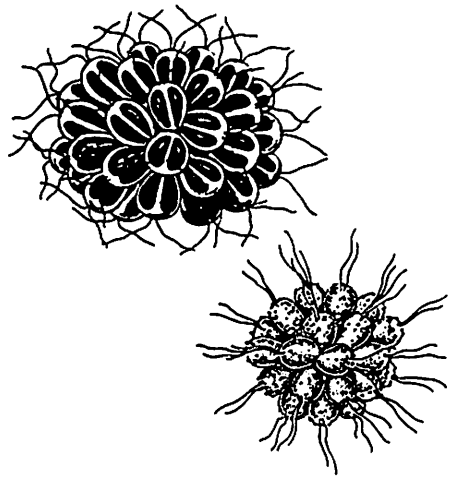


10. Calothrix

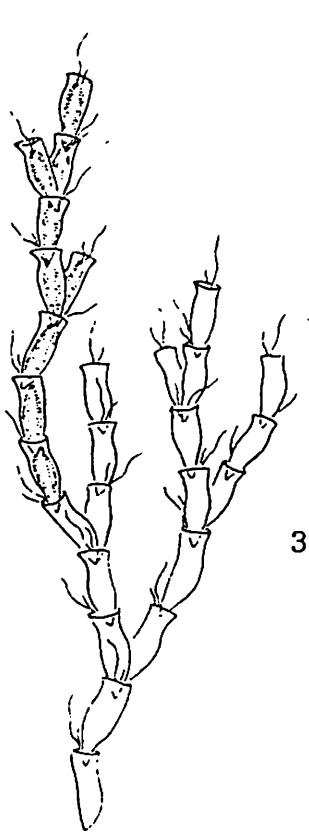
ALGAE - Blue-green Algae



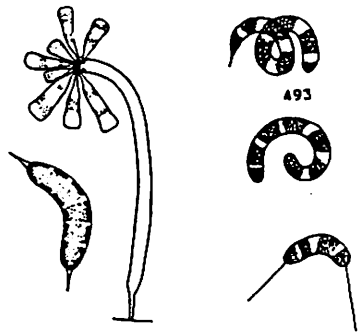
1. Mallomonas



2. Synura



3. Dinobryon

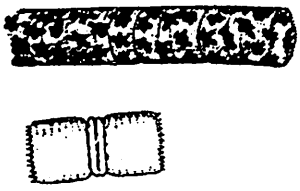


4. Ophiocytium

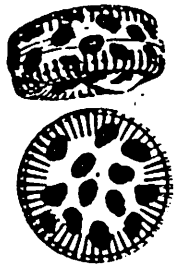
5. Tribonema

6. Vaucheria

ALGAE - Golden-brown Algae

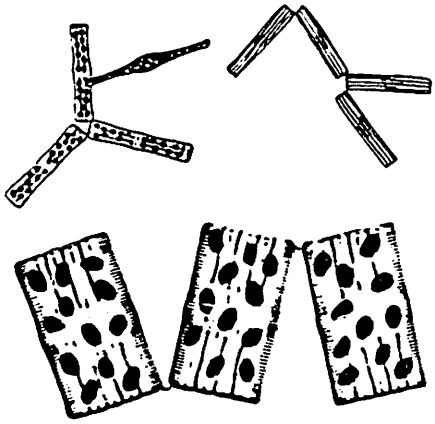


7. Melosira

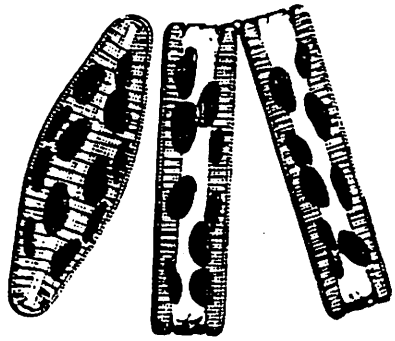


8. Cyclotella

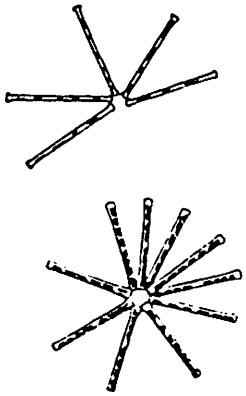
9. Stephanodiscus



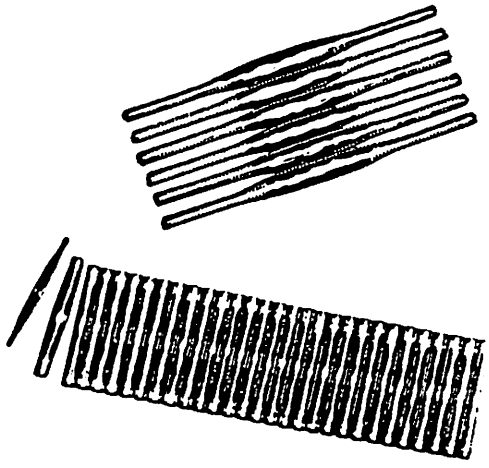
10. Tabellaria



11. Diatoma

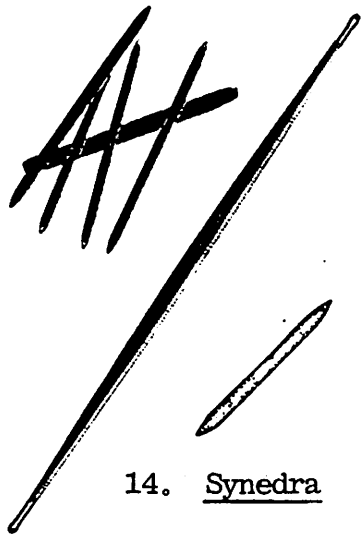


12. Asterionella

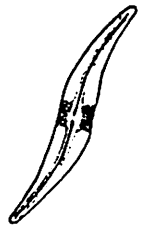


13. Fragilaria

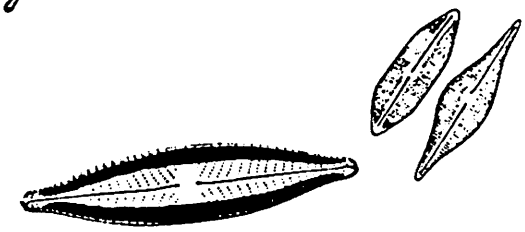
ALGAE - Golden-brown Algae



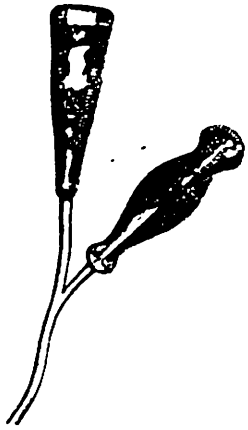
14. Synedra



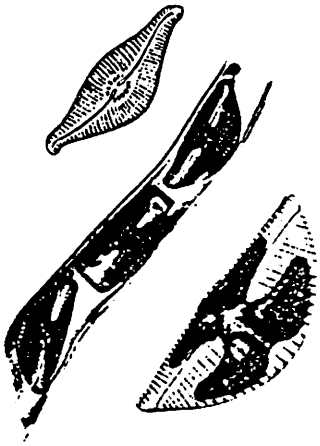
15. Gyrosigma



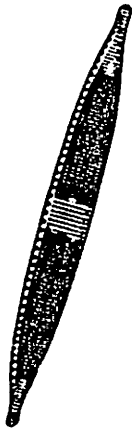
16. Navicula



17. Gomphonema



18. Cymbella

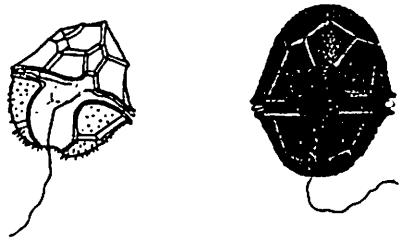


19. Nitzchia

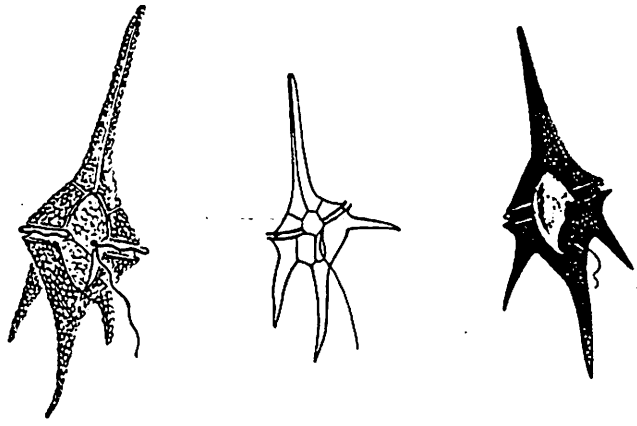
20. Surivella

ALGAE - Golden-brown Algae

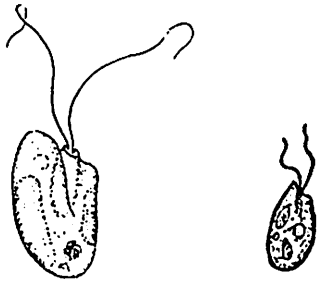
1. Gymnodinium



2. Peridinium



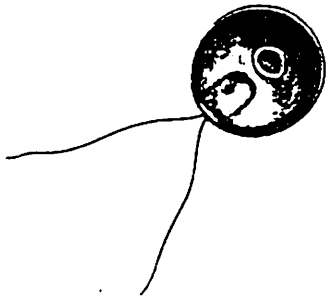
3. Ceratium



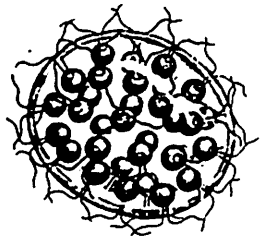
4. Cryptomonas

5. Rhodomonas

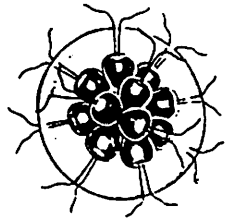
ALGAE - Common Fire Algae and Cryptophytes



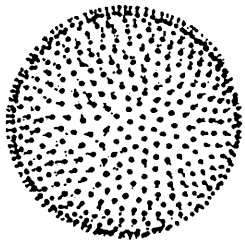
1. Chlamydomonas



2. Eudorina

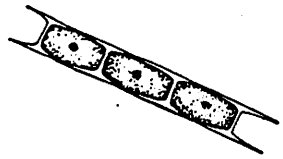


3. Pandorina

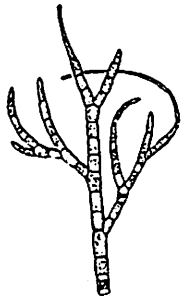


4. Volvox

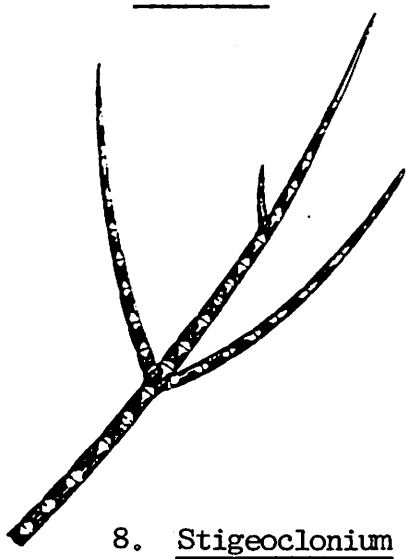
5. Ulothrix



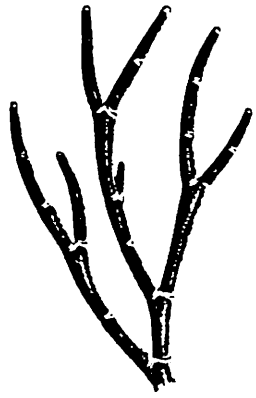
6. Microspora



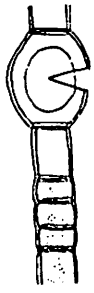
7. Chaetophora



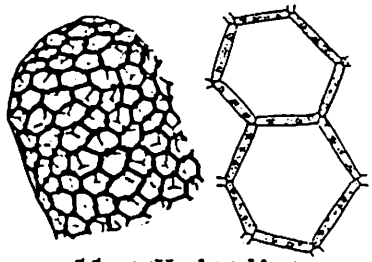
8. Stigeoclonium



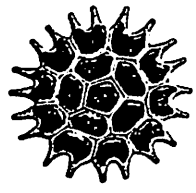
9. Cladophora



10. Oedogonium



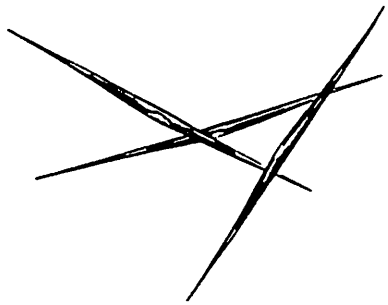
11. Hydrodictyon



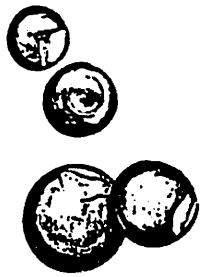
12. Pediastrum

ALGAE - Green Algae

13. Coelastrum

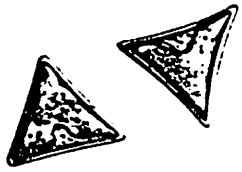


14. Ankistrodesmus

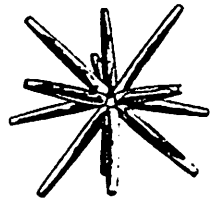


15. Chlorella

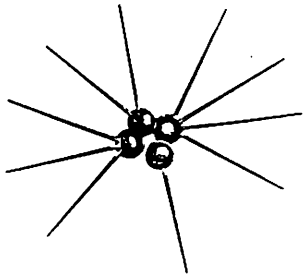
16. Oocystis



17. Tetraedon

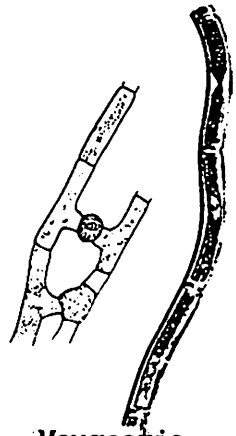


18. Actinostrum

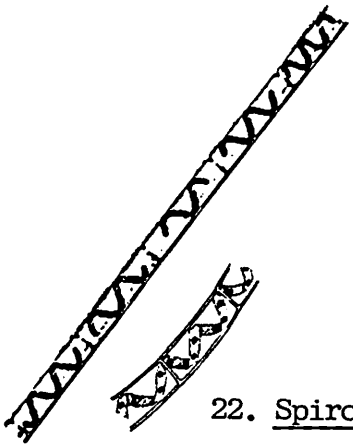


19. Microactinium

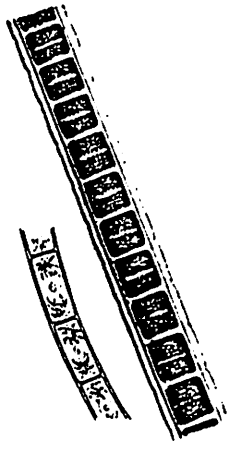
20. Scenedesmus



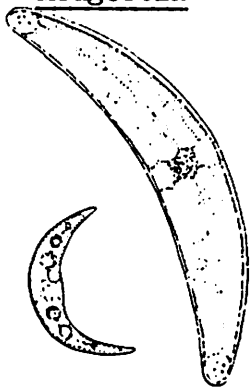
21. Mougeotia



22. Spirogyra

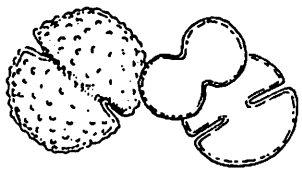


23. Zygnema

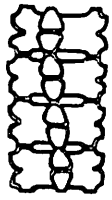


24. Closterium

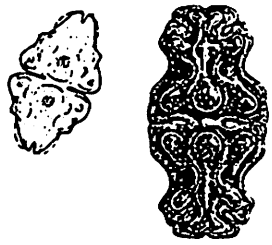
ALGAE - Green Algae



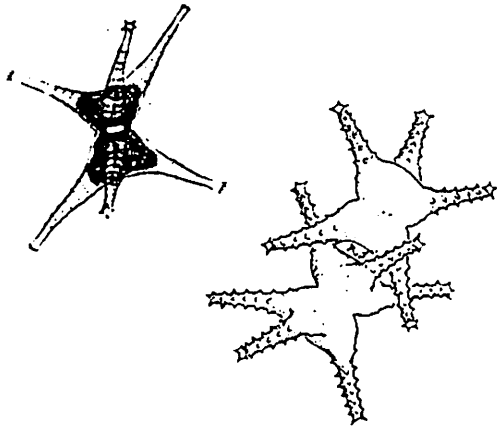
25. Cosmarium



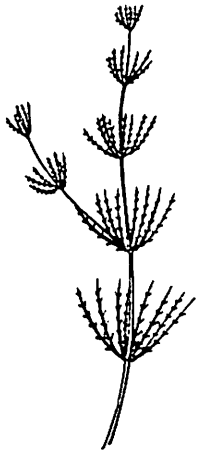
26. Desmidium



27. Euastrum



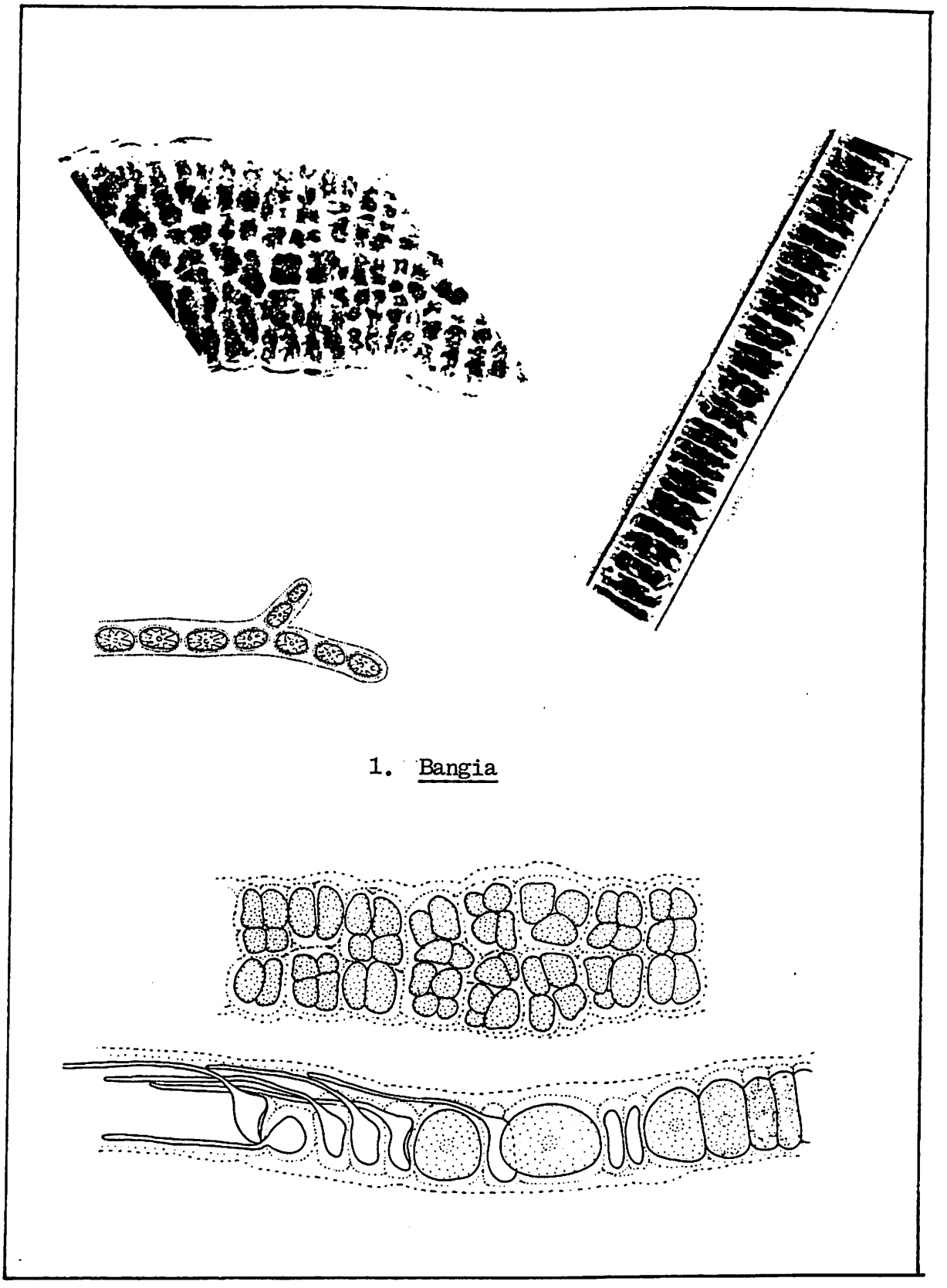
28. Staurastrum



29. Chara

30. Nitella

ALGAE - Green Algae



1. Bangia

AQUATIC PLANTS

COMMON AQUATIC PLANTS OF THE LAKE ERIE ISLANDS

EMERGENT AND SHORE PLANTS

Class Angiospermae (flowering plants)
Subclass monocotyledonae (monocots)
Order Pandanales
Family Typhaceae (cat-tails)
1. Typha angustifolia (narrow-leaved cat-tail)
2. Typha latifolia (broad-leaved cat-tail)

Family Sparganium (bur-reeds)
3. Sparganium eurycarpum (giant bur-reed)

Order Alismales
Family Alismataceae (water-plantains)
4. Alisma plantago-aquatica (water-plantain)
5. Sagittaria latifolia (arrowhead)

Family Butomaceae (flowering rushes)
6. Butomus umbellatus (flowering rush)

Order Graminales
Family Gramineae (grasses)
7. Calamagrostis canadensis (bluejoint)
8. Glyceria strata (manna grass)
9. Leersia oryzoides (rice cut grass)
10. Phalaris arundinacea (reed-canary grass)

Family Cyperaceae (sedges)
11. Carex comosa (bristly sedge)
12. Carex stipata (awl-fruited sedge)
13. Cyperus ferruginescens (rusty cyperus)
14. Eleocharis obtusa (blunt spike-rush)
15. Scirpus acutus (hard-stemmed bulrush)
16. Scirpus americanus (American bulrush)
17. Scirpus atrovirens (dark green bulrush)
18. Scirpus fluviatilis (river bulrush)
19. Scirpus validus (great bulrush)

Order Xyridales
Family Pontederiaceae (pickerel-weeds)
20. Heteranthera dubia (mud plantain or water stargrass)
21. Pontederia cordata (pickerel-weed)

Order Liliales
Family Juncaceae (rushes)
22. Juncus effusus (soft rush)
23. Juncus nodosus (knotted rush)

Subclass Dicotyledonae (dicots)
Order Polygonales
Family Polygonaceae
24. Polygonum lapathifolium (nodding smartweed)

Family Polygonaceae (Continued)

25. Polygonum persicaria (lady's thumb)
26. Polygonum punctatum (water smartweed)
27. Rumex verticillatus (swamp dock)

Order Papaverales

Family Cruciferae (mustards)

28. Cardamine pensylvania (bitter cress)
29. Rorippa palustris (marsh cress)

Order Primulates

Family Asclepiadaceae (milkweeds)

30. Asclepias incarnata (swamp milkweed)

Order Polemoniales

Family Labiatae (mints)

31. Lycopus americanus (water horehound)
32. Scutellaria epilobiiflora (skullcap)
33. Scutellaria lateriflora (mad-dog skullcap)
34. Stachys palustris (woundwort)

Family Acanthaceae (acanthids)

35. Justicia americana (water willow)

Order Rubiales

Family Rubiaceae (madders)

36. Cephalanthus occidentalis (buttonbush)

Order Campanulales

Family Lobelliaceae (lobelias)

37. Lobelia siphilitica (blue lobelias)

Order Asterales

Family Compositae (composites)

38. Bidens cernua (nodding beggar ticks)
39. Bidens frondosus (beggar ticks)
40. Eupatorium perfoliatum (bonset)

ATTACHED FLOATING-LEAVED PLANTS

Class Angiospermacea (flowering plants)
Subclass Monocotyledonae (monocots)
Order Xyridales
Family Pontederiaceae (pickerel-weeds)
41. *Pontederia cordata* (pickerel-weed)

Subclass Dicotyledonae (dicots)
Order Polygonales
Family Polygonaceae (buckwheats)
42. *Polygonum amphibium* (water smartweed)

Order Ranales
Family Nymphaeaceae (water-lillies)
43. *Nelumbo lutea* (American lotus)
44. *Nuphar advena* (yellow water-lily or spatterdock)
45. *Nymphaea tuberosa* (white water-lily)

Order Malvales
Family Malvaceae (mallows)
46. *Hibiscus mosheutos* (swamp rosemallow)

Order Myrtales
Family Lythaceae (loosestrifes)
47. *Decodon verticillatus* (swamp loosestrife)

Family Onagraceae (evening-primroses)
48. *Ludwigia palustris* (water primrose)

FLOATING PLANTS

Class Angiospermae (flowering plants)
Subclass Monocotyledonae (monocots)
Order Arales
Family Lemnaceae (duckweeds)
49. *Lemna minor* (small duckweed)
50. *Spirodela polyrhiza* (large duckweed)
51. *Wolffia columbiana* (watermeal)
52. *Wolffia punctata* (watermeal)

SUBMERSED PLANTS

Class Angiospermae (flowering plants)
- Subclass Monocotyledonae (monocots)
  - Order Najadales
    - Family Najacadeae (bushy pondweed)
      53. *Najas marina* (spiny naiad)

    - Family Potamogeton (pondweeds)
      54. *Potamogeton crispus* (curly pondweed)
      55. *Potamogeton filiformis* (filiform pondweed)
      56. *Potamogeton foliosus* (leafy pondweed)
      57. *Potamogeton nodosus* (knotty pondweed)
      58. *Potamogeton pectinatus* (sago pondweed)
      59. *Potamogeton pusillus* (small pondweed)
      60. *Potamogeton richardsonii* (Richardson's pondweed)

    - Family Zannichelliaceae (horned pondweeds)
      61. *Zanichellia palustris* (horned pondweed)

  - Order Hydrocharitales
    - Family Hydrocharitaceae (frogbits)
      62. *Elodea canadensis* (water weed)
      63. *Vallisneria americana* (eel grass or wild celery)

  - Order Xyridales
    - Family Pontederiaceae (pickerel-weeds)
      64. *Heteranthera dubia* (mud plantain or water stargrass)

- Subclass Dicotyledonae (dicots)
  - Order Ranales
    - Family Ceratophyllaceae (hornworts)
      65. *Ceratophyllaceae demersum* (hornwort or coontail)

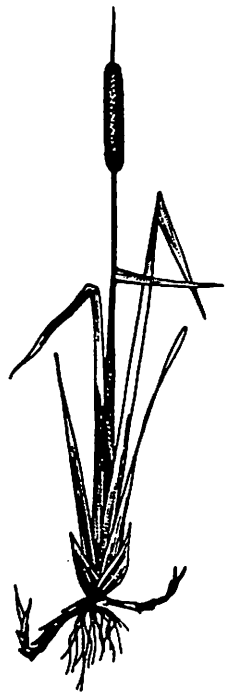
    - Family Ranunculaceae (buttercups)
      66. *Ranunculus scleratus* (water crowfoot)

  - Order Papaverales
    - Family Cruciferae (mustards)
      67. *Roprippa palustris* (marsh cress)

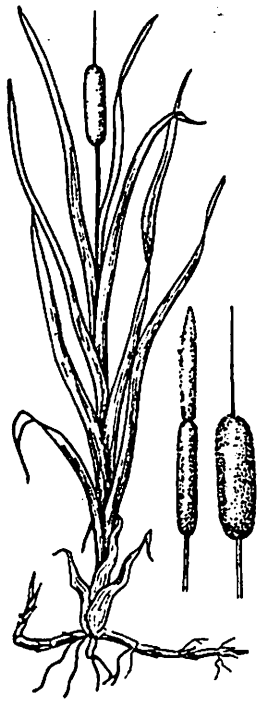
  - Order Myrtales
    - Family Haloragidaceae (water-milfoils)
      68. *Myriophyllum exalbescens* (water-milfoil)

    - Family Onagraceae (eveing primrose)
      69. *Ludwigia palustris* (water primrose)

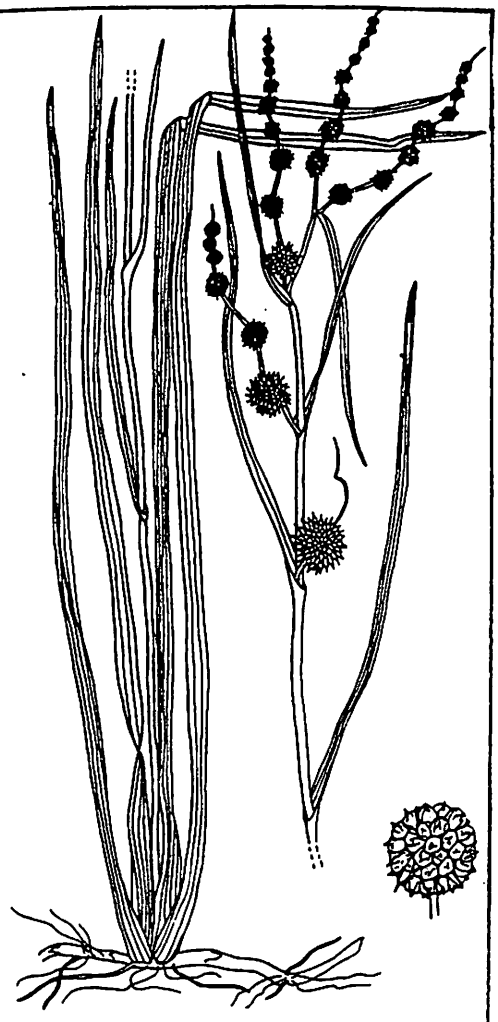
  - Order Polemoniales
    - Family Lentibulariaceae
      70. *Utricularia vulgaris* (bladderwort)



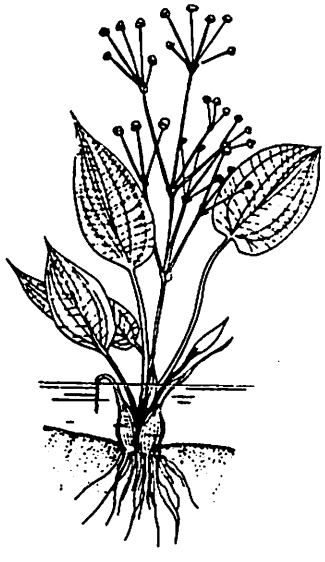
1. Narrow-leaved cat-tail



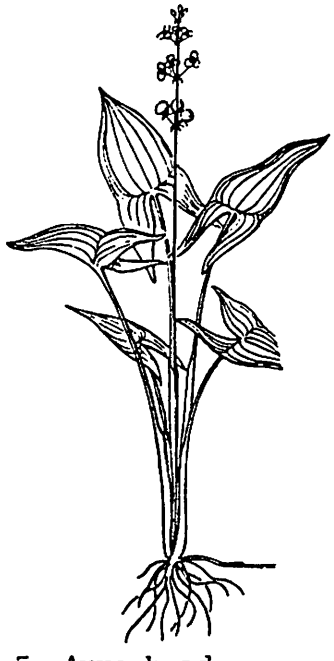
2. Broad-leaved cat-tail



3. Giant bur-reed



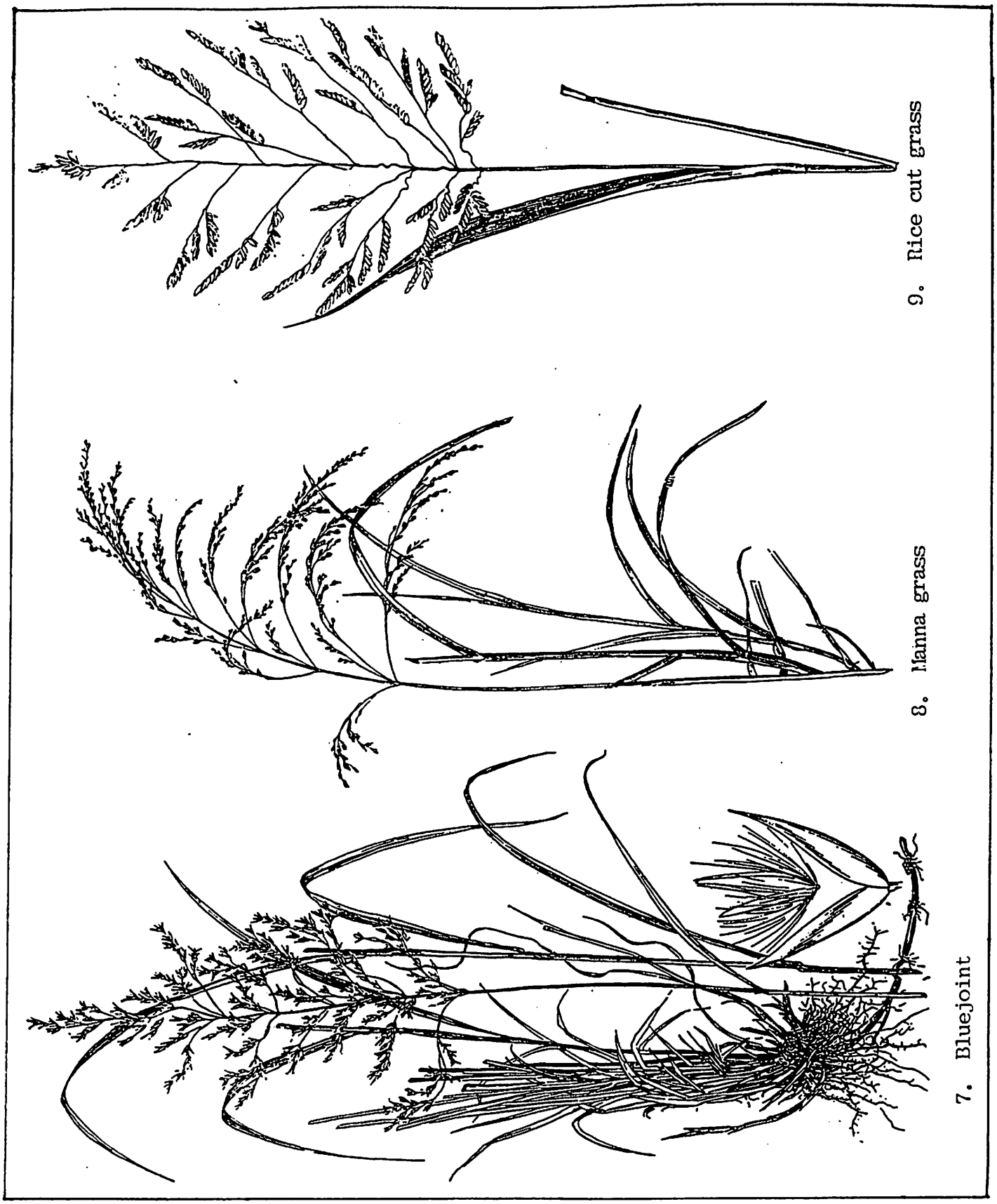
4. Water-plantain



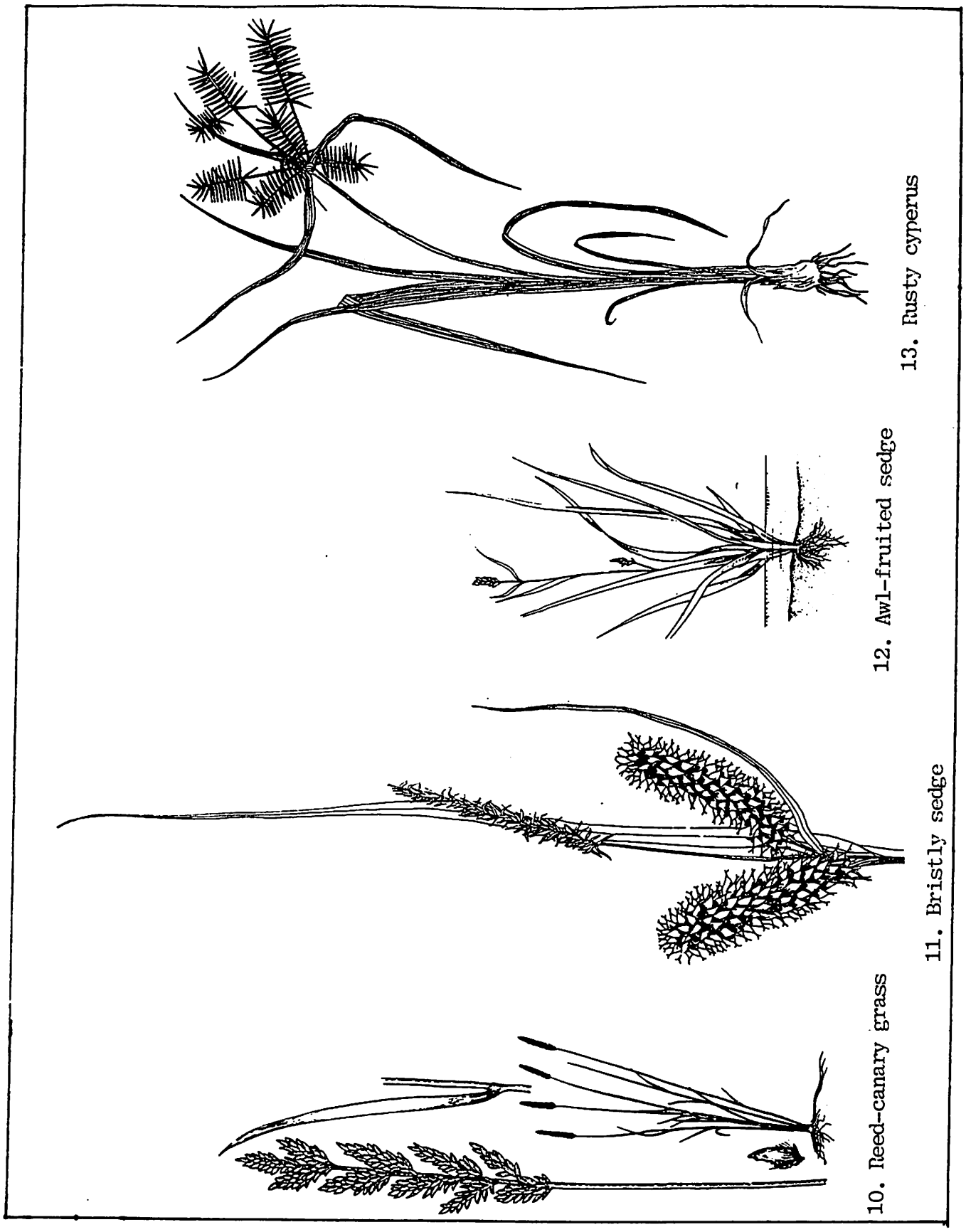
5. Arrowhead

6. Flowering rush

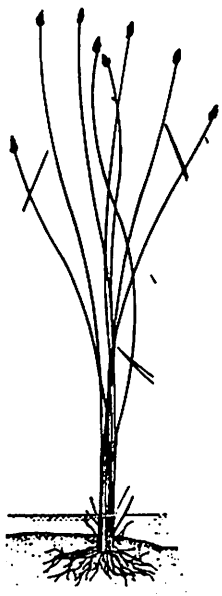
AQUATIC PLANTS - Emergent and Shore Plants



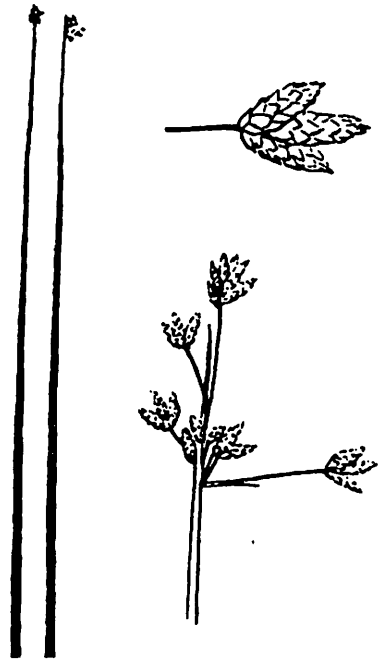
AQUATIC PLANTS - Emergent and Shore Plants



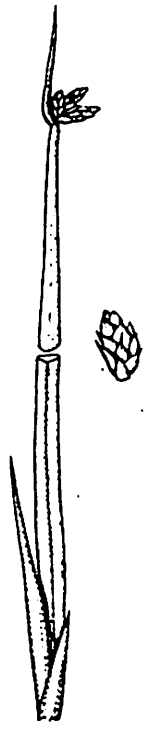
AQUATIC PLANTS - Emergent and Shore Plants



14. Blunt spike-rush



15. Hard-stemmed bulrush



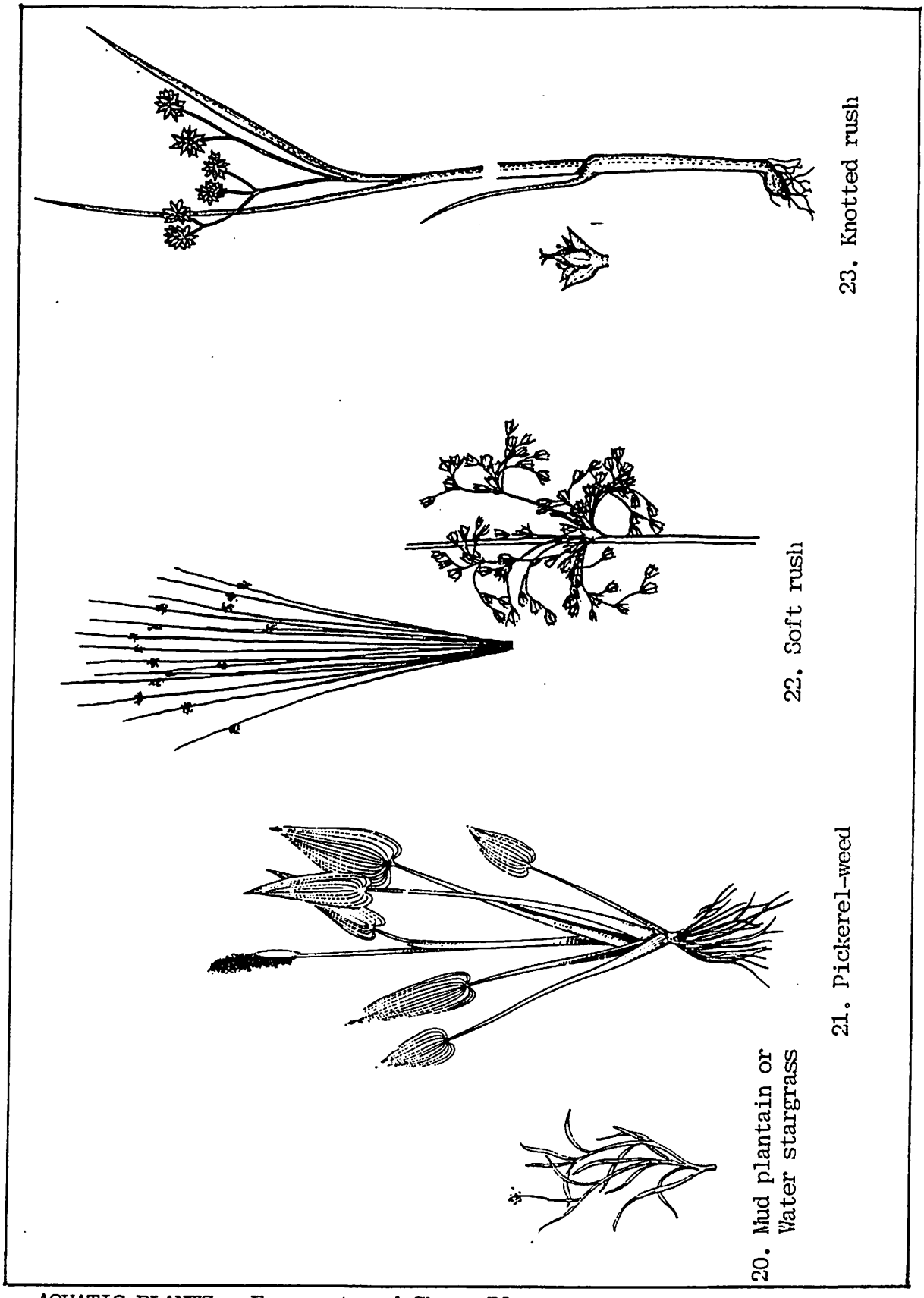
16. American bulrush

17. Dark green bulrush

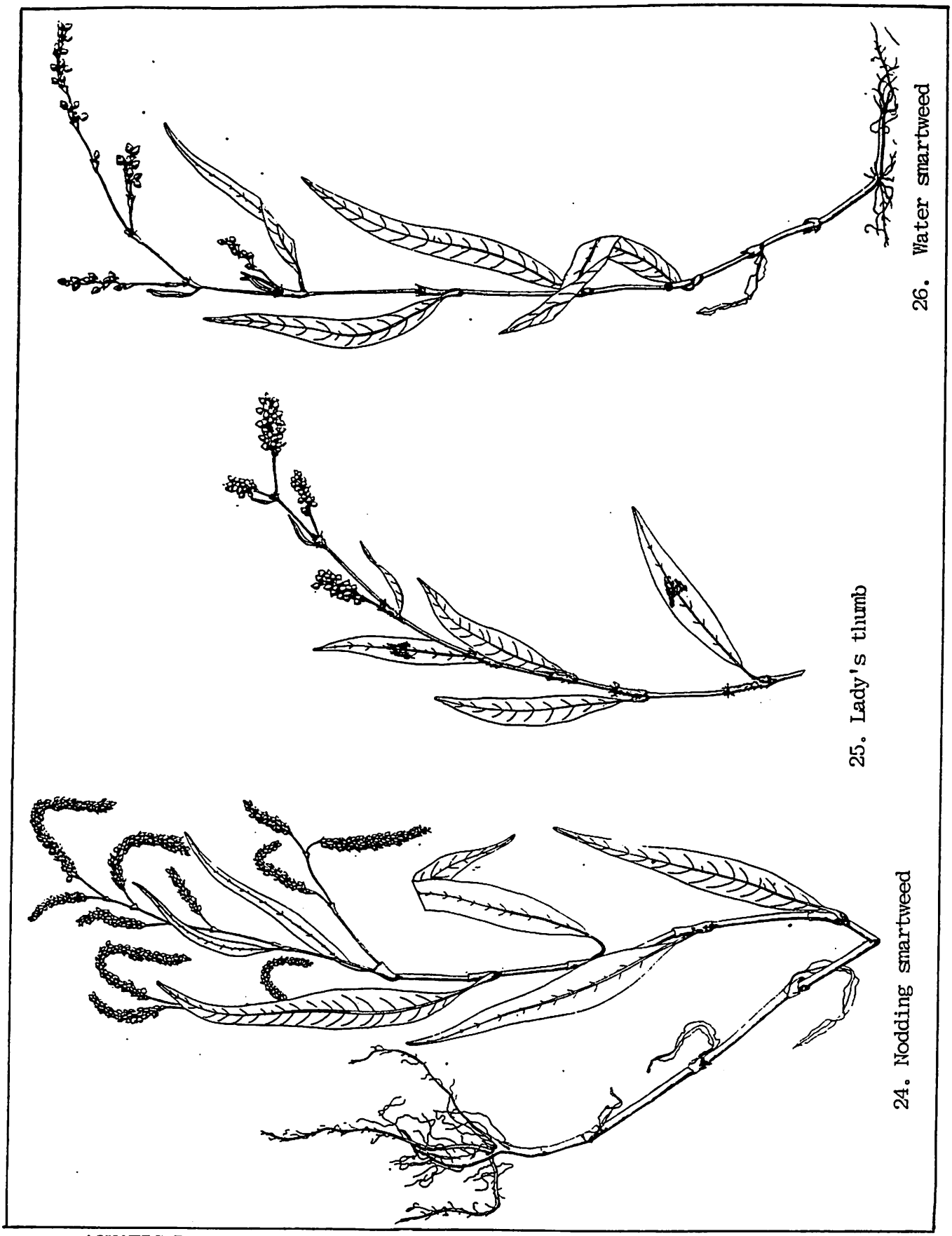
18. River bulrush

19. Great bulrush

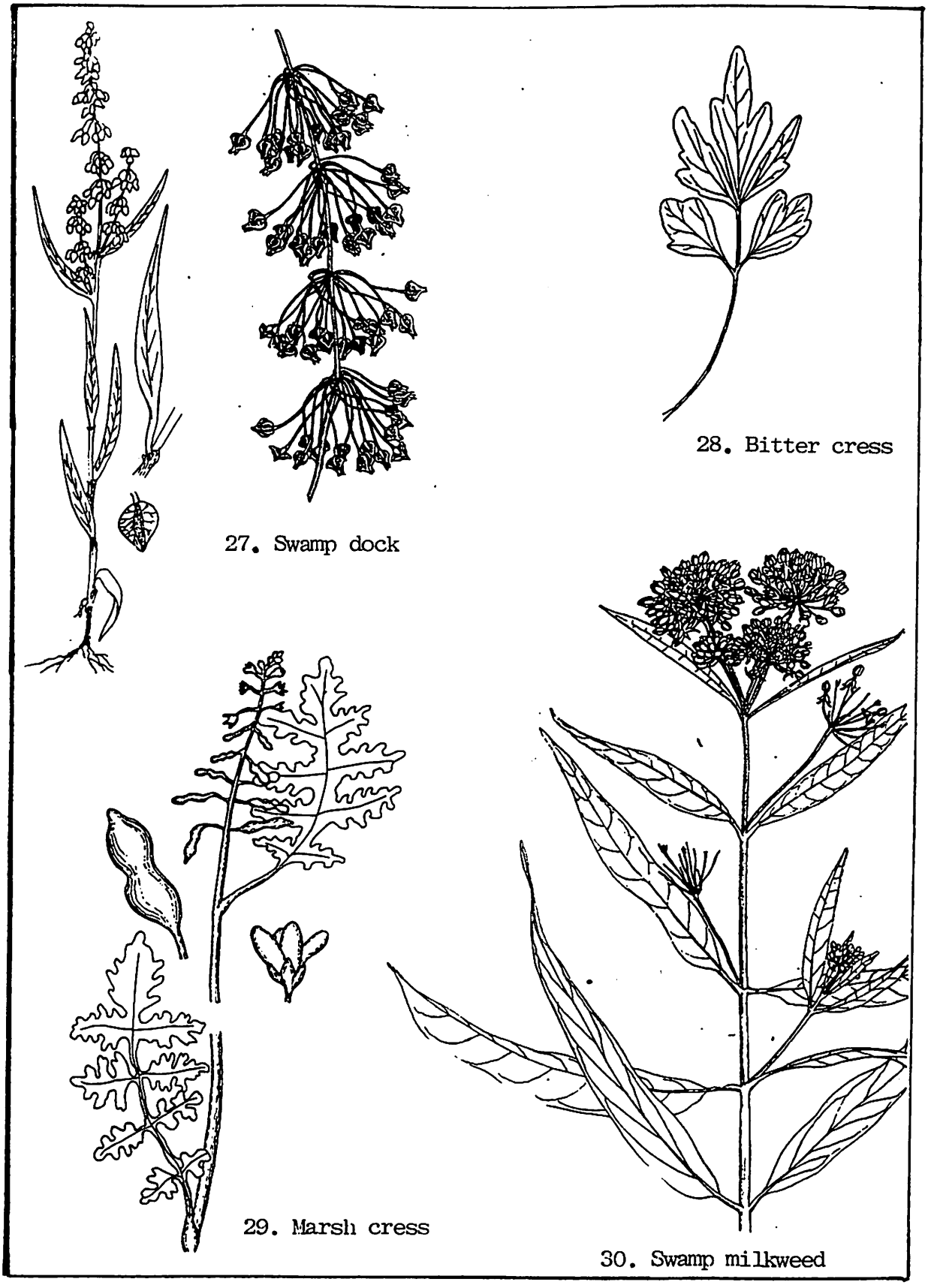
AQUATIC PLANTS - Emergent and Shore Plants



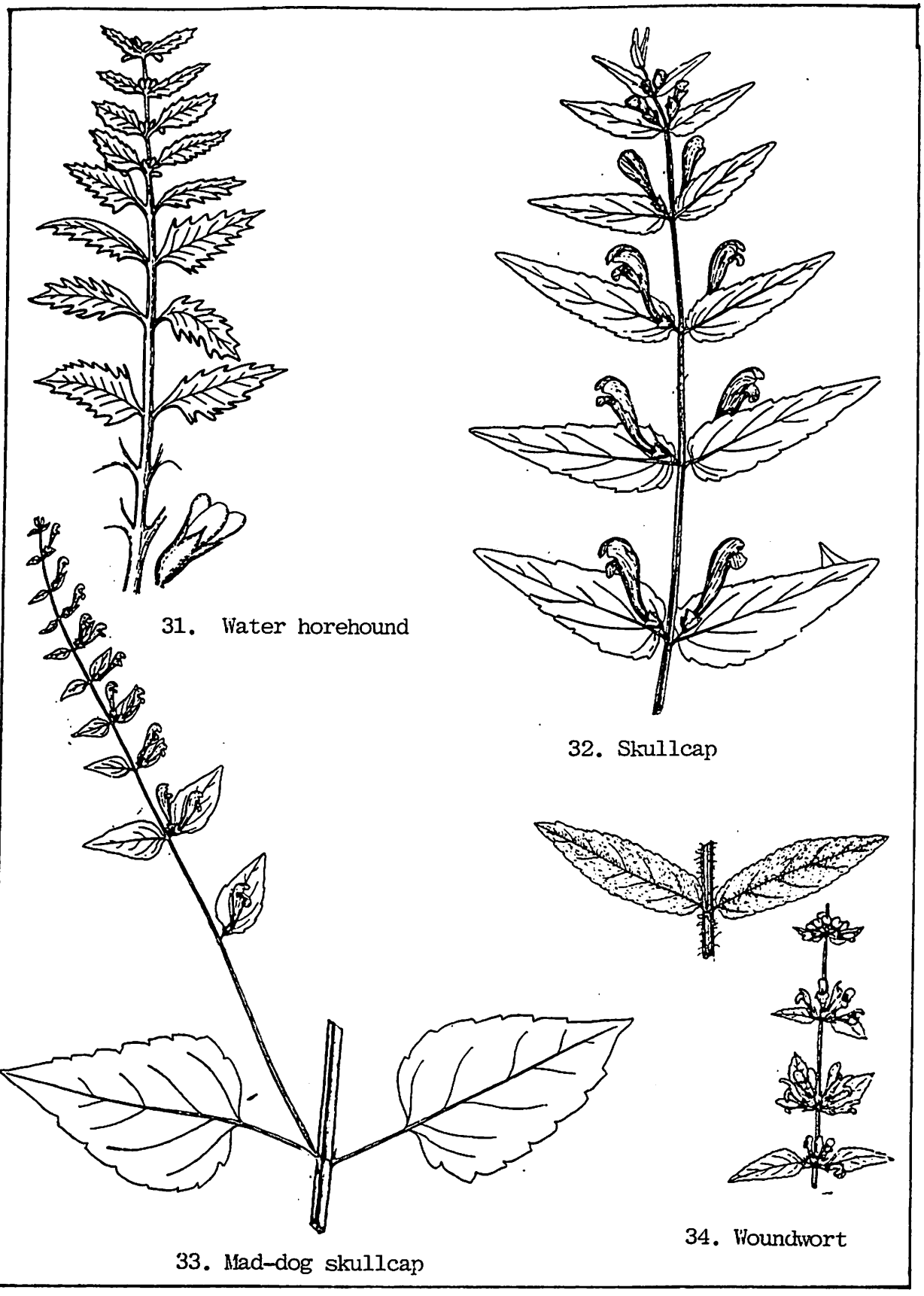
AQUATIC PLANTS - Emergent and Shore Plants



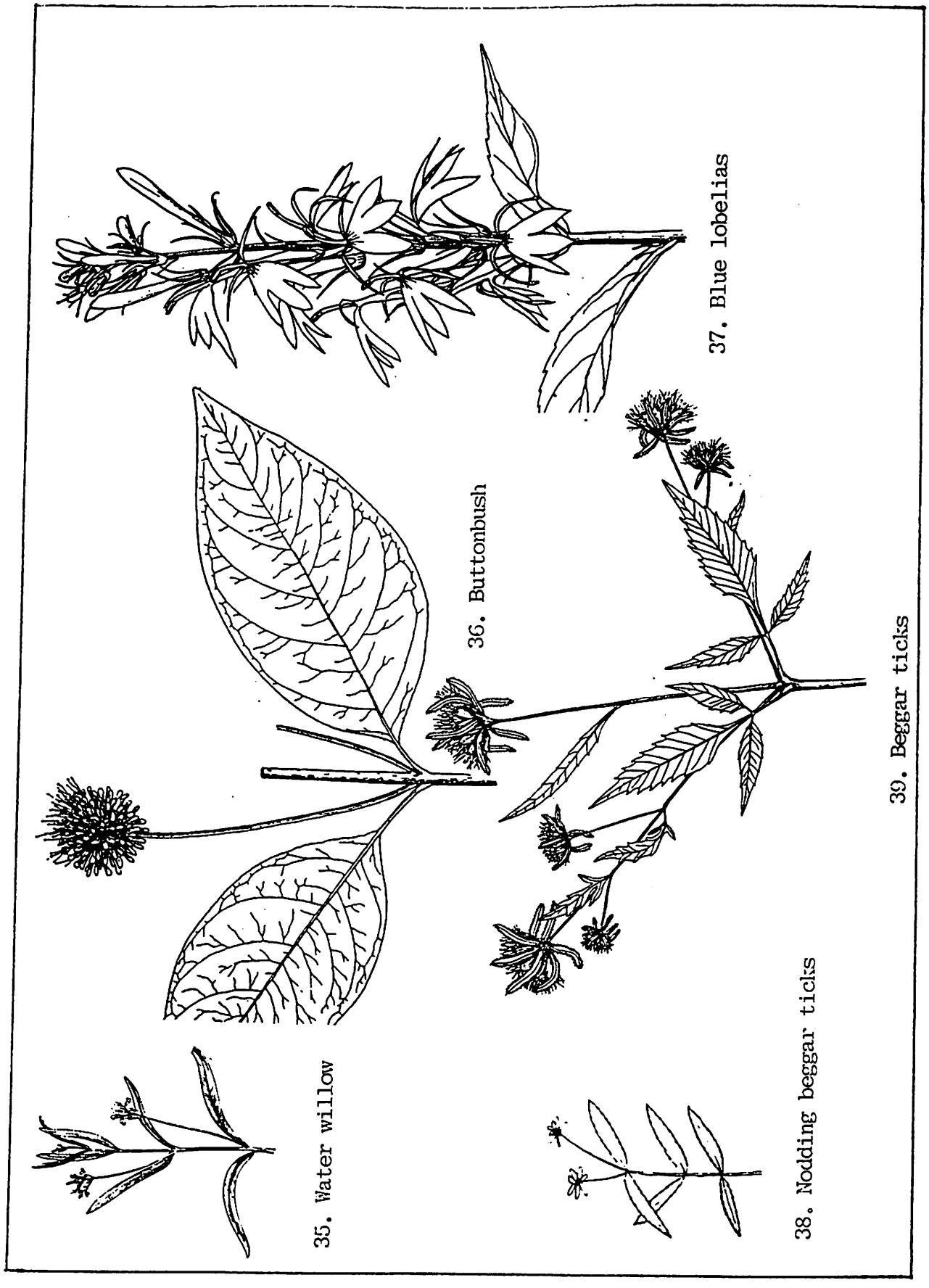
AQUATIC PLANTS - Emergent and Shore Plants



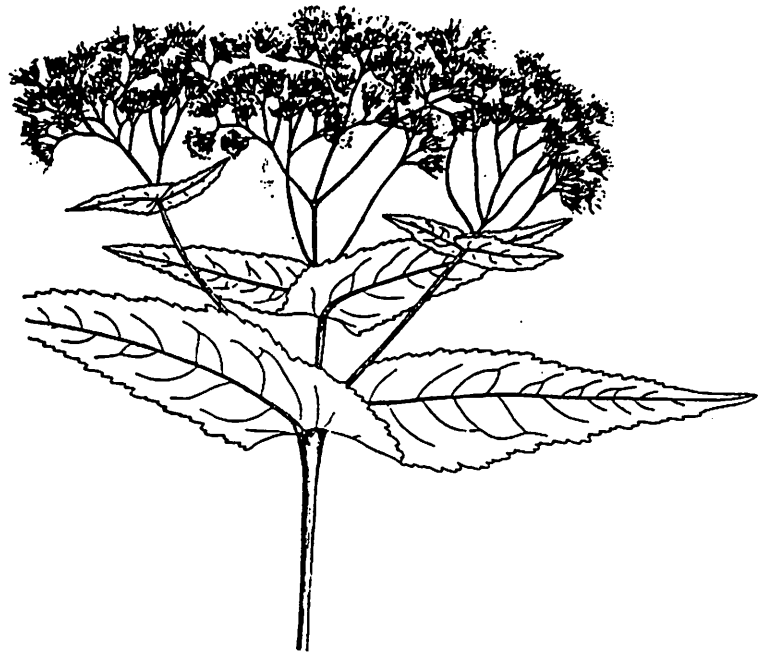
AQUATIC PLANTS - Emergent and Shore Plants



AQUATIC PLANTS - Emergent and Shore Plants



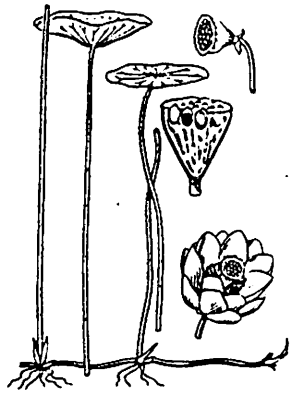
AQUATIC PLANTS - Emergent and Shore Plants



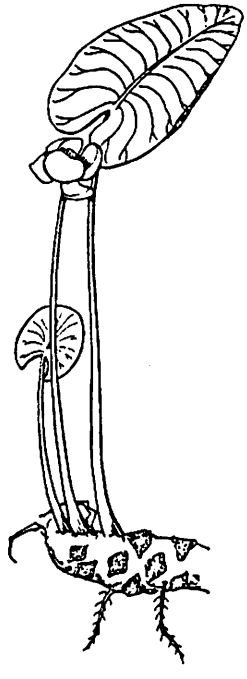
40. Bonset

41. Pickerel-weed

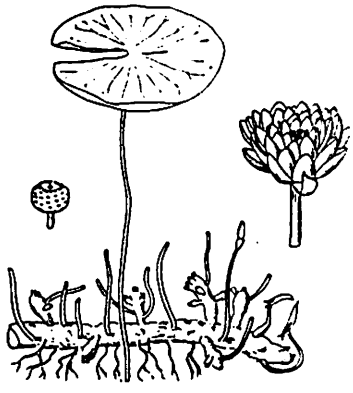
42. Water smartweed



43. American lotus

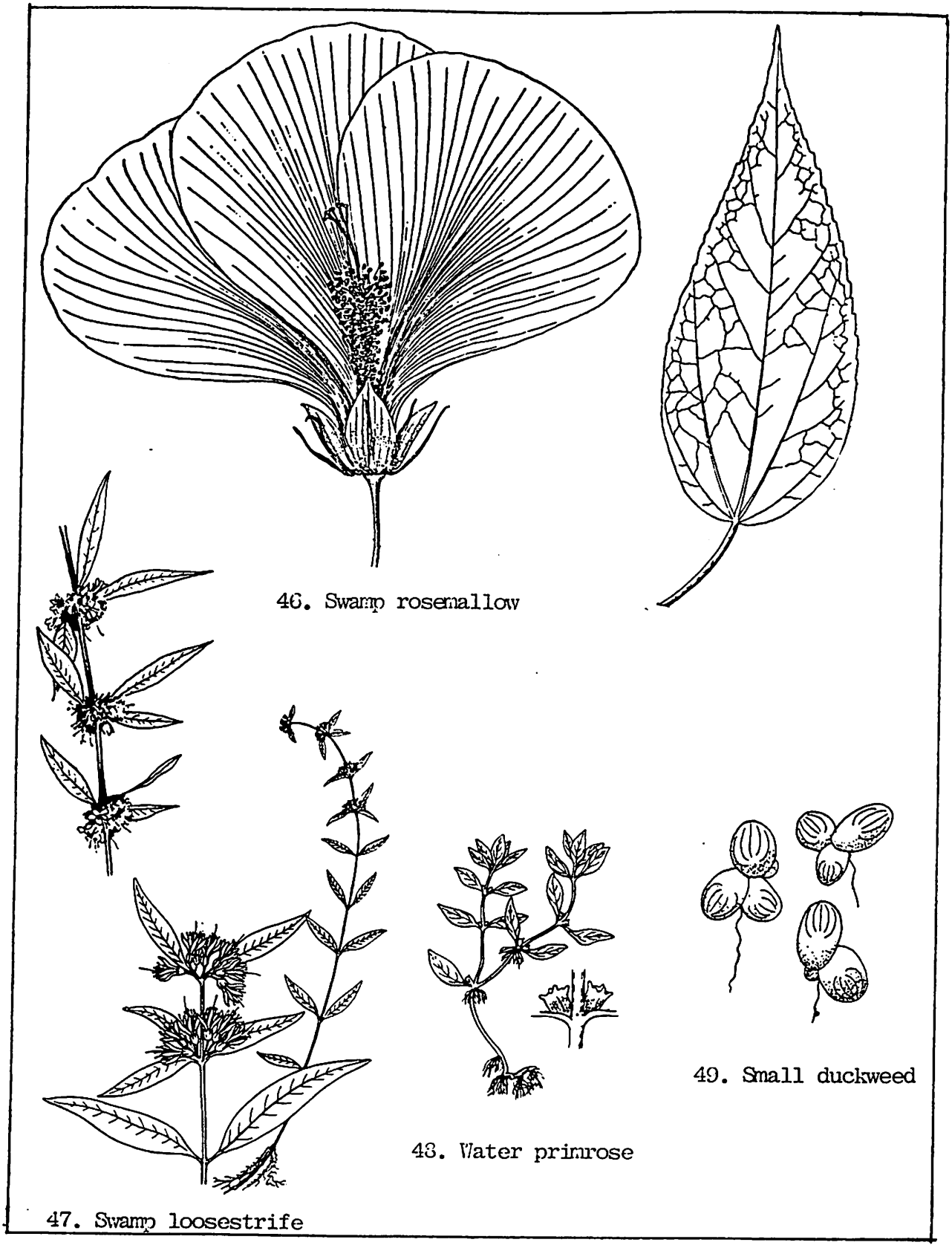


44. Yellow water-lily or Spatterdock

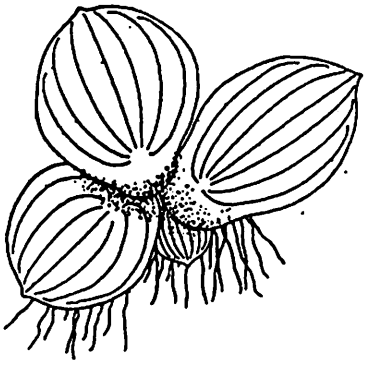


45. White water-lily

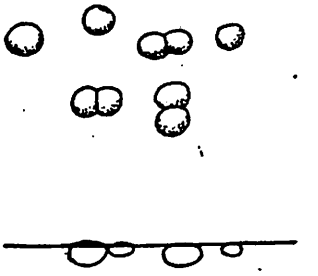
AQUATIC PLANTS - Emergent and Shore Plants and Attached Floating-Leaved Plants



AQUATIC PLANTS - Attached Floating-Leaved Plants and Floating Plants

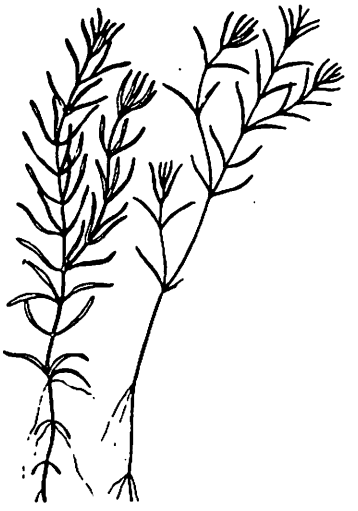


50. Large duckweed



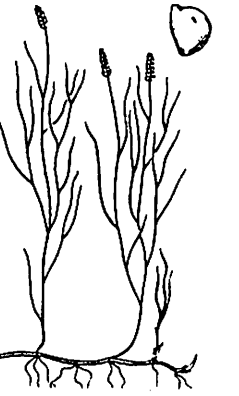
51. Watermeal

52. Watermeal



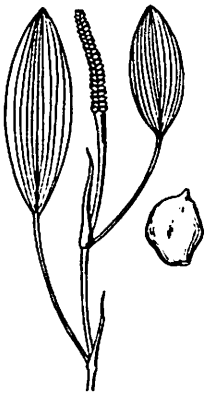
53. Spiny naiad

54. Curly pondweed

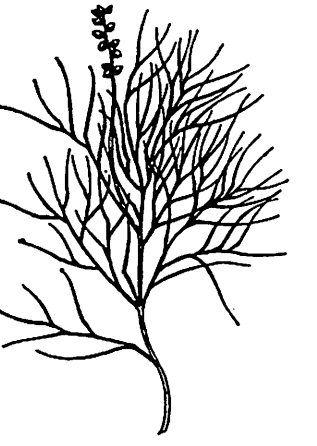


55. Filiform pondweed

56. Leafy pondweed



57. Knotty pondweed

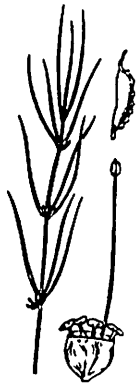


58. Sago pondweed

AQUATIC PLANTS - Floating Plants and Submerged Plants

59. Small pondweed

60. Richardson's pondweed

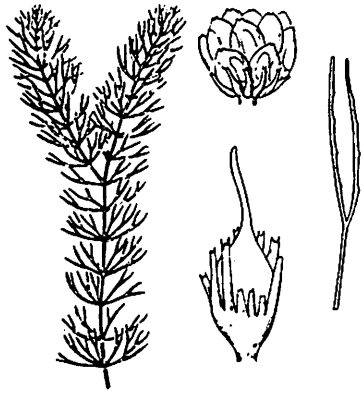


61. Horned pondweed

62. Water weed

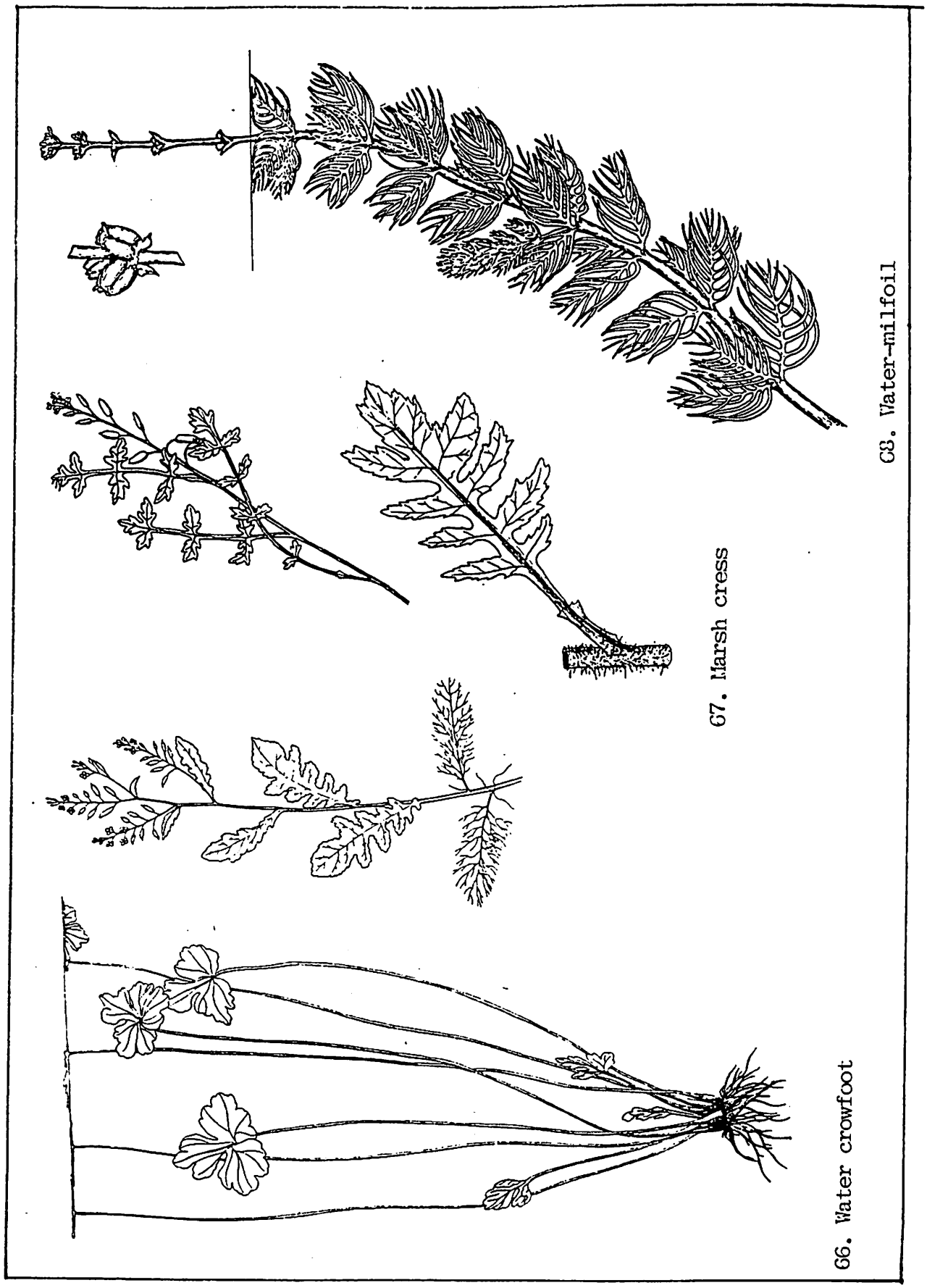
63. Eel grass or Wild celery

64. Mud plantain or Water stargrass



65. Hornwort or Coontail

AQUATIC PLANTS - Submerged Plants



AQUATIC PLANTS - Submerged Plants

AQUATIC PLANTS - Submerged Plants

Green Paper

AQUATIC INVERTEBRATES

COMMON AQUATIC INVERTEBRATES OF THE LAKE ERIE ISLAND REGION

Phylum Protozoa (protozoans)
- Class Sarcodina (amoeboids)
  - Subclass Rhixopoda
    - Order Amoebida
      - Family Amoebida
        1. Pelomyxa
      - Family Arcellidae
        2. Arcella
        3. Centropyxis
        4. Difflugia
        5. Nebela
      - Family Euglyphidae
        6. Euglypha
        7. Trinema
  - Subclass Heliozoa (sun animalcules)
    - Order Aphothoraca
      - Family Aphrothoracidae
        8. Actinophrys
        9. Actinosphaerium
        10. Vampyrella
    - Order Chalarathoracida
      - Family Chalarathoracidae
        11. Acanthocystis
    - Order Desmothoraca
      - Family Desmothoracidae
        12. Clathrulina
- Class Ciliophora (ciliates)
  - Order Holotrichida
    - Family Paramecidae
      13. Paramecium
  - Order Heterotrichida
    - Family Stentoridae
      14. Stentor
  - Order Peritrichida
    - Family Vorticellidae
      15. Vorticella
      16. Zoothamnium

Phylum Porifera (sponges)
- Class Demospongiae (horny sponges)
  - Order Haploslerina
    - Family Spongillidae (freshwater sponges)
      17. Spongilla

Phylum Coelenterata
Class Hydrozoa
Order Hydroida
Family Hydridae
18. *Hydra*

Family Clavidae
19. *Cordylophora lacustris*

Order Trachylina
Family Petasidae
20. *Craspedacusta sowerbyi* (freshwater jellyfish)

Phylum Platyhelminthes (flatworms)
Class Turbellaria (planarians)
Order Tricladida
Family Planariidae
21. *Dugesia* (=Planaria)

Phylum Rotatoria (rotifers)
Class Monogononata
Order Floscullariidae
Family Hexarthridae
22. *Hexarthra*

Family Testudinellidae
23. *Filinia*

Order Ploimacea
Family Notommatidae
24. *Monommata*

Family Synchaetidae
25. *Polyarthra*
26. *Synchaeta*

Family Asplanchnidae
27. *Asplanchnopus*
28. *Asplanchna*

Family Brachionidae
29. *Brachionus*
30. *Epiphanes*
31. *Kellicottia*
32. *Keratella*
33. *Lecane*
34. *Monostyla*

Phylum Nematoda (roundworms)
Class Adenophorea
Order Enoplida
Family Tripylidae
35. *Trilobus eriensis*

Phylum Bryozoa (bryozoans)
Class Entoprocta (noddingheads)
Order Pedicellinea
Family Urnatellidae
36. Urnatellae gracilis

Class Ectoprocta (moss animals)
Order Gymnolaemata
Family Paludicellidae
37. Paludicella articulata

Order Phylactolaemata
Family Cristatellidae
38. Cristatella mucedo

Family Fredericellidae
39. Fredericella sultana

Family Lophopdidae
40. Lophopdella carteri

Family Pectinatellidae
41. Pectinatella magnifica

Family Plumatellidae
42. Plumatella repens

Phylum Annelida (segmented worms)
Class Polychaeta
Order Sabellida
Family Sabellidae (fan worms)
43. Monayunkia speciosa

Class Oligochaeta
Order Tubificina
Family Tubificidae
44. Branchiura sowerbyi
45. Limnodrilus
46. Peloscolex
47. Tubifex tubifex

Family Naididae
48. Aulophorus
49. Chaetogaster
50. Dero
51. Nais
52. Stylaria

Order Branchiodellida
Family Branchiodellidae
53. Bdellodrilus

Class Hirudinea (leeches)
Order Rhynchobdellida
Family Glossiphoniidae
54. Actinobdella

Family Glossiphoniidae (Continued)
55. Glossiphonia
56. Helobdella
57. Placobdella

Order Gnathobdellida
Family Hirudinidae
58. Haemopis

Phylum Tardigrada (water bears)
Class Eutardigrada
Order Macrobiotoidea
Family Macrobiotidae
59. Macrobiotus

Family Echiniscidae
60. Echiniscus

Phylum Mollusca (soft-bodied animals)
Class Gastropoda (snails)
Order Basommatophora
Family Physidae
61. Physa

Family Planorbidae
62. Helisoma
63. Gyraulus

Family Ancylidae
64. Ferrissia

Family Lymnaeidae
65. Lymnaea
66. Bulimnea

Order Mesogastropoda
Family Viviparidae
67. Campeloma
68. Lioplex
69. Viviparus

Family Valvatidae
70. Valvata

Family Peluroceridae
71. Goniobasis
72. Pleurocera

Family Amnicolidae
73. Amnicola
74. Somatogyrus

Class Pelecypoda (=Bivalvia) (clams)
Order Eulamellibranchia
Family Unionidae

Family Unionidae (Continued)
Subfamily Ambleminae
75. Amblema costata
76. Amblema plicata
77. Cyclonaias tuberculata
78. Elliptio dilatatus
79. Fusconaia flava
80. Fusconaia undata
81. Quadrula pustulosa
82. Quadrula quadrula

Subfamily Anodontinae
83. Alasmidonta marginata
84. Anodonta grandis
85. Anodonta marginata
86. Anodontoides ferussacianus
87. Lasmigona complanata
88. Lasmigona compressa
89. Lasmigona costata
90. Strophitus undulatus

Subfamily Lampsilinae
91. Actinonaias carinata
92. Carunculina parva
93. Lampsilis ventricosa
94. Lampsilis siliquoidea
95. Leptodea fragilis
96. Ligumia recta
97. Obovaria olivaria
98. Proptera alata
99. Truncilla donaciformis
100. Truncilla truncata

Order Heterodonta
Family Sphaeriidae (fingernail clams)
101. Pisidium
102. Sphaerium

Family Corbiculidae (Asiatic clams)
103. Corbicula

Phylum Arthropoda (joint-legged animals)
Class Crustacea
Subclass Branchiopoda
Order Conchostraca (clam shrimps)
Family Limnadadiidae
104. Eulimnadia

Order Cladocera (water fleas)
Family Daphnidae
105. Ceriodaphnia lacustris
106. Daphnia galeata
107. Daphnia longispina
108. Daphnia pulex
109. Daphnia retrocurva

Family Daphnidae (Continued)
110. Scapholeberis
111. Simocephalus serrulatus

Family Leptodoridae
112. Leptodora kindtii

Family Sididae
113. Diaphanosoma
114. Latona
115. Sida

Family Holopedidae
116. Holopedium

Family Bosminidae
117. Bosmina longirostris
118. Eubosmina coregoni

Family Chydoridae
119. Acroperus
120. Alona
121. Chydorus globosus
122. Chydorus sphaericus
123. Graptoleberis
124. Pleuroxus

Family Macrothricidae
125. Ilyocryptus

Subclass Ostracoda (seed shrimps)
Order Podocopa
Family Cytheridae
126. Limnocythere

Family Cypridae
127. Cyclocypris
128. Cypria
129. Cypridopsis
130. Ilyocypris
131. Physocypria

Subclass Copepoda (copepods)
Order Eucopepoda
Suborder Calnoida (calanoid copepods)
Family Centropagidae
132. Limnocalanus macrurus

Family Diaptomidae
133. Diaptomus

Family Temoridae
134. Epischura lacustris
135. Senecella calanoides

Suborder Calnoida (Continued)
Family Temoridae
134. Epischura lacustris
135. Senecella calanoides

Suborder Cyclopoida (cyclopoid copepods)
Family Cyclopidae
136. Cyclops bicuspidatus
137. Cyclops vernalis
138. Eucyclops speratus
139. Mesocyclops edax

Suborder Harpacticoida (harpacticoid copepods)
Family Harpacticidae
140. Canthocamptus

Suborder Caligoida
Family Lernaeidae
141. Lernea

Suborder Lernaeopodida
Family Lernaepodidae
142. Achtheres

Subclass Malacostraca
Order Mysidacea (opossum shrimps)
Family Mysidae
143. Mysis relicta

Order Isopoda (aquatic sowbugs)
Family Asellidae
144. Asellus racovitzai

Order Amphipoda (scuds)
Family Gammaridae
145. Gammarus fasciatus

Family Talitridae
146. Hyalella azteca

Family Haustoriidae
147. Pontoporeia affinis

Order Decapoda
Suborder Natantia (shrimps)
Family Palaemonidae (freshwater shrimps)
148. Palaemonetes

Suborder Reptantia (crayfishes)
Family Cambaridae
149. Cambarus
150. Orconectes

Class Insecta (=Hexapoda) (insects)
Order Collembola (springtails)
Family Poduridae
151. Podura aquatica

Order Collembola (Continued)
Family Smithuridae
152. Smithurides aquaticus

Order Plecoptera (stoneflies)
Family Perlidae
153. Acroneuria
154. Neoperla

Order Ephemeroptera (mayflies)
Family Ephermerellidae
155. Ephemerella

Family Ephemeridae (burrowing mayflies)
156. Ephemera
157. Hexagenia

Family Polymitaricidae
158. Ephoron

Family Baetidae (small mayflies)
159. Baetis
160. Callibaetis

Family Heptageniidae (stream mayflies)
161. Epeorus
162. Stenonema

Family Caenidae (tiny mayflies)
163. Caenis

Order Odonata (dragonflies and damselflies)
Suborder Anisoptera (dragonflies)
Family Gomphidae
164. Gomphus

Family Aeshnidae (darners)
165. Anax

Family Libellulidae (skimmers)
166. Celithemis
167. Epicordulia
168. Libellula
169. Macromia

Suborder Zygoptera (damselflies)
Family Calopterygidae
170. Calopteryx

Family Lestidae
171. Lestes

Family Coenagrionidae
172. Argia
173. Enallagma
174. Ischnura

Order Hemiptera (bugs)
Family Corixidae (water boatmen)
175. Sigara

Family Notonectidae (back swimmers)
176. Notonecta

Family Naucoridae (creeping water bugs)
177. Pelocoris

Family Belostamatidae (giant water bugs)
178. Belostoma
179. Lethocerus

Family Nepidae (water scorpions)
180. Ranatra

Family Gelastocoridae (toad bugs)
181. Gelastocoris

Family Gerridae (water striders)
182. Gerris

Family Veliidae (small water striders)
183. Rhagovelia

Family Hydrometridae (marsh treaders)
184. Hydrometra

Family Pleidae (pigmy backswimmers)
185. Neoplea

Order Megaloptera (alderflies and dobsonflies)
Family Sialidae (alderflies)
186. Sialis

Order Neuroptera (nerve-winged insects)
Family Sisyridae (spongilla flies)
187. Climacia

Order Trichoptera (caddisflies)
Family Hydroptilidae (micro-caddisflies)
188. Hydroptila

Family Hydropsychidae (net-spinning caddisflies)
189. Cheumatopsyche
190. Hydropsyche

Family Polycentropodidae (tube-making caddisflies)
191. Phylocentropus
192. Polycentropus

Family Molannidae
193. Molanna

Order Trichoptera (Continued)
Family Leptoceridae (long-horned caddisflies)
194. Mystacides
195. Oecetis
196. Triaenodes

Family Limnephilidae (log-cabin caddisflies)
197. Limnephilus

Family Helicopsychidae
198. Helicopsyche

Order Coleoptera (beetles)
Family Psephenidae (water pennies)
199. Psephenus

Family Haliplidae (crawling water beetles)
200. Peltodytes

Family Dytiscidae (predacious diving beetles)
201. Dytiscus

Family Chrysomelidae (leaf beetles)
202. Donacia piscatrix

Family Gyrinidae (whirligig beetles)
203. Dineutus
204. Gyrinus

Family Hydrophilidae (water scavenger beetles)
205. Tropisternus

Family Elmidae (riffle beetles)
206. Stenelmis

Order Diptera (true flies)
Family Tipulidae (crane flies)
207. Tipula

Family Chaoboridae (phantom midges)
208. Chaoborus

Family Culicidae (mosquitoes)
209. Culex

Family Simulidae (black flies)
210. Simulium

Family Chironomidae (=Tendipedidae) (midges)
Subfamily Tanypodinae
211. Coelotanypus
212. Procladius
213. Tanypus

Family Chironomidae (Continued)
Subfamily Chironominae
214. Chironomus
215. Polypedilum
216. Tanytarsus

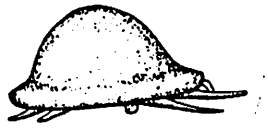
Family Ceratopogonidae (biting midges)
217. Holoconops catawbae

Family Rhagionidae (snipe flies)
218. Atherix

Family Tabanidae (deer and horse flies)
219. Tabanus

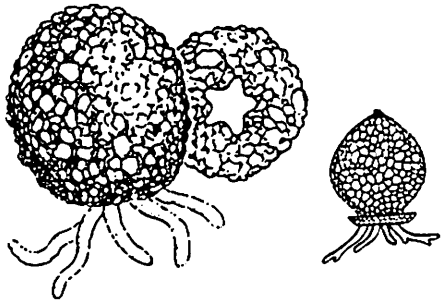
Family Syrphidae (flower flies, rat-tailed maggots)
220. Eristalis

1. Pelomyxa

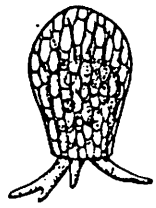


2. Arcella

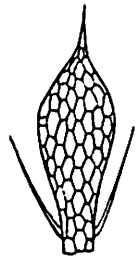
3. Centropyxis



4. Difflugia

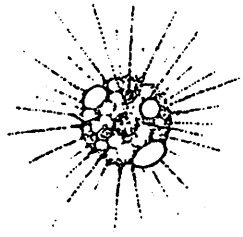


5. Nebela

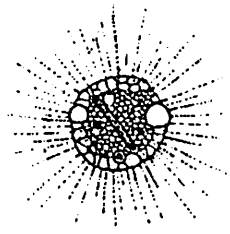


6. Euglypha

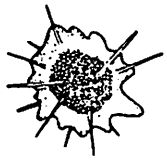
7. Trinema



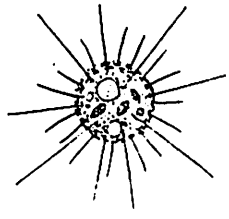
8. Actinophrys



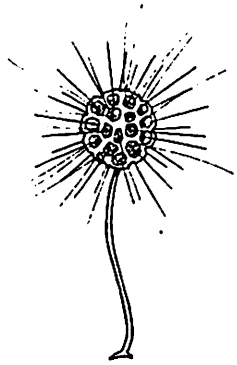
9. Actinosphaerium



10. Vampyrella

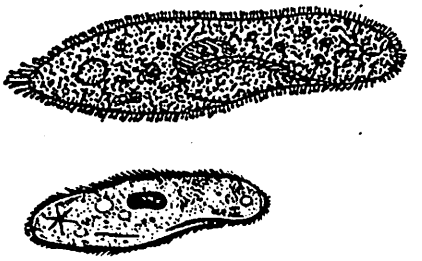


11. Acanthocystis



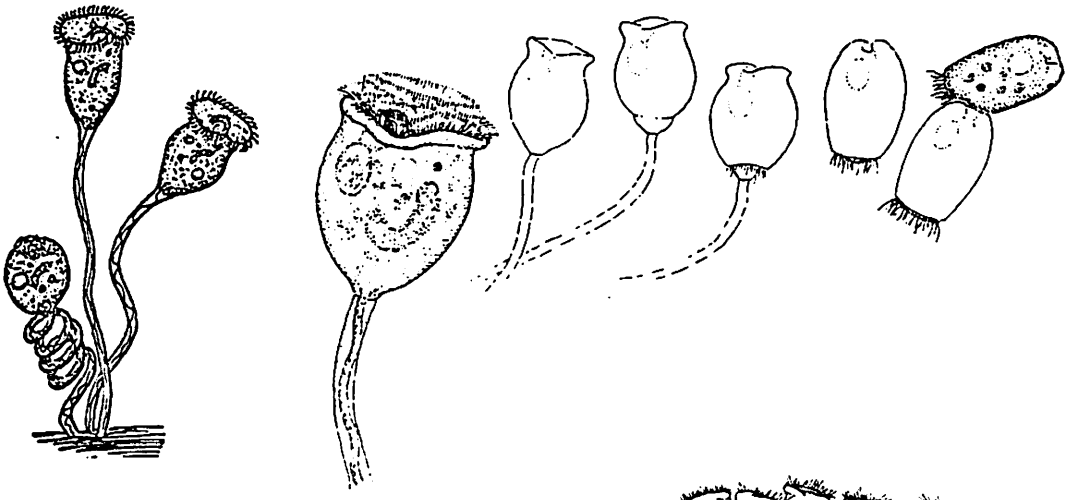
12. Clathrulina

AQUATIC INVERTEBRATES - Protozoans

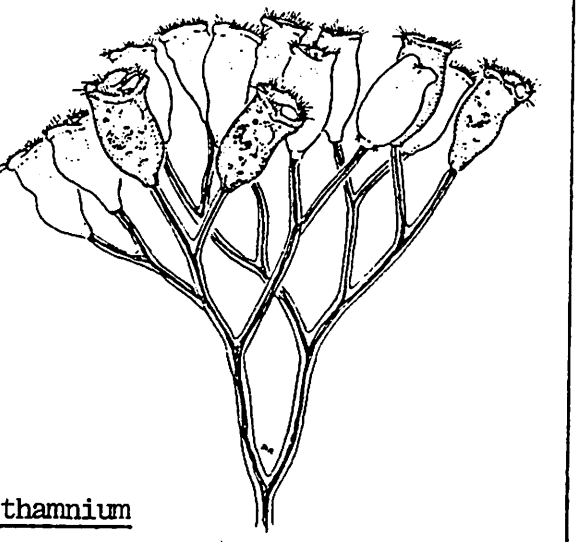


13. Paramecium

14. Stentor

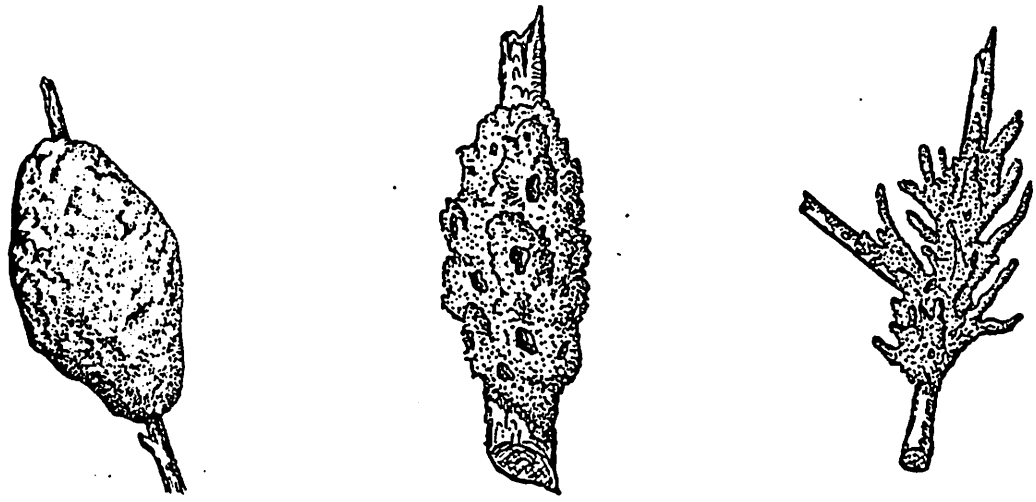


15. Vorticella



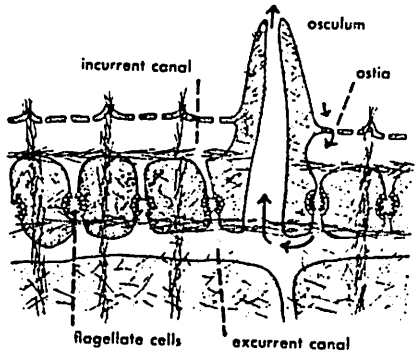
16. Zoothamnium

AQUATIC INVERTEBRATES - Protozoans

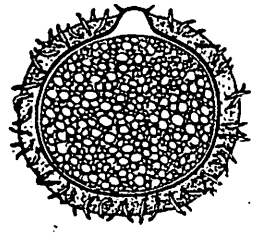


17. Spongilla

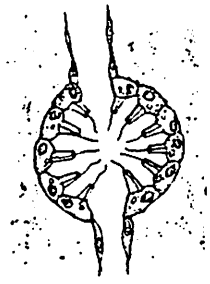
Lobate and branching freshwater sponges attached to sticks.



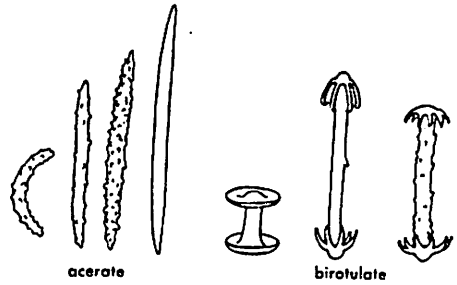
Portion of body wall



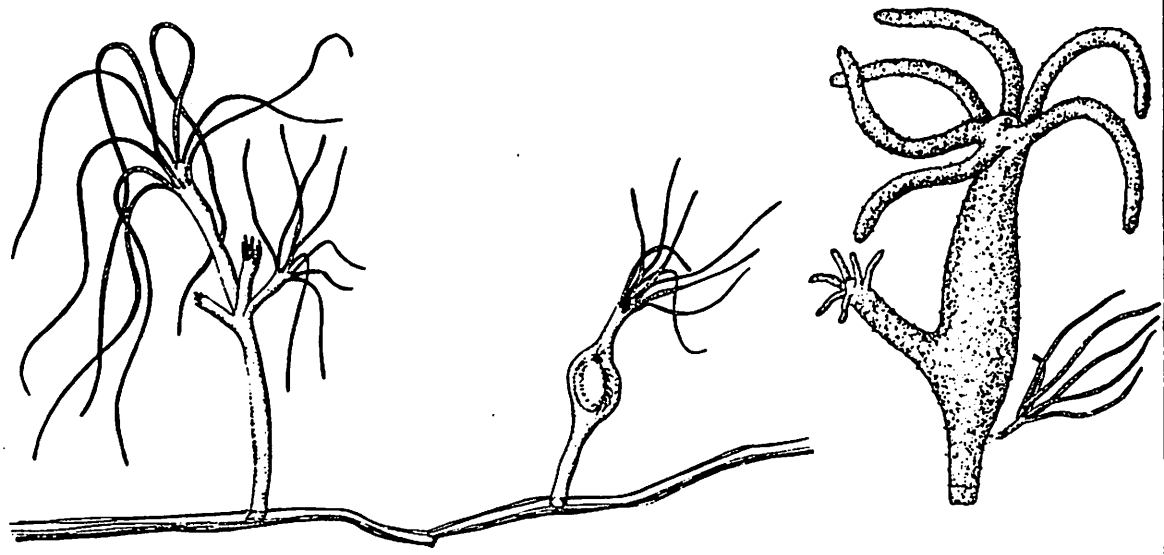
Gremmule



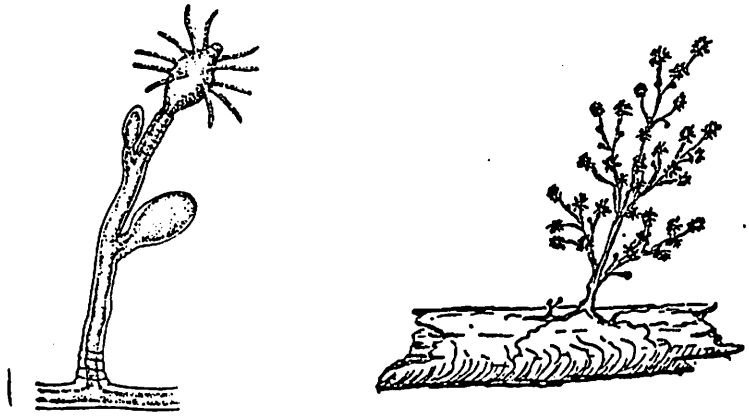
Flagellated cells



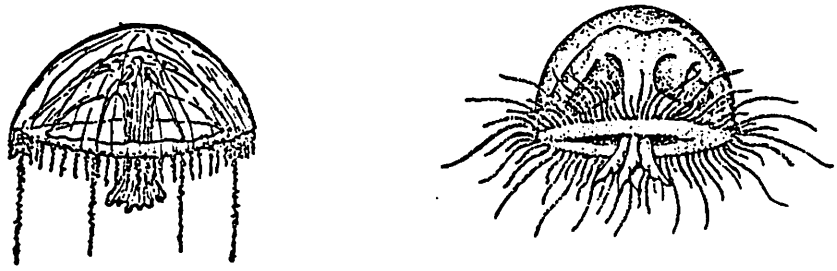
Types of spicules



18. Hydra

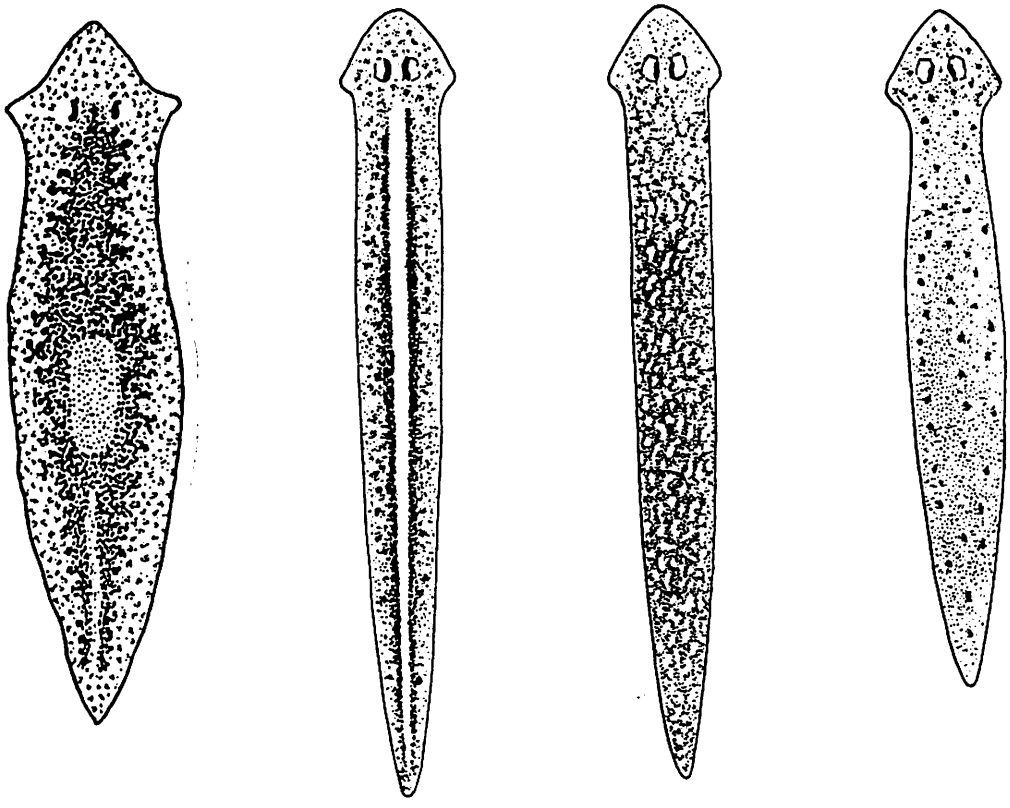


19. Cordylophora lacustris

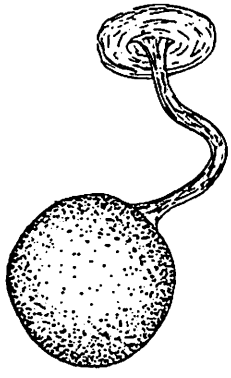


20. Freshwater jellyfish

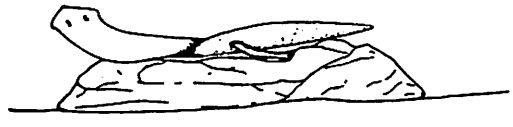
AQUATIC INVERTEBRATES - Coelenterata



21. Dugesia

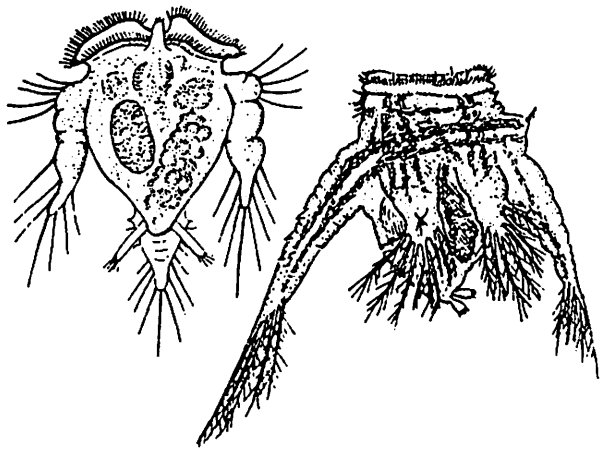


Stalked planarian cocoon

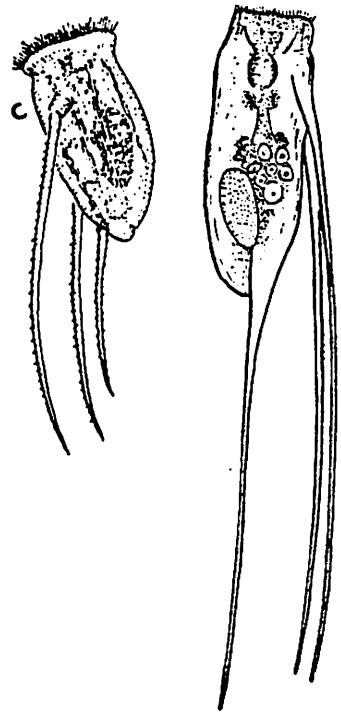


Planarian with extruded pharynx, just beginning to feed on a bit of food.

AQUATIC INVERTEBRATES - Planarians



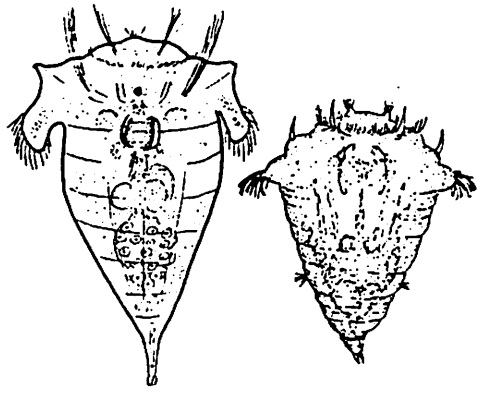
22. Hexarthra



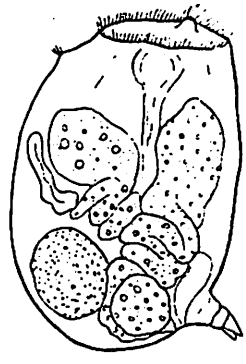
23. Filinia

24. Monommata

25. Polyarthra

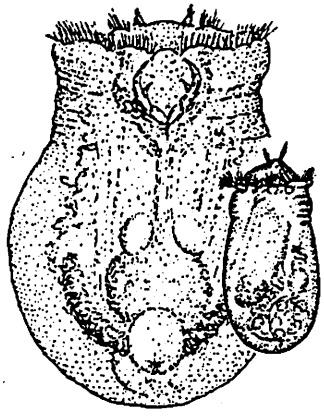


26. Synchaeta

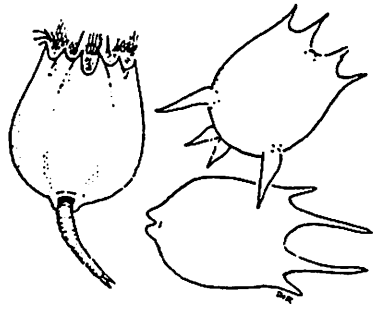


27. Asplanchnopus

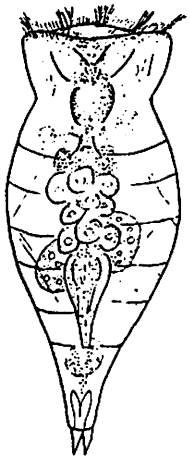
AQUATIC INVERTEBRATES - Rotatoria



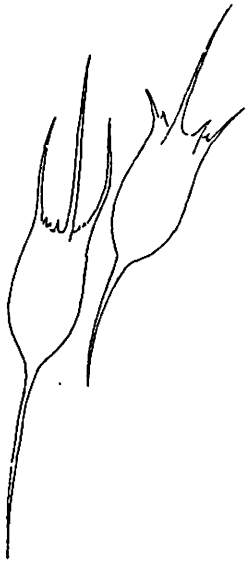
28. Asplanchna



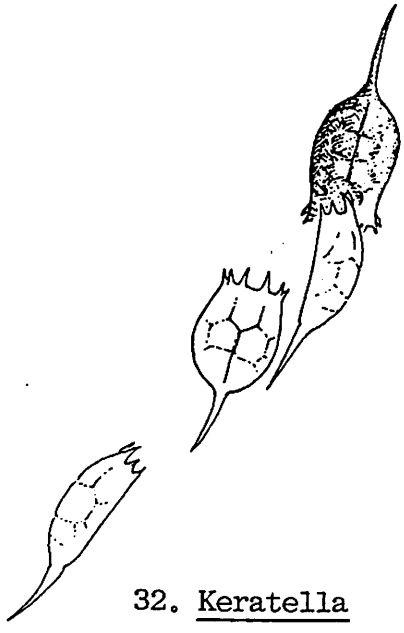
29. Brachionus



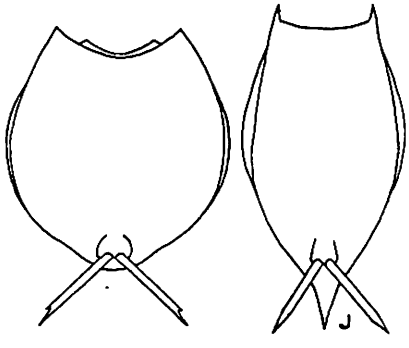
30. Epiphanes



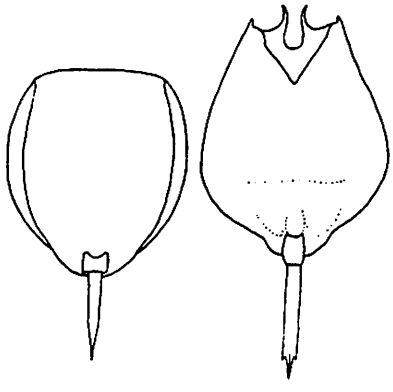
31. Kellicottia



32. Keratella

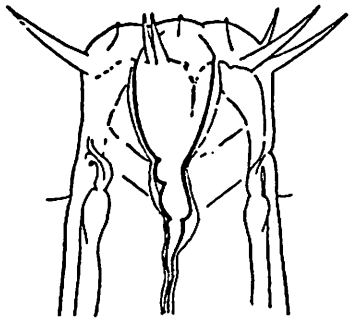


33. Lecane

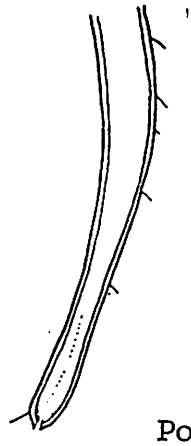


34. Monostyla

AQUATIC INVERTEBRATES - Rotatoria

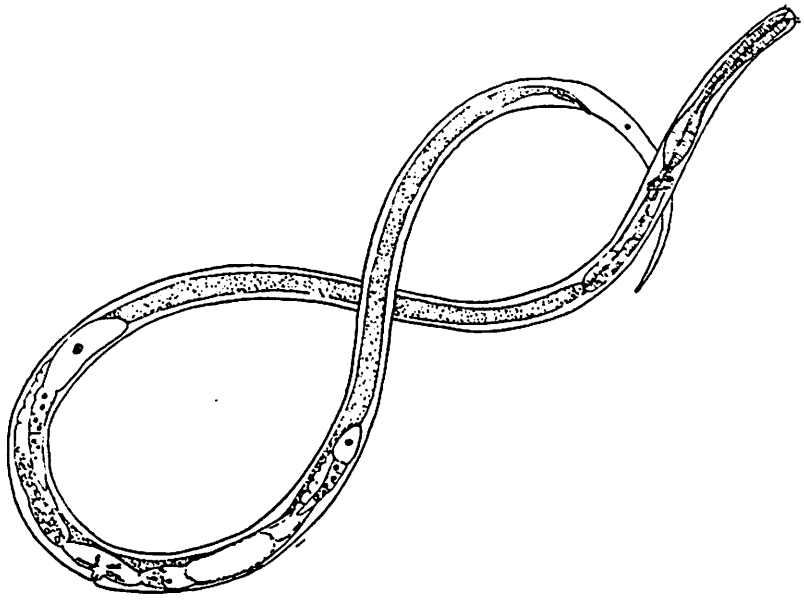


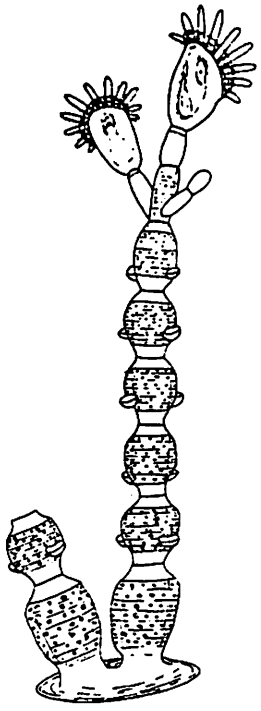
Anterior



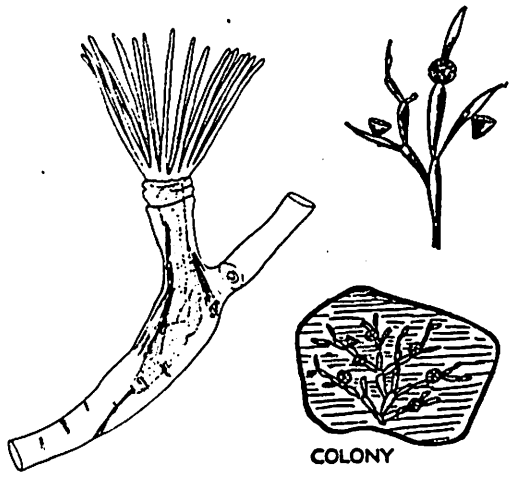
Posterior

35. Trilobus eriensis

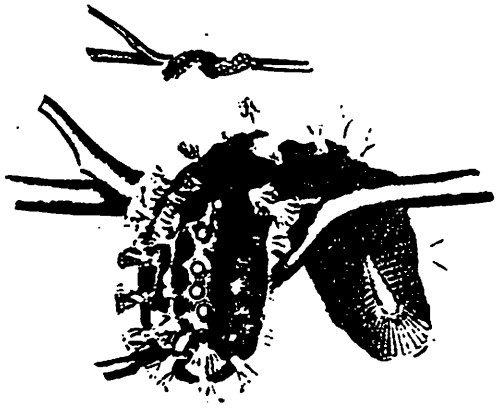




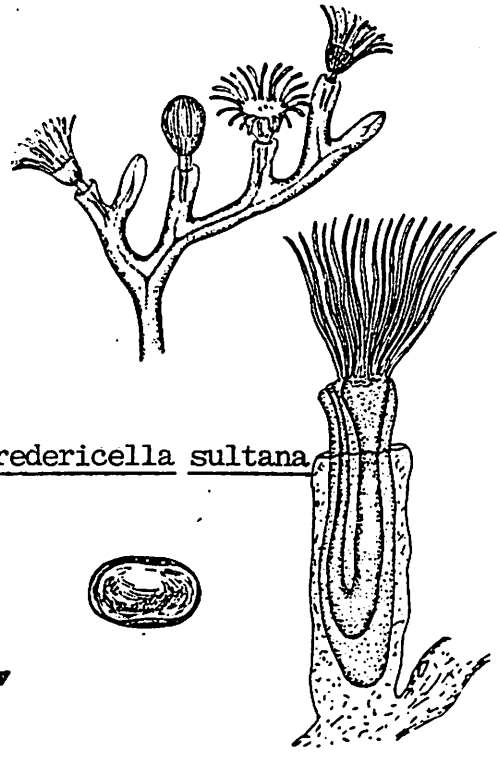
36. Urnatellae gracilis



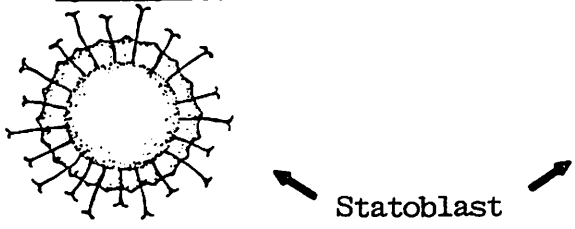
37. Paludicella articulata



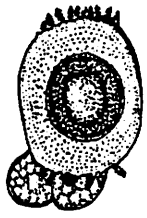
38. Cristatella mucedo



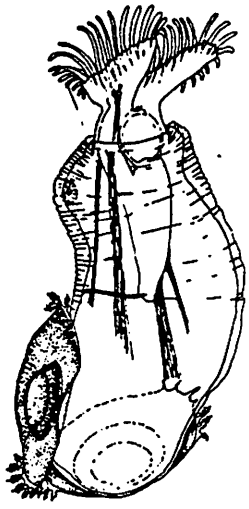
39. Fredericella sultana



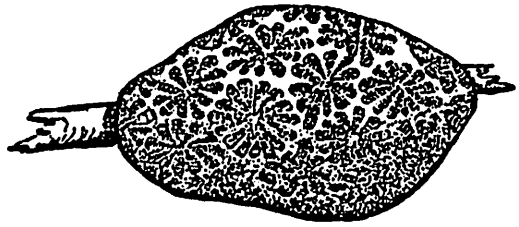
AQUATIC INVERTEBRATES - Bryozoa

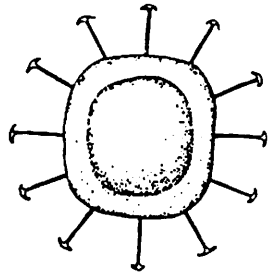


Germinating statoblast

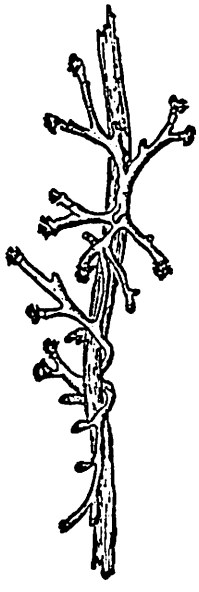


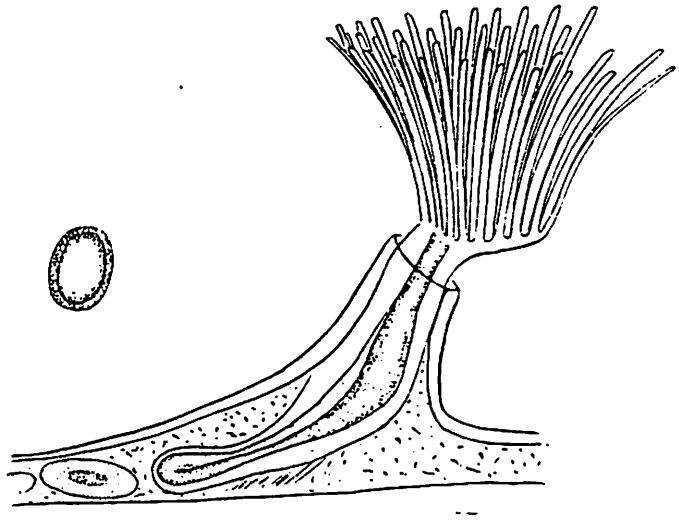
40. Lophopdella carteri



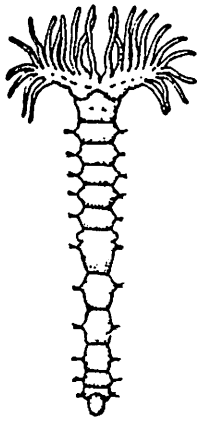


41. Pectinatella magnifica

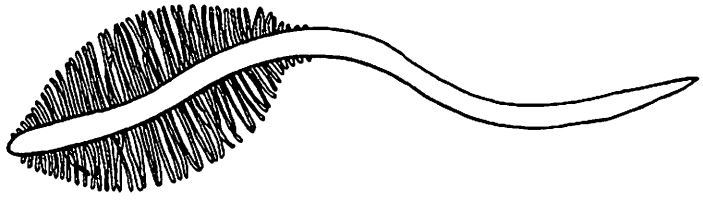




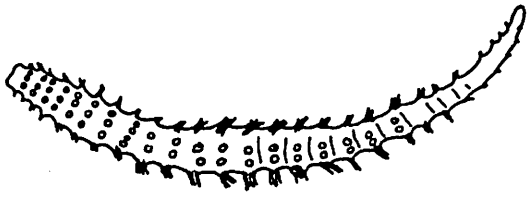
42. Plumatella repens



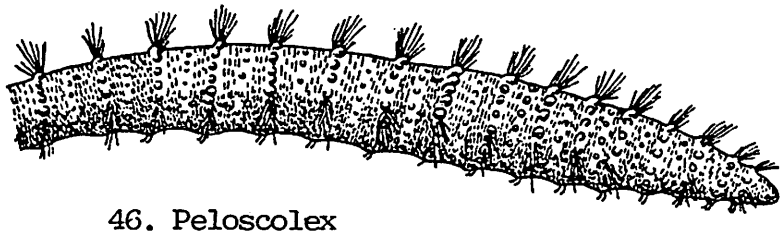
43. Monayunkia speciosa



44. Branchiura sowerbyi

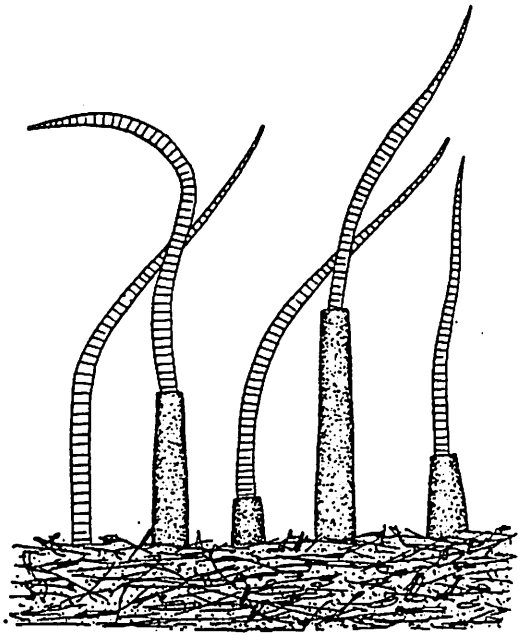


45. Limnodrilus

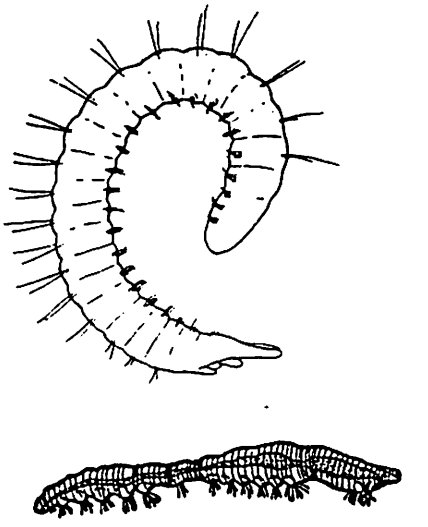


46. Peloscolex

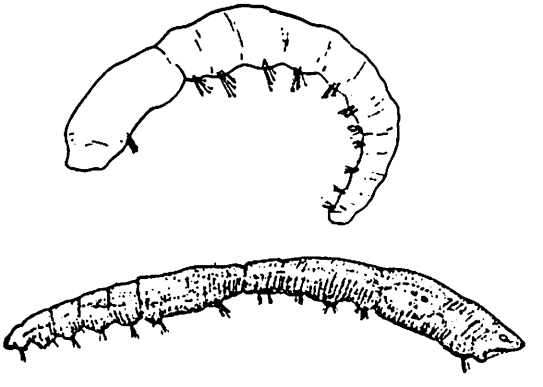
AQUATIC INVERTEBRATES - Annelida



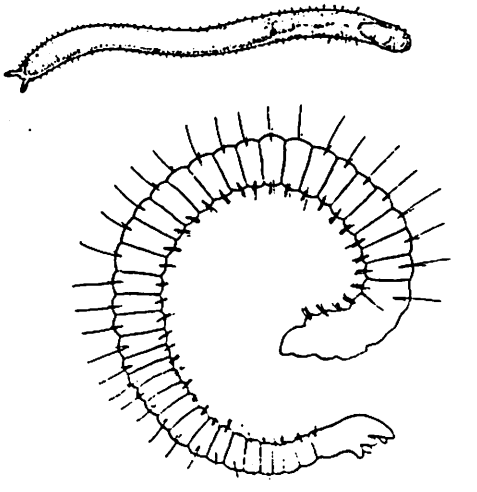
47. Tubifex tubifex



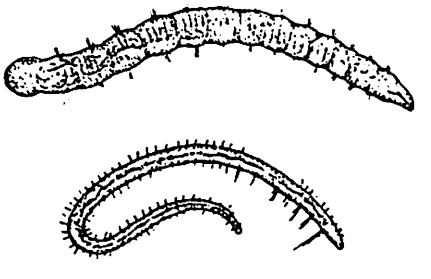
48. Aulophorus



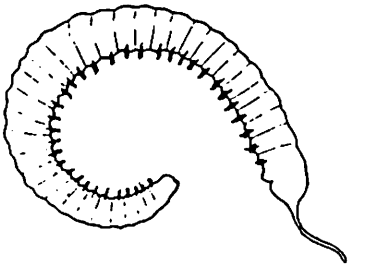
49. Chaetogaster



50. Dero

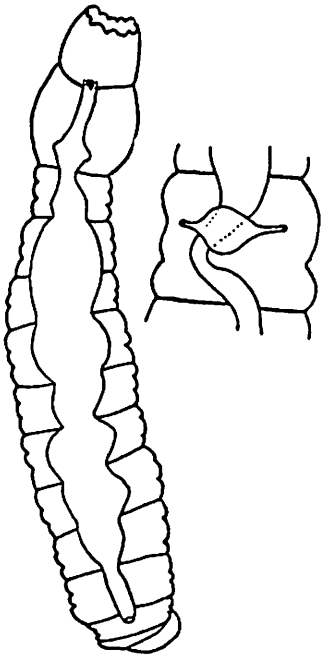


51. Nais



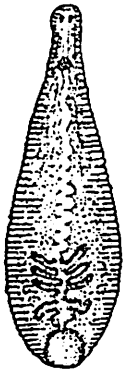
52. Stylaria

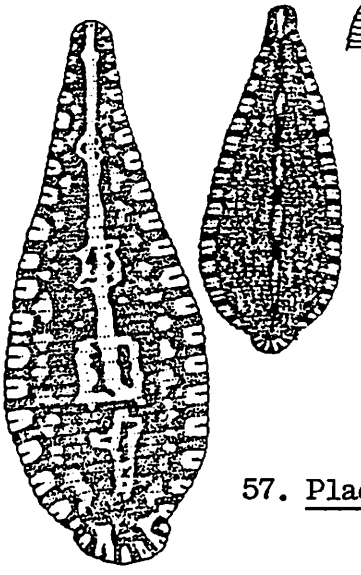
AQUATIC INVERTEBRATES - Annelida



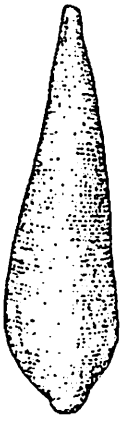
53. Bdellodrilus

54. Actinobdella





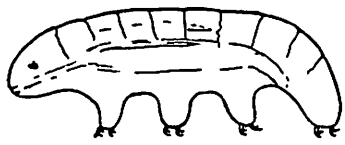
57. Placobdella

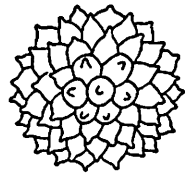


58. Haemopis

56. Helobdella

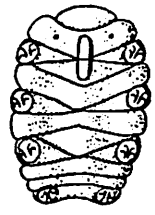
AQUATIC INVERTEBRATES - Annelida

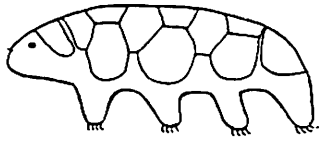


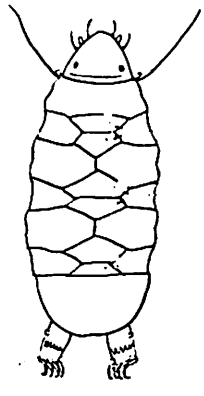


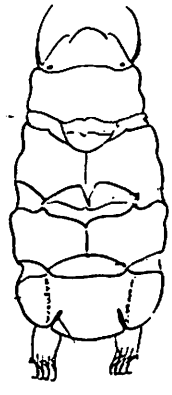
59. Macrobiotus

claws



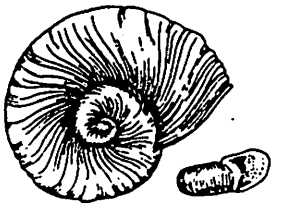






60. Echiniscus

61. Physa

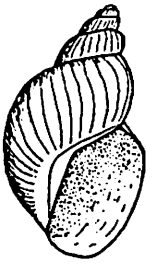


62. Helisoma

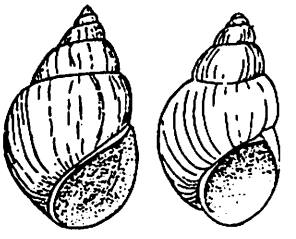
63. Gyraulus

64. Ferrissia

65. Lymnaea

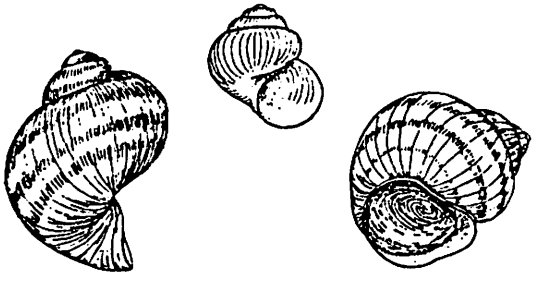


66. Bulimnea



67. Campeloma

68. Lioplex

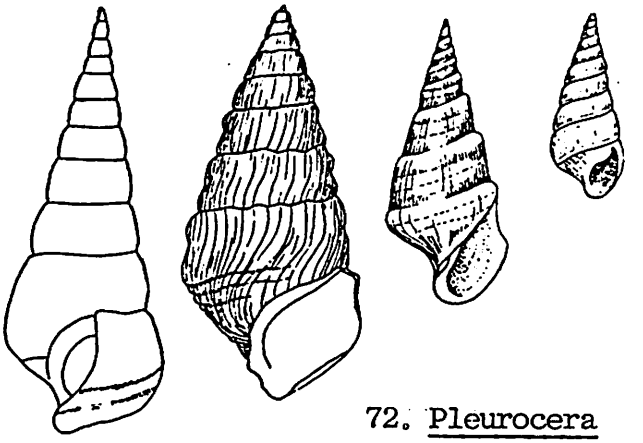


69. Viviparus

AQUATIC INVERTEBRATES - Gastropoda

70. Valvata

71. Goniobasis

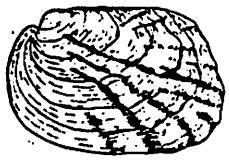


72. Pleurocera

73. Amnicola

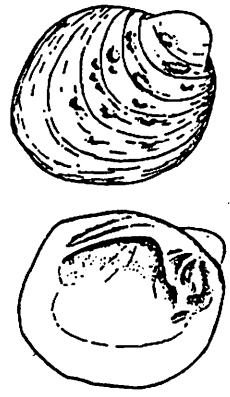
74. Somatogyrus

AQUATIC INVERTEBRATES - Gastropoda

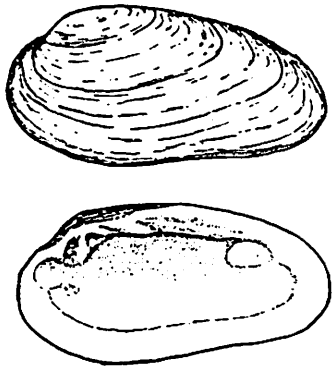


75. Amblema costata

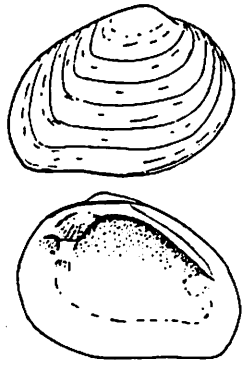
76. Amblema plicata



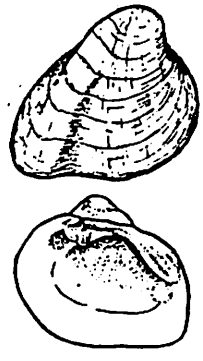
77. Cyclonaias tuberculata



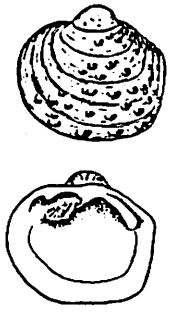
78. Elliptio dilatatus



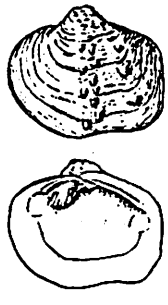
79. Fusconaia flava



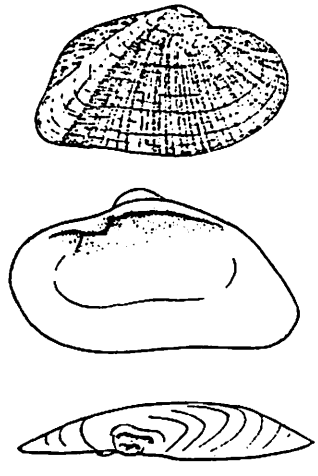
80. Fusconaia undata



81. Quadrula pustulosa

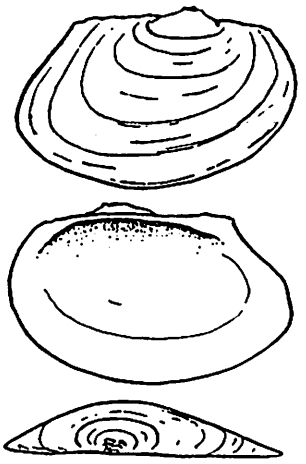


82. Quadrula quadrula

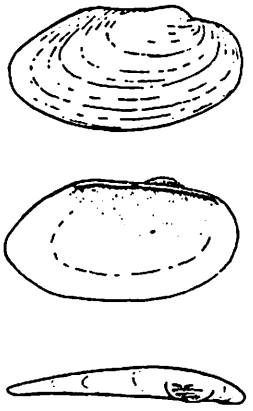


83. Alasmidonta marginata

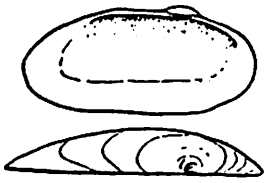
AQUATIC INVERTEBRATES - Pelecypoda



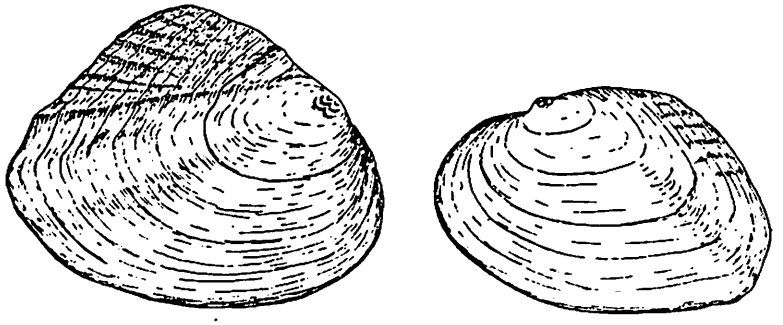
84. Anodonta grandis



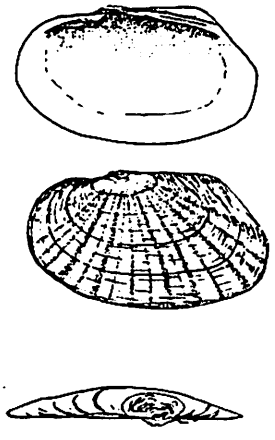
85. Anodonta marginata



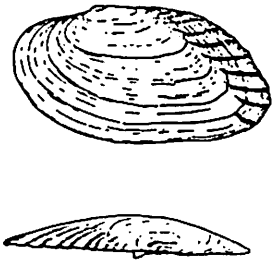
86. Anodontoides ferussacianus



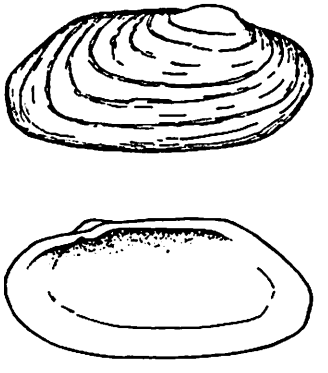
87. Lasmigona complanata



88. Lasmigona compressa

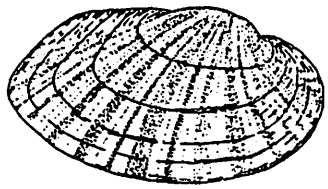


89. Lasmigona compressa



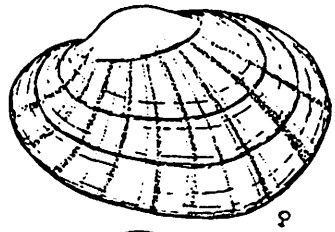
90. Strophitus undulatus

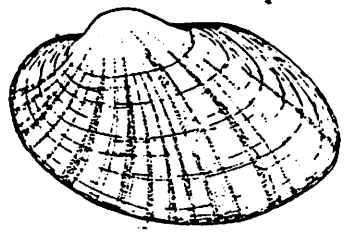
AQUATIC INVERTEBRATES - Pelecypoda



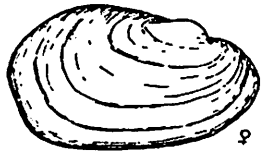
91. Actinonaias carinata

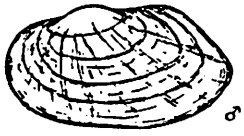
92. Carunculina parva

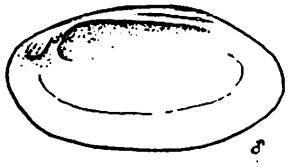




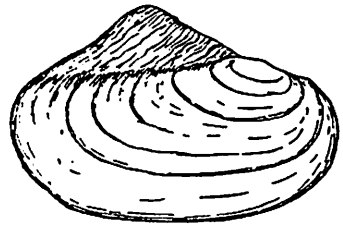
93. Lampisilis ventricosa

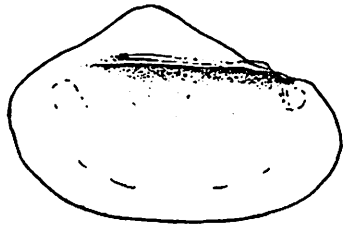




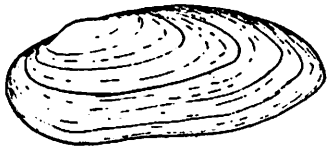


94. Lampsilis siliquoidea

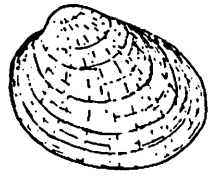




95. Leptodea fragilis

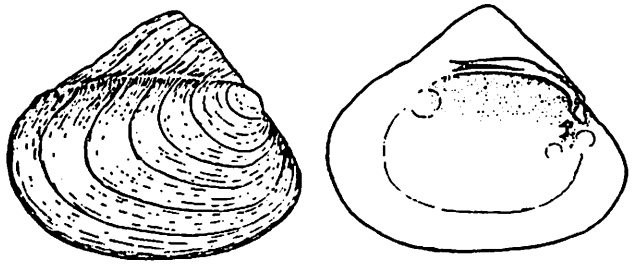


96. Ligumia recta



97. Obovaria olivaria

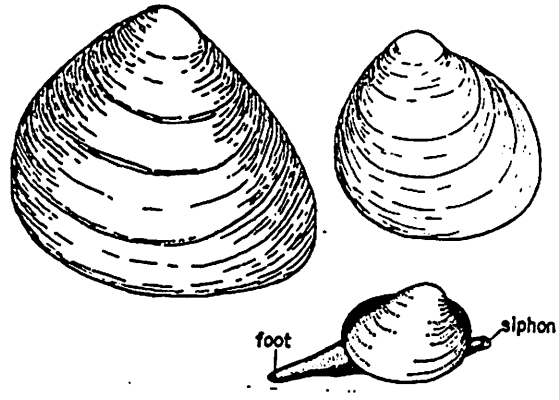
AQUATIC INVERTEBRATES - Pelecypoda



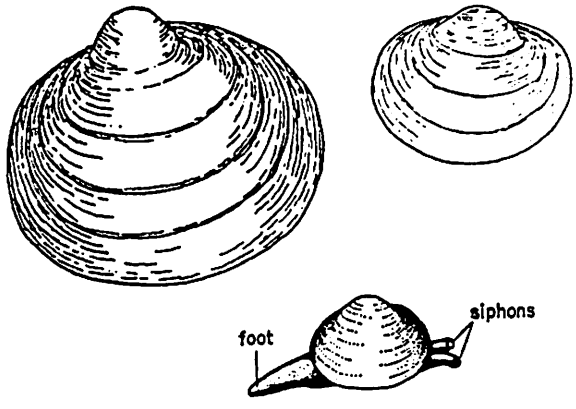
98. Proptera alata

99. Truncilla donaciformis

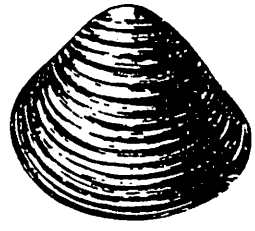
100. Truncilla truncata



101. Pisidium



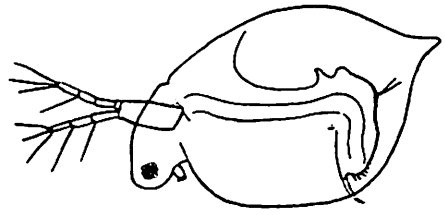
102. Sphaerium



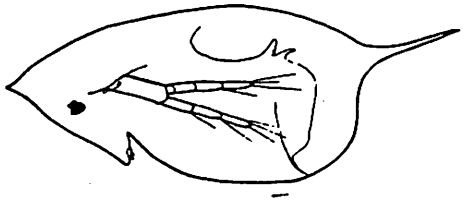
103. Corbicula

AQUATIC INVERTEBRATES - Pelecypoda

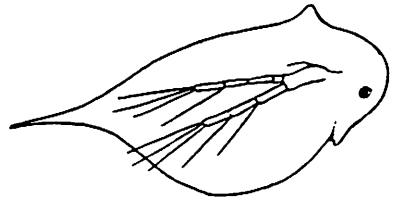
104. Eulimnadia



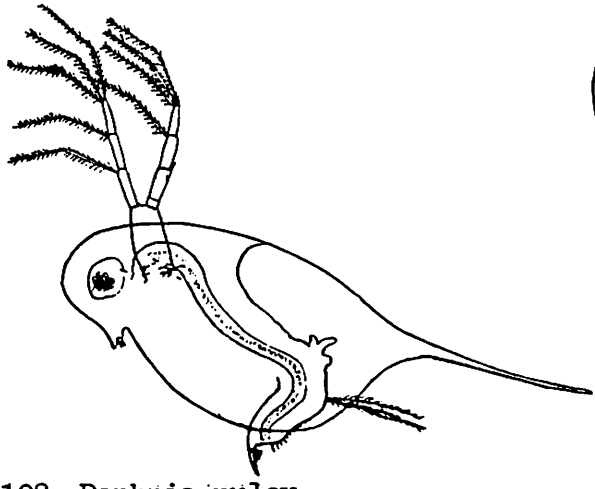
105. Ceriodaphnia lacustris



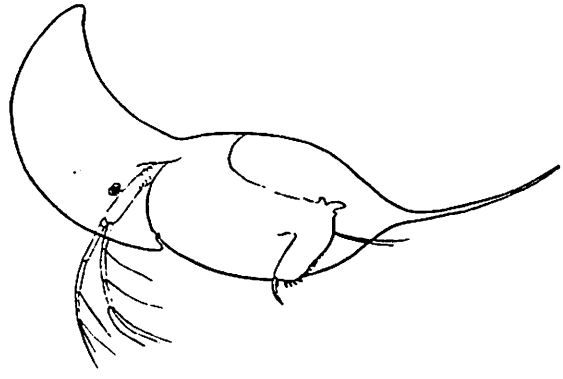
106. Daphnia galeata



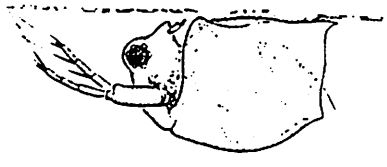
107. Daphnia longispina



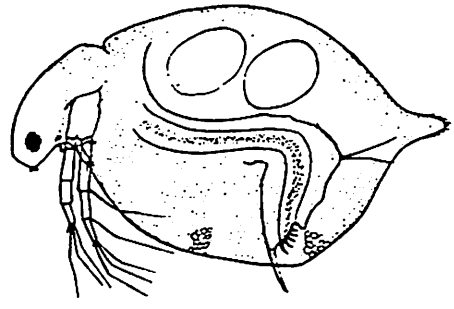
108. Daphnia pulex



109. Daphnia retrocurva

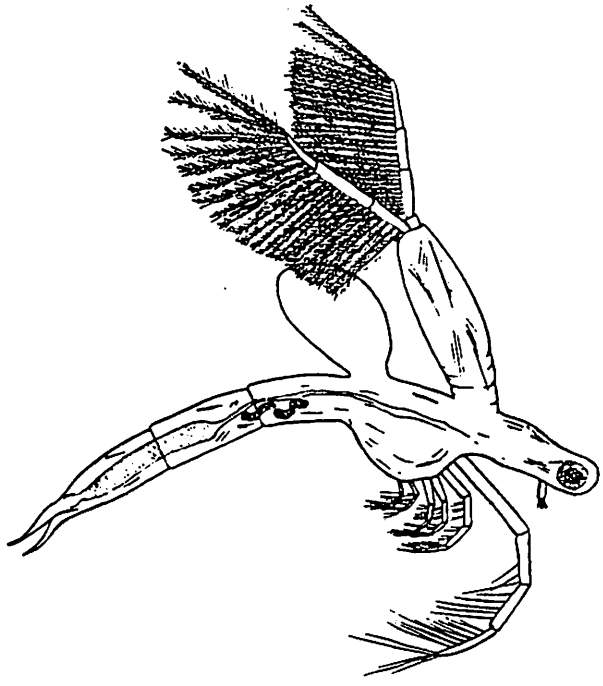


110. Scapholeberis

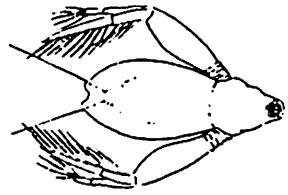


111. Simocephalus serrulatus

AQUATIC INVERTEBRATES - Arthropoda

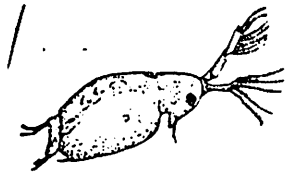


112. Leptodora kindtii

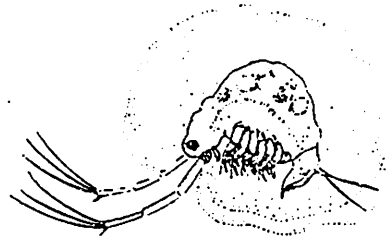


113. Diaphanosoma

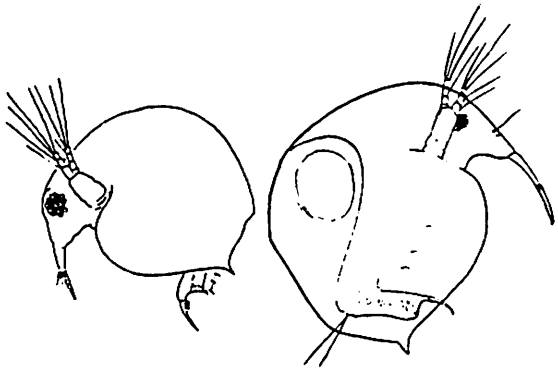
114. Latona



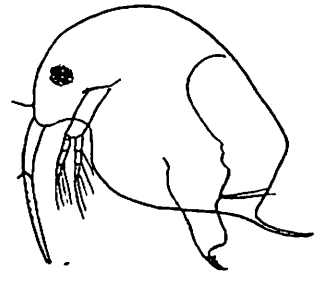
115. Sida



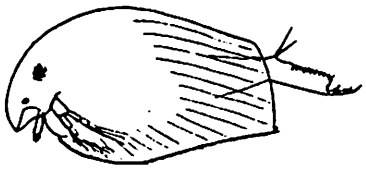
116. Holopedium



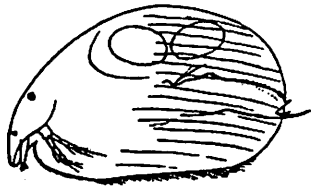
117. Bosmina longirostris



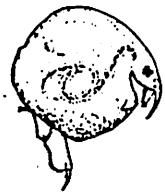
118. Eubosmina coregoni



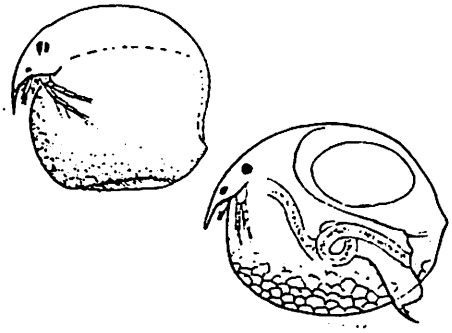
119. Acroperus



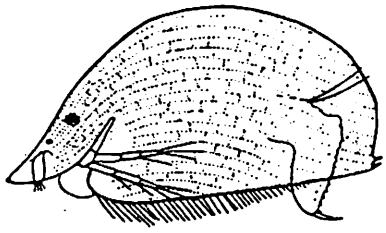
120. Alona



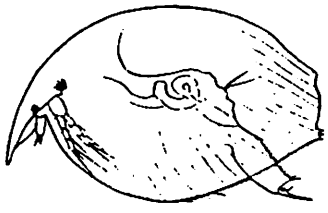
121. Chydorus globosus



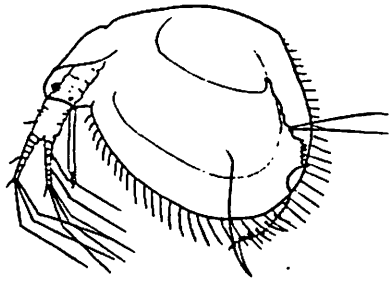
122. Chydorus sphaericus



123. Graptoleberis

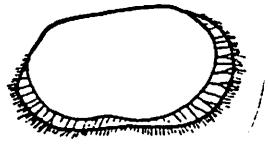


124. Pleuroxus

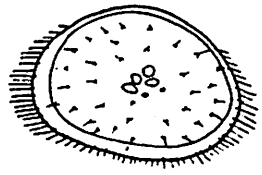


125. Ilyocryptus

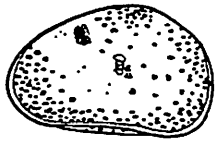
AQUATIC INVERTEBRATES - Arthropoda



126. Limnocythere

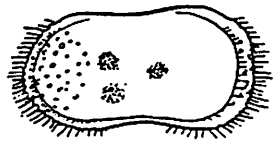


127. Cyclocypris

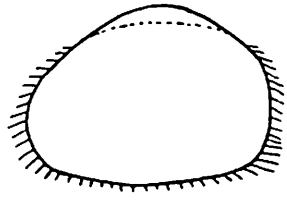


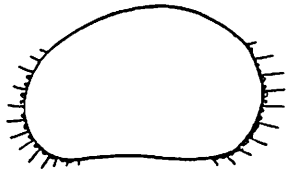
128. Cypria

129. Cypridopsis

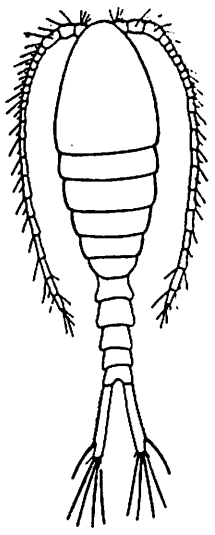


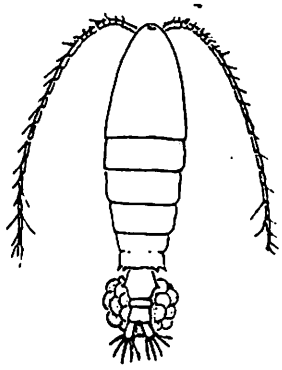
130. Ilyocypris

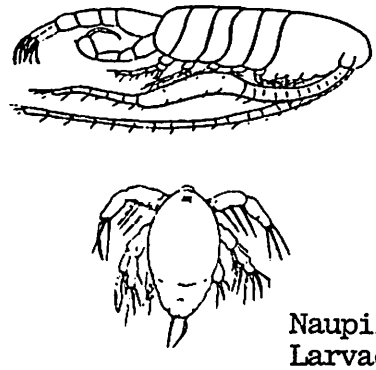




131. Physocypria



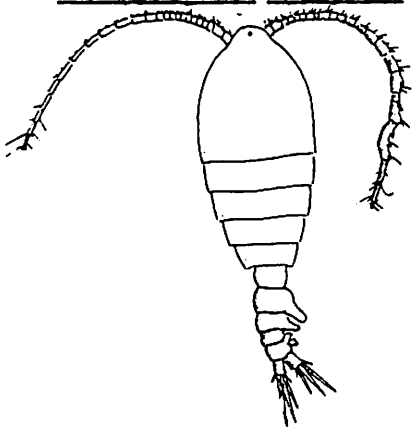


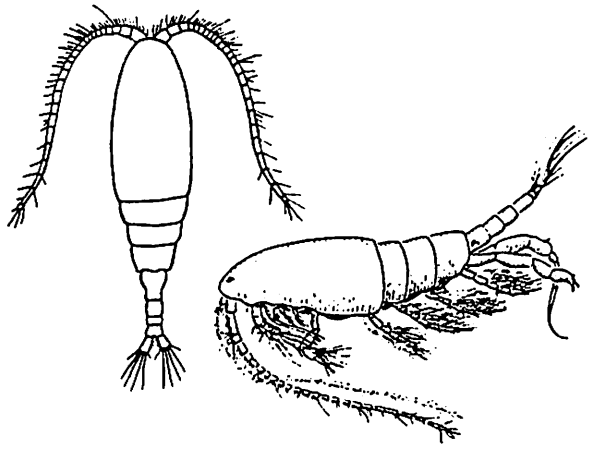


Naupilis Larvae

133. Diaptomus

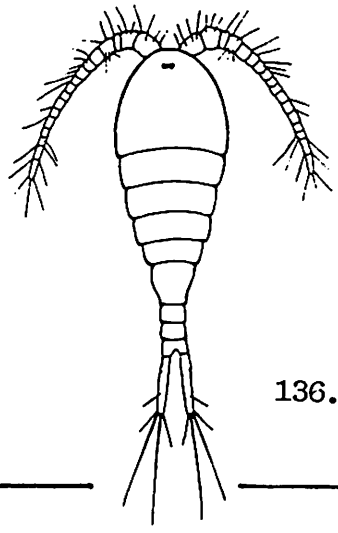
132. Limnocalanus macrurus



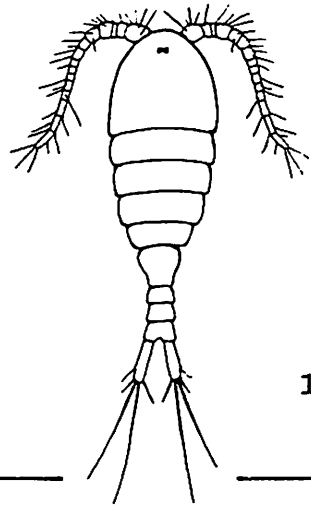


134. Epischura lacustris

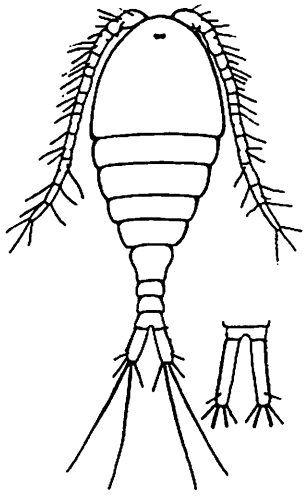
135. Senecella calanoides



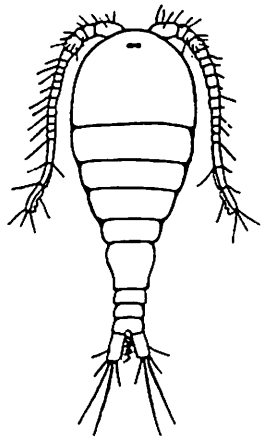
136. Cyclops bicuspidatus



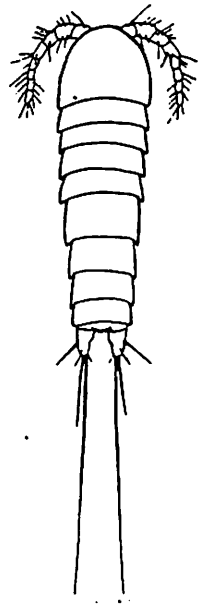
137. Cyclops vernalis



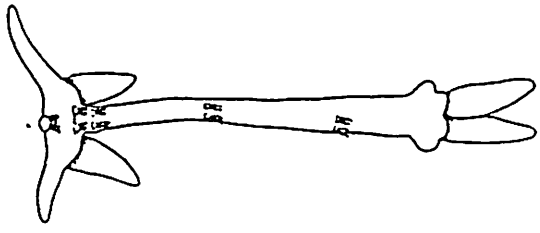
138. Eucyclops speratus



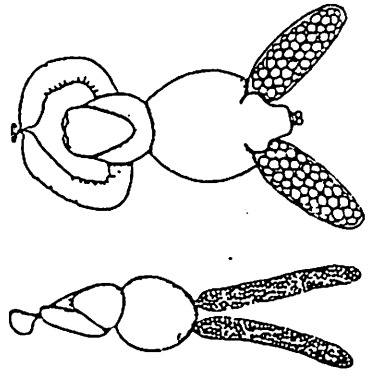
139. Mesocyclops edax



140. Canthocamptus

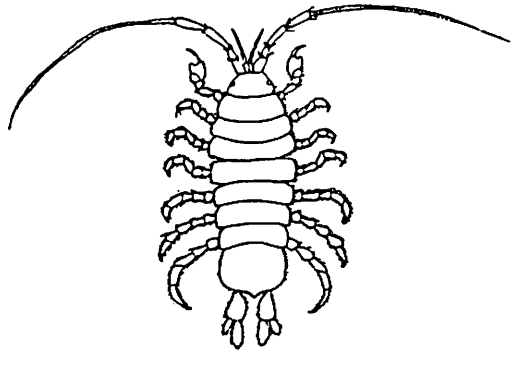


141. Lernea



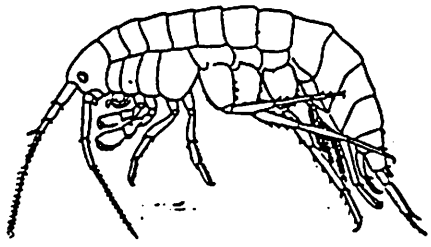
142. Achtheres

143. Mysis relicta

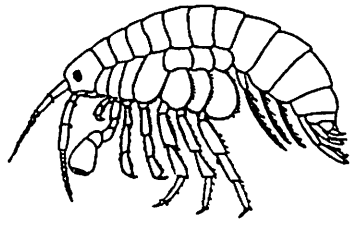


144. Asellus racovitzai

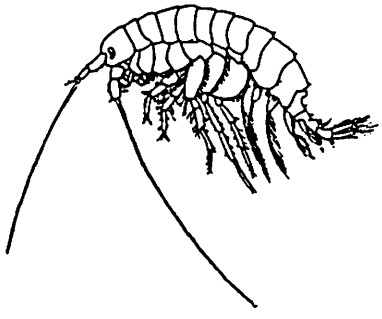
AQUATIC INVERTEBRATES - Arthropoda

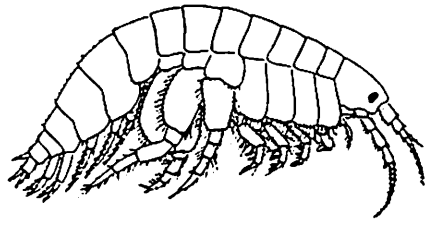


145. Gammarus fasciatus

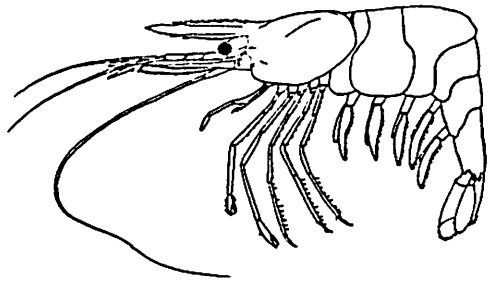


146. Hyalella azteca



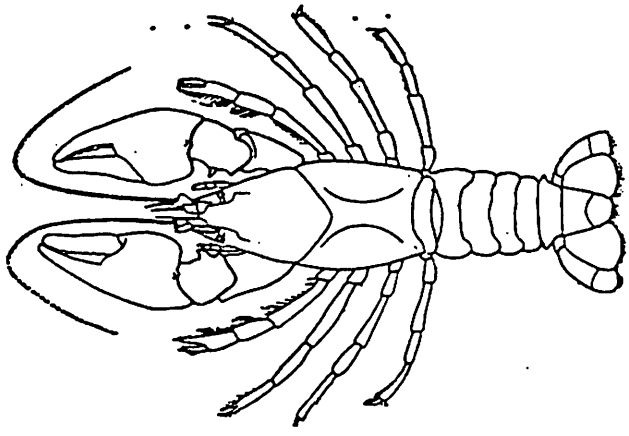


147. Pontoporeia affinis

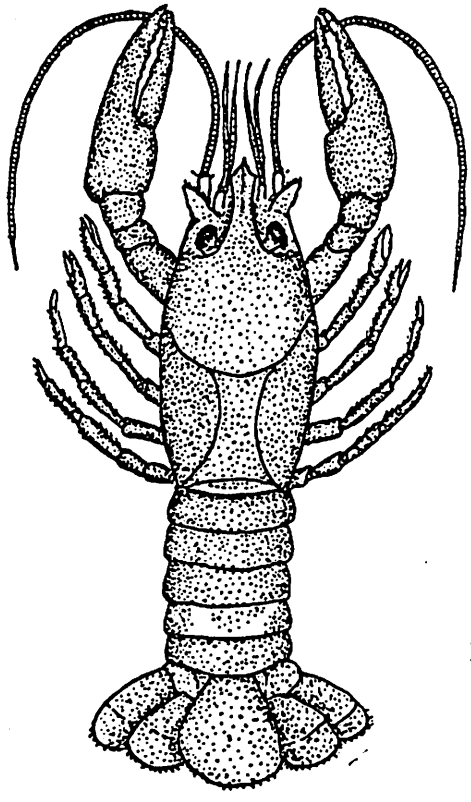


148. Palaemonetes

AQUATIC INVERTEBRATES - Arthropoda

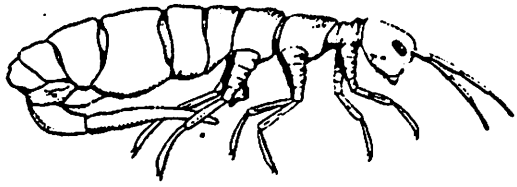


149. Cambarus



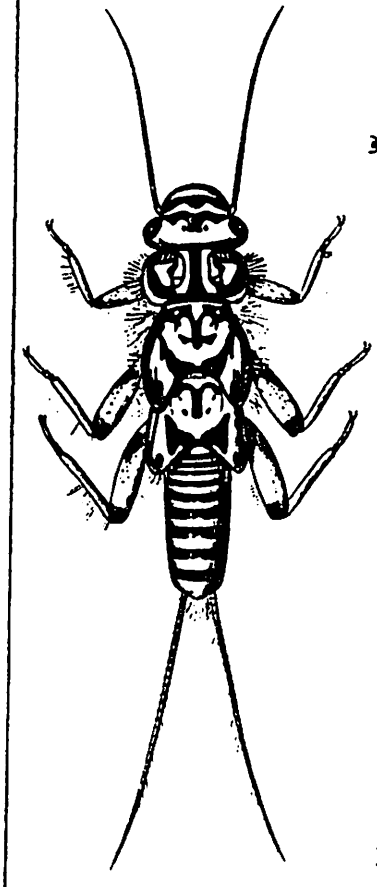
150. Orconectes

AQUATIC INVERTEBRATES - Arthropoda

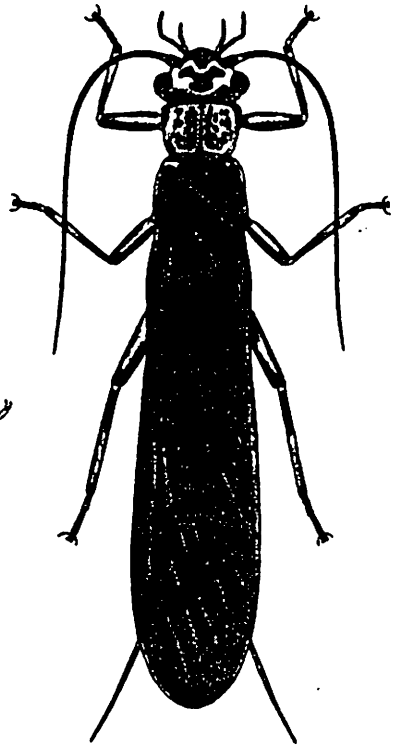


151. Podura aquatica

152. Smithurides aquatica



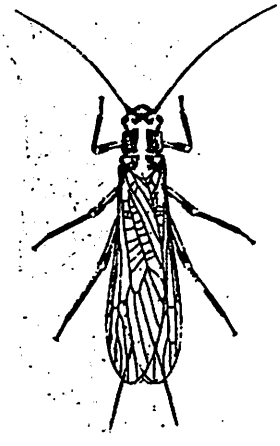
Nymph



Adult

153. Acroneuria

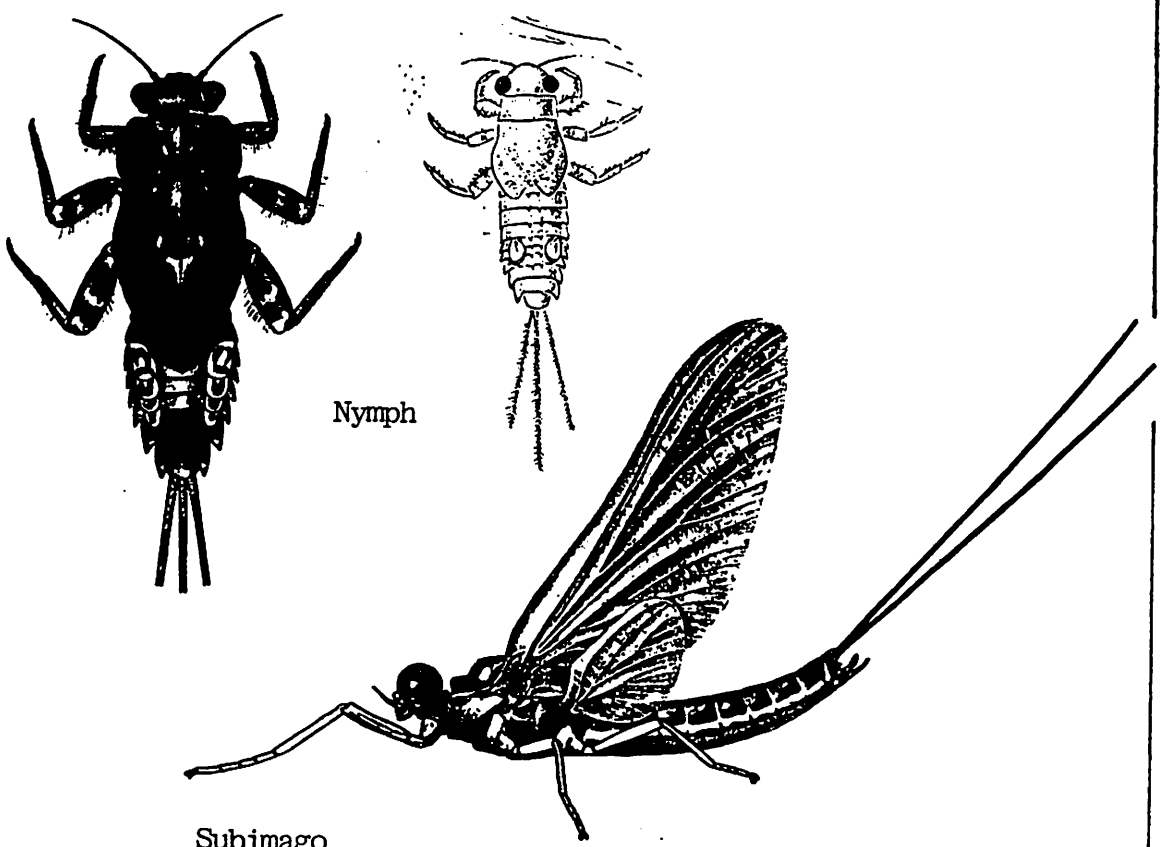
Nymph



Adult

154. Neoperla

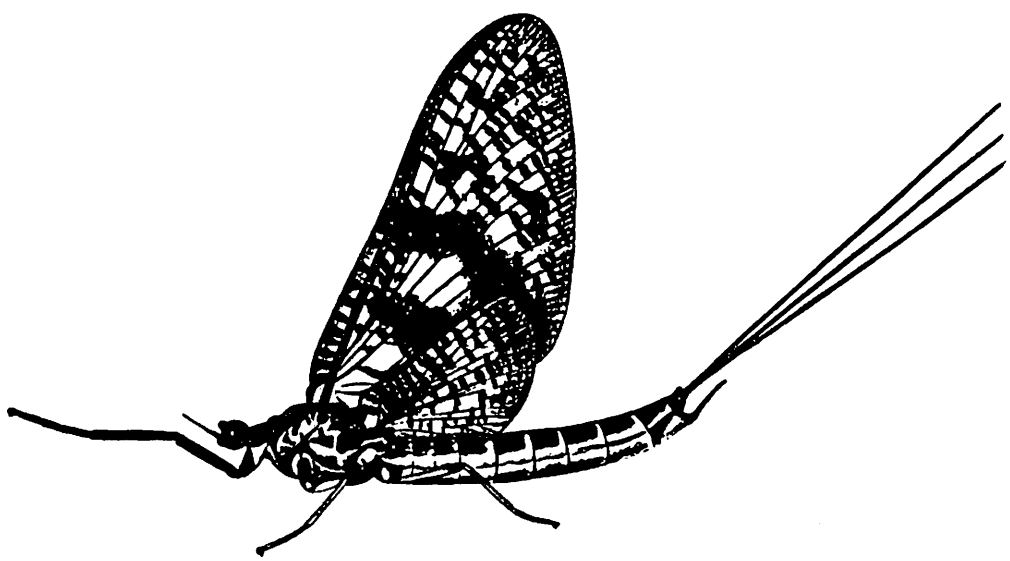
AQUATIC INVERTEBRATES - Insects



Nymph

Subimago

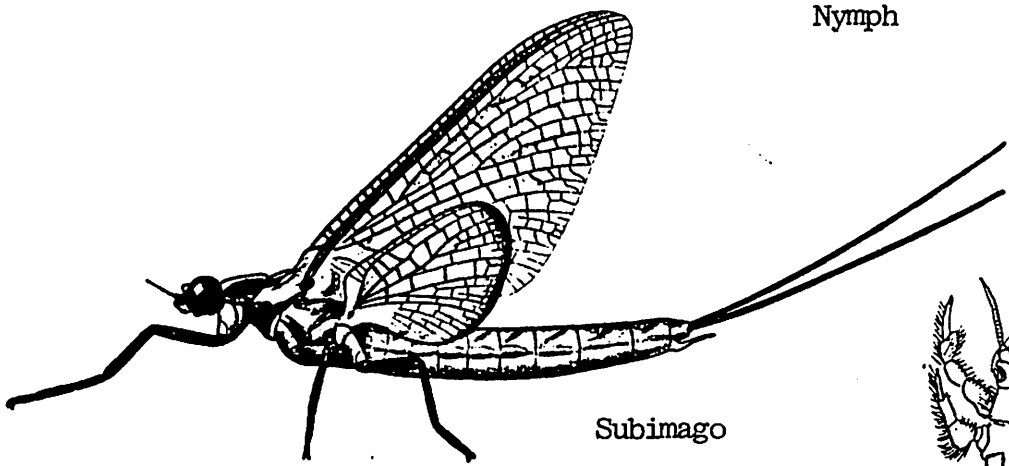
155. Ephemerella



Adult

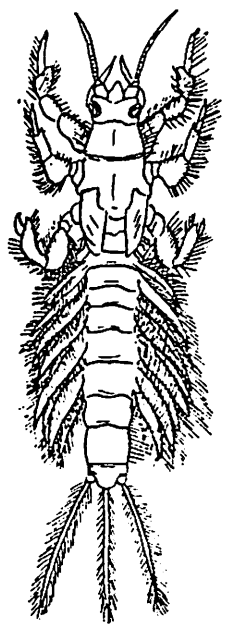
156. Ephemera

Nymph



Subimago

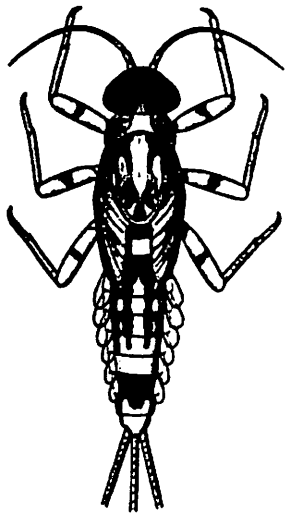
157. Hexagenia



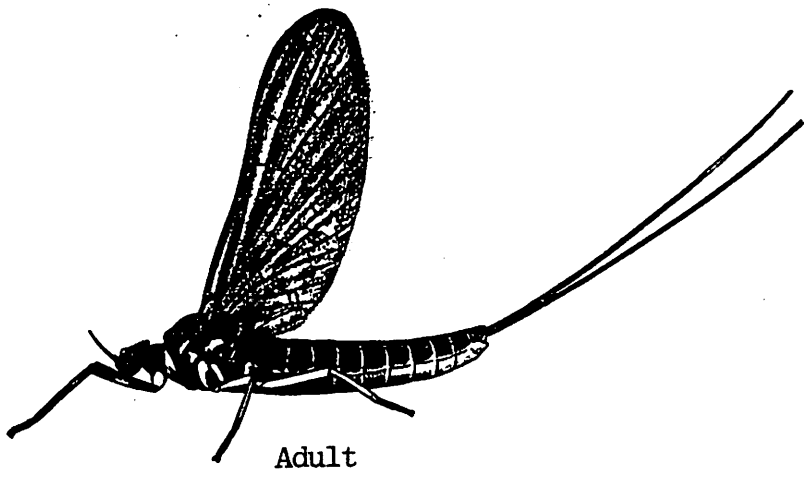
Nymph

158. Ephoron

Nymph

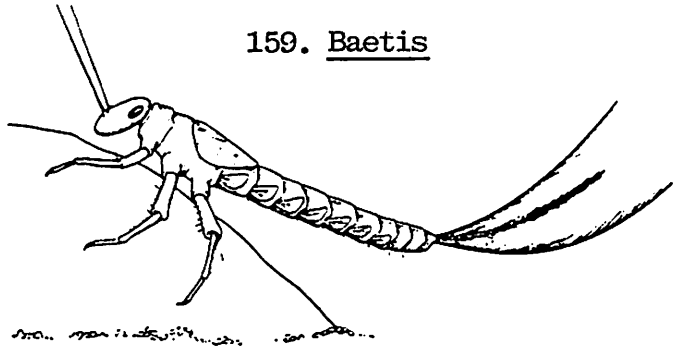


Nymph

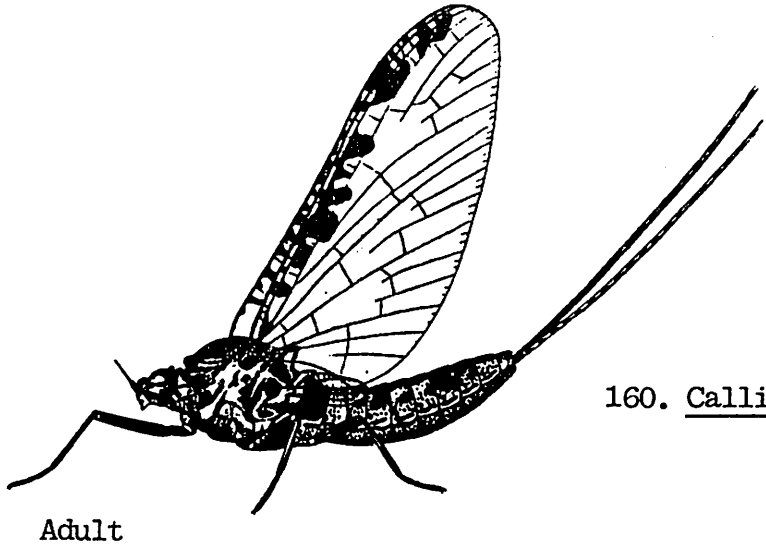


Adult

159. Baetis

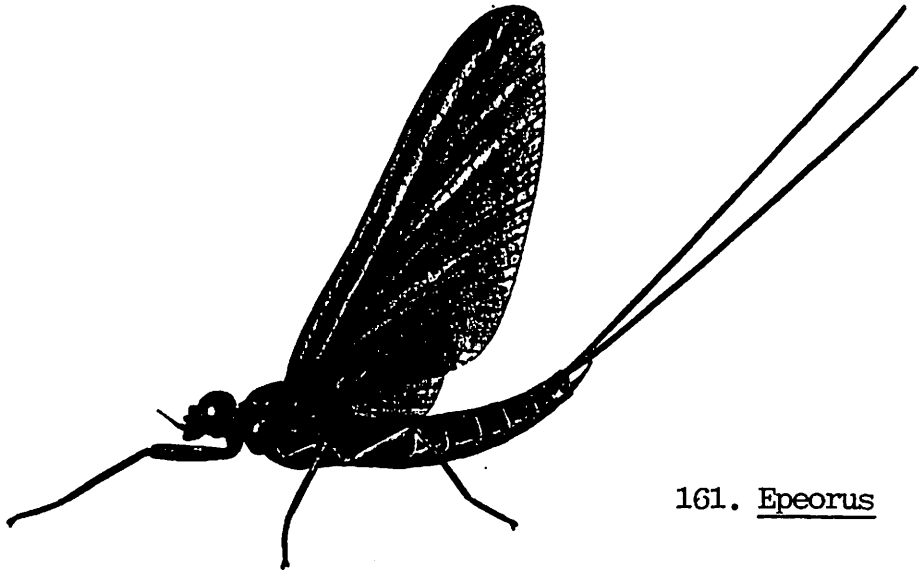


Nymph



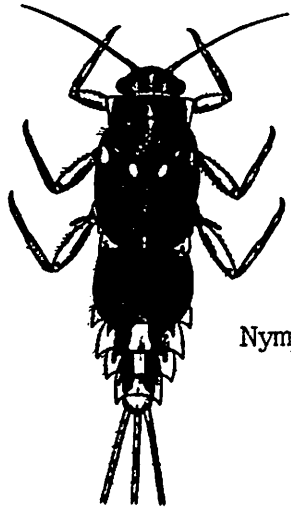
Adult

160. Callibaetis

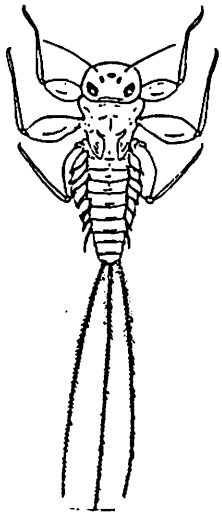


Subimago

161. Epeorus

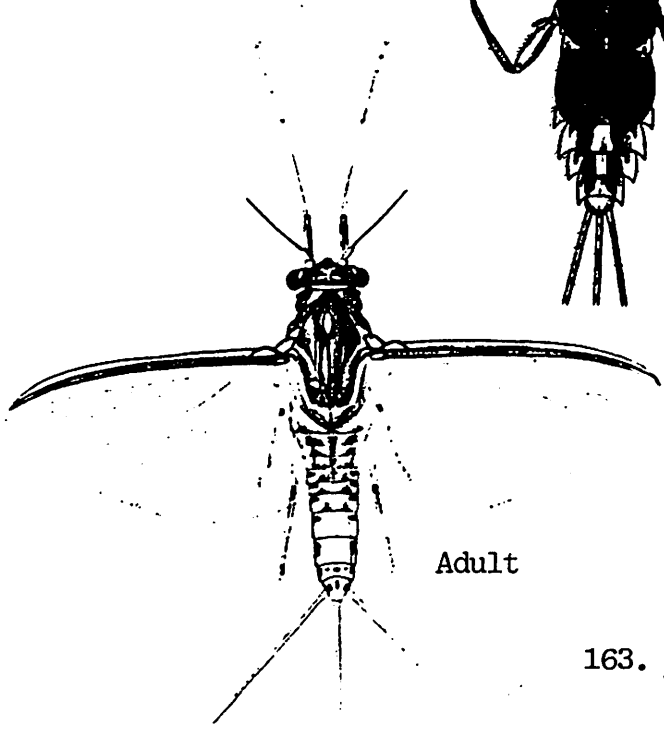


Nymph



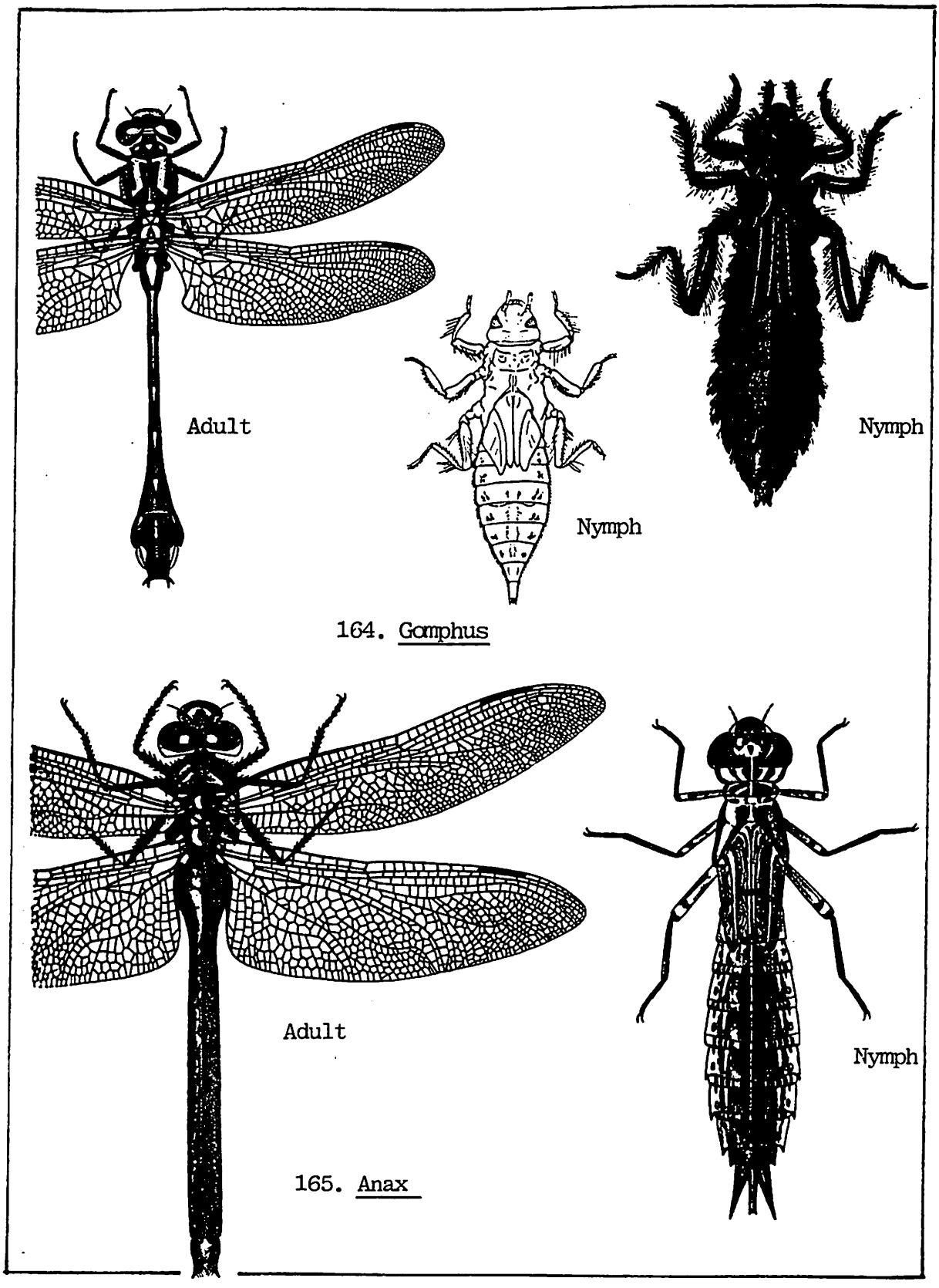
Nymph

162. Stenonema



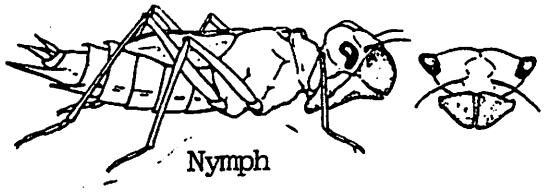
Adult

163. Caenis



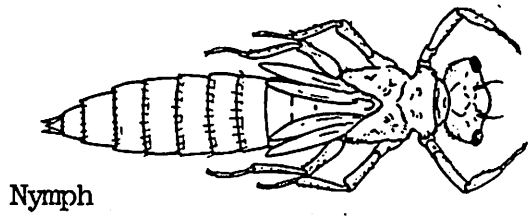
164. Gomphus

165. Anax



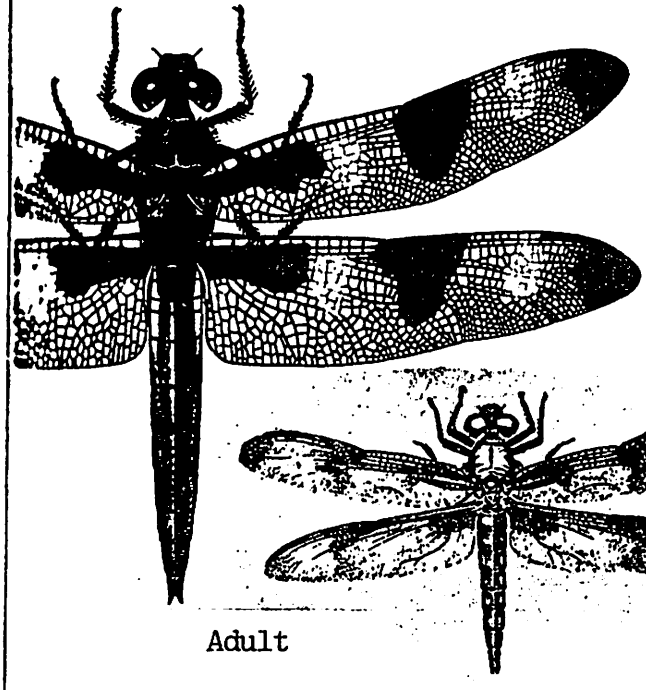
Nymph

166. Celithemis

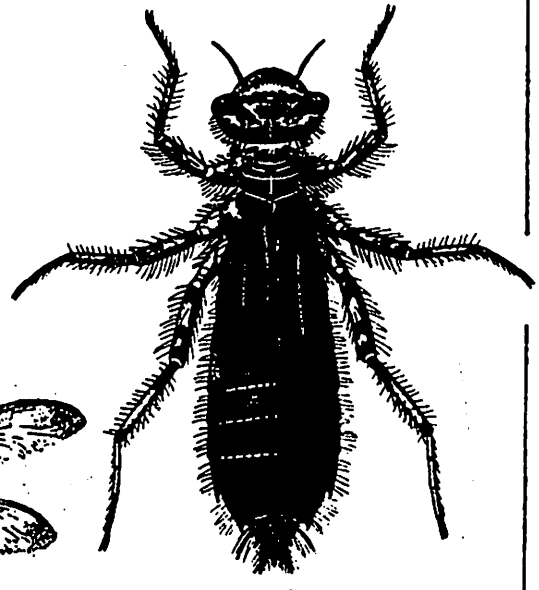


Nymph

167. Epicordulia

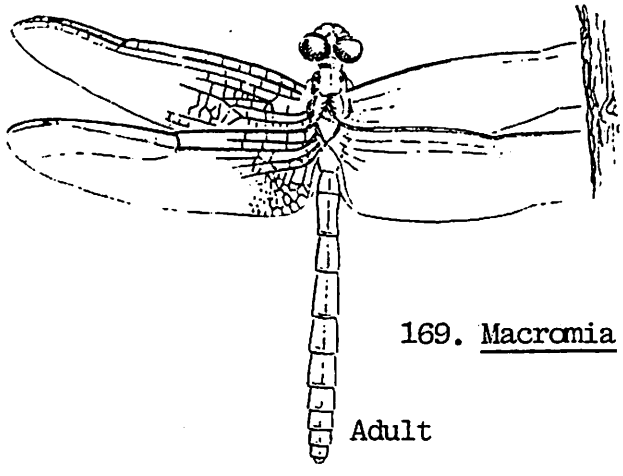


Adult



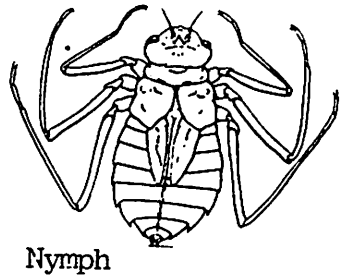
Nymph

168. Libellula

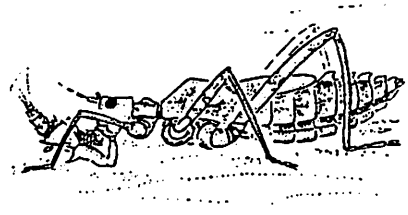


Adult

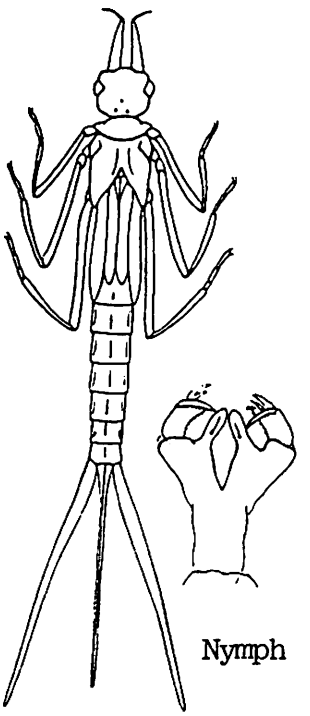
169. Macromia



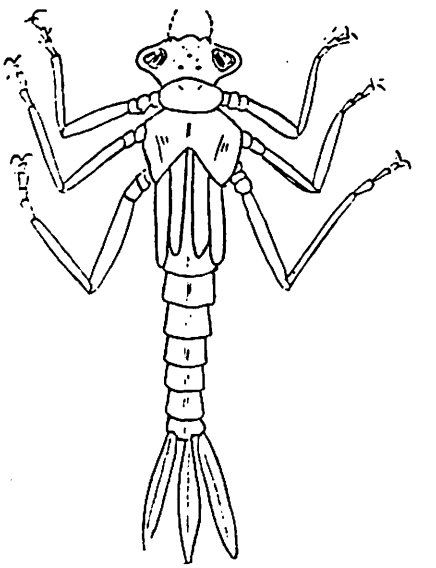
Nymph



AQUATIC INVERTEBRATES - Insects



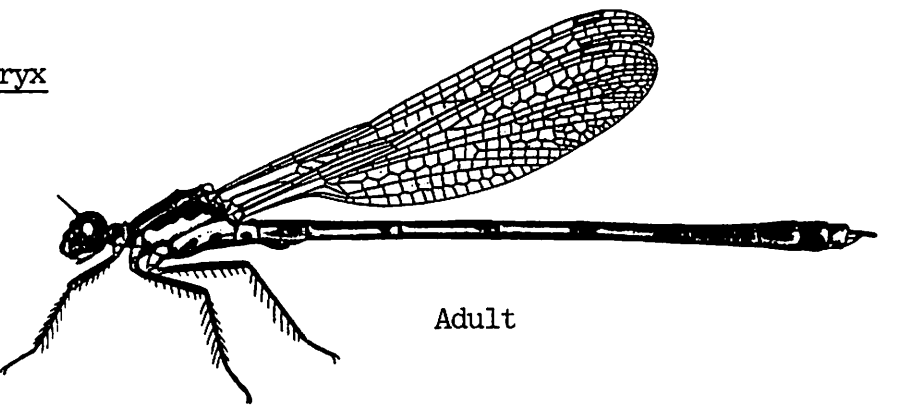
Nymph



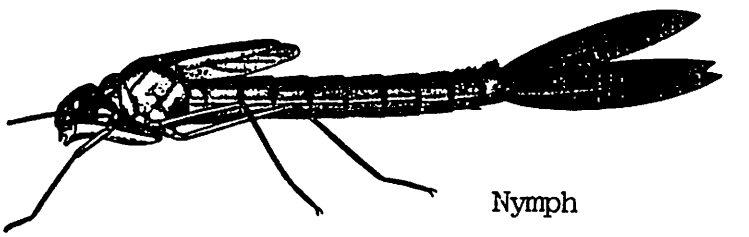
Nymph

171. Lestes

170. Calopteryx

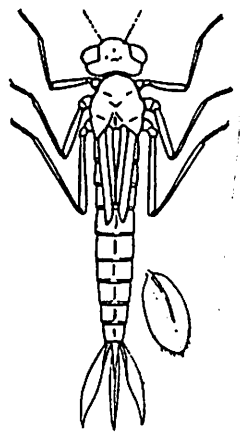


Adult



Nymph

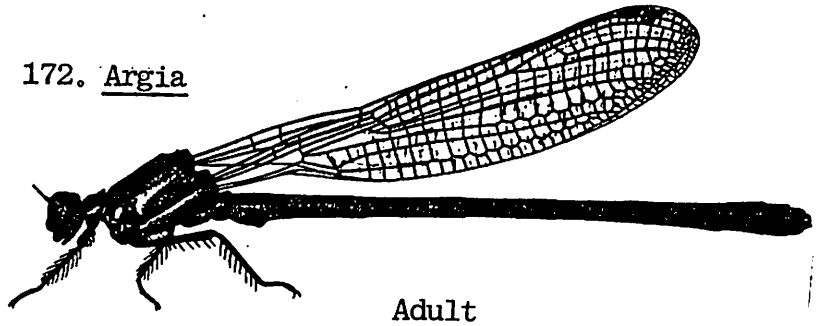
AQUATIC INVERTEBRATES - Insects



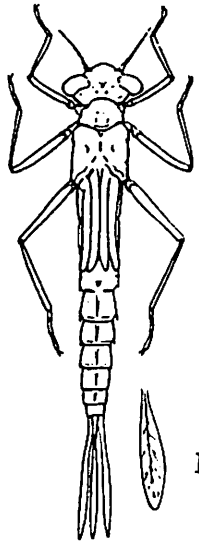
Nymph

Nymph

172. Argia

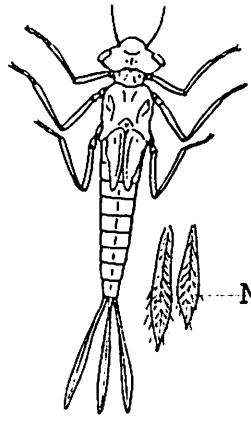


Adult



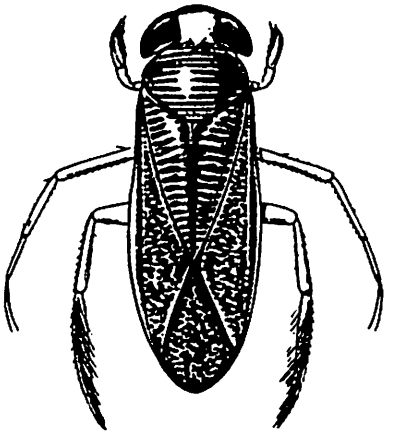
Nymph

173. Enallagma

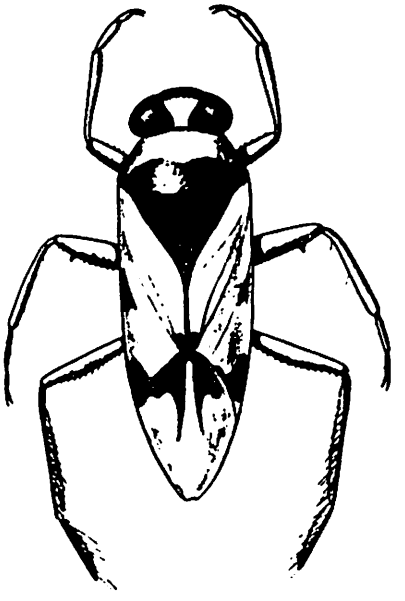


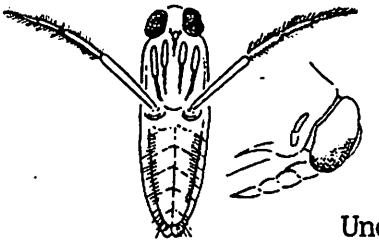
Nymph

174. Ischnura



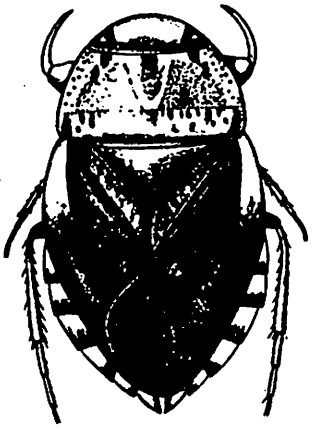
175. Sigara



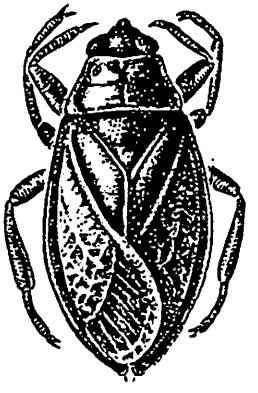


Underside

176. Notonecta

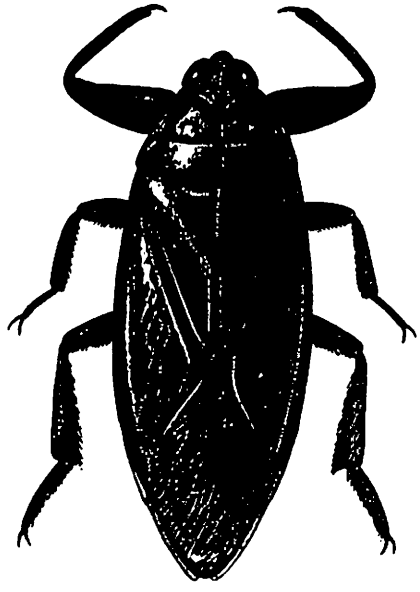


177. Pelocoris

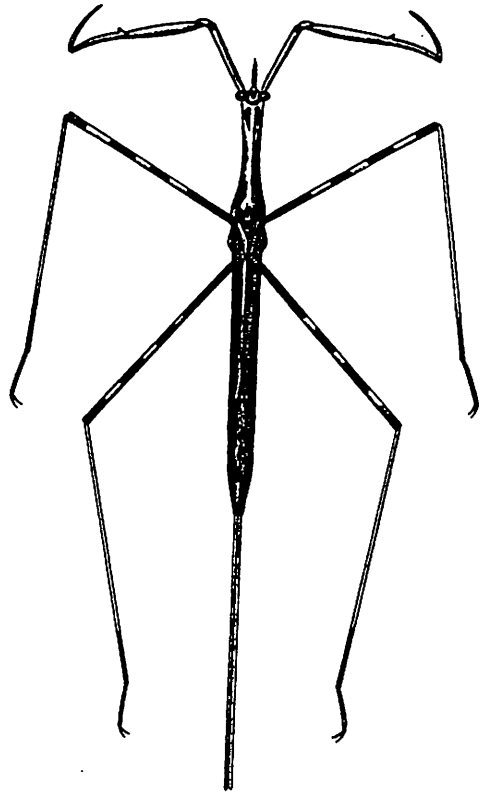


178. Belostoma

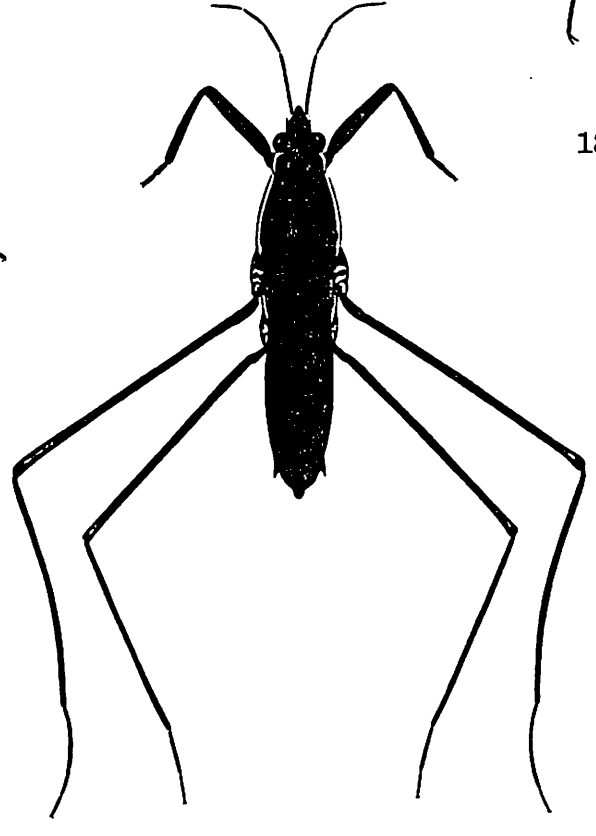
AQUATIC INVERTEBRATES - Insects



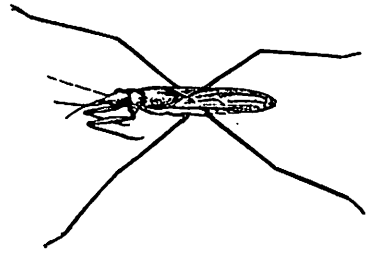
179. Lethocerus



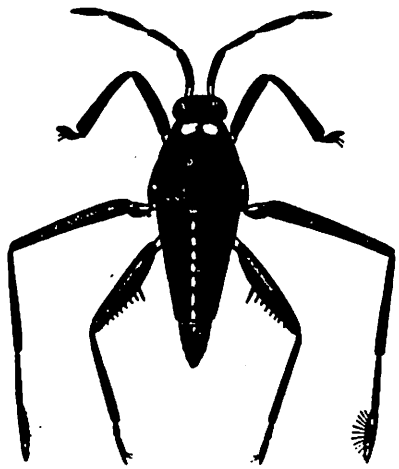
180. Ranatra



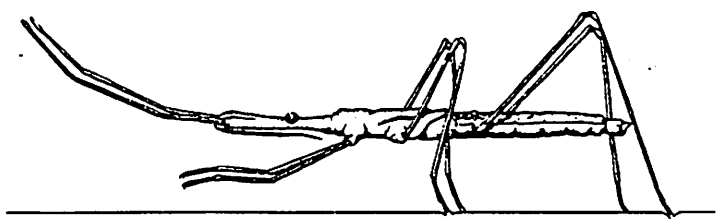
181. Gelastrocoris



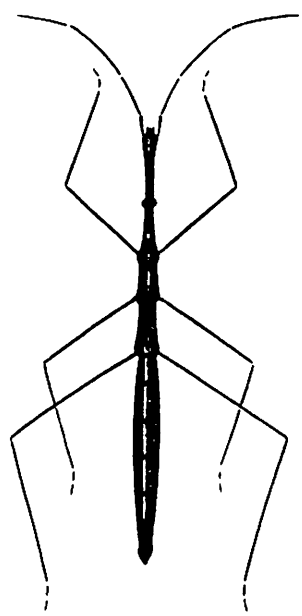
182. Gerris

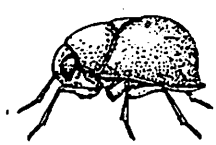


183. Rhagovelia

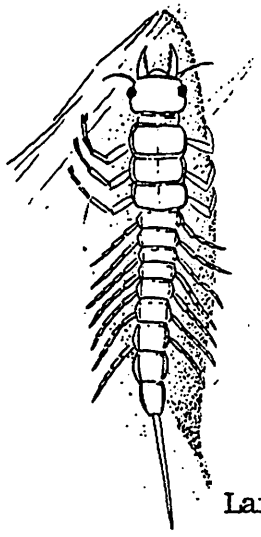


184. Hydrometra

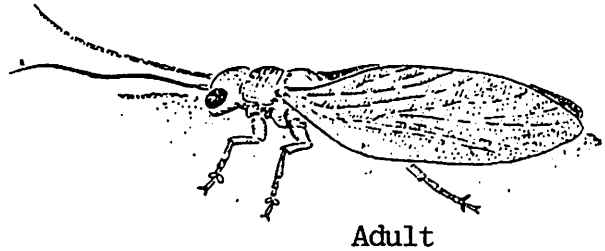




185. Neoplea

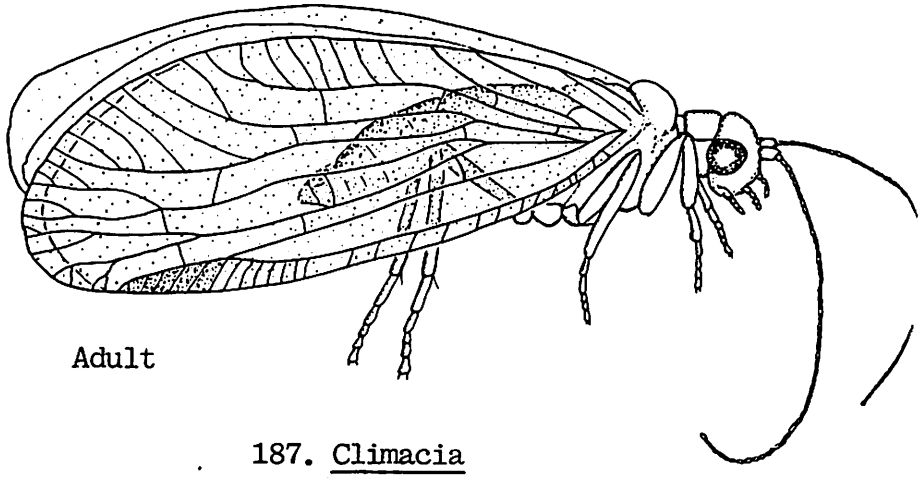


Larva



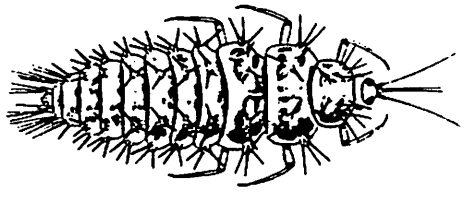
Adult

186. Sialis

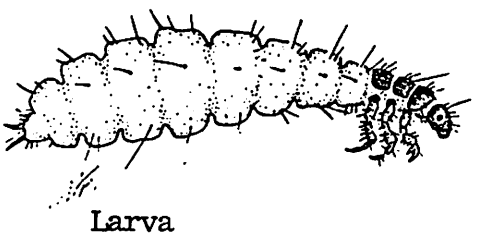


Adult

187. Climacia

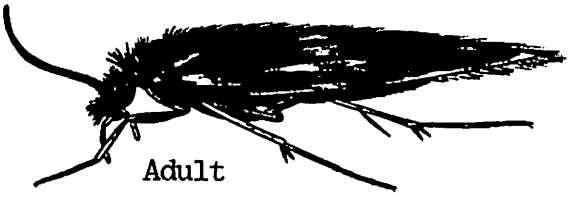


Larva



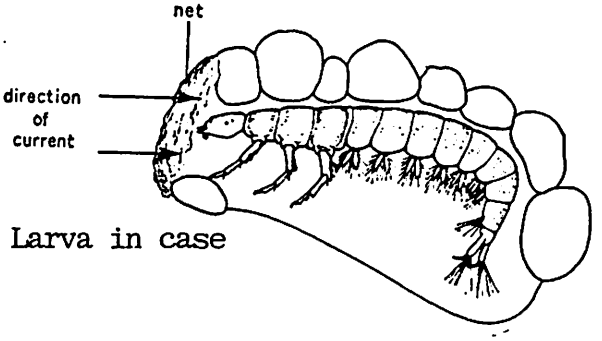
Larva

Larva in case

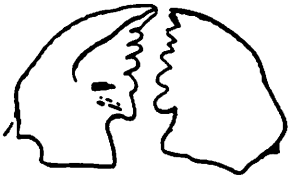


Adult

188. Hydroptila

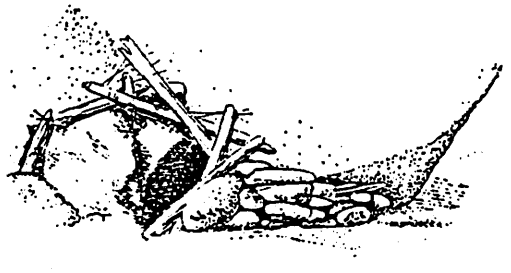


Larva in case

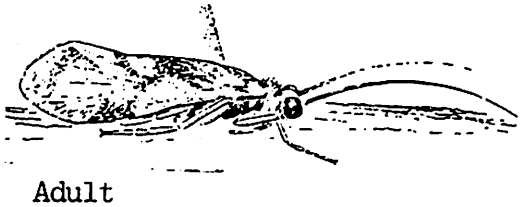


Mandibles

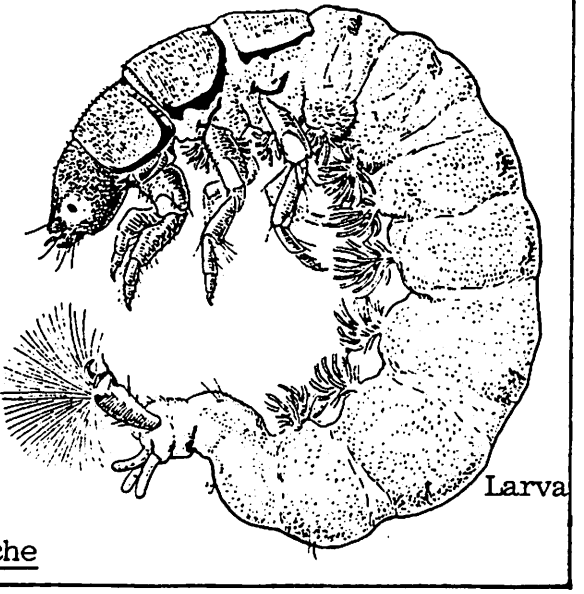
189. Cheumatopsyche



Net and case

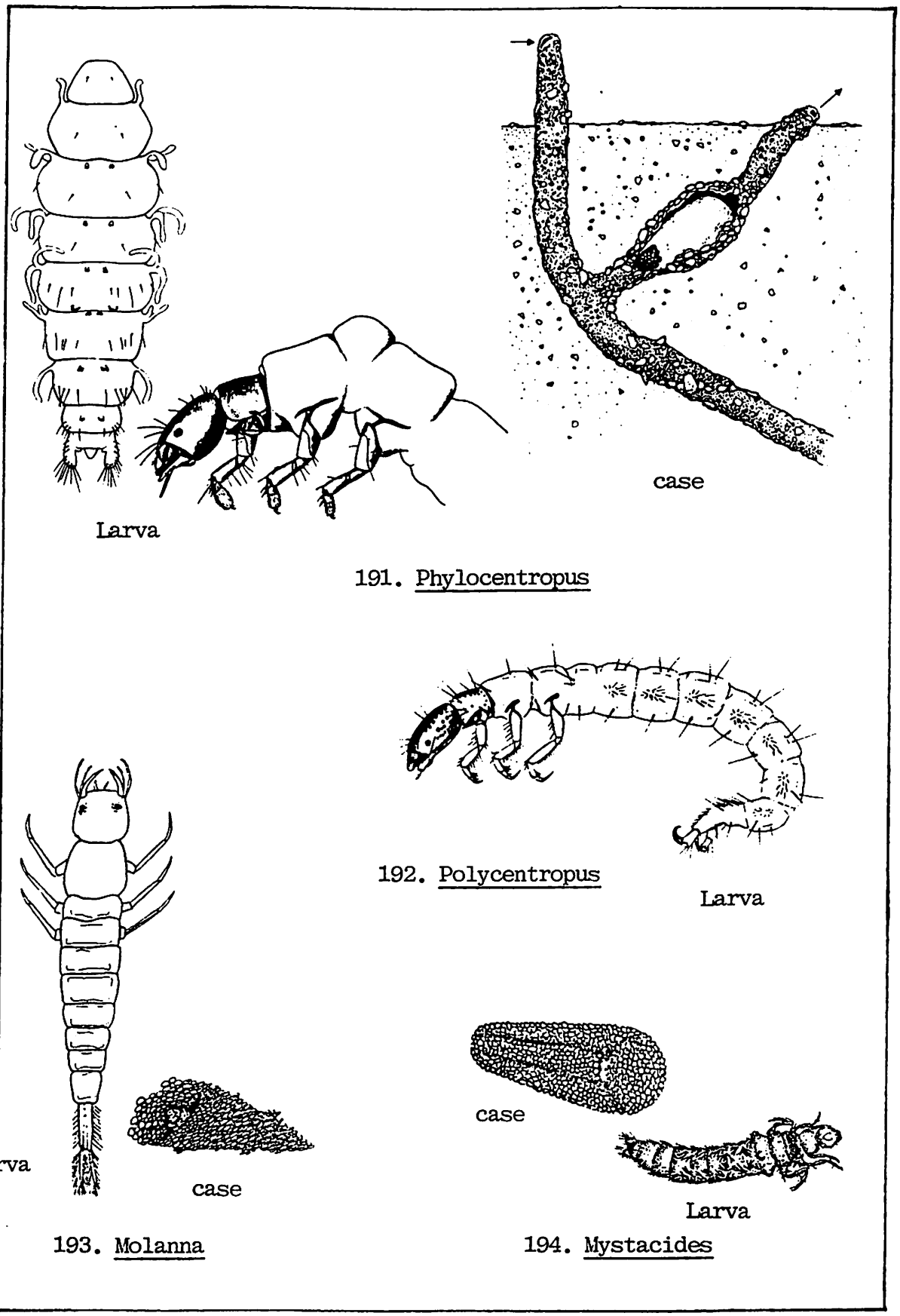


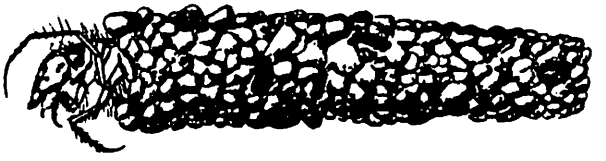
Adult



Larva

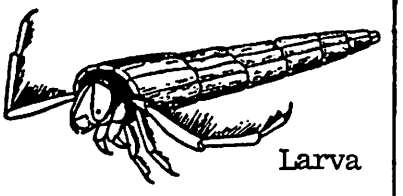
190. Hydropsyche


Larva
case
191. Phylocentropus
192. Polycentropus
Larva
Larva
case
193. Molanna
case
Larva
194. Mystacides

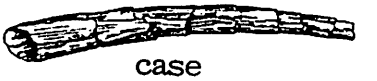


Larva in case

195. Oecetis



Larva



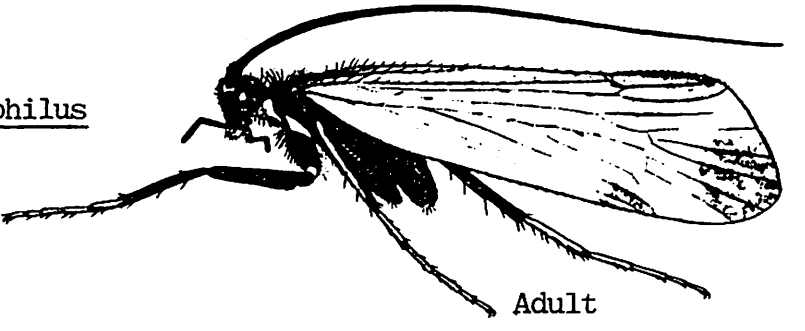
case

196. Triaenodes

Larva

case

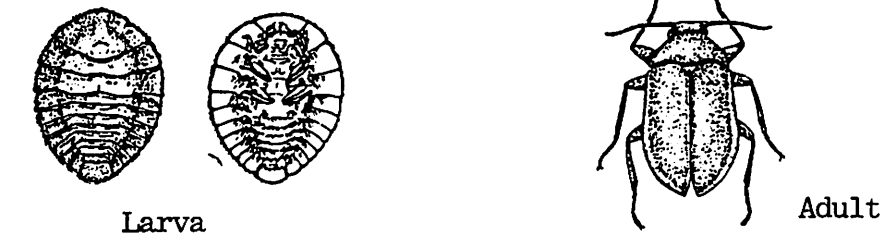
197. Limnephilus



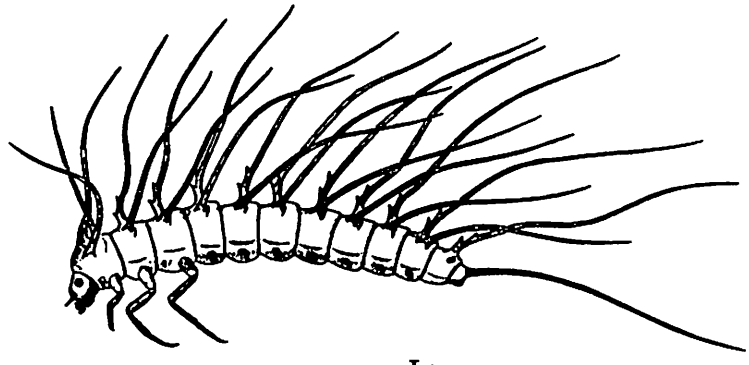
Adult

198. Helicopsyche

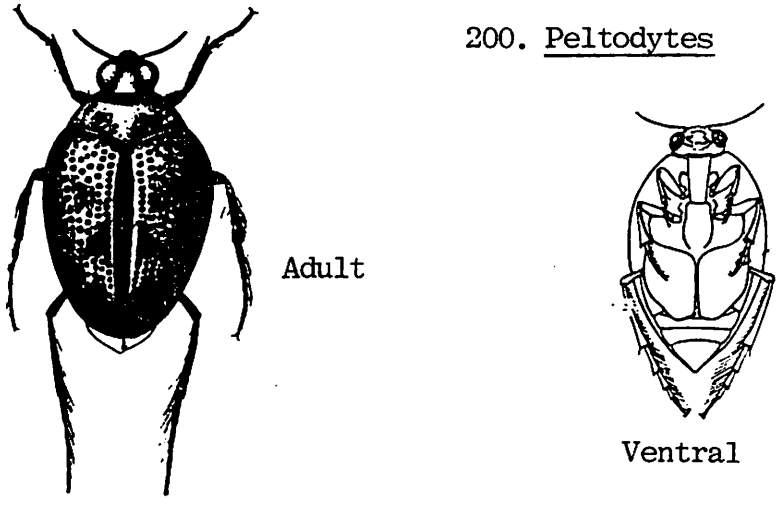
Larva in case

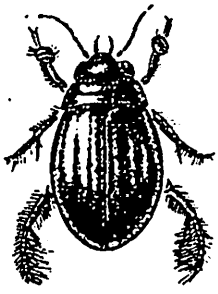


199. Psephenus



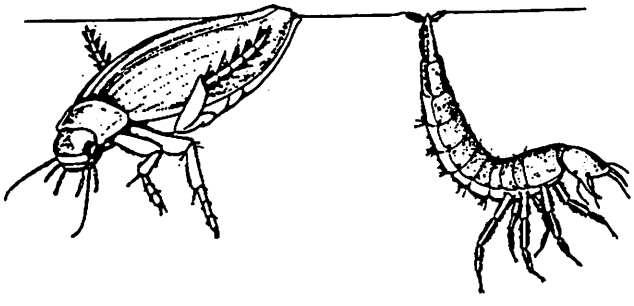
200. Peltodytes



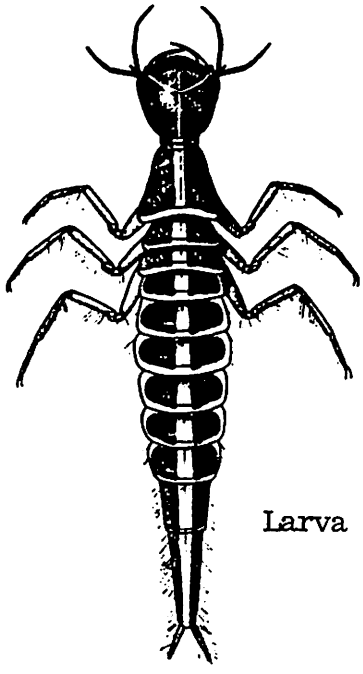


Adult

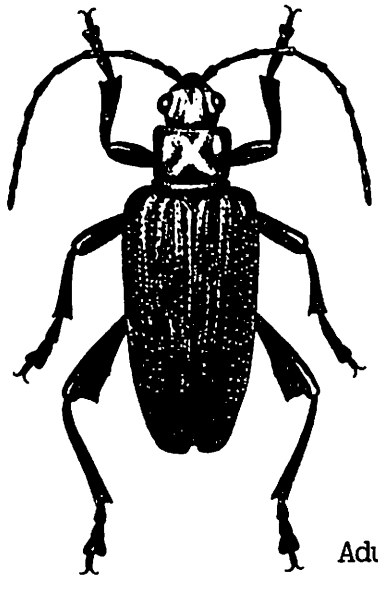
201. Dytiscus



Larva



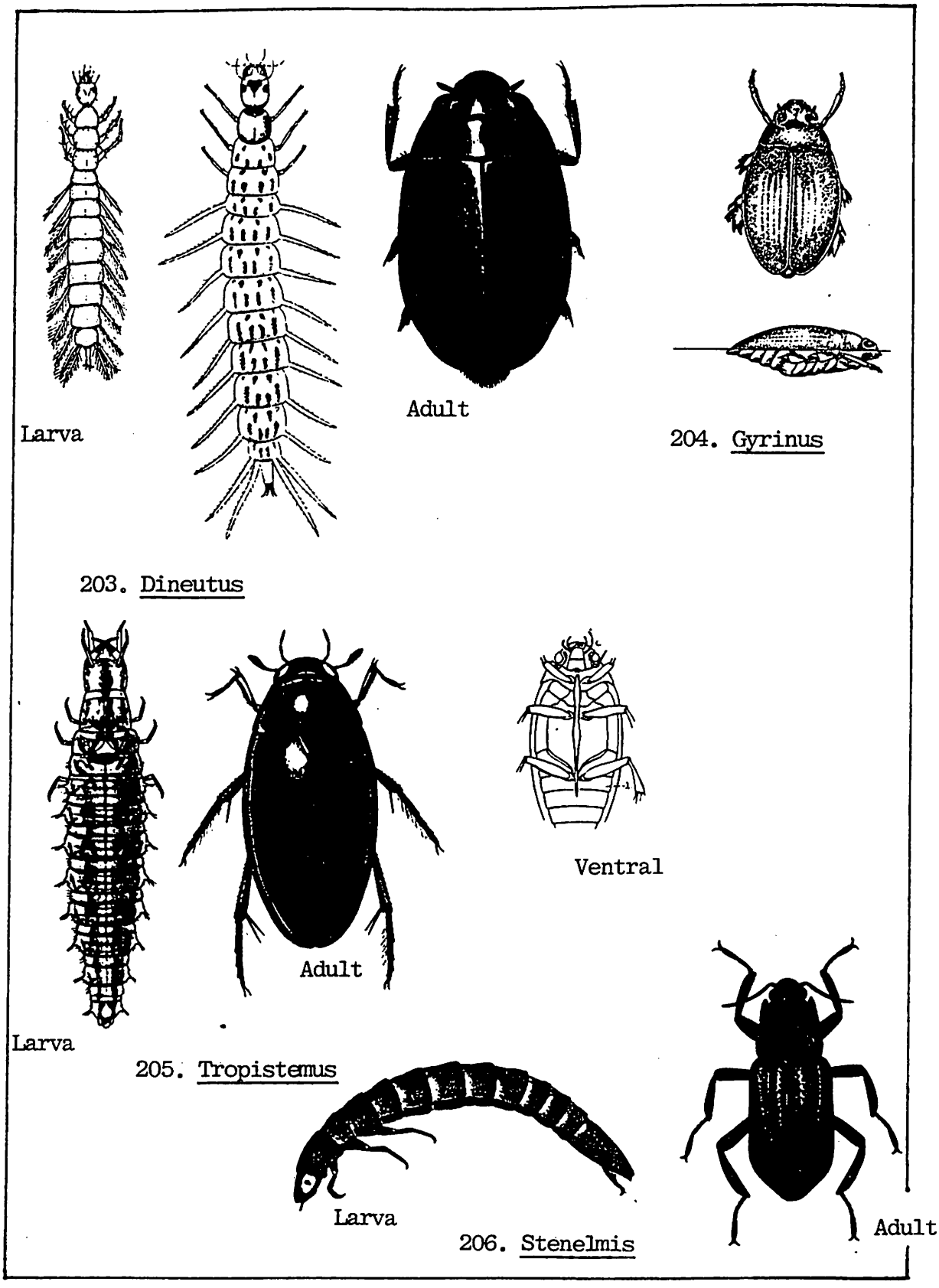
Larva



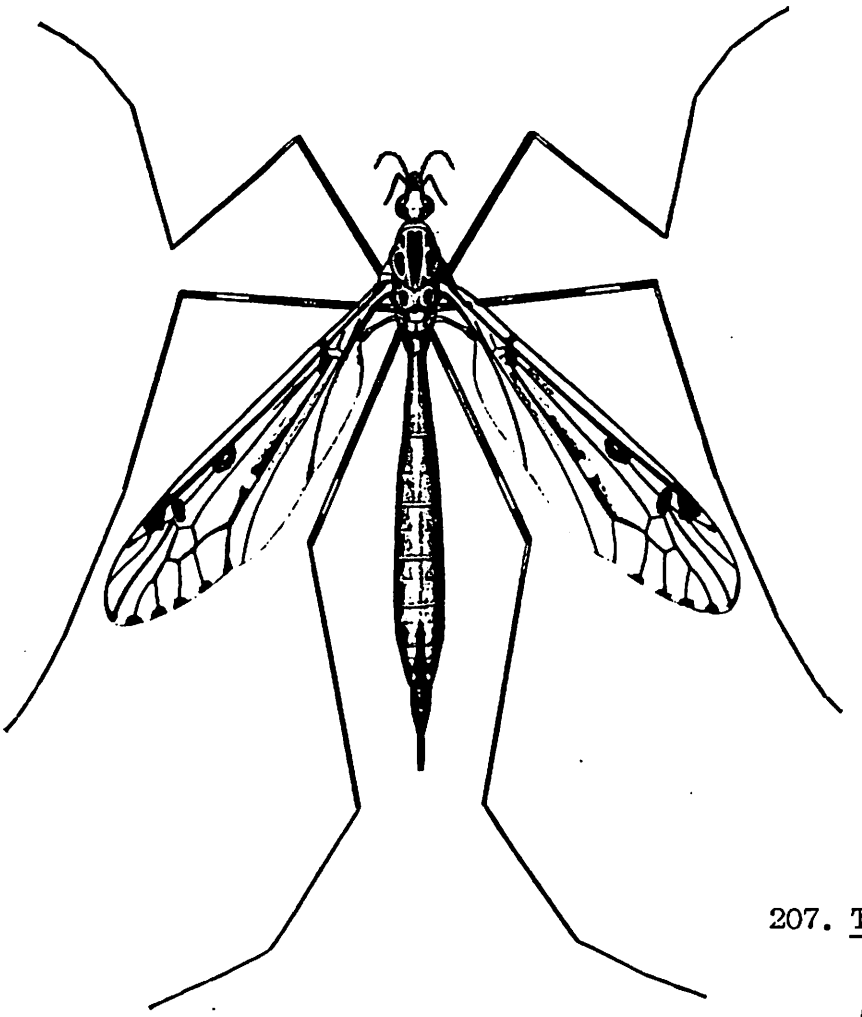
Adult

202. Donacia piscatrix

Larva



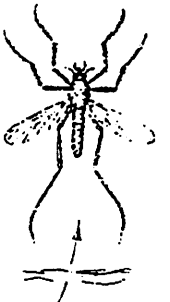
AQUATIC INVERTEBRATES - Insects



Adult

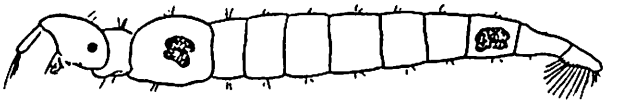
Larva

207. Tipula



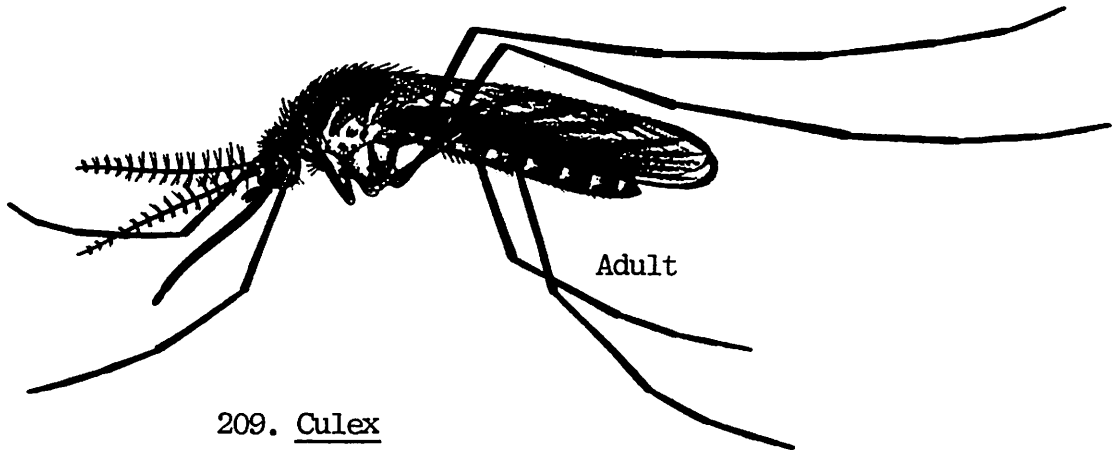
Adult

208. Chaoborus

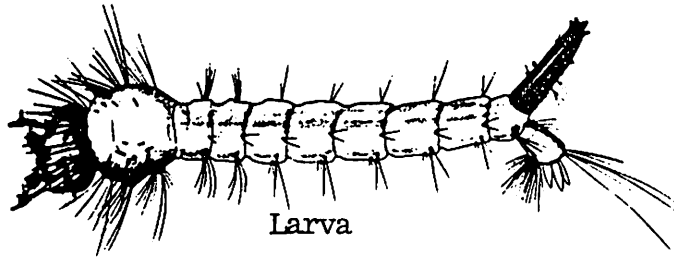


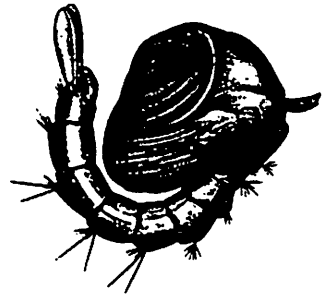
Larva

AQUATIC INVERTEBRATES - Insects

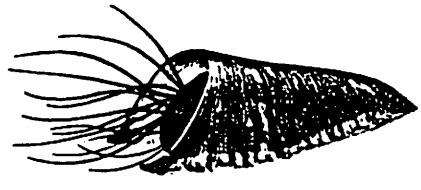


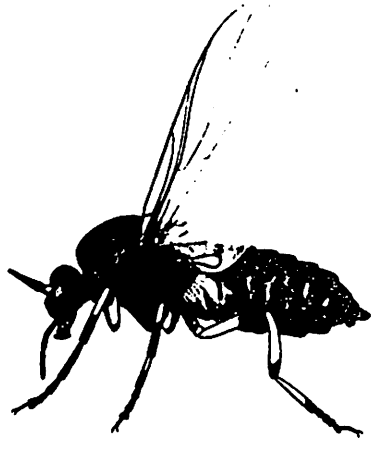
209. Culex

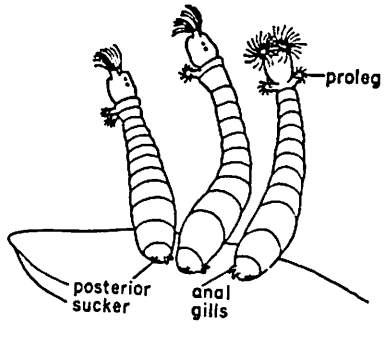


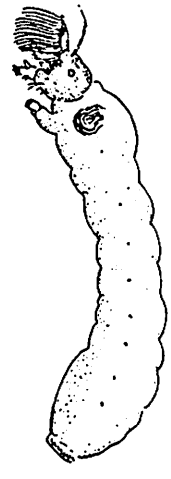


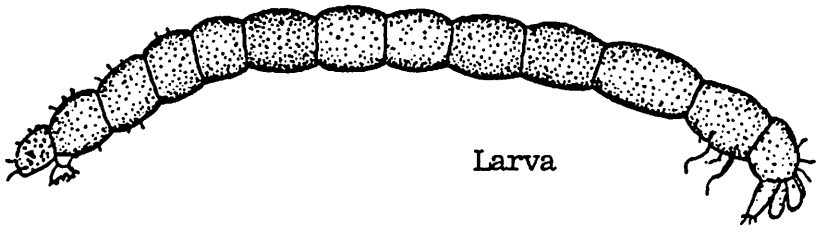
210. Simulium









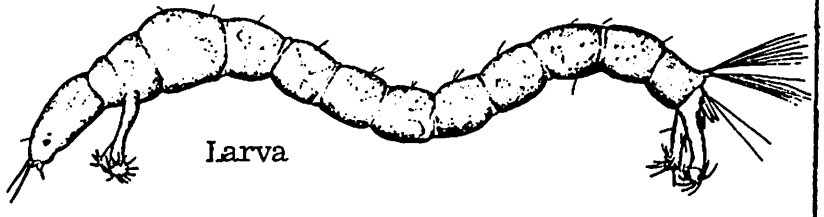


Larva

Mandible

211. Coelotanypus

Lingua

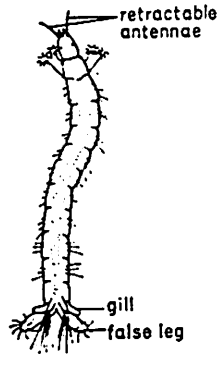


Larva

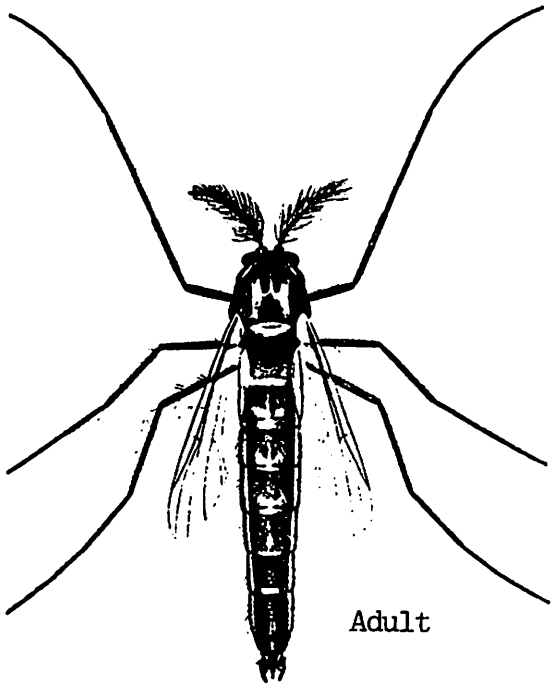
212. Procladius

Larva

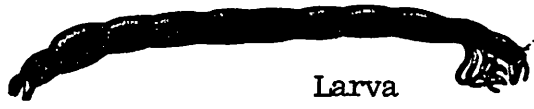
213. Tanypus



Larva

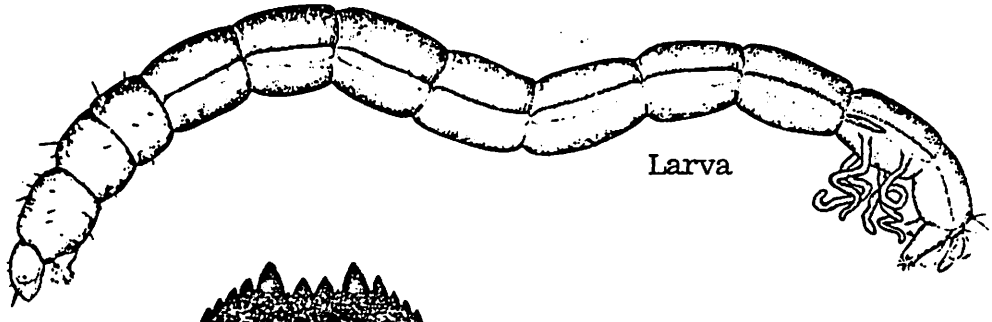


Adult



Larva

214. Chironomus

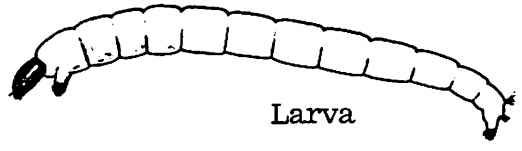


Larva

Labial plate

215. Polypedilum

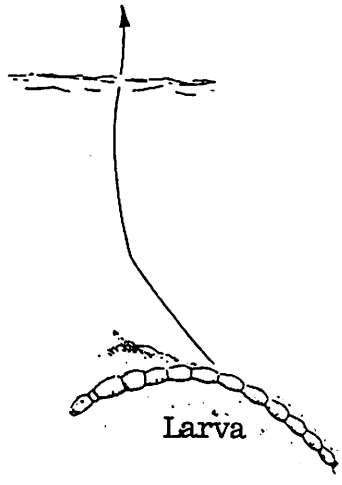
216. Tanytarsus



Larva

AQUATIC INVERTEBRATES - Insects

Adult

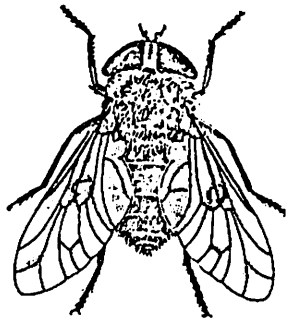


Larva

217. Holoconops catawbae

Larva

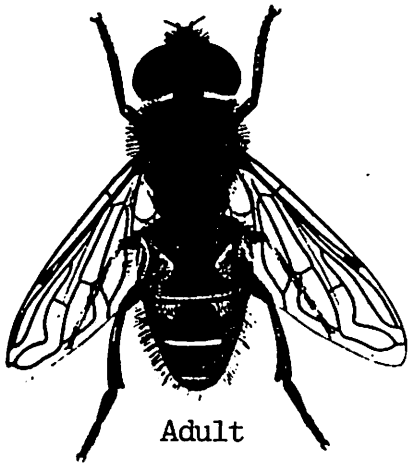
218. Atherix



Adult

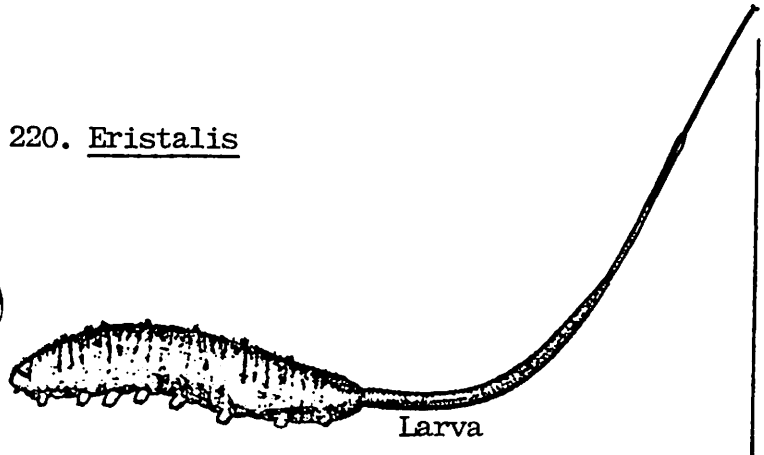
Larva

219. Tabanus



Adult

220. Eristalis



Larva

AQUATIC INVERTEBRATES - Insects

FISH

COMMON FISH OF WESTERN LAKE ERIE

Phylum Cordata (chordates)
Subphyllum Vertebrata (vertebrates)
Superclass Pisces (fish)
Class Agnatha (jawless fish)
Order Petromyzontiformes
Family Petromyzontidae (lampreys)
1. Ichthyomyzon unicuspis (silver lamprey)
2. Petromyzon marinus (sea lamprey)

Class Osteichthyes (bony fish)
Order Acipenseriformes
Family Acipenseridae (sturgeons)
3. Acipenser fulvescens (lake sturgeon)

Order Semionotiformes
Family Lepisosteidae (gars)
4. Lepisosteus osseus (longnose gar)

Order Amiiformes
Family Amiidae (bowfins)
5. Amia calva (bowfin)

Order Anguilliformes
Family Anguillidae (freshwater eels)
6. Anguilla rostrata (American eel)

Order Clupeiformes
Family Clupeidae (herrings)
7. Alosa pseudoharengus (alewife)
8. Dorosoma cepedianum (gizzard shad)

Order Osteoglossiformes
Family Hiodontidae (mooneyes)
9. Hiodon tergisus (mooneye)

Order Salmoniformes
Family Salmonidae (trouts)
10. Coregonus artedii (cisco or lake herring)*
11. Coregonus clupeaformis (lake whitefish)*
12. Oncorhynchus kisutch (coho salmon)
13. Oncorhynchus tshawytscha (chinook salmon)
14. Salmo gairdneri (rainbow trout)
15. Salvelinus namaycush (lake trout)*

Family Osmeridae (smelts)
16. Osmerus mordax (rainbow smelt)

Family Umbridae (mudminnows)
17. Umbra limi (central mudminnow)

Order Salmoniformes (Continued)
Family Esocidae (pikes)
18. Esox lucius (northern pike)
19. Esox masquinongy (muskellunge)*

Order Cypriformes
Family Cyprinidae (carps and minnows)
20. Carassius auratus (goldfish)
21. Cyprinus carpio (common carp)
22. Notemigonus crysoleucas (golden shiner)
23. Notropis atherinoides (emerald shiner)
24. Notropis hudsonius (spottail shiner)
25. Notropis spilopterus (spotfin shiner)
26. Notropis stramineus (sand shiner)
27. Pimephales notatus (bluntnose minnow)
28. Pimephales promelas (fathead minnow)

Family Catostomidae (suckers)
29. Carpiodes cyprinus (quillback)
30. Catostomus commersoni (white sucker)
31. Ictiobus cyrpinellus (bigmouth buffalo)
32. Moxostoma macrolepidotum (shorthead redhorse)

Order Siluriformes
Family Ictaluridae (bullhead catfishes)
33. Ictalurus melas (black bullhead)
34. Ictalurus natalis (yellow bullhead)
35. Ictalurus nebulosus (brown bullhead)
36. Ictalurus punctatus (channel catfish)
37. Noturus flavus (stonecat)
38. Noturus miurus (brindled madtom)

Family Percopsidae (trout-perches)
39. Percopsis omiscomaycus (trout-perch)

Order Gadiformes
Family Gadidae (codfishes)
40. Lota lota (burbot)*

Order Atheriniformes
Family Cyprinodontidae (killifishes)
41. Fundulus diaphanus (banded killifish)

Family Atherinidae (silversides)
42. Labidesthes sicculus (brook silverside)

Order Gasterosteiformes
Family Gasterosteidae (sticklebacks)
43. Culaea inconstans (brook stickleback)

Order Perciformes
Family Percichthyidae
44. Morone americana (white perch)
45. Morone chrysops (white bass)

Order Perciformes (Continued)

Family Centrarchidae (sunfishes)

46. Ambloplites rupestris (rock bass)
47. Lepomis gibbosus (pumpkin seed)
48. Lepomis macrochirus (bluegill)
49. Micropterus dolomieui (smallmouth bass)
50. Micropterus salmoides (largemouth bass)
51. Poxomis annularis (white crappie)
52. Poxomis nigromaculatus (black crappie)

Family Percidae (perches)

53. Etheostoma nigrum (johnny darter)
54. Perca flavescens (yellow perch)
55. Percina caprodes (logperch)
56. Stizostedion canadense (sauger)
57. Stizostedion vitreum glaucum (blue pike)*
58. Stizostedion vitreum vitreum (walleye)

Family Sciaenidae (drums)

59. Aplodinotus grunniens (freshwater drum)

Family Cottidae (sculpins)

60. Cottus bairdi (mottled sculpin)

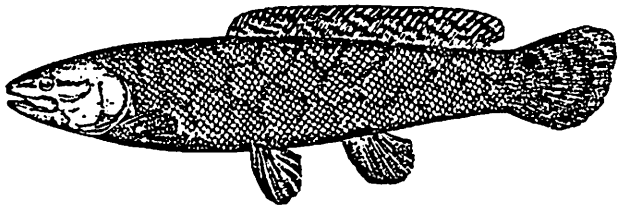
*Formerly common, now rare

1. Silver lamprey

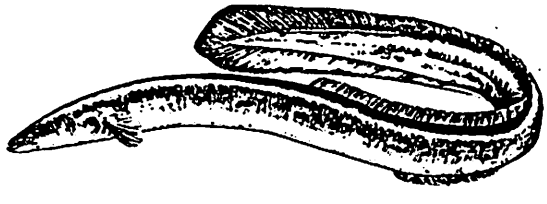
2. Sea lamprey

3. Lake sturgeon

4. Longnose gar

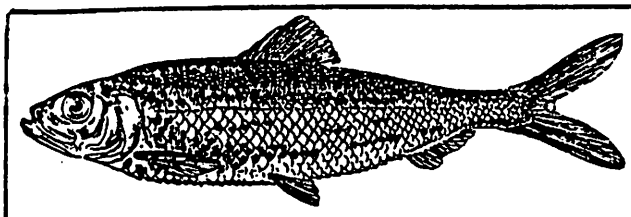


5. Bowfin

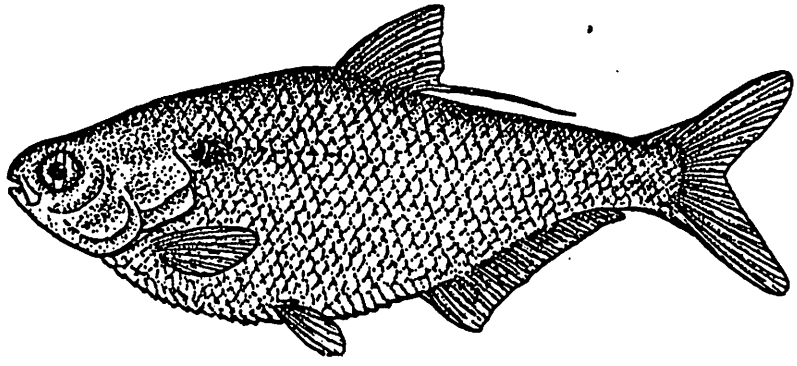


6. American eel

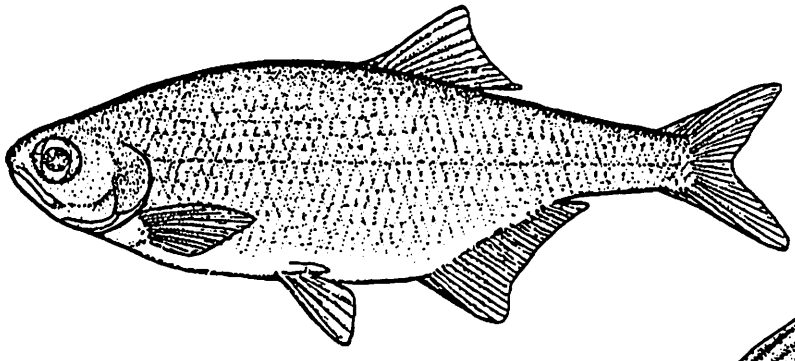
FISH



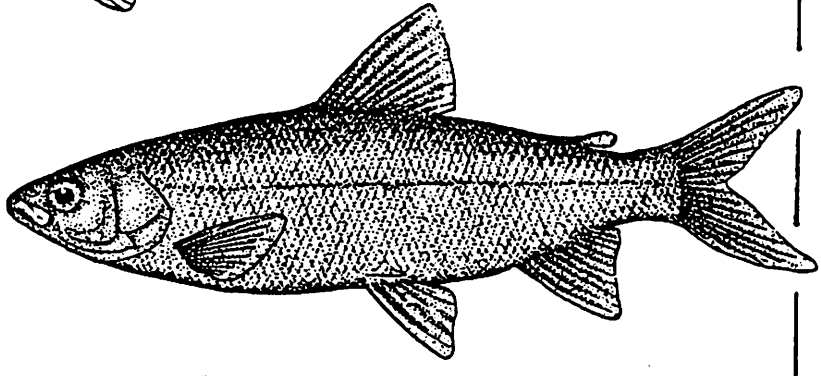
7. Alewife



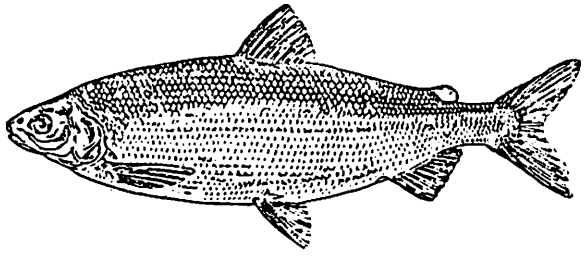
8. Gizzard shad



9. Mooneye

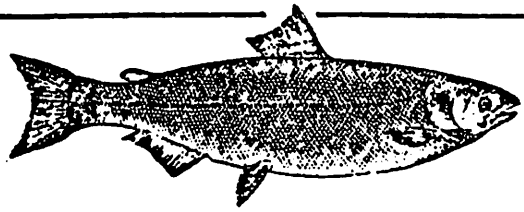


10. Cisco or Lake herring

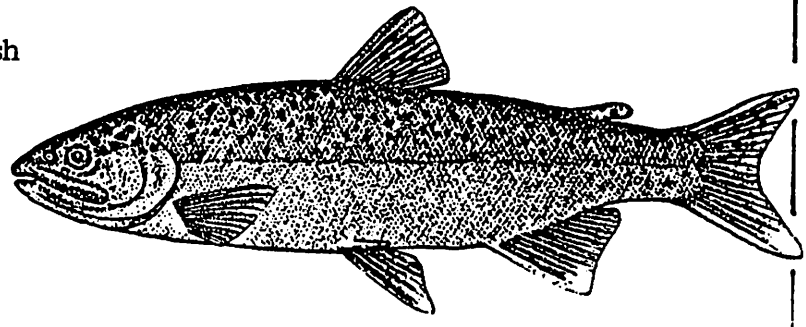


11. Lake whitefish

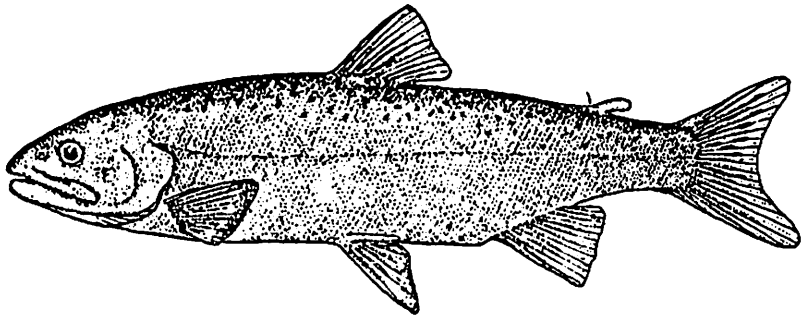
FISH



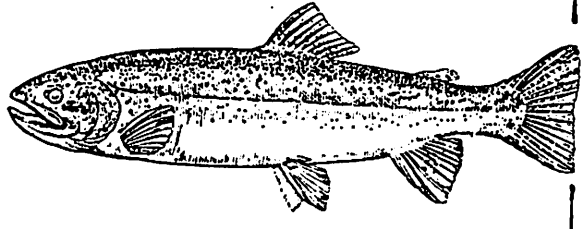
11. Lake whitefish



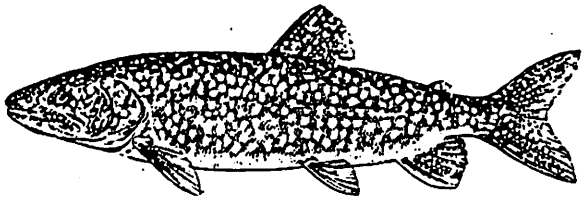
12. Coho salmon



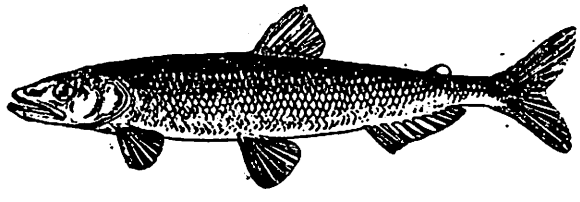
13. Chinook salmon



14. Rainbow trout

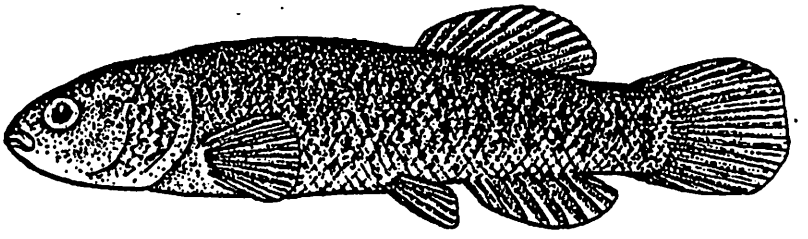


15. Lake trout

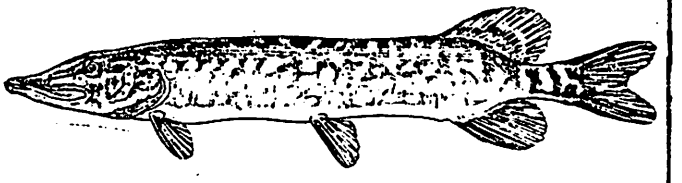


16. Rainbow smelt

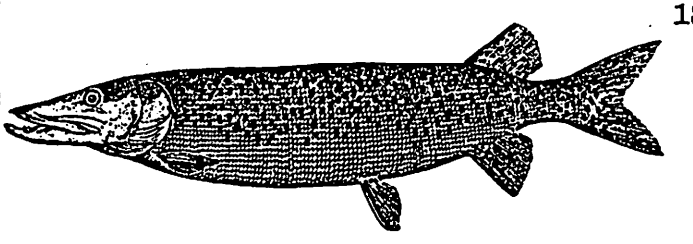
FISH



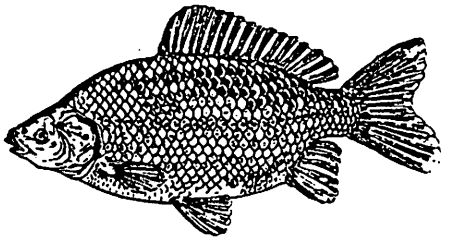
17. Central mudminnow



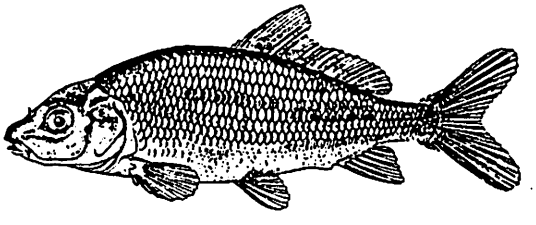
18. Northern pike



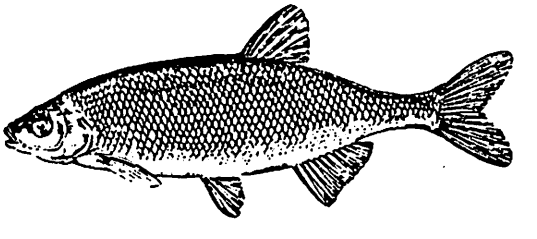
19. Muskellunge



20. Goldfish

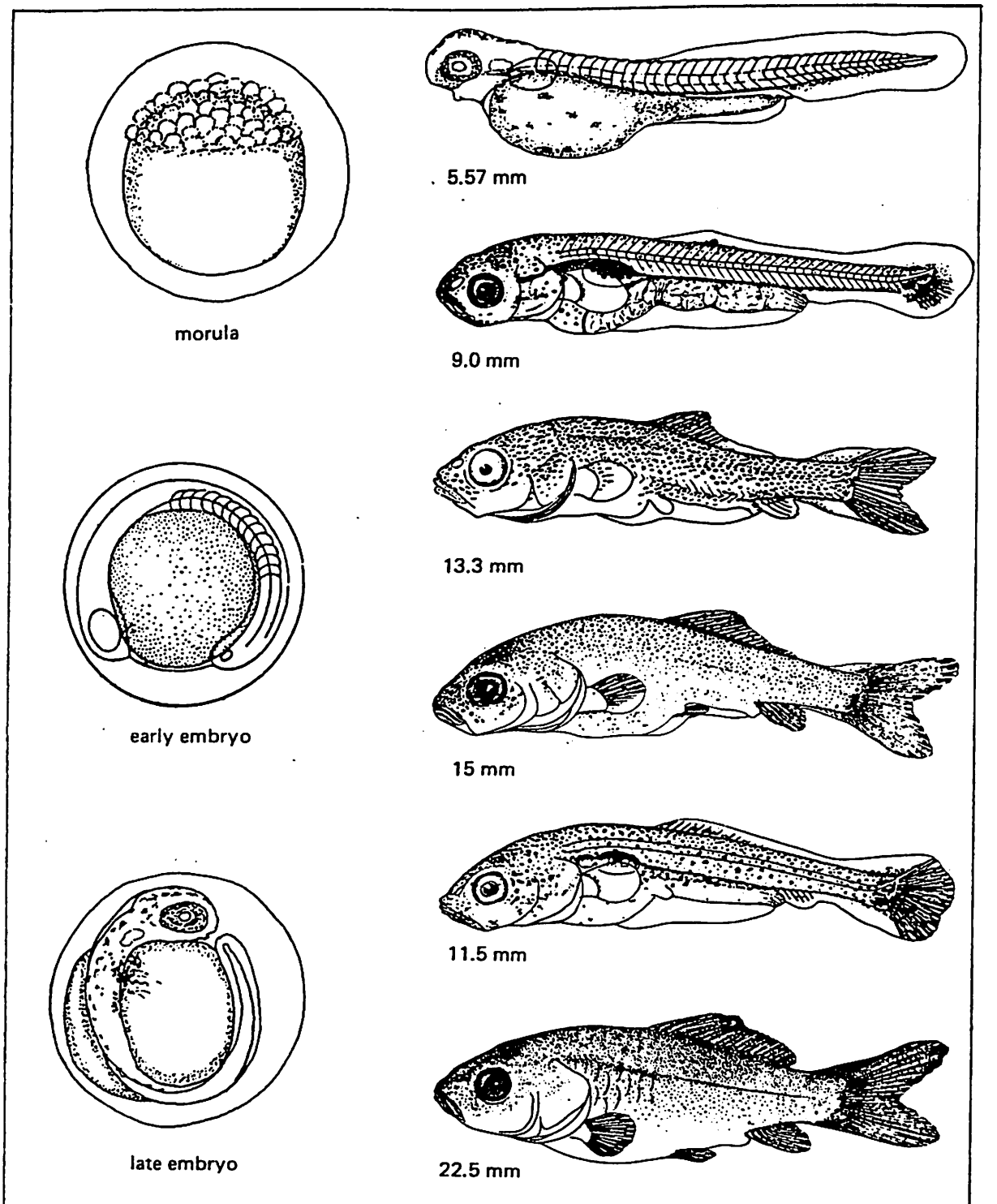


21. Common carp



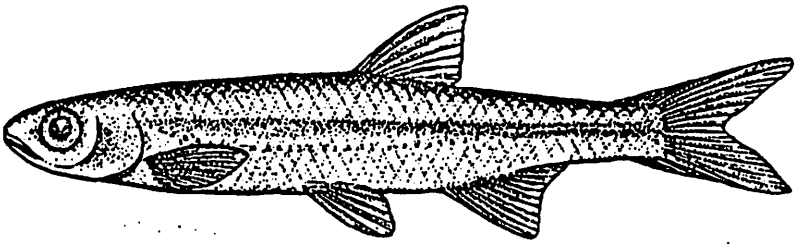
22. Golden shiner

FISH

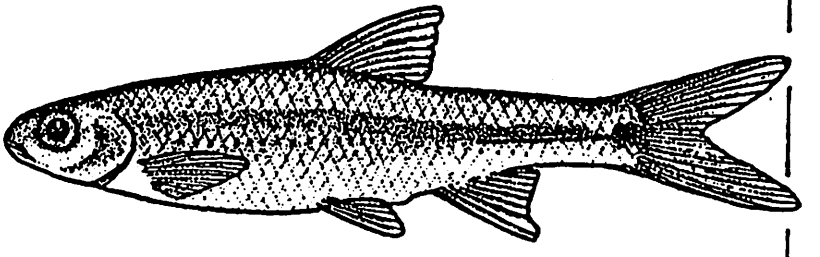


Developmental Stages of Carp

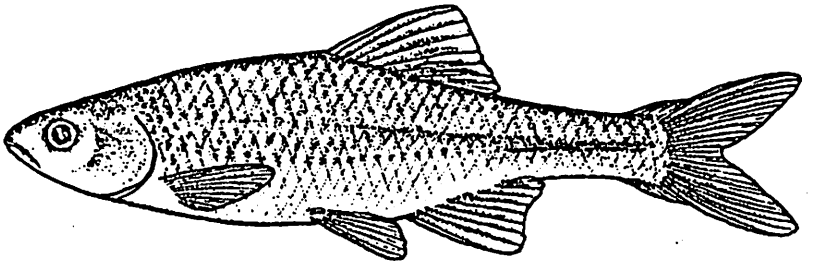
FISH



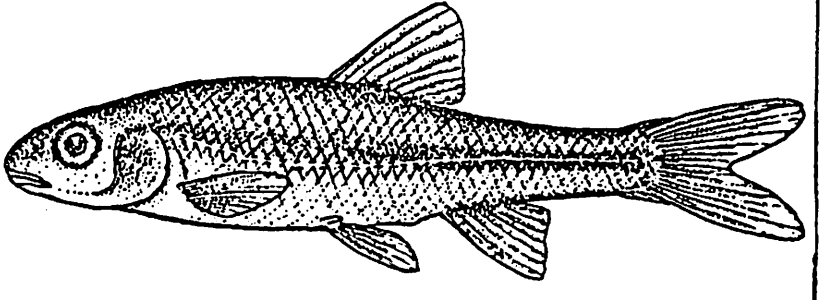
23. Emerald shiner



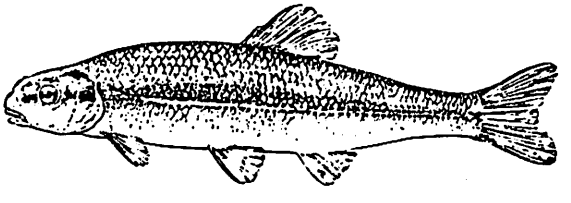
24. Spottail shiner



25. Spotfin shiner

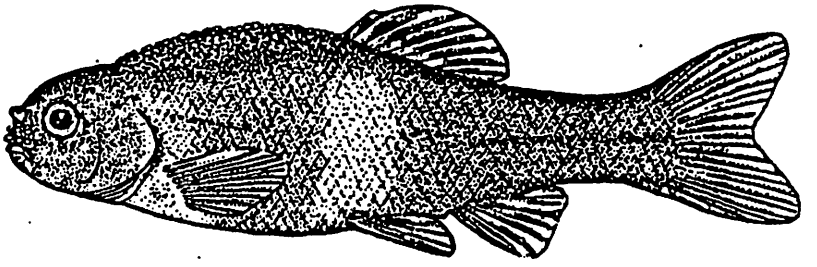


26. Sand shiner

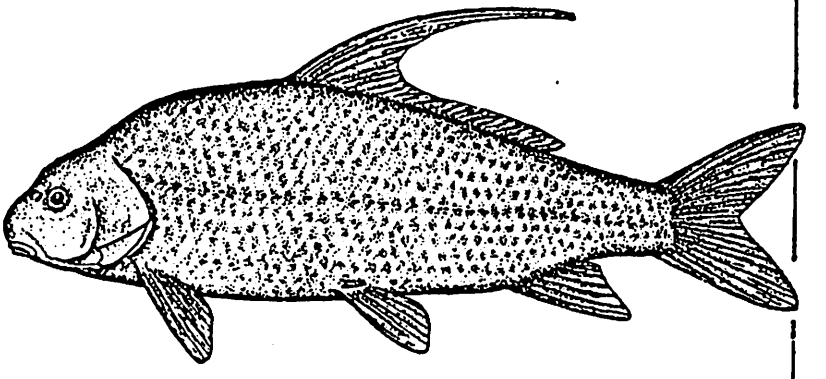


27. Bluntnose minnow

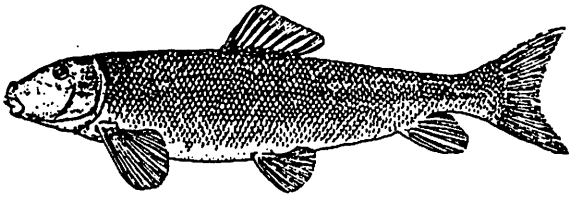
FISH



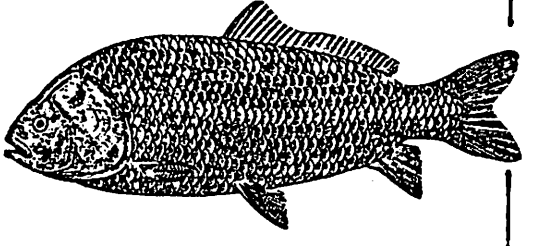
28. Fathead minnow



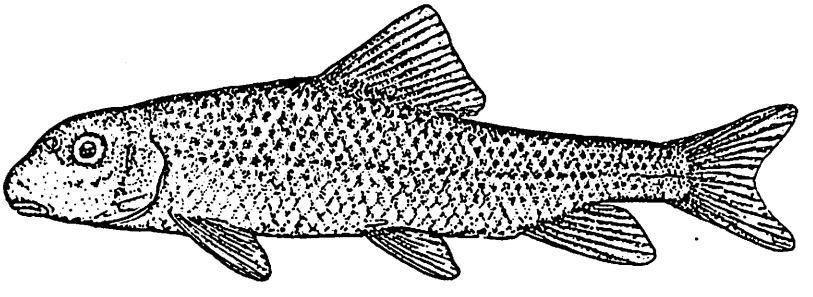
29. Quillback



30. White sucker

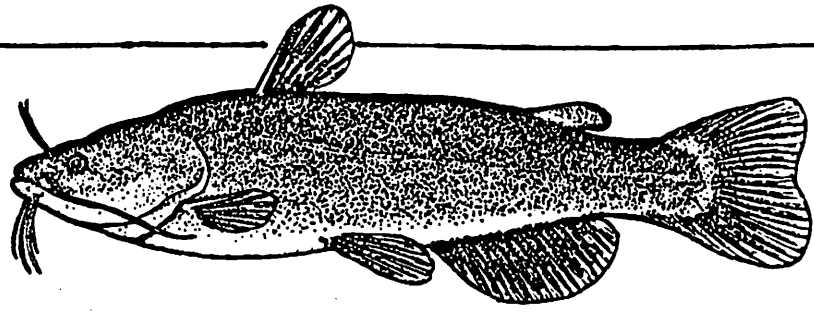


31. Bigmouth buffalo



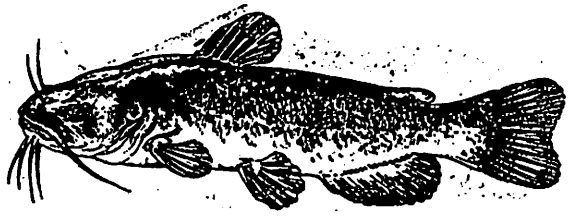
32. Shorthead redhorse

FISH

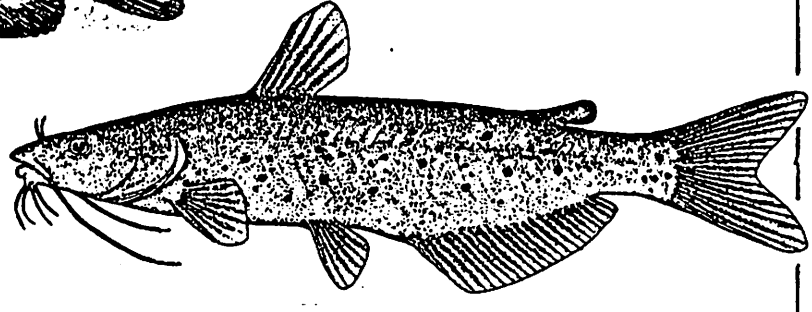


33. Black bullhead

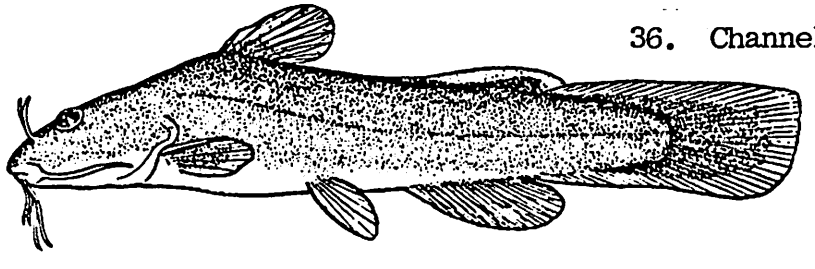
34. Yellow bullhead



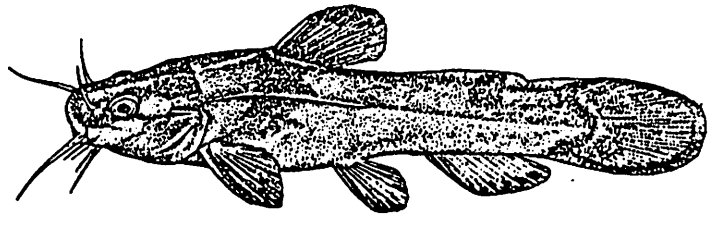
35. Brown bullhead



36. Channel catfish

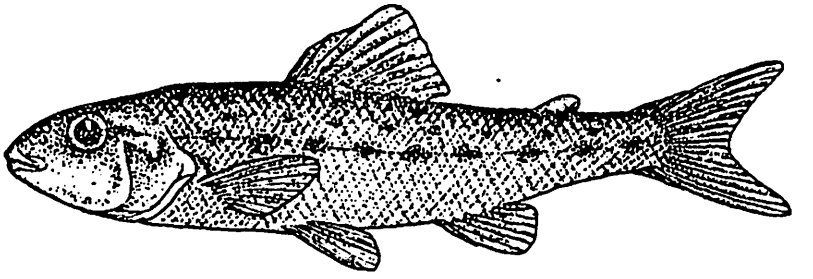


37. Stonecat

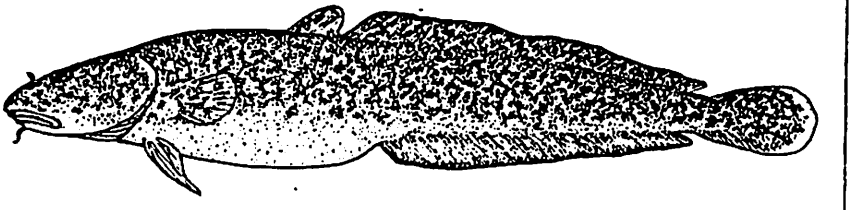


38. Brindled madtom

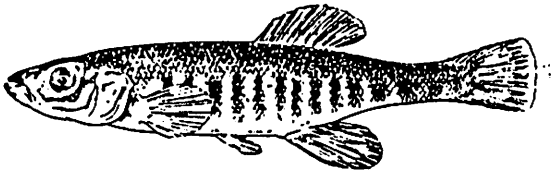
FISH



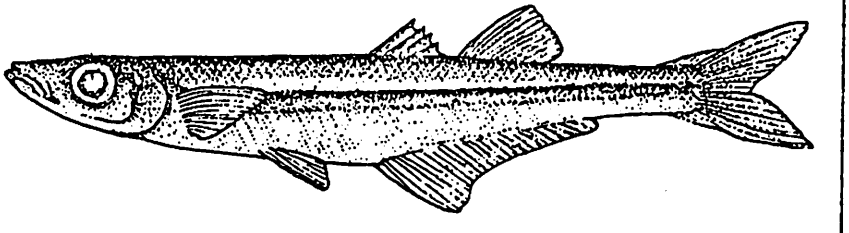
39. Trout-perch



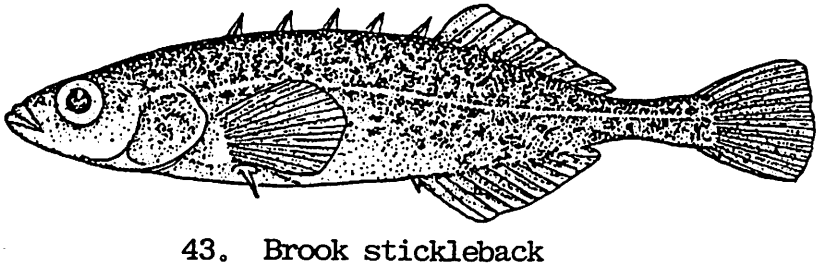
40. Burbot



41. Banded killifish

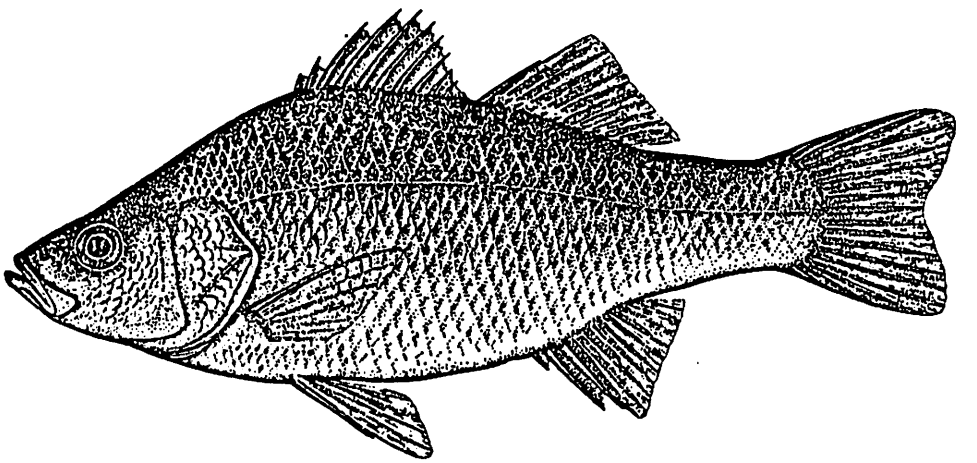


42. Brook silverside

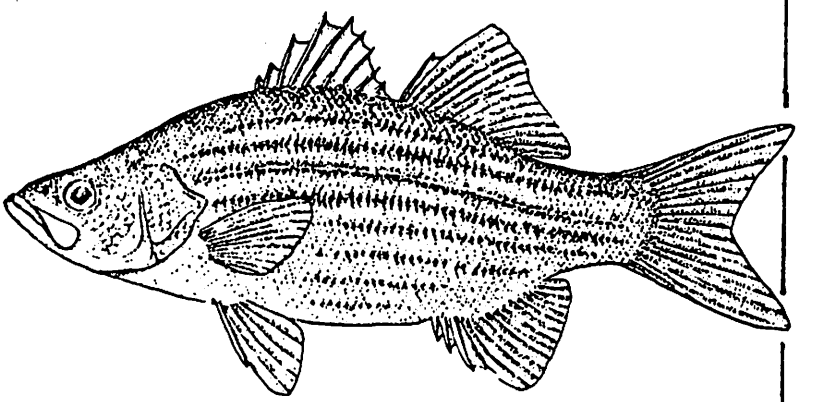


43. Brook stickleback

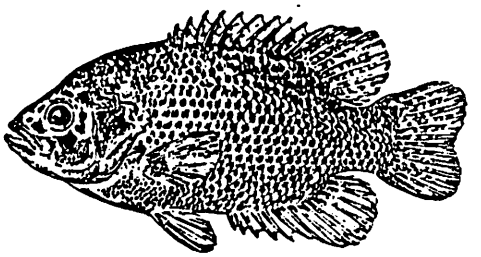
FISH



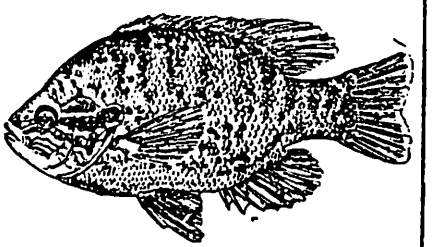
44. White perch



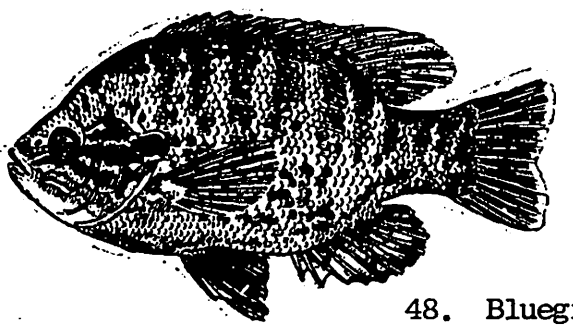
45. White bass



46. Rock bass

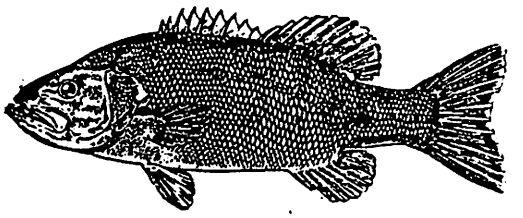


47. Pumpkin seed

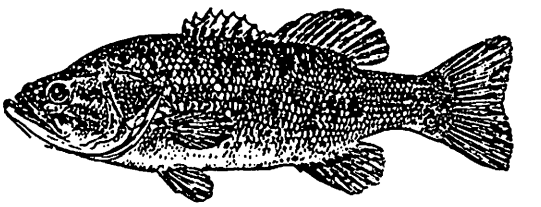


48. Bluegill

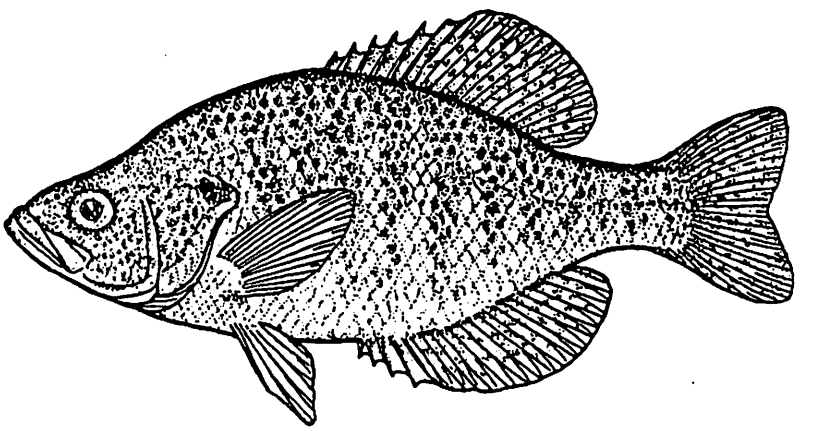
FISH



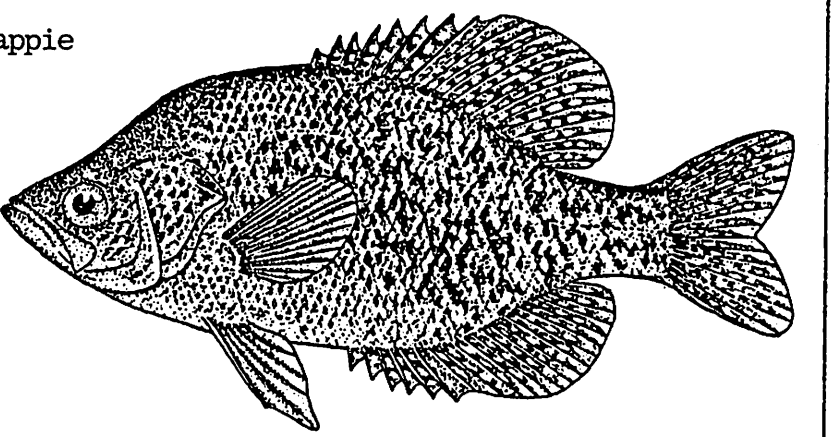
49. Smallmouth bass



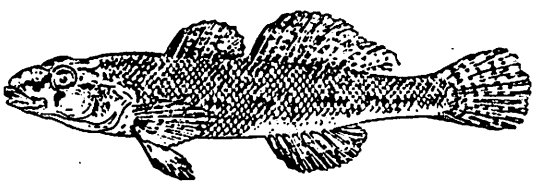
50. Largemouth bass



51. White crappie

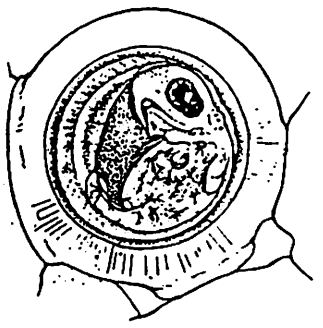


52. Black crappie

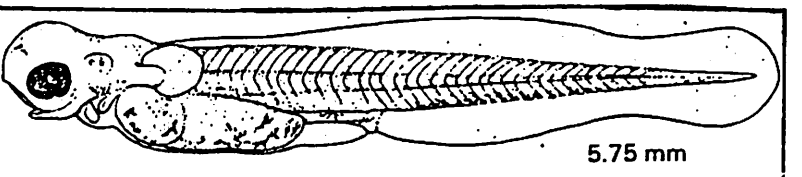


53. Johnny darter

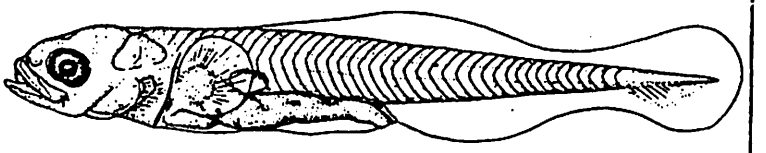
FISH



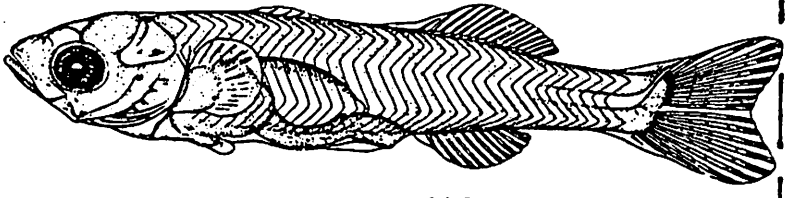
late embryo



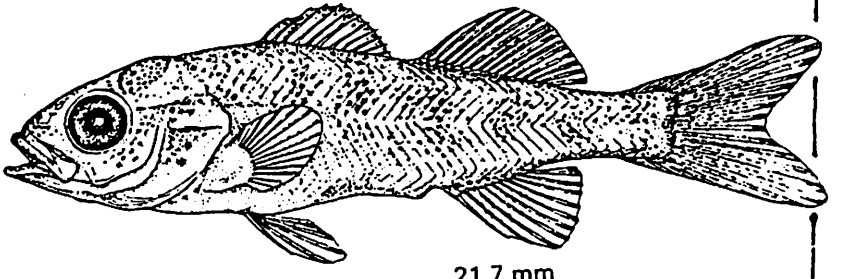
5.75 mm



8.7 mm

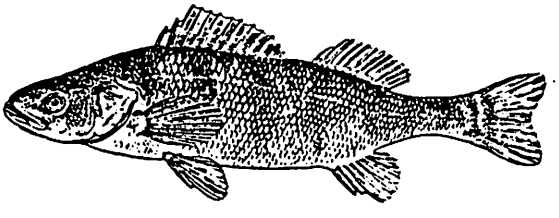


14.2 mm

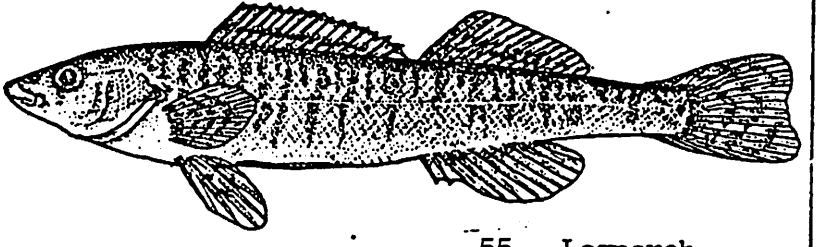


21.7 mm

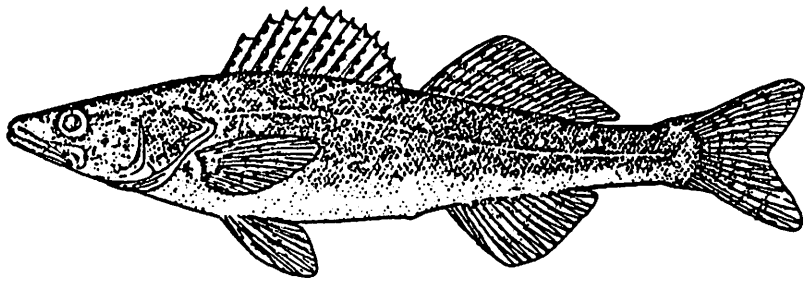
Developmental Stages of Yellow Perch



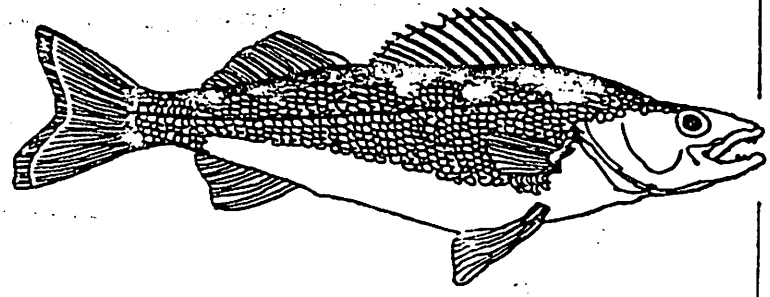
54. Yellow perch



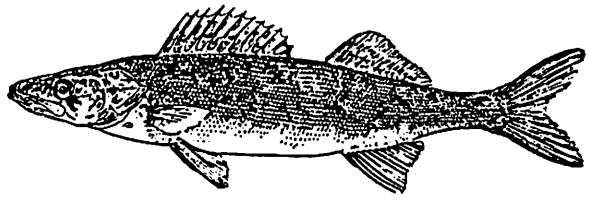
55. Logperch



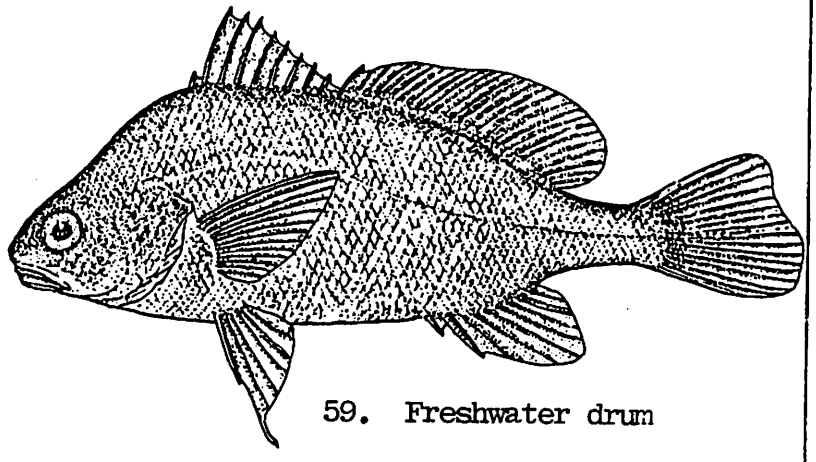
56. Sauger



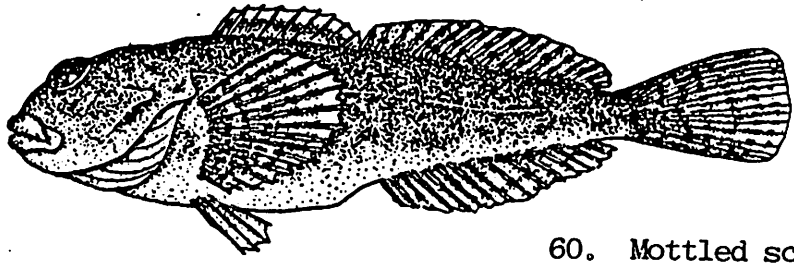
57. Blue pike



58. Walleye



59. Freshwater drum



60. Mottled sculpin

AMPHIBIANS AND REPTILES

COMMON AMPHIBIANS AND REPTILES OF THE LAKE ERIE ISLANDS REGION

Class Amphibia (amphibians)
- Order Urodela (salamanders)
  - Family Proteidae (mudpuppies and waterdogs)
    1. *Necturus maculosus* (mudpuppy)
  - Family Ambystomidae (mole salamanders)
    2. *Ambystoma jeffersonianum* (Jefferson salamander)
    3. *Ambystoma maculatum* (spotted salamander)
    4. *Ambystoma texanum* (smallmouth salamander)
    5. *Ambystoma tigrinum* (tiger salamander)
  - Family Salamandridae (newts)
    6. *Diemictylus viridescens* (red-spotted newt)
  - Family Plethodontidae (lungless salamanders)
    7. *Desmognathus fuscus fuscus* (northern dusky salamander)
    8. *Plethodon cinereus cinereus* (red-backed salamander)
- Order Salienta (toads and frogs)
  - Family Bufonidae (toads)
    9. *Bufo americanus* (American toad)
  - Family Hylidae (tree frogs)
    10. *Acris crepitans* (cricket frog)
    11. *Hyla crucifer crucifer* (spring peeper)
    12. *Pseudacris triseriata triseriata* (western chorus frog)
  - Family Ranidae (true frogs)
    13. *Rana catesbeiana* (bullfrog)
    14. *Rana pipiens* (leopard frog)
    15. *Rana pulustris* (pickerel frog)

Class Reptilia (reptiles)
- Order Chelonia (turtles)
  - Family Chelydridae (snapping turtles)
    1. *Chelydra serpentina serpentina* (snapping turtle)
  - Family Testudinidae (box and water turtles)
    2. *Chrysemys picta marginata* (midland painted turtle)
    3. *Clemmy guttata* (spotted turtle)
    4. *Emydoidea* (=Emys) *blandingi* (Blanding's turtle)
    5. *Graptemys geographica* (map turtle)
    6. *Terrapene carolina* (box turtle)
  - Family Trionychidae (softshell turtles)
    7. *Amyda* (=Trionyx) *spinifera* (spiny soft-shelled turtle)
- Order Squamata (lizards and snakes)
  - Suborder Serpentes (snakes)
    - Family Colubridae (colubrids)
      8. *Coluber constrictor* (black racer)

Family Colubridae (Continued)

9. Coluber foxi (blue racer)
10. Diadophis punctatus (ring-necked snake)
11. Elaphe obsoleta (black rat snake)
12. Elaphe vulpina (fox snake)
13. Heterodon contortrix (hog-nosed snake)
14. Natrix kirtlandii (Kirtland's water snake)
15. Natrix sipedon insularum (Lake Erie water snake)
16. Natrix sipedon sipedon (northern water snake)
17. Storeria dekayi (northern brown snake, DeKay's snake)
18. Thamnophis sirtalis (common garter snake)

Family Viperidae (vipers)

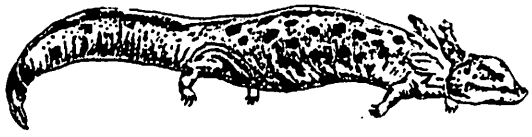
19. Crotalus horridus (timber rattlesnake)*

Suborder Lacertilia (lizards)

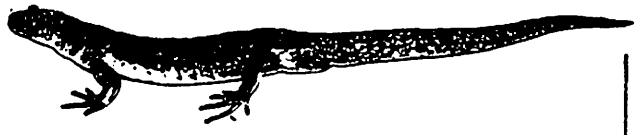
Family Scincidae (skinks)

20. Eumeces fasciatus (five-lined skink)

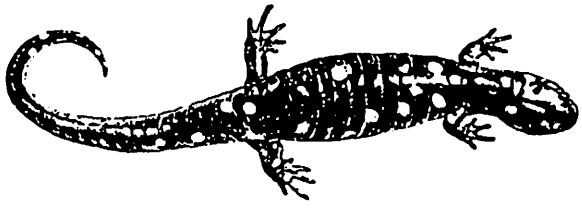
*formerly common, now rare



1. Mudpuppy



2. Jefferson salamander



3. Spotted salamander

4. Smallmouth salamander

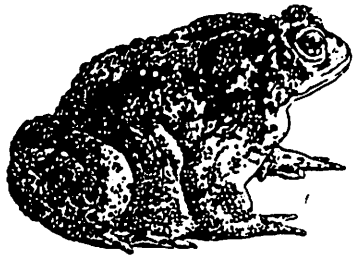
5. Tiger salamander

6. Red-spotted newt

7. Northern dusky salamander

8. Red-backed salamander

AMPHIBIANS



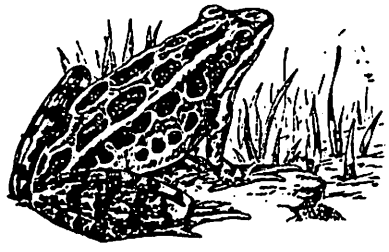
9. American toad

10. Cricket frog

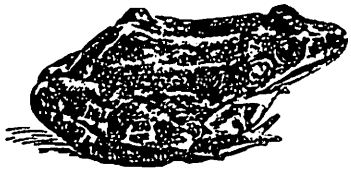
11. Spring peeper

12. Western chorus frog

13. Bullfrog

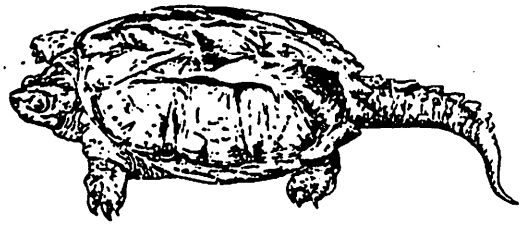


14. Leopard frog

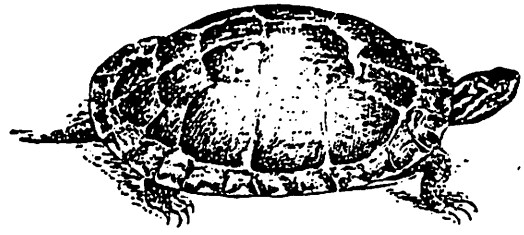


15. Pickerel frog

AMPHIBIANS



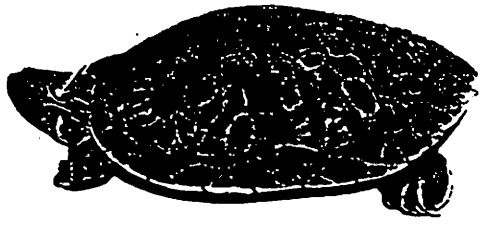
1. Snapping turtle



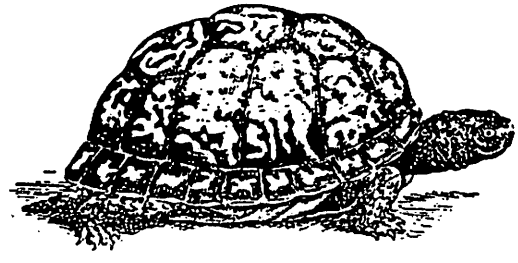
2. Midland painted turtle

3. Spotted turtle

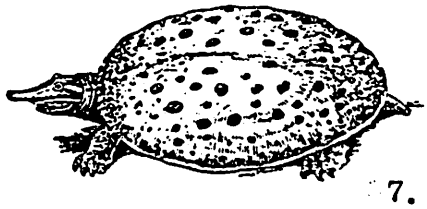
4. Blanding's turtle



5. Map Turtle

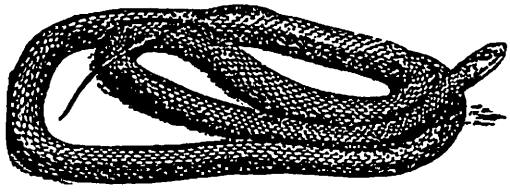


6. Box turtle



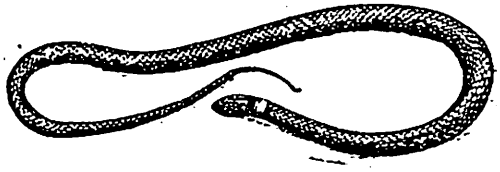
7. Spiny soft-shelled turtle

REPTILES

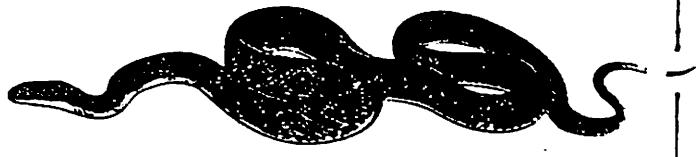


8. Black racer

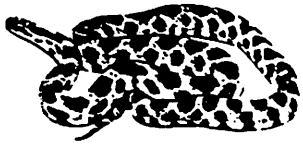
9. Blue racer



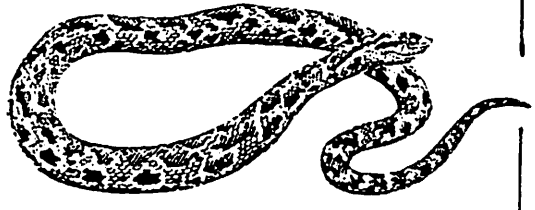
10. Ring-necked snake



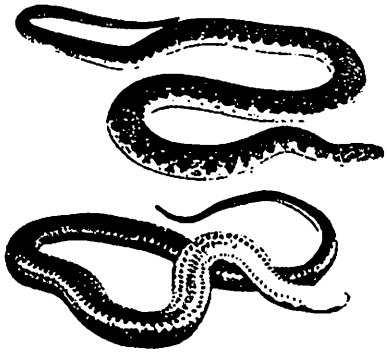
11. Black rat snake



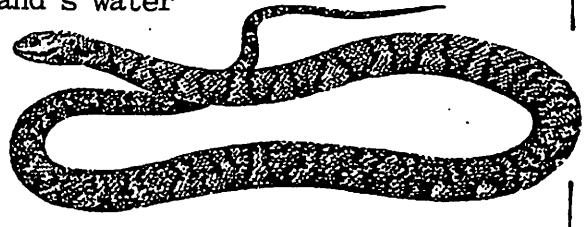
12. Fox snake



13. Hog-nosed snake

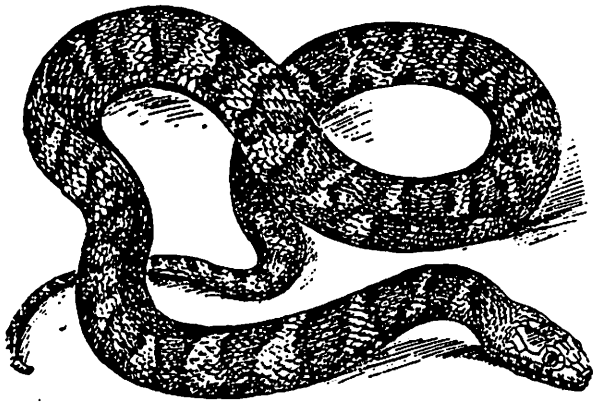


14. Kirtland's water snake

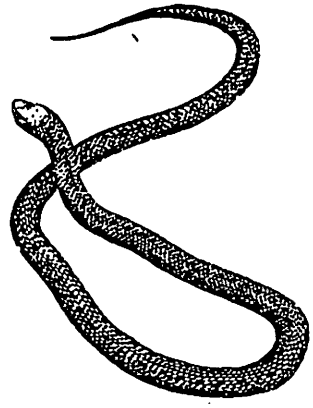


15. Lake Erie water snake

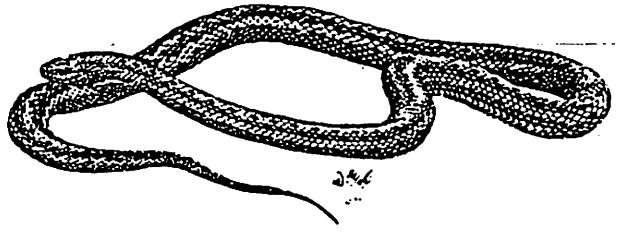
REPTILES



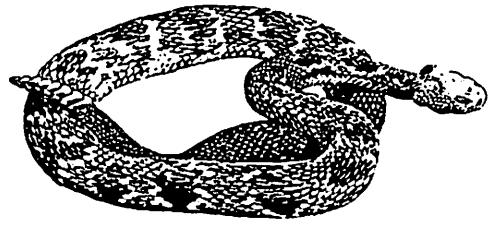
16. Northern water snake



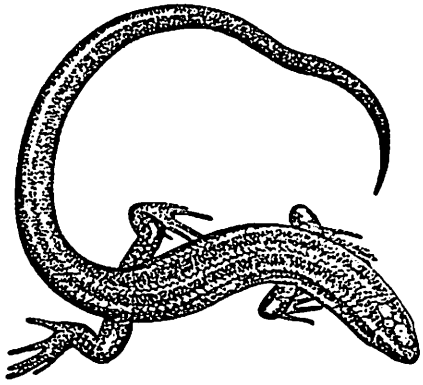
17. Northern brown snake, DeKay's snake



18. Common garter snake



19. Timber rattlesnake



20. Five-lined skink

REPTILES

BIRDS

COMMON BIRDS OF WESTERN LAKE ERIE

Class Aves (birds)	Season	Ecological Niche	Habitat
Order Gaviiformes (loons)			
Family Gaviidae (loons)			
1. *Gavia immer* (common loon)	Sp, A	waterfowl, diver	bays
Order Podicipediformes (grebes)			
Family Podicipedidae (grebes)			
2. *Podilymbus podiceps* (pied-billed grebe)	Sp, Su, A	waterfowl	wetlands, ponds, lakes
Order Pelecaniformes (full webbed swimmers)			
Family Phalacrocoracidae (cormorants)			
3. *Phalacrocorax auritus* (double-crested cormorant)	Sp, Su, A	water bird	lakes, shores
Order Ciconiiformes (herons and allies)			
Family Ardeidae			
4. *Ardea herodias herodias* (great blue heron)	Sp, Su, A	wading bird	wetlands, ponds, shores
5. *Butorides striatus virescens* (green-backed heron)	Sp, Su	wading bird	wetlands, ponds, shores
6. *Casmerodius albus egretta* (great egret)	Sp, Su, A	wading bird	wetlands, ponds, shores
7. *Nyticorax nyticorax hoactli* (black-crowned night-heron)	Sp, Su	wading bird	wetlands, shores, ponds
Order Anseriformes (waterfowl)			
Family Anatidae (waterfowl)			
Subfamily Anserinae (geese)			
8. *Branta canadensis* (Canada goose)	P	waterfowl	wetlands, ponds, bays, open fields
9. *Chen caerulescens* (snow goose)	A	waterfowl	wetlands, ponds, bays
Subfamily Anatinae (ducks)			
10. *Aix sponsa* (wood duck)	Sp, Su, A	waterfowl, dabbler	wetlands, ponds,
11. *Anas acuta* (northern pintail)	Sp, A	waterfowl, dabbler	ponds, bays, wetlands, prairies

	Season	Ecological Niche	Habitat
Subfamily Anatinae (Continued)			
12. Anas clypeata (northern shoveler)	Sp, A	waterfowl, dabbler	wetlands, ponds
13. Anas discors (blue-winged teal)	Sp, A	waterfowl, dabbler	wetlands, ponds
14. Anas platyrhynchos (mallard)	P	waterfowl, dabbler	wetlands, ponds, bays, lakes
15. Anas rubripes (American black duck)	Sp, Su, A	waterfowl, dabbler	wetlands, ponds, bays
16. Aythya affinis (lesser scaup duck)	Sp, A	waterfowl, diver	wetlands, bays
17. Aythya americana (redhead)	Sp, A	waterfowl, diver	wetlands, bays
18. Aythya valisineria (canvasback)	Sp, A	waterfowl, diver	wetlands, bays
19. Bucephala clangula (common goldeneye)	Sp	waterfowl, diver	bays
20. Mergus serrator (red-breasted merganser)	Sp, A	waterfowl, diver	bays
Order Falconiformes (birds of prey)			
Family Cathartidae (American vultures)			
21. Cathartes aura (turkey vulture)	Su	raptor	woodlands, open fields
Family Accipitridae (hawks, eagles)			
Subfamily Panioninae (ospreys)			
22, Pandion haliaetus (osprey)	Sp, Su, A	raptor	shores
Subfamily Accipitrinae (hawks)			
23. Accipiter cooperii (Cooper's hawk)	Su	raptor	woodlands
24. Accipiter striatus (sharp-shinned hawk)	Su	raptor	woodlands, brushlands
25. Buteo jamaicensis (red-tailed hawk)	P	raptor	woodlands, open fields
26. Buteo lagopus (rough-legged hawk)	P	raptor	wetlands, open fields
27. Buteo platypterus (broad-winged hawk)	Sp	raptor	woodlands
28. Haliaeetus leucocephalus (bald eagle)	P	raptor	shores

	Season	Ecological Niche	Habitat
Family Falconidae (falcons)			
29. Falco sparverius (American kestral)	P	raptor	wood edges, farmlands, openfields
Order Galliformes (fowl-like birds)			
Family Phasianidae (pheasants)			
30. Phasianus colchicus (ring-necked pheasant)	P	game bird	wetlands, edges, open fields, farm-lands, brush lands
Order Gruiformes (cranes, rails and allies)			
Family Rallidae (coots, moorhens)			
31. Fulica americana (American coot)	Sp, Su, A	waterbird	wetlands, ponds, bays
32. Gallinula chloropus (common moorhen)	Su	waterbird	wetlands
Order Chradriiformes (shorebirds, gulls, auks)			
Family Charadriidae (plovers)			
33. Charadrius vociferous (killdeer)	Sp, Su, A	wading bird	open fields, shores
Family Scolopacidae (sandpipers)			
34. Actitus macularia (spotted sandpiper)	Sp, Su, A	wading bird	gravel shores, ponds
35. Bartramia longicauda (solitary sandpiper)	Sp, A	wading bird	swamps, ponds, marshes
36. Calidris alba (sanderling)	Sp, Su, A	wading bird	shores
37. Calidris minutilla (least sandpiper)	Sp, A	wading bird	wetlands, mudflats, shores
38. Limnodromus griseus (short-billed dowitcher)	Sp, A	wading bird	mudflats, pond edges
39. Scolopax minor (American woodcock)	Sp, A	game bird	wetlands, open fields
40. Tringa flavipes (lesser yellowlegs)	Sp, A	wading bird	wetlands, mudflats, shores
41. Tringa melanoleuca (greater yellowlegs)	Sp, A	wading bird	wetlands, mudflats, ponds

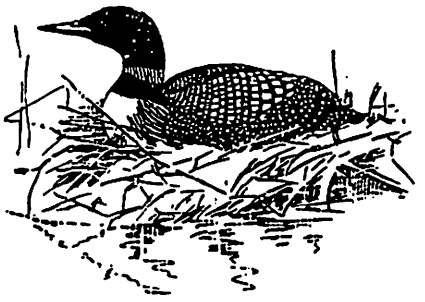
	Season	Ecological Niche	Habitat
Family Laridae (gulls, terns)			
Subfamily Larinae (gulls)			
42. Larus argentatus (herring gull)	P	water bird	bays, beaches, shores, farmlands
43. Larus delawarensis (ring-billed gull)	Su, A	water bird	bays, open water
44. Larus philadelphia (Bonaparte's gull)	Su, A	water bird	open water
Subafamily Sterninae (terns)			
45. Sterna caspia (Caspian tern)	Sp, Su, A	water bird	bays, beaches, open water
46. Sterna hirundo (common tern)	Sp, Su, A	water bird	open water, shores
Order Columbiformes (doves, pigeons)			
Family Columbidae (pigeons)			
47. Zenaida macroura (mourning dove)	Sp, Su, A	nonpasserine land bird	woodlands, farmlands
Order Cuculiformes (cuckoos)			
Family Cuculidae (cuckoos)			
48. Coccyzus americanus (yellow-billed cuckoo)	Sp, Su, A	nonpasserine land bird	woodlands, brushlands, farmlands, orchards
49. Coccyzus erythropthalmus (black-billed cuckoo)	Sp, Su, A	nonpasserine land bird	woodlands, wood edges, brushlands
Order Strigiformes (owls)			
Family Strigidae (owls)			
50. Bubo virginianus (great horned owl)	P	raptor	woodlands, open fields, brushlands
51. Nyctea scandiaca (snowy owl)	W	raptor	prairies, open fields, wetlands, beaches

	Season	Ecological Niche	Habitat
Order Apodiformes (swifts)			
Family Apodidae (swifts)			
52. *Chaetura pelagica* (chimney swift)	Sp, Su, A	nonpasserine land bird	towns
Family Trochilidae (hummingbirds)			
53. *Archilochus colubris* (ruby-throated hummingbird)	Su, A	nonpasserine land bird	wood edges, flower gardens
Order Coraciiformes (kingfishers)			
Family Alcedinidae (kingfishers)			
54. *Ceryle alcyon* (belted kingfisher)	P	nonpasserine land bird	ponds, bays, shores
Order Piciformes (woodpeckers and allies)			
Family Picidae (woodpeckers)			
55. *Colaptes auratus* (Northern flicker)	P	nonpasserine land bird	woodlands, wood edges, farmlands
56. *Picoides pubescens* (downy woodpecker)	P	nonpasserine land bird	woodlands
Order Passeriformes (perching birds)			
Family Tyrannidae (tyrant flycatchers)			
Subfamily Fluvicolinae			
57. *Contopus virens* (eastern wood pewee)	Sp, Su, A	passerine	woodlands
Subfamily Tyranninae			
58. *Myiarchus crinitus* (great crested flycatcher)	Sp, Su, A	passerine	woodlands
59. *Tyrannus tyrannus* (eastern kingbird)	Sp, Su, A	passerine	wood edges
Family Hirundinidae (swallows)			
60. *Hirundo rustica* (barn swallow)	Sp, Su, A	passerine	wetlands, shores, open fields
61. *Tachycineta bicolor* (tree swallow)	Sp, Su, A	passerine	wetlands, open fields
62. *Hirundo pyrrhonota* (cliff swallow)	Sp, Su	passerine	shores, farmlands, open fields, cliffs

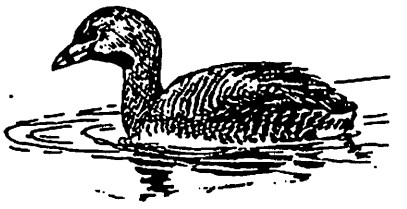
	Season	Ecological Niche	Habitat
Family Hirundinidae (Continued)			
63. Progne subis (purple martin)	Sp, Su	passerine	shores, farmlands, open fields, towns
64. Riparia riparia (bank swallow)	Sp, Su	passerine	wetlands, shores, open fields
65. Stelgidopteryx serripennis (rough-winged swallow)	Sp, Su	passerine	shores
Family Corvidae (crows, jays)			
66. Corvus brachyrhynchos (American crow)	P	passerine	shores, woodlands, farmlands
67. Cyanocitta cristata (blue jay)	P	passerine	woodlands, towns
Family Paridae (titmice)			
68. Parus atricapillus (black-capped chickadee)	P	passerine	woodlands, brushlands
Family Sittidae (nuthatches)			
69. Sitta carolinensis (white-breasted nuthatch)	P	passerine	woodlands
Family Certhiidae (creepers)			
70. Certhia americana (brown creeper)	P	passerine	woodlands
Family Troglodytidae (wrens)			
71. Thryothorus ludovicianus (Carolina wren)	P	passerine	brushlands, towns
72. Troglodytes aedon (house wren)	Sp, Su, A	passerine	woodlands, brushlands, towns
Family Muscicapidae (thrushes)			
73. Sialia sialis (eastern bluebird)	Sp	passerine	farmlands, open fields
74. Turdus migratorius (American robin)	Sp, Su, A	passerine	woodlands, farmlands, towns
Family Mimidae (mimic thrushes)			
75. Dumetella carolinensis (gray catbird)	Sp, Su, A	passerine	brushlands, towns

	Season	Ecological Niche	Habitat
Family Mimidae (Continued)			
76. *Toxostoma rufum* (brown thrasher)	Sp, Su, A	passerine	brushlands
Family Bombycillidae (waxwings)			
77. *Bombycilla cedrorum* (cedar waxwing)	P	passerine	woodlands, orchards
Family Sturnidae (starlings)			
78. *Sturnus vulgaris* (European starling)	Sp	passerine	farmlands, open fields, towns
Family Vireonidae (vireos)			
79. *Vireo flavifrons* (yellow-throated vireo)	Sp	passerine	woodlands
80. *Vireo olivaceus* (red-eyed vireo)	Sp, Su	passerine	woodlands
Family Emberizidae (warblers, sparrows and allies)			
Subfamily Parulinae (wood warblers)			
81. *Dendroica petechia* (yellow warbler)	Sp, Su	passerine	wetland edges, brushlands
82. *Geoghlypis trichas* (common yellowthroat)	Sp, Su	passerine	wetlands
83. *Setophaga ruticilla* (American redstart)	Sp, Su	passerine	woodlands
Subfamily Thraupinae (tanagers)			
84. *Piranga olivacea* (scarlet tanager)	Sp	passerine	woodlands
Subfamily Cardinalinae (cardinals, buntings)			
85. *Cardinalis cardinalis* (northern cardinal)	P	passerine	wood edges, brushlands, towns
86. *Passerina cyanea* (indigo bunting)	Sp, Su	passerine	brushlands, wood edges
Subfamily Emberizinae (juncos, sparrows, buntings)			
87. *Junco hyemalis* (dark-eyed junco)	W	passerine	woodlands, brushlands
88. *Melospiza melodia* (song sparrow)	P	passerine	wetlands, brushlands
89. *Plectrophenax nivalis* (snow bunting)	W	passerine	prairies, open fields, shores

	Season	Ecological Niche	Habitat
Subfamily Emberizinae (Continued)			
90. Spizella passerina (chipping sparrow)	Sp, Su	passerine	woodlands, farmlands, towns, orchards
91. Spizella pusilla (field sparrow)	Sp, Su, A	passerine	brushlands
Subfamily Icterinae (blackbirds, orioles, etc.)			
92. Agelaius phoeniceus (red-winged blackbird)	Sp, Su, A	passerine	wetlands, open fields
93. Dolichonyx oryzivorus (bobolink)	Su	passerine	wetlands, open fields
94. Icterus galbula (Northern oriole)	Sp, Su	passerine	woodlands
95. Molothrus ater (brown-headed cowbird)	Sp, Su, A	passerine	wood edges, open fields, farmlands
96. Quiscalus quiscula (common grackle)	Sp, Su, A	passerine	farmlands, towns
97. Sturnella magna (eastern meadowlark)	Sp, Su, A	passerine	open fields, prairies
Family Fringillidae (finches)			
98. Carduelis tristis (American goldfinch)	P	passerine	woodlands, towns
99. Carpodacus purpureus (purple finch)	Sp	passerine	woodlands, brushlands
Family Passeridae (weaver finches)			
100. Passer domesticus (house sparrow)	P	passerine	farmlands, towns



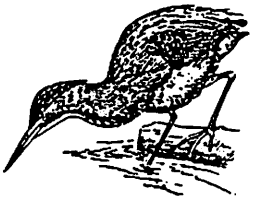
1. Common Loon



2. Pied-billed Grebe

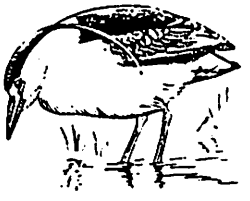
3. Double-breasted Cormorant

4. Great Blue Heron



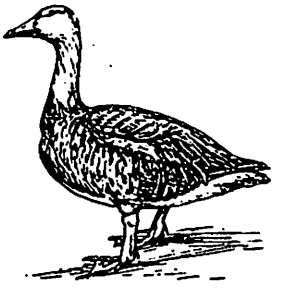
5. Green-backed Heron

6. Great Egret



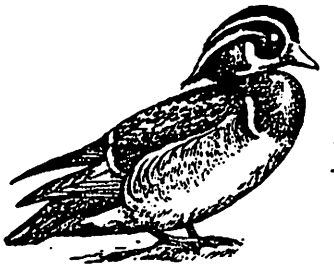
7. Black-crowned Night Heron

8. Canada Goose



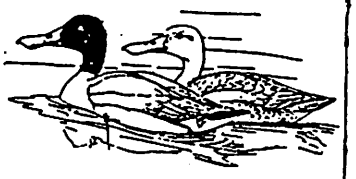
9. Snow Goose

BIRDS

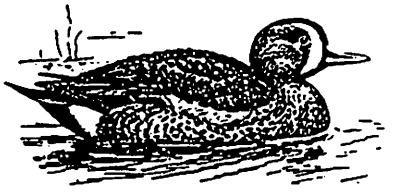


10. Wood Duck

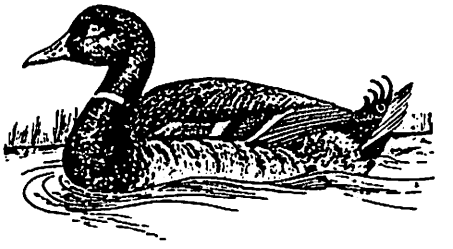
11. Northern Pintail



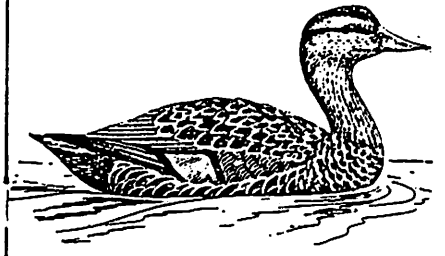
12. Northern Shoveler



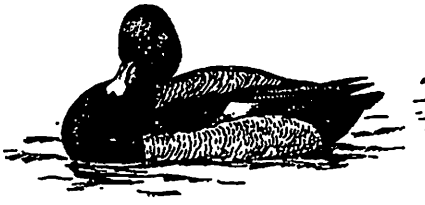
13. Blue-winged Teal



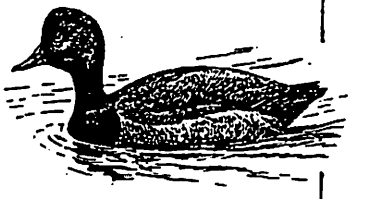
14. Mallard



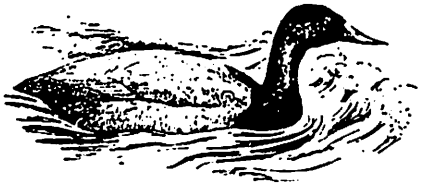
15. American Black Duck



16. Lesser Scaup Duck

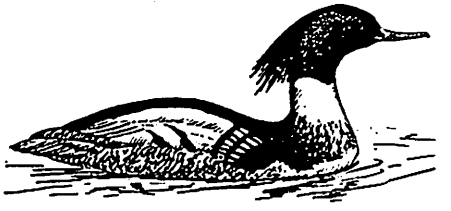


17. Redhead Duck



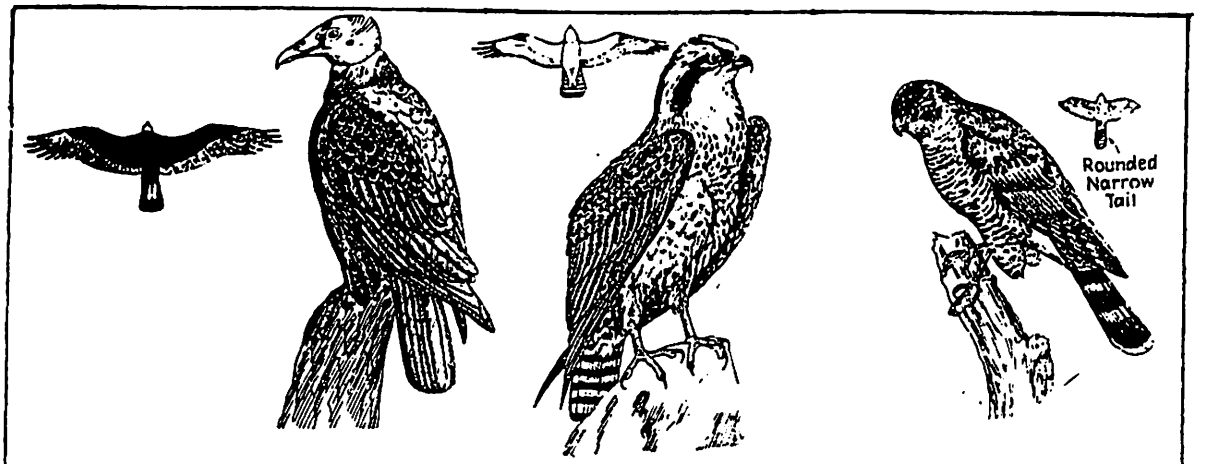
18. Canvasback Duck

19. Common Goldeneye



20. Red-breasted Merganser

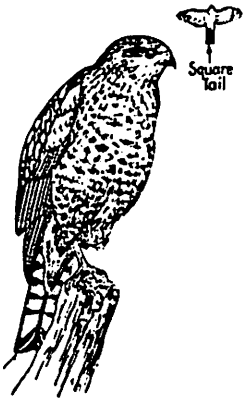
BIRDS



21. Turkey Vulture

22. Osprey

23. Cooper's Hawk

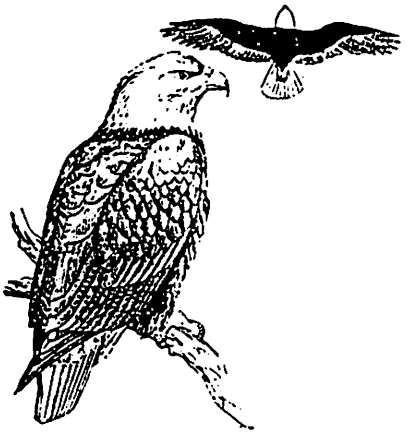


24. Sharp-shinned Hawk

25. Red-tailed Hawk

26. Rough-legged Hawk

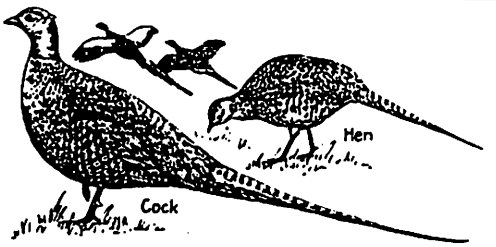
27. Broad-winged Hawk



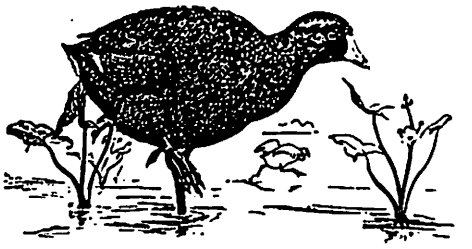
28. Bald Eagle

29. American Kestrel

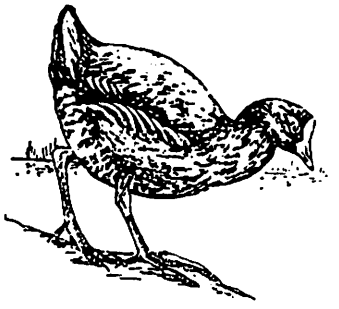
BIRDS



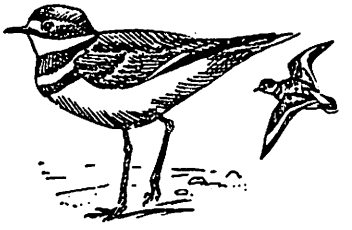
30. Ring-necked Pheasant



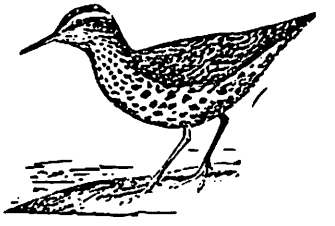
31. American Coot



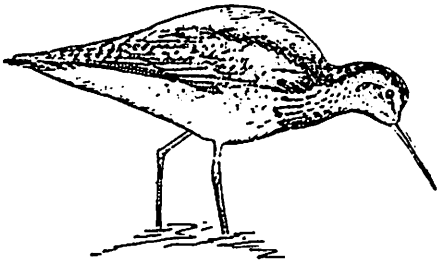
32. Common Moorhen



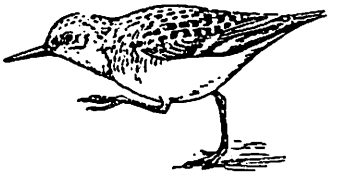
33. Killdeer



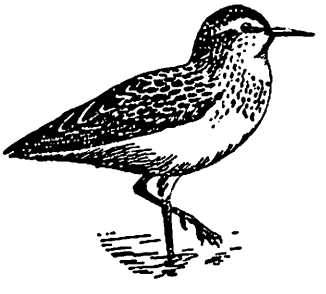
34. Spotted Sandpiper



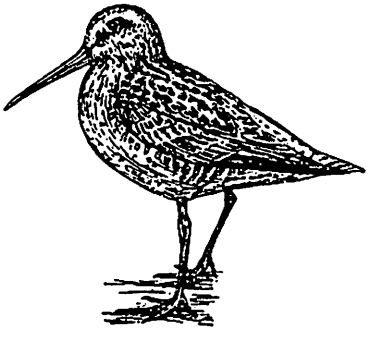
35. Solitary Sandpiper



36. Sanderling



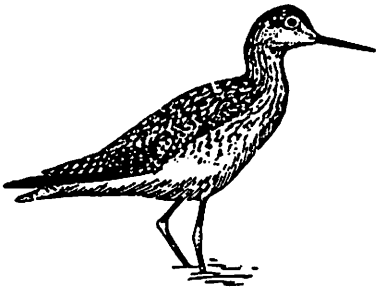
37. Least Sandpiper



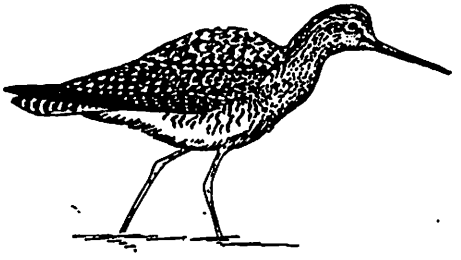
38. Short-billed Dowitcher

BIRDS

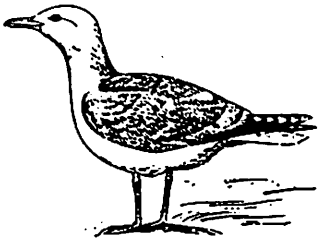
39. American Woodcock



40. Lesser Yellowlegs

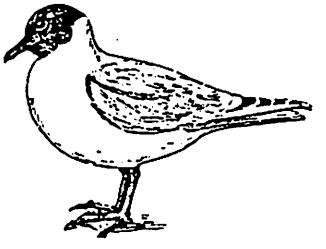


41. Greater Yellowlegs

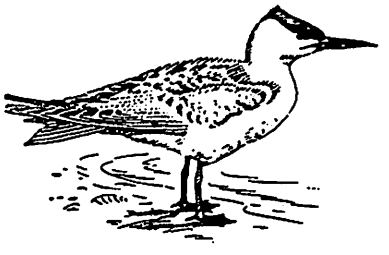


42. Herring Gull

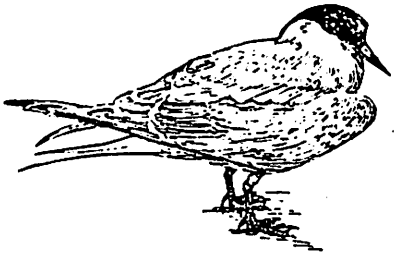
43. Ring-billed Gull



44. Bonaparte's Gull



45. Caspian Tern



46. Common Tern

BIRDS

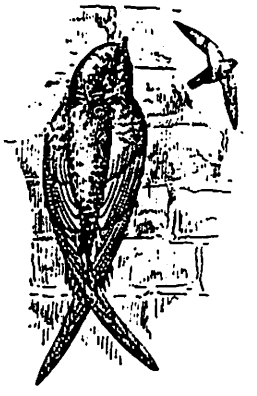
47. Mourning Dove

48. Yellow-billed Cuckoo

49. Black-billed Cuckoo

50. Great Horned Owl

51. Snowy Owl



52. Chimney Swift

53. Ruby-throated Hummingbird

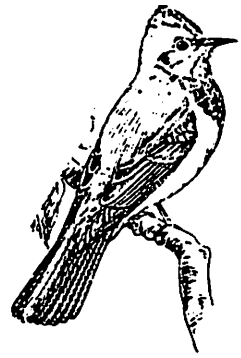
54. Belted Kingfisher

55. Northern Flicker

BIRDS

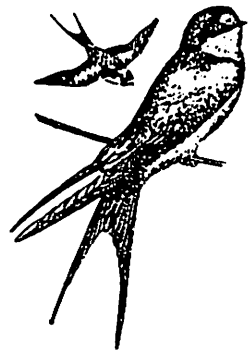
56. Downy Woodpecker

57. Eastern Wood-Pewee

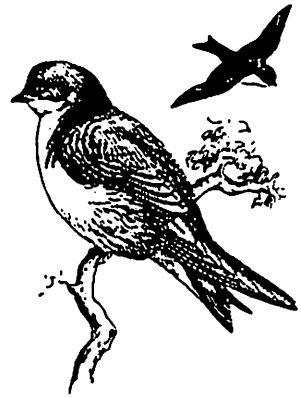


58. Great Crested Flycatcher

59. Eastern Kingbird



60. Barn Swallow



61. Tree Swallow

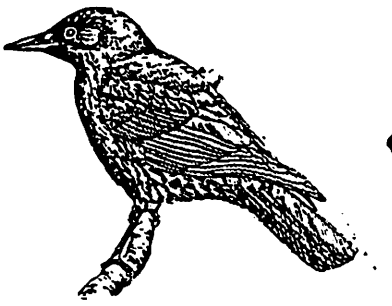
62. Cliff Swallow

63. Purple Martin

64. Bank Swallow

BIRDS

65. Northern Rough-winged Swallow



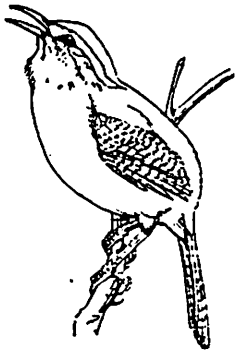
66. American Crow

67. Blue Jay

68. Black-capped Chickadee

69. White-breasted Nuthatch

70. Brown Creeper



71. Carolina Wren

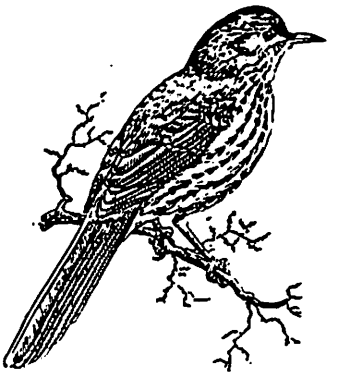
72. House Wren

73. Eastern Bluebird

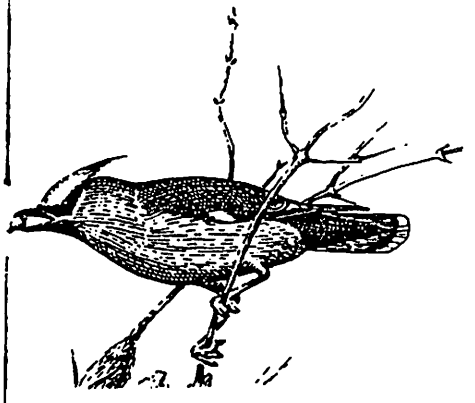
BIRDS

74. American Robin

75. Gray Catbird



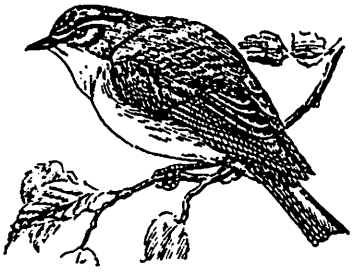
76. Brown Thrasher



77. Cedar Waxwing

78. European Starling

79. Yellow-throated Vireo



80. Red-eyed Vireo

81. Yellow Warbler

82. Common Yellow Throat

BIRDS

83. American Redstart

84. Scarlet Tanager

85. Northern Cardinal

86. Indigo Bunting

87. Dark-eyed Junco

88. Song Sparrow

89. Snow Bunting

90. Chipping Sparrow

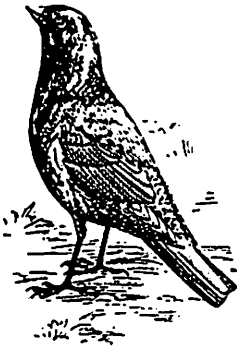
91. Field Sparrow

BIRDS

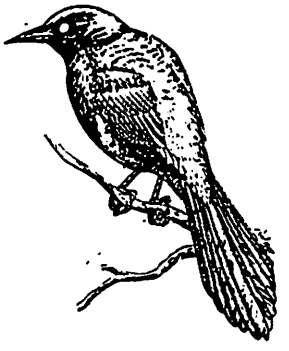
92. Red-winged Blackbird

93. Bobolink

94. Northern Oriole



95. Brown-headed Cowbird



96. Common Grackle

97. Eastern Meadowlark

98. American Goldfinch

99. Purple Finch

100. House Sparrow

BIRDS

MAMMALS

COMMON MAMMALS OF THE LAKE ERIE ISLANDS REGION

Class Mammalia (mammals)

Order Marsupialia (pouched mammals)

Family Didelphidae (oppossums)

1. *Didelphis virginiana* (Virginia oppossum)

Order Insectivora (shrews and moles)

Family Soricidae (shrews)

2. *Blarina brevicauda* (short-tailed shrew)

Family Talpidae (moles)

3. *Scalopus aquaticus* (eastern mole)

Order Chiroptera (bats or flying mammals)

Family Vespertilionidae (insect-eating bats)

4. *Lasiurus cinereus* (hoary bat)
5. *Myotis lucifagus* (little brown bat)

Order Lagomorpha (rabbits and allies)

Family Leporida (rabbits)

6. *Sylvilagus floridanus* (eastern cottontail)

Order Rodentia (rodents)

Family Sciuridae (squirrels)

7. *Marmota monax* (woodchuck)
8. *Sciurus carolinensis* (gray squirrel)
9. *Tamiasciurus hudsonius* (red squirrel)
10. *Tamias striatus* (chipmunk)

Family Cricetidae (American mice and rats)

11. *Peromyscus leucopus* (white-footed mouse)
12. *Peromyscus maniculatus* (deer mouse)
13. *Microtus pennsylvanicus* (meadow vole)
14. *Ondartra zibethicus* (muskrat)

Family Muridae (Old World mice and rats)

15. *Rattus norvegicus* (Norway rat)
16. *Mus musculus* (house mouse)

Family Zapodidae (jumping mice)

17. *Zapus hudsonius* (meadow jumping mouse)

Order Carnivora (flesh-eaters)

Family Canidae (dogs and allies)

18. *Urocyon cinereoargenteus* (gray fox)
19. *Vulpes fulva* (red fox)

Family Procyonidae (racoons and allies)

20. *Procyon lotor* (racoon)

Family Mustelidae (weasels and allies)

21. Mustela frenata (long-tailed weasel)*

Family Mustelidae (Continued)

22. Mustela nivalis (least weasel)*
23. Mustela vison (mink)*
24. Mephitis mephitis (striped skunk)

Order Artiocactyla

Family Cervidae

25. Odocoileus viginianus (white-tailed deer)

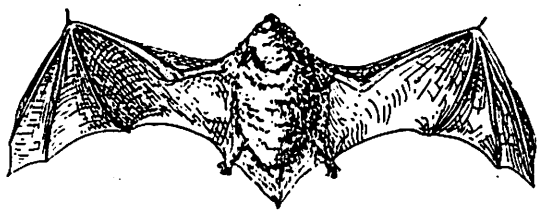
*formerly common, now rare

1. Virginia oppossum

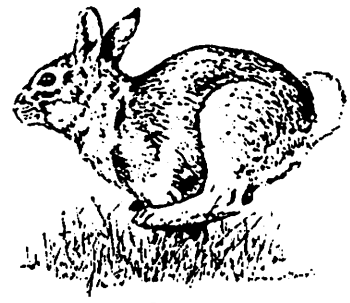
2. Short-tailed shrew

3. Eastern mole

4. Hoary bat



5. Little brown bat



6. Eastern cottontail

7. Woodchuck

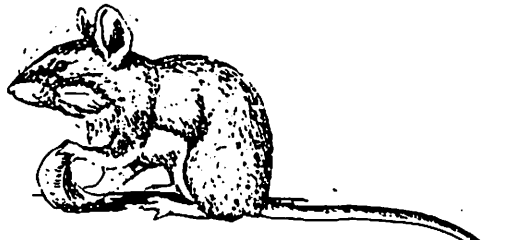
MAMMALS

8. Gray squirrel

9. Red squirrel

10. Chipmunk

11. White-footed mouse

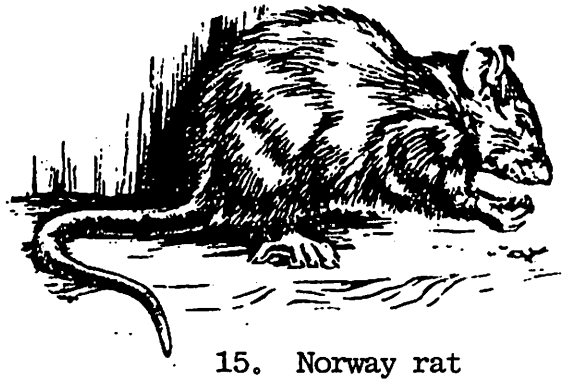


12. Deer mouse

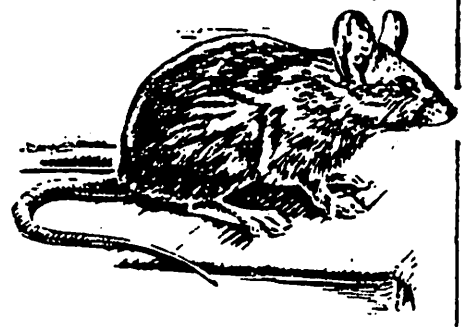
13. Meadow vole

14. Muskrat

MAMMALS

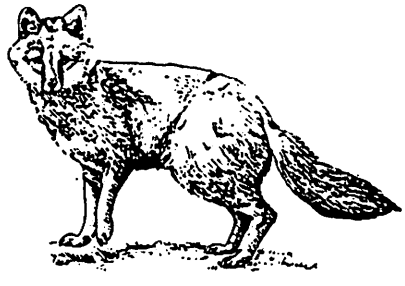


15. Norway rat

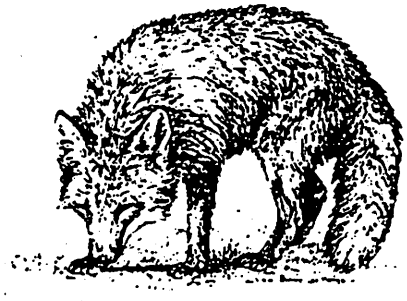


16. House mouse

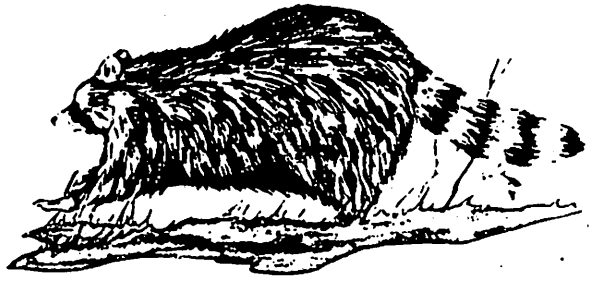
17. Meadow jumping mouse



18. Gray vox

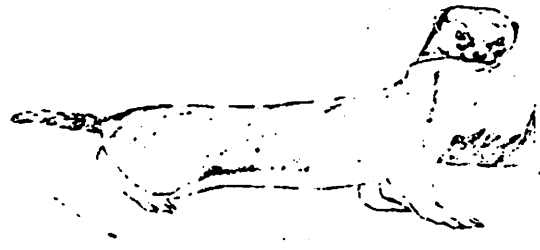


19. Red fox

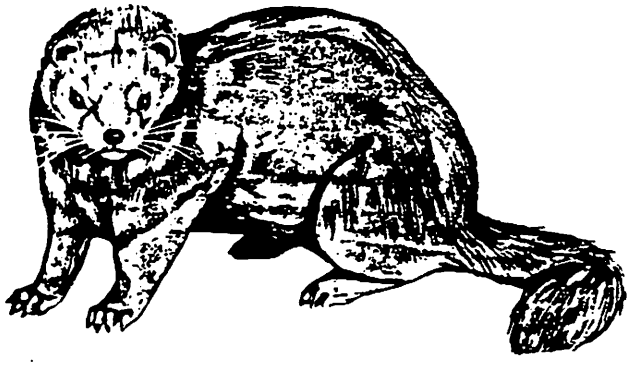


20. Raccoon

21. Long-tailed weasel



22. Least weasel



23. Mink

24. Striped skunk

25. White-tailed deer

ROCKS AND MINERALS

ROCKS AND MINERALS OF SOUTH BASS ISLAND

Various aspects of South Bass Island geology have received attention of investigators in the past. As a result there is probably as much known about the nature and origin of the island as of any other Ohio area of similar size. The first detailed study appears to have been that of Newberry in 1873. In his report to the Ohio Geological Survey, he discussed the stratigraphy, paleontology, and glacial sculpturing of the island and included several remarks on the caves and minerals found there. The origin of the island archipelago, of which South Bass is a major component, has been interpreted by Carman (1946). The island caves, of interest to tourist and geologist alike, have been extensively studied by Kraus (1905), Cottingham (1919), White (1926), Langlois (1951), and Verber and Stansbery (1953). The most detailed study of the island is that of Mohr (1931), in which almost every aspect of island geology has been covered with the exception of the mineral deposits.

Despite the coverage given most phases of island geology, very little information has been found concerning the minerals native to its bedrock. It seems probable that this apparent lack of interest is due to the absence of any known deposits which could be profitably mined. Some tons of celestite crystals were removed from Crystal Cave soon after its discovery in 1897 but it was decided that it would have far greater value as a tourist attraction in its native state in the cave than on the market. The remaining deposit has been carefully preserved to date.

During the period 1951-1955, Professor David H. Stansbery had an opportunity to study the rock outcrops on the island. The bedrock was observed in three different types of localities, each yeilding information of a different sort, but all adding to the understanding of the geology of the region. These three locality types are the cliff-like shore outcrops, surface outcroppings in the

island's interior and many island caves. Vertical sections observed along the west shore and in caves greatly simplified the task of tracing the rock strata. All mineral specimens were collected either from the cliff faces or from the caves. Inland areas where the glacial till has been removed from the rock surface gave interesting views of glacial grooves and striations, but yielded little in the way of minerals.

In discussing the minerals of the Bass Islands, Newberry (1873) stated: "....here we find the interstices of the brecciated rock not unfrequently filled with masses of calc spar (calcite), sulphate of baryta (barite), sulphate of strontia (celestite), and native sulphur." No additions to this list or confirmation of the occurrence of barite or sulphur has been found in a search of subsequent literature on island geology.

Celestite

The most abundant island mineral appears to be celestite, the most spectacular deposit being that in Crystal Cave at the Heineman Winery. Here it occurs as large bluish transparent crystals, some exceeding 15 inches in length and 3 inches in thickness. Smaller crystals of the same type are found at several places along the west shore and in at least one of the other island caves. Several specimens taken from Kindts' Cave were covered with a thick layer of travertine and would have been unidentifiable to the eye but for the characteristic crystalline form. Celestite also occurs as large white concretionary masses in the massive stratum of dolomite exposed on the cliff face of the west shore. The mineral here is of a fibrous texture and usually milky opaque. Many of these latter deposits measure several feet in diameter and appear to be or have been almost spherical.

Sulphur

Several smaller celestite concretions collected along the west shore contained

small bright yellow crystals of native sulphur. These were the only sulphur specimens collected in this study. It may be that the deposits mentioned by Newberry have since eroded away or they may have been found on one of the other two islands of the group.

Calcite

Calcite assumes a variety of forms on the island. It is usually found as "dog tooth spar" lining the inner walls of fractures and pockets exposed along the shore. Some specimens exhibit all-but-transparent hexagonal crystals while others are opaque granular masses. At one site on the southeast shore, clear calcite has filled several exposed joints, and a number of perfect cleavage rhombs of the mineral have been taken there. This locality may be easily located by following the beach until one finds water-worn snow-white pebbles of this mineral.

Barite

Only one barite deposit of appreciable magnitude has been discovered on the island. The crystals here are small (0-5 mm), numerous and milky white. They have been found encasing calcite crystals indicating that they were formed after that mineral. This deposit is located in the massive dolomite stratum along the west shore just north of the present state park. Many specimens of very small transparent barite crystals have been collected along the southern portion of the west shore but they were mostly isolated deposits no larger than 3 cm in diameter.

Quartz

In several of the thin bedded strata of dolomite along the west shore, numerous small cherty concretions have been found. While most of these quartz deposits appear to contain a large percentage of impurities, several held small transparent

quartz crystals. One such geode held crystals of translucent blue amethyst. Several specimens of transparent quartz crystals have been found along the west and south shores, but none over 2 mm in length.

Epsomite

One might expect water soluble minerals to be absent in a bedrock so extensively jointed. A single deposit of epsomite was found, however, in a sheltered pcoket in the west shore cliff near the base of the Victory Anticline. Several quart jars of this brittle fibrous white mineral were removed from the recessed deposit with a spoon. The cliff at this site is periodically drenched with the water from breaking waves during storms. In view of this, it seems likely that the epsomite may be deposited here between storms by the local evaporation of mineral-bearing ground water.

Travertine

Many of the island caves exhibit stalactitic formations of several varieties. Not only is travertine present as stalactites and stalagmites, but portions of several cave floors are covered with this "flow stone." Travertine may also be found under some overhanging rock ledges along the shore.

Marcasite

The Tymochtee shaly dolomite at the base of the Victory Anticline has included within it small, marble-sized aggregations of silver-green cock's comb crystals of marcasite. This mineral, one of the iron sulphides, somewhat resembles iron pyrite (fool's gold) in hardness, color, and acid solubility. Both give the odor of sulfur when struck with a hammer but their crystalline structure is distinctly different. Perfect crystals were recovered from the dolomite by dissolving the surrounding matrix in an acid solution. Iron pyrite was not found in this study. Marcasite, however, was located at several places

in the cliff side between the state park and the south point light.

Other Minerals

A thorough search of the island caves and outcrops failed to reveal any gypsum deposits although it has been found at a depth of 60-100 feet in island well drilling operations.

Specimens of selenite and fluorite have been found on the island but, so far as I can determine, never in the bedrock. Fluorite of the type found has been recorded for nearby Rattlesnake Island (Newberry 1873) and several fine specimens were collected from that island in 1955. Gilbert (1873) reported selenite for West Sister Island. These minerals may have been transported to South Bass Island and later discarded.

Other minerals of igneous and metamorphic origin have been found in the glacial till, but these have not been observed in the bedrock. I assume, therefore, that they were transported to the island from the Canadian shield by glaciers some 12,000 or more years ago.

The manner of deposition of the island's native minerals remains to be solved. Newberry (1873) suggested deposition by thermal springs but this does not seem likely in view of several facts which have been discovered within the past half century. At the time of Newberry's survey, the nature of the deep-lying rock strata beneath Ohio's broad expanse of sedimentary deposits was not known. It was perhaps assumed that igneous masses of a molten or near-molten state lay just beneath a relatively thin sedimentary crust. Well records (Hubbard 1932) have since shown that the first non-sedimentary rocks lie 3,000 to 4,000 feet below the surface of Ohio. These rocks are metamorphic in nature and lie immediately beneath sedimentary strata which have not been metamorphosed. It seems unlikely that mineral bearing springs would rise from such a great depth in view of the fact that those strata lying just above the metamorphic rocks

habe not been so altered. This indicates that the underlying rocks were formed and modified before the deposition of the overlying sedimentary strata.

Knowing little about mineral formation, I will leave the answer to this problem to those qualified to give it. The possibility of formation by evaporation or be precipitation out of a saturated solution does, however, seem more likely in view of the evidence than the method previously suggested.

ROCKS AND MINERAL CHARACTERISTICS

Rocks and minerals have characteristic physical properties. The most common are:

1. Hardness: Rocks and minerals vary greatly in hardness. It is possible to scratch a specimen with the sharp edge of a harder mineral provided enough pressure is applied. Moh's scale of hardness is such that the hardest mineral is number 10 and the softest is number 1. The hardness of some of the common minerals is as follows:

HARDNESS	MINERAL
1	Talc
2	Gypsum
3	Calcite
4	Fluorite
5	Apatite
6	Orthoclase - feldspar
7	Quartz
8	Topaz
9	Corundum
10	Diamond

The thumb nail scratches number 2. A copper coin scratches and is scratched by number 3. Glass scratches and is scratched by number 5. A knife blade has the hardness of about 5½-6. Keep in mind that impure minerals may vary in hardness.

2. Color: The color of rocks or minerals is due to the light reflecting from the specimen to the eye. Some may have several colors, such as

Fluorite, Quartz, Granite, Calcite, Orthoclase, chert or flint, bauxite and kaolin. Some rocks are composed of 20 or more different kinds of rocks and minerals.

3. Luster: The luster of rocks or minerals depends upon its composition and the quality and intensity of the light which is reflected from its surface. Many terms are used to describe luster such as, metallic, non-metallic, vitreous (glass), silky, pearly, dull or earthy, resinous, greasy, and adamantine (brilliant).
4. Streak: Streak is the color of the mark a specimen makes when it is rubbed across a porcelain or streak plate. The streak usually agrees with the color of the specimen, but not always.
5. Cleavage: The tendency that some minerals have to break along smooth planes in definite directions is called cleavage. Some minerals have as many as six cleavage planes while other minerals have no cleavage.
6. Fracture: When specimens having no cleavage are broken, the break is irregular and is called a fracture.

    A. Some fractures tend to have surfaces that are irregularly curved in or out. A fracture of this type is called a conchoidal.

7. Weight: The specific gravity of a rock or mineral is its weight compared to an equal volume of water. Quartz is considered to have an average specific gravity for minerals.
8. Crystal form: When pure, most rocks or minerals will crystallize into definite forms. These forms follow certain geometric arrangements. Crystals are easy to recognize but care should be exerted to not confuse cleavage with crystal forms.

KEY TO COMMON ROCKS

1. Porous rocks, very light in weight, frothy in texture - 2

1. Non-porous rocks, relatively heavy, sinking in water - 3

2. Dissolves in water; tastes salty. DESERT SALT CRUST

2. Bubble under hydrochloric acid. Calcareous TUFA

2. Does not form bubbles under acid. Volcanic PUMICE.

3. Rocks composed of small grains, crystals or pebbles large enough to be seen with the naked eye or under a hand lens - 4

3. Rocks composed of rather large crystals, fragments or pebbles, some particles exceeding one-half inch in size - 14

3. Rocks dense in texture, with no separate particles visible to the naked eye or under a lens - 17

4. More than one mineral present; more than one color apparent, "salt and pepper" patterns - 5

4. One mineral in excess; one color predominates - 8

5. Minerals in rather distinct layers or bands - 6

5. Minerals not arranged in distinct layers; rather uniform pattern of colors throughout the specimen - 7

6. Banding conspicuous and of varying width; structure solid; gray, white, pink or red varieties; generally light-colored. GNEISS

6. Bands very narrow; rarely wavy; structure flaky; generally dark-colored. SCHIST

7. <u>With</u> quartz grains that appear glassy under a lens and/or with mica and/or other blackish minerals throughout; generally rather coarsely crystalline; occurring in gray, whitish, pink or even red varieties. GRANITE See also #26 inkey, to felsite.

7. <u>Without</u> quartz; much more feldspar (a light-colored mineral) than mica and/or hornblende (a black mineral). Generally coarsely crystalline and light gray in color. SYENITE

7. <u>Without</u> quartz; with more hornblende than feldspar. DIORITE

8. Mostly light-colored, very hard, glassy crystals. QUARTZ (*)

Mostly sand particles visible, or otherwise not as above - 9

9. Mostly sand particles present; will scratch glass - 10

9. Mostly blackish or greenish crystals present - 11

9. Mostly grayish, whitish or brownish grains present; will not scratch glass - 12

10. Crumbles when scratched with an iron nail. SANDSTONE

10. Too hard to be crumbled with a nail. QUARTZITE

11. With needle-like crystals, yielding fibers when scratched or when scraped lightly with a nail. ASBESTOS

11. Coarse-grained; crystals easily seen with the naked eye; color very dark, often greenish, with "salt-and-pepper" pattern GABBRO

11. Fine-grained; crystals visible under a hand lens; freshly broken surfaces should be examined. DIABASE (gray); SERPENTINE (greenish).

12. Dissolves in water; tastes salty. SEA SALT

12. Bubbles plainly visible under acid - 13

12. Bubbles hardly visible under acid, except with magnifier. DOLOMITE

13. Crystalline structure visible on close inspection. MARBLE

13. No crystals visible, except, rarely, calcite in "Pockets." LIMESTONE

Rocks Composed of Rather Large Fragments

14. Well-rounded pebbles and sand grains cemented together like "plums" in a pudding. CONGLOMERATE

14. Angular, irregular fragments cemented together with fine materials. BRECCIA. In volcanic regions the similar LAVA PORPHYRY may occur.

14. Rocks of coarse crystals or similar fragments with no cement or apparently none; fused or pressed together - 15

15. Jet-black; scratched or crumbled easily with nail. BITUMINOUS COAL

15. Foaming under acid; scratched easily with a nail. CALCITE (*)

15. Not forming bubbles under acid; much harder than iron nail - 16

16. Rock consisting of more than one kind of mineral. PEGMATITE

16. Rock coated with tiny glassy crystals. DRUSY QUARTZ (*)

16. Hollow rocks lined with glassy crystals. GEODE

Rocks Dense in Texture; Non-crystalline, or with Microscopic Granules invisible to the Naked Eye or Under a Hand lens.

17. Scratched easily with fingernail or quill - 18

17. Not as above; scratched easily with an iron nail - 19

CONSTRUCTING A ROCK KEY

OBJECTIVE: To assist student to observe differences and similarities in the characteristics of rocks.

To help to clarify concepts about the structure, nature, and organization of knowledge.

PROCEDURES: 1. Take the student into the field to collect rocks. The number of different types required for a challenge depends upon the age level. Primary children may need only 6 or 8 different rocks, older children may want a dozen or more.

2. Have the students work individually or in teams.

3. The rocks should be put into piles, all the like specimens piled together.

4. Select one typcial or "Type" specimen from each pile. Line these in a row and attach a number (masking tape or marking pencil) so as to identify each specimen with its group.

5. Examine the "Type" specimens closely. Find a character, description, or adjective dividing these specimens into two groups, each containing one or more specimens. Record this description at "A" in your outline, and list after it the rocks fitting this description.

6. Record the opposite condition at "AA" in your outline and list the specimens meeting its condition.

7. Work with the "A" specimens. Identify a character to divide them into two groups. Record at "B" and the opposite under "BB" (under

the main heading A.) List the rocks fitting into the "B" category and the "BB" category. Continue through the outline until only one specimen is in each group. Repeat with the "AA".

8. Checking: Select an unused specimen from one of the original piles. Read the "A" and "AA" descriptions and determine under which this specimen belongs. Continue through the outline until you have the number assigned to a type specimen. Compare this rock with that type specimen. Are they the same? Repeat this several times. If successful, appropriate descriptions were apparently used.

9. Assign a descriptive name to replace each of the numbers. By doing so, you have followed a procedure similar to that used by scientists to categorize and name objects.

10. Have teams switch specimens and "keys" to find if they can identify each others rocks and determine the names given to them.

TAXONOMIC KEYS

DICHOTOMOUS KEY TO MAJOR GROUPS OF PLANKTONIC ORGANISMS

1.	Cells essentially submicroscopic	bacteria
	Cells <u>not</u> submicroscopic (phytoplankton and zooplankton) .	2
2.	Greenish (occasionally brownish) pigment present (phytoplankton)	3
	Greenish pigment absent (zooplankton)	10
3.	Pigment bluish-green, diffuse throughout cells	blue-green algae
	Pigment grass-green, yellow-green, or brownish, pigment generally localized in chromatophores	4
4.	Pigment yellow-green or brownish, cell wall composed of two nearly equal halves (Chrysophyta)	5
	Pigment grass-green, cell wall not subdivided	6
5.	Cells capsule-like, walls definitely composed of two silicious valves (which may be ornamented with regular bumps and striations)	diatoms
	Cells not capsule-like, walls not composed of silicious valves	golden-brown algae
6.	Flagella present	7
	Flagella absent (Chlorophyta)	8
7.	Transverse furrow generally present, body generally armored with plates	dinoflagellates
	Transverse furrow generally absent, unarmored nucleus generally conspicuous, gullet often present and conspicuous, cells sometimes arranged in regular colonies	euglenoids and other plant-like flagellates
8.	Cells divided into distinct halves by median constriction, mostly unicellular (or weakly filamentous)	desmids
	Cells not divided by median constriction	9

9. Cells arranged in long filamentous colonies (which may be branched) . . . . . filamentous green algae

   Cells not arranged in filamentous colonies . . . . . other green algae

10. Body organization unicellular or colonial with no true tissues or organs present (Protozoa) 11

    Body organization multicellular (tissues and complex organs present) 12

11. Pseudopodia present, no cilia, shell cases may be present (Class Sarcodina) . . . . . rhizopods and heliozoans

    With cilia (Class Ciliata) . . . . . ciliates

12. Body form slender and worm-like 13

    Body form not worm-like 14

13. Body nonsegmented . . . . . nematodes

    Body segmented . . . . . annelids

14. Jointed appendages absent, body with one or two terminal ciliated rings (may be withdrawn), body may be encased in shell or case (Rotifera) . . . . . rotifers

    Jointed appendages present, ciliated rings absent (Arthropoda, Class Crustacea) 15

15. Trunk appendages flattened and mostly enclosed in paired valves, body form bird-like . . . . . cladocerans

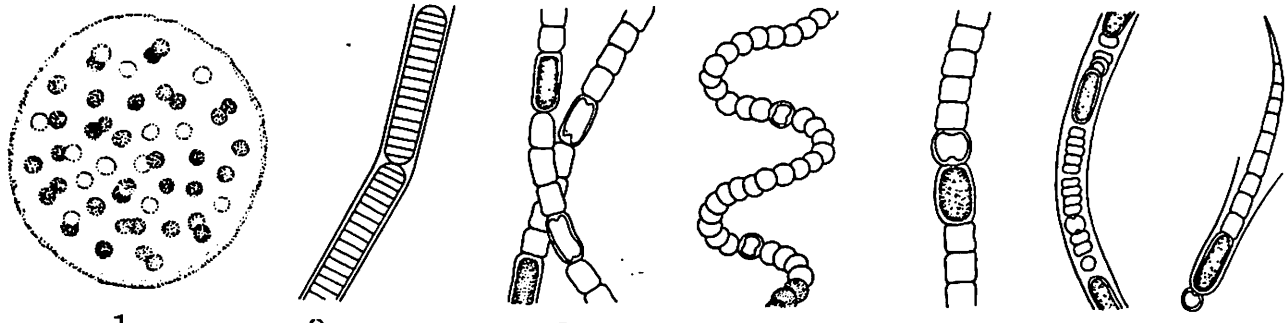
    Trunk appendages slender and jointed, body form not bird-like 16

16. Body entirely enclosed in paired valves, body form bean-like . . . . . ostracods

    Body not enclosed in paired valves, body segmentation obvious, body elongated, not bean-like, anterior appendages enlarged for swimming . . . . . copepods

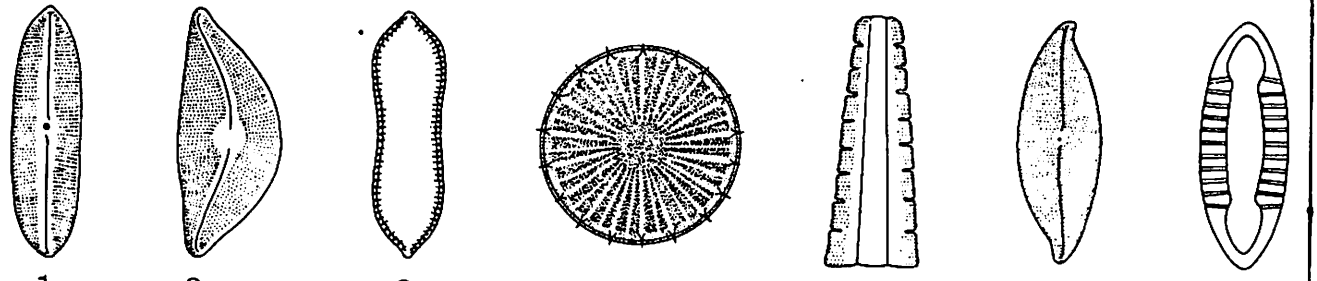
PICTORIAL KEY TO COMMON PLANKTONIC ORGANISMS

A. Blue-green Algae



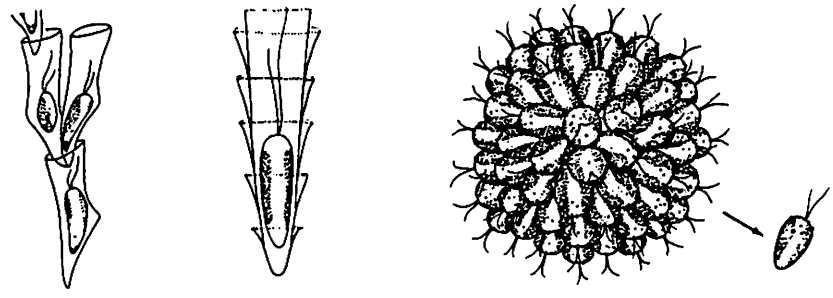
1. 2. 3. 4. 5. 6. 7.

B. Diatoms



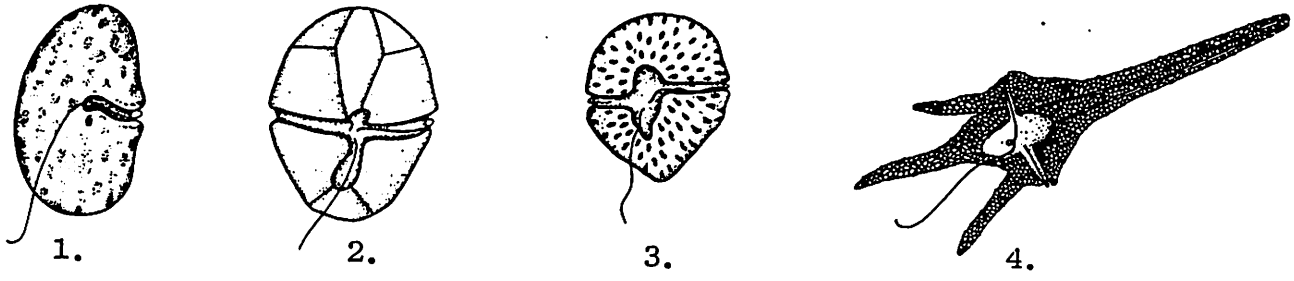
1. 2. 3. 4. 5. 6. 7.

C. Golden-brown Algae



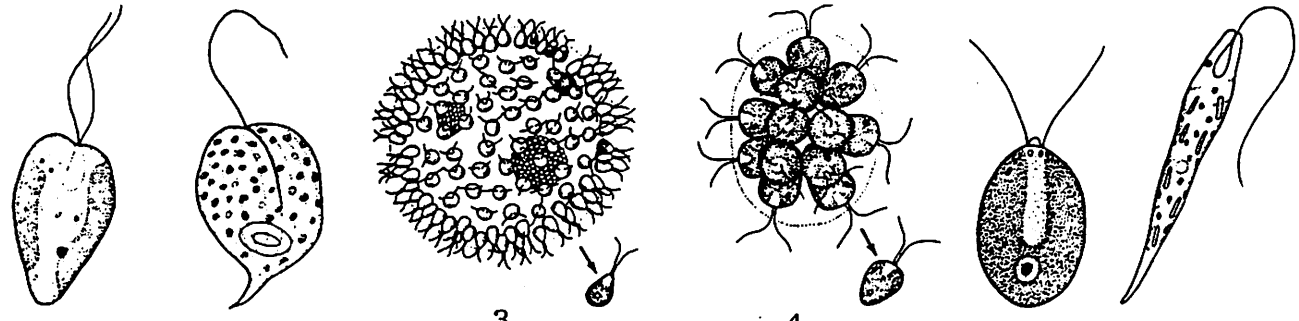
1. 2. 3.

D. Dinoflagellates



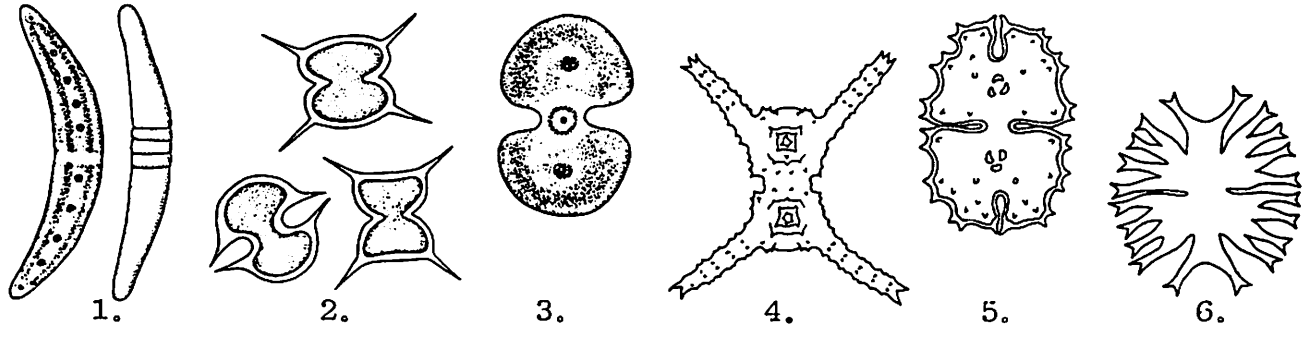
1. 2. 3. 4.

E. Euglenoids and other Plant-like Flagellates



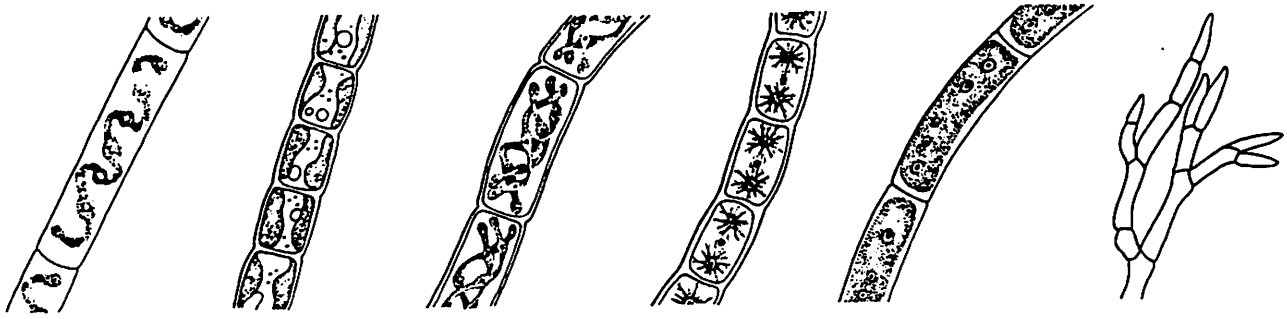
1. 2. 3. 4. 5. 6.

F. Desmids



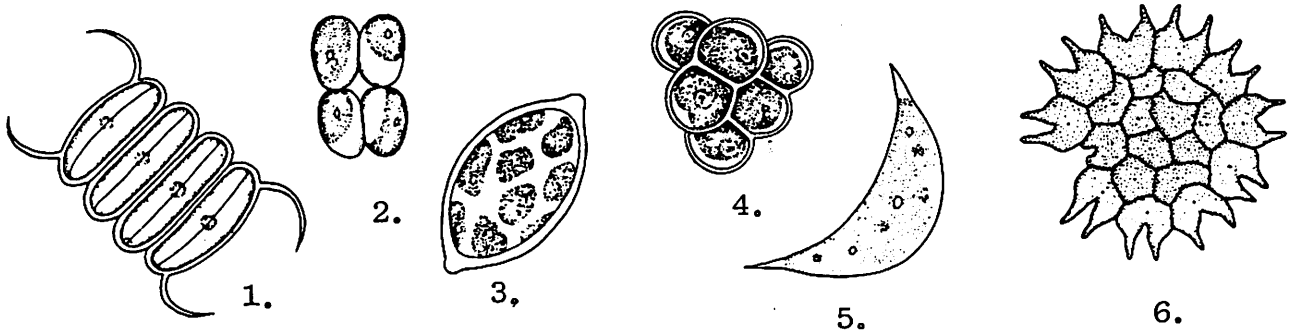
1. 2. 3. 4. 5. 6.

G. Filamentous Algae



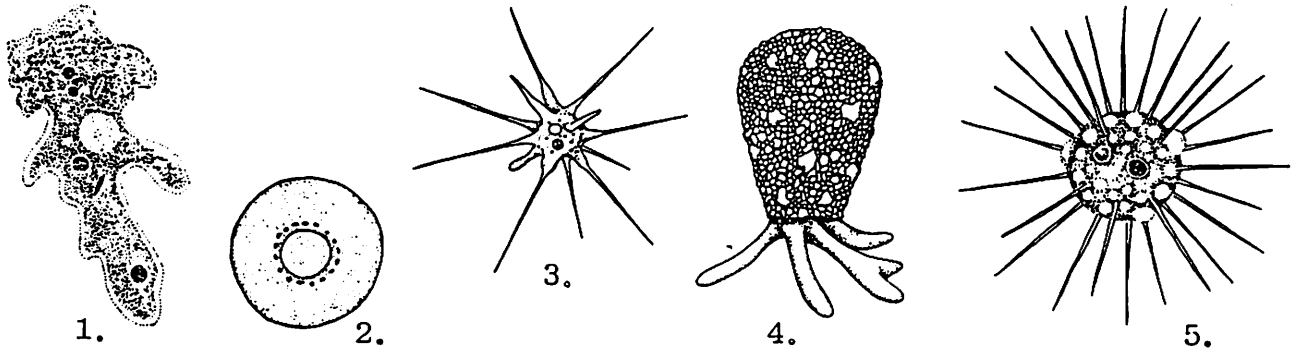
1. 2. 3. 4. 5. 6.

H. Green Algae



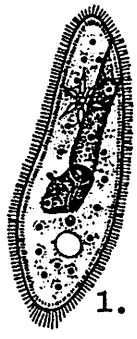
1. 2. 3. 4. 5. 6.

I. Rhizopods and Heliozoans



1. 2. 3. 4. 5.

J. Ciliates



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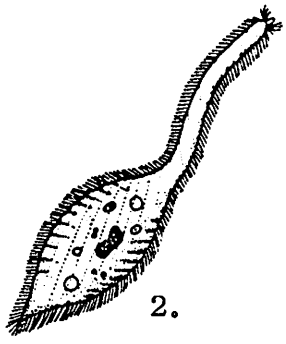

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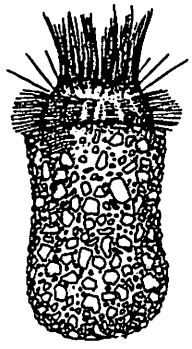

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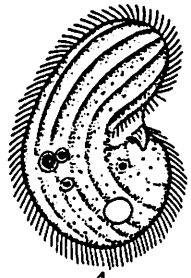

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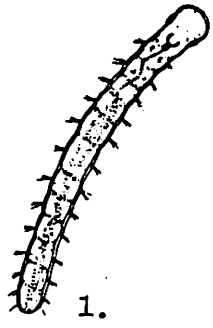
5.

K. Nematodes

1.

L. Annelids



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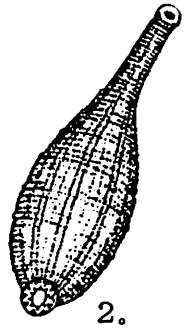

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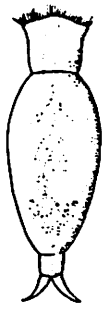
M. Rotifers



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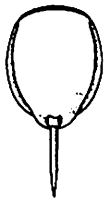

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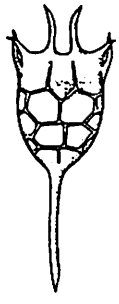
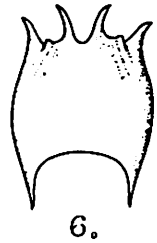


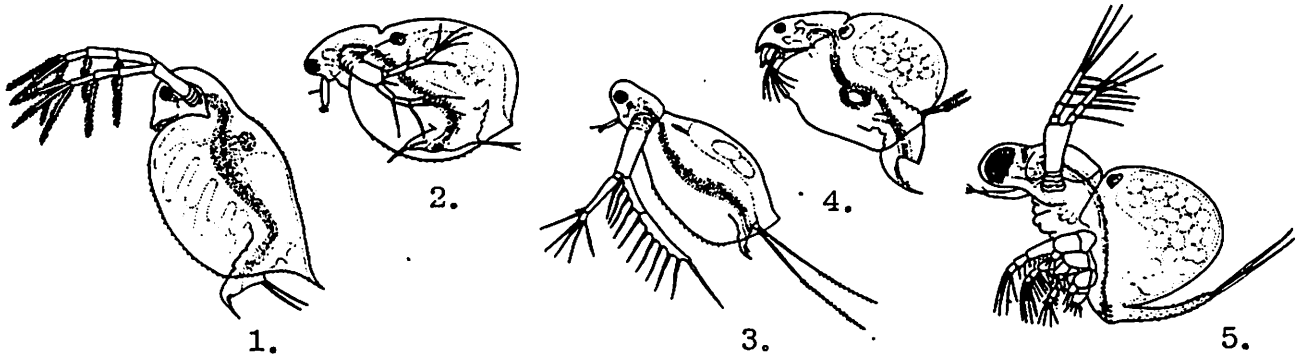
4.

5.



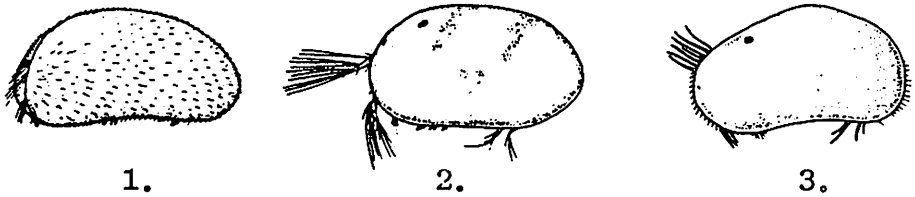
6.

N. Cladocerans



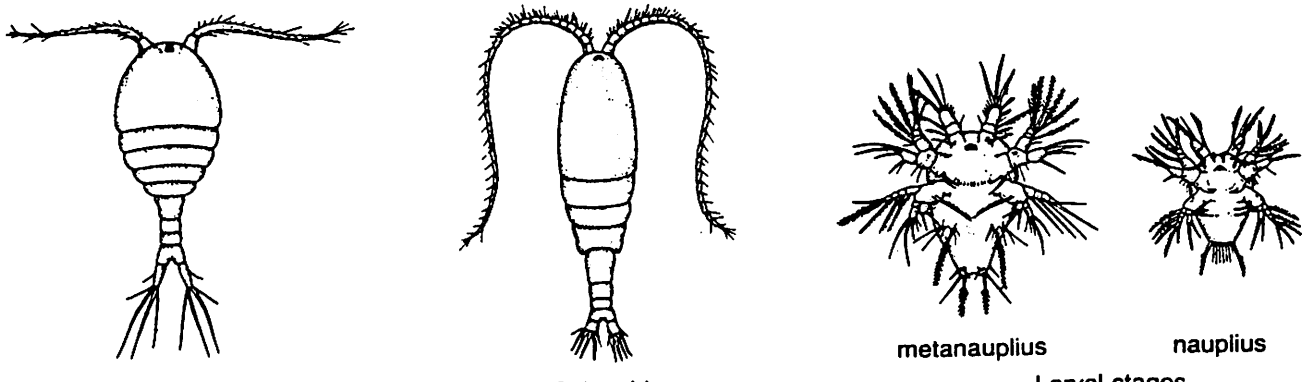
1. 2. 3. 4. 5.

O. Ostracods



1. 2. 3.

P. Copepods



1. 2. 3. 4.

LIST OF GENERA ILLUSTRATED IN PICTORIAL KEY OF PLANKTONIC ORGANISMS

A. Blue-green Algae

1. Microcystis
2. Plectonema
3. Aphanizomenon
4. Nostoc
5. Anabaena
6. Aulosira
7. Gleotrichia

B. Diatoms

1. Navicula
2. Cymbella
3. Cymatopleura
4. Stephanodiscus
5. Gomphonema
6. Gyrosigma
7. Mastogloia

C. Golden-brown Algae

1. Dinobryon
2. Hyalobryon
3. Synura

D. Dinoflagellates

1. Hemidinium
2. Gonyaulax
3. Gymnodinium
4. Ceratium

E. Euglenoids and other Plant-like Flagellates

1. Cryptomonas (cryptomonad)
2. Phacus (euglenoid)
3. Uroglena (golden-brown algae)
4. Pandorina (green algae)
5. Chlamydomonas (green algae)
6. Euglena (euglenoid)

F. Desmids

1. Closterium
2. Arthrodesmus
3. Cosmarium
4. Staurastrum
5. Euastrum
6. Micrasterias

G. Filamentous Green Algae

1. Spirogyra
2. Ulothrix
3. Spirogyra
4. Zygnema
5. Mougeotia
6. Chaetophora

H. Green Algae

1. Scenedesmus
2. Crucigenia
3. Oocystis
4. Desmococcus
5. Closteridium
6. Pediastrum

I. Rhizopods and Heliozoans

1. Amoeba
2. Arcella
3. Actinocoma
4. Difflugia
5. Actinophrys (only heliozoan)

J. Ciliates

1. Paramecium
2. Lacymaria
3. Codonella
4. Colpidium
5. Vorticella (extended)
6. Vorticella (contracted)

K. Nematodes

1. Tobrilus (roundworm)

L. Annelids

1. Aeolosoma (oligochaete worm)
2. Placobdella (leech)

M. Rotifers

1. Cephalodella
2. Rotaria
3. Monostyla
4. Keratella
5. Polyarthra
6. Brachionus

N. Cladocerans

1. Daphnia
2. Moinodaphnia
3. Diaphanosoma
4. Eurycerus
5. Polyphemus

O. Ostracods

1. Potamocypris
2. Candocypris
3. Cypria

P. Copepods

1. Cyclops (cyclopoid)
2. Senecella (calanoid)
3. Cyclops (metanauplius larval stage)
4. Cyclops (nauplius larval stage)

Recent and Fossil Phyla and Classes of Multicellular Animals of the Great Lakes Region

Barry Dean Valentine
Department of Zoology
The Ohio State University
Columbus, Ohio 43210

1. Invertebrate----------2
   Vertebrate, with internal supporting vertebrae, and a cranium---------- ----------Phylum CHORDATA-41
2. Body asymmetrical, with many small surface pores, and an internal skeleton of microscopic siliceous spicules---------- ----------Phylum PORIFERA, Class DEMOSPONGIA
   Body symmetrical; without surface pores and spicules----------3
3. Body with radial symmetry----------4
   Body with bilateral symmetry, or modified by coiling----------6
4. Skeleton absent, or massive, one-piece, and external; soft parts with stinging cells----------Phylum COELENTERATA-5
   Skeleton present, of many small pieces, internal; soft parts without stinging cells; fossil---------- ----------Phylum ECHINODERMATA, Class CRINOIDEA
5. No hard skeleton; no internal partitions----------Class HYDROZOA
   Hard skeleton present; body with inwardly projecting skeletal partitions; fossil----------Class ANTHOZOA
6. Body not segmented although transverse wrinkles may be present-------7
   Body segmented, with reptition of parts----------26
7. No anus; no body cavity between gut and body wall---------- ----------(part) Phylum PLATYHELMINTHES-8
   Anus present; body cavity present or absent----------9

8. Freeliving; no ventral suction discs---------Class TURBELLARIA

Internal parasites; one or more ventral suction discs---------

----------Class TREMATODA

9. Very slender worms, with no cavity between gut and body wall except a dorsal space housing a long smooth evertible proboscis----------Phylum NEMERTINA, Class ENOPLA

Body wormlike or not, with a cavity between gut and body wall; probocis, if present not in a dorsal space, and with rows of hooks or spines----------10

10. Body flexible but not contractile; diameter and shape constant due to rigid cuticle; no cilia; no shell----------11

Body flexible and contractile; diameter and shape changeable, cilia present; shell present or absent----------13

11. Posterior end of body with 2 or 3 lobes, with the anus at their base----------Phylum NEMATOMORPHA

Posterior end of body pointed, anus preapical----------

----------Phylum NEMATODA-12

12. Phasmids (a pair of minute lateral post-anal pores and ducts) absent; excretory duct rarely with a terminal cuticular lining----------Class ADENOPHOREA

Phasmids present; excretory duct with a cuticular lining continuous with the outer body surface----------

----------Class SECERNENTEA

13. Colonial, rarely solitary; each animal with a cluster of thin retractile tentacles around the mouth----------14

Solitary; zero to 6 tentacles, some distant from mouth---------16

14. Animal at end of an erect stalk which resembles a short string of beads; tentacles short, forming a complete circle around mouth and anus----------Phylum ENDOPROCTA

Animals in erect or prostrate tubes or embedded in a gelatinous matrix, tentacles long and very slender, usually arranged in a 2-rowed horseshoe, sometimes in a circle, surrounding the mouth but not the anus----------Phylum BRYOZOA-15

15. Animal projecting from the side of a clear, honey-colored, cellophane-like tube via a raised square aperture; tentacles arranged in a complete circle----------
----------Class GYMNOLAEMATA

Animal projecting from the end of an opaque tube, or embedded in jelly-like material; tentacles usually arranged in a horseshoe shape, occasionally in a complete circle---------
----------Class PHYLACTOLAEMATA

16. Animal covered by a bivalved shell----------17

Animal with 1 shell or shelless----------18

17. Shells dorsal and ventral, usually unequal; fossil----------
----------Phylum BRACHIOPODA, Class ARTICULATA

Shells right and left, similar----------
----------Phylum MOLLUSCA, (part) Class PELECYPODA

18. Microscopic; at most barely visible without magnification-----19

Macroscopic, visible without magnification----------21

19. Dorsum densely spiney or scaley----------Phylum GASTROTRICHA

Dorsum smooth or wrinkled----------Phylum ROTIFERA-20

20. Leech-like; females with 2 ovaries----------Class BDELLOIDA

Not leech-like; female with 1 ovary---------Class MONOGONONTA

21. Endoparasitic softbodied worms with a retractile probosics armed with rows of hooks or spines----Phylum ACANTHOCEPHALA---22

Freeliving; not wormlike; usually with an external shell------23

22. One syncyctial cement gland----------Class EOACANTHOCEPHALA

Six or eight cement gland cells-----Class METACANTHOCEPHALA

23. No shell----------Phylum MOLLUSCA, (part) Class GASTROPODA

Shell present----------24

24. Shell elongate-tubular, tapering, not curved; fossil-------

----------Phylum TENTACULITIDA

Shell spiral----------(part) Phylum MOLLUSCA---25

25. Shell with one continues internal space----Class GASTROPODA

Shell with a series of internal compartments; fossil----------

----------Class CEPHALOPODA

26. Internal parasites; no digestive tract; attached to gut wall by hooks or suckers-Phylum PLATYHELMINTHES,Class CESTODA

External or not parasitic; digestive tract normally present---27

27. Body wormlike; without jointed appendages; no chitinous external skeleton----------Phylum ANNELIDA---28

Body may or may not be wormlike; jointed appendages usually present; chitinous external skeleton present----------31

28. Paired lobes each with a tuft of bristles on each body segment; a crown of retractile tentacles around the mouth----------

----------Class POLYCHAETA

Body segments without paired lobes, if setae present they are embedded in the cylindrical body surface; one or no tentacles around the mouth----------29

29. Setae present; segmentation variable; no posterior sucker-------
----------Class OLIGOCHAETA

Setae absent; segmentation constant; a posterior sucker present-30

30. Each segment subdivided by external annuli; freeliving or
ectoparasites on vertebrates----------Class HIRUDINEA

Segments not subdivided; ectoparasites on crayfish----------
----------Class BRANCHIOBDELLIDA

31. With 4 pairs of fleshy, not segmented legs--Phylum TARDIGRADA

Legs (various numbers) with stiffened segments and joints
----------Phylum ARTHROPODA---32

32. No jaws or chelicerae; fossil----------Class TRIBOBITA

Jaws or chelicerae present----------33

33. Mouthparts chelicerate; no antennae----------34

Mouthparts mandibulate (or modified for sucking); antennae
present----------35

34. Abdomen with a long unsegmented pointed telson; fossil----------
----------Class MEROSTOMATA

Abdomen segmented or without a long telson;---Class ARACHNIDA

35. Two pairs of antennae; some appendages biramous----------
----------Class CRUSTACEA

One pair of antennae or none; no appendages biramous----------36

36. Legs absent, or 3 pairs, or rarely only 1 fleshy leg below the head
----------(part) Class INSECTA

More than three pairs of legs present----------37

37. The three jointed pairs of legs behind the head very different from
the fleshy legs farther back------(part) Class INSECTA

All legs jointed and essentially similar in structure----------38

38. First segment behind the head with legs modified into a pair of large poison delivering fangs which look like mouthparts; 15 or more pairs of walking legs---------Class CHILOPODA

First segment behind the head without poison fangs----------39

39. 13 or more antennal segments; 12 pairs of legs--Class SYMPHYLA

Fewer than ten antennal segments; 8 to 11 or 13 or more pairs of legs---------- 40

40. Eight to eleven (usually 9) pairs of legs; antennal tip 3 branched----------Class PAUROPODA

Thirteen or more pairs of legs; antennal tip simple----------

----------Class DIPLOPODA

41. No jaws; no lateral paired fins; no legs---------Class AGNATHA

Jaws and lateral paired fins or legs present----------42

42. Median and paired fins present and supported by rays----------

----------Class OSTEICHTHYES

No paired fins, median fins if present without supporting rays--43

43. Median fins present or absent; fingers and toes if present without claws; body without scales, feathers, or hair----------

----------Class AMPHIBIA

Median fins absent; fingers and toes, if present, with claws, nails or hooves----------44

44. Body entirely covered with scales or granular to rectangular plates

----------Class REPTILIA

Body without scales except on legs or tails of some----------45

45. Body covered with feathers; toothless beak present--Class AVES

At least some part of the body with hair; toothed jaws present-

----------Class MAMMALIA

KEY TO THE FRESH-WATER MUSSELS (FAMILY UNIONIDAE) OF WESTERN LAKE ERIE

by
Carol B. Stein
The Franz Theodore Stone Laboratory
The Ohio State University
June, 1962

1. Pseudocardinal and lateral teeth present.....4

   Pseudocardinal and lateral teeth absent; shell thin, without wing.2

2. Hinge line straight or nearly so, not thickened below umbones; beak sculpture strongly double-looped or beaks flattened..... 3

   Hinge line undulate and somewhat thickened below umbones; beak sculpture of concentric rings, not double-looped; periostracum dark brown or green, sometimes with faint dark rays. .....Strophitus undulatus (Say, 1817).

3. Umbones flattened, not rising above the hinge line; beak sculpture fine and inconspicuous; shell very thin and fragile; periostracum bright green.....Anodonta imbecillis Say, 1829.

   Umbones prominent, rising above the hinge line; beak sculpture strongly double-looped; periostracum bright green to black. .....Anodonta grandis Say, 1829.

4. Shell with knobs, pustules, or multiple oblique ridges on the disc..7

   Surface of shell smooth, without knobs, pustules, or multiple oblique ridges..... 5

5. Shell ovate or subquadrate, compressed, with a prominent wing... 6

   Shell without wing; shape variable.....11

6. Periostracum dark green or brown; nacre purple or deep pink (rarely white); pseudocardinals moderately developed and angled toward the ventral margin.....Proptera alata (Say, 1817).

   Periostracum bright horn yellow, with darker posterior slope and wing; nacre white with a pink tinge below the lateral teeth; pseudocardinals weak, lamellar, scarcely divergent from the hinge line.....Leptodea fragilis (Rafinesque, 1820).

7. Nacre purple; posterior 2/3 of disc irregularly covered with pustules; shell outline nearly round; pseudocardinals heavy and ragged; interdentum very broad and platelike. .....Cyclonaias tuberculata (Rafinesque, 1820).

Nacre white; shell not as described above.....8

8. Surface of shell fluted, with 2-4 indistinct oblique ridges originating below umbones and extending across the disc to the post-ventral margin; no knobs or pustules present. .....Amblema plicata (Say, 1817).

Disc with knobs or pustules, but without multiple oblique ridges. 9

9. Two to four large knobs extending in a vertical row from the umbone to the ventral margin, arranged in such a manner that when shell is viewed from the end, the knobs appear, zig-zag fashion, alternately on the two valves. Remainder of shell smooth, except for small ridges on the posterior slope. .....Obliquaria reflexa Rafinesque, 1820.

Shell not as described above.....10

10. Shell outline quadrate; a sulcus, usually free of pustules, extending from the umbone to the post-ventral margin; pustules beginning at the tip of the umbone and extending out along the posterior ridge and across the median area of the disc. .....Quadrula quadrula quadrula (Rafinesque, 1820).

Shell outline nearly round; no sulcus present; posterior ridge rounded; few to many pustules scattered over the disc, the first ones usually appearing near the second or third annulus; a broad green stripe, especially prominent on young specimens, extends from the umbones across the disc toward the post-ventral margin. .....Quadrula pustulosa (Lea, 1831).

11. Periostracum black or brown, sometimes faintly rayed; nacre white, pink or purple.....12

Periostracum yellow or green, usually smooth and polished, with more or less distinct green rays; rarely yellowish and rayless; nacre white or pinkish, never purple.....19

12. Adult (shells having 3 or more annuli are here considered to be adult) size longer than 30 mm.; nacre color variable.....14

Adult size less than 30 mm. in length; nacre white.....13

13. Lateral teeth thick and short; pseudocardinals well developed; cicatrices of adductor muscles deeply impressed; beak sculpture double-looped and very fine....Villosa fabalis (Lea, 1831).

Lateral teeth thin and relatively long; pseudocardinals small; posterior adductor cicatrix lightly impressed; beak sculpture coarse, consisting of 4-5 concentric ridges which are sharply angled posteriorly. Uncommon in Lake Erie. .....Carunculina parva (Barnes, 1823).

14. Height of shell 70% or more of length.....17

Height of shell less than 60% of length.....15

15. Lateral teeth thick, short, and at a slight but distinct angle to the ventral margin; nacre purple (very rarely white). ..... Elliptio dilatatus (Rafinesque, 1820).

Lateral teeth thin, long, and parallel to the ventral margin; nacre white, sometimes with a salmon or pink tinge near the umbones (very rarely purple).....16

16. Pseudocardinals lamellar, thin, and low; ventral and dorsal margins slightly angled at posterior end of lateral teeth; posterior end sharply pointed; posterior ridge distinct. ..... Ligumia nasuta (Say, 1817).

Pseudocardinals moderately heavy, serrate, and high; ventral and dorsal margins scarcely curved; posterior end broadly rounded in females, bluntly pointed in males; posterior ridge indistinct. ..... Ligumia recta (Lamarck, 1819).

17. Shell outline nearly circular, with the umbones centrally located; periostracum brown to black except for the posterior slope, which is yellow.....Obovaria subrotunda (Rafinesque, 1820).

Shell outline subtriangular; posterior slope not noticeably lighter in color than the disc.....18

18. Ventral margin nearly straight; posterior ridge distinct, preceded by a shallow sulcus.....Fusconaia flava (Rafinesque, 1820).

Ventral margin broadly rounded; posterior ridge blunt and not preceded by a sulcus.....Pleurobema cordatum (Rafinesque, 1820).

19. Shell heavy, elliptical in outline, strongly compressed; lateral teeth thick, short, and at a slight angle to the ventral margin; pseudocardinals well developed; periostracum yellow, usually with interrupted green rays, but without a polished appearance. .....Ptychobranchus fasciolaris (Rafinesque, 1820).

Shell not strongly compressed; lateral teeth long and thin or, if short, then shell outline nearly round.....20

20. Height of shell less than 55% of length.....21

Height 60% or more of length.....22

21. Shell small, under 2 1/2 inches when mature; periostracum yellow with more or less interrupted green rays; pseudocardinals triangular, small; no posterior ridge; posterior end and ventral margin gently rounded.....Villosa iris (Lea, 1829).

Shell not as above.....16

22. Posterior ridge sharp, extending from umbone to post-ventral margin, forming a truncate posterior slope..... 23

Posterior ridge rounded, not forming a truncate posterior slope... 24

23. Posterior slope with a series of fine ridges perpendicular to the annuli.....Dysnomia triquetra (Rafinesque, 1820).

Posterior slope smooth, without such ridges. .....Truncilla truncata Rafinesque, 1820.

24. Shell small, less than 50 mm., with green rays supplemented by more or less distinct zigzag lines; height 65% of length; no interdentum.....Truncilla donaciformis (Lea, 1829)

Not as above.....25

25. Pseudocardinal teeth heavy and triangular; interdentum present... 26

Pseudocardinals light and lamellar; interdentum not evident..... 27

26. A broad green stripe extending post-ventrally from the umbone; shell outline rounded, without a posterior sulcus or swelling. .....Quadrula pustulosa (Lea, 1831).

26 . Many fine green rays radiating from the umbone; a broad shallow sulcus (males) or distinct swelling (mature females) posteriorly; shell much thinner posteriorly than anteriorly.
.....Dysnomia torulosa (Rafinesque, 1820).

27. Umbones inflated; beak sculpture consisting of 3-4 straight or slightly emarginate heavy bars; shell ovate, with rounded ventral margin....Lampsilis ovata form ventricosa (Barnes, 1823).

Umbones not greatly inflated, sculptured with 5-9 fine double-looped ridges; ventral margin almost straight.
.....Lampsilis radiata siliquoidea (Barnes, 1823).

NOTE: A record exists for Anodontoides ferussacianus (Lea, 1834) from East Harbor, and a single specimen each of Uniomerus tetralasmus (Say. 1830), and Lampsilis fasciola Rafinesque, 1820, has been taken from western Lake Erie. Because of their rarity in this region, these species have not been included in this key. Lasmigona costata (Rafinesque, 1820) is now represented from western Lake Erie by three specimens.

THE UNIONIDAE OF THE ISLAND REGION OF WESTERN LAKE ERIE

A Checklist Compiled by
David H. Stansbery and Carol B. Stein
Department of Zoology and Entomology
The Ohio State University
June, 1962

Family UNIONIDAE (Fleming, 1828) Ortmann, 1911.

Subfamily UNIONINAE (Swainson, 1840) Ortmann, 1910.

Fusconaia flava (Rafinesque, 1820).
Amblema plicata (Say, 1817).
Quadrula quadrula quadrula (Rafinesque, 1820).
Quadrula pustulosa (Lea, 1831).
Cyclonaias tuberculata (Rafinesque, 1820).
Pleurobema cordatum (Rafinesque, 1820).
Elliptio dilatatus (Rafinesque, 1820).
*Uniomerus tetralasmus (Say, 1830).

Subfamily ANODONTINAE (Swainson, 1840) Ortmann, 1910.

***Lasmigona costata (Rafinesque, 1820).
Anodonta grandis Say, 1829.
Anodonta imbecillis Say, 1829.
Strophitus undulatus (Say, 1829).
**Anodontoides ferussacianus (Lea, 1834).

Subfamily LAMPSILINAE (von Ihering, 1901) Ortmann, 1910.

Ptychobranchus fasciolaris (Rafinesque, 1820).
Obliquaria reflexa Rafinesque, 1820.
Obovaria subrotunda (Rafinesque, 1820).
Truncilla truncata Rafinesque, 1820.
Truncilla donaciformis (Lea, 1829).
Leptodea fragilis (Rafinesque, 1820).
Proptera alata (Say, 1817).
Carunculina parva (Barnes, 1823).
Ligumia recta (Lamarck, 1819).
Ligumia nasuta (Say, 1817).
Villosa fabalis (Lea, 1831).
Villosa iris (Lea, 1829).
Lampsilis radiata siliquoidea (Barnes, 1823).
Lampsilis ovata form ventricosa (Barnes, 1823).

*Lampsilis fasciola Rafinesque, 1820.
Dysnomia triquetra (Rafinesque, 1820).
Dysnomia torulosa (Rafinesque, 1820).

* Represented by only a single specimen from western Lake Erie.

** Represented by a literature record for East Harbor.

*** Represented by only three specimens from western Lake Erie.

A KEY TO THE UNIONIDAE OF WESTERN LAKE ERIE

Barry D. Valentine
The Ohio State University
1978

1.--Articulating hinge teeth absent or vestigial. 2
--Articulating hinge teeth present. 6

2.--Vestigial pseudocardinal teeth indicated by a more or less prominant depression and thickening just anterior to beak. Ridges of beak sculpture without a central sinuation. 3
--Pseudocardinal teeth entirely absent. Ridges of beak sculpture with a central sinuation. 4

3.--Beak sculpture coarse, bars sharply angled on posterior ridge . . . . . Strophitus undulatus (Say)
--Beak sculpture fine, bars rounded on posterior ridge . . . . . Anodontoides ferussacianus (Lea)

4.--Beak flat, in lateral view not interrupting the hinge line. . . . . Anodonta imbecilis (Say)
--Beak inflated, in lateral view projecting dorsal to the hinge line. 5

5.--Height less that 1/2 the length, beak sculpture fine, without central sinuation . . . . . Anodontoides ferussacianus (Lea)
--Height more than 1/2 the length, beak sculpture coarse, with central sinuation. . . . . Anodonta grandis (Say)

6.--Lateral hinge teeth well developed, forming an interlocking tongue-and-groove when valves are together 8
--Lateral hinge teeth vestigial, not interlocking when valves are together 7

7.--Shell very flat, with a high wing, no oblique wrinkles on posterior slope . . . . . Lasmigona complanata (Barnes)
--Shell normal, without a high wing, oblique wrinkles on posterior slope . . . . . Lasmigona costata (Raf.)

8.--Posterior half of shell with 2 to 4 broad rounded oblique ridges crossing the growth lines from below the umbo to the posterior-ventral margin. . . . . Amblema plicata (Say)
--Posterior half of shell with fine wrinkles, or pustules, or one oblique ridge, or without sculpture 9

9.--Valve tuberculate or pustulate 10
--Valve smooth, or at most, wrinkled along posterior slope 14

10.--Valve much longer than wide. . . . . Tritogonia verrucosa (Barnes)
--Valve, at best, slightly longer than wide. 11

11.--Nacre purple . . . . . Cyclonaias tuberculata (Raf.)
--Nacre white. 12

12.--Two to four large knobs in a vertical row from umbo to ventral margin, these formed first on one valve, then the other so that when valves are together, the knobs of one valve alternate with those of the other valve . . . . . Obliquaria reflexa (Raf.)
--Knobs or pustules more numerous, and at least some out of line. 13

13.--Shell obviously longer than high. Pustulate region of valve including umbone, the pustules arranged in two groups on either side of a smooth post-median depression . . . . . Quadrula quadrula (Raf.)
--Shell barely longer than high. Pustulate region of valve not including umbo, nor the first 2 or 3 years of growth, pustules arranged irregularly, no smooth post-median depression . . . . . Quadrula pustulosa (Lea)

14.--Valves compressed, with a prominent wing dorsal to the lateral teeth; umbones very weakly developed 15
--Valves without a prominent dorsal wing; degree of compression and umbo development variable 16

15.--Pseudocardinal teeth heavy, directed towards ventral margin of valve, usually on a line along posterior margin of anterior adductor scar . . . . . Potamilus alatus (Say)
--Pseudocardinal teeth thin, lamellar, directed towards anterior margin of valve, usually on a line through or above anterior adductor scar . . . . . Leptodea fragilis (Raf.)

16.--Valve long, height less than or equal to 1/2 the length 17
--Valve short, height more than 1/2 the length 22

17.--Umbonal cavity completely exposed in lateral view; nacre usually purple . . . . . Elliptio dilatatus (Raf.)
--Umbonal cavity partially hidden by anterior portion of lateral teeth when looking directly into shell. 18

18.--Pseudocardinal teeth thin and lamellar, with just a dorsal and ventral surface, forming a flat triangle. 19
--Pseudocardinal teeth heavier, with an anterior surface too, forming an acute pyramid 20

19.--Periostracum not rayed; posterior end of valve gradually and broadly rounded . . . . . Uniomerus tetralasmus (Say)
--Periostracum rayed; posterior end of valve abruptly narrowed and tapered to a rounded point. . . . . Ligumia nasuta (Say)

20.--Interdentum broad; lateral teeth strongly arched downward toward ventral margin of valve. . . . Ptychobranchus fasciolaris (Raf.)
--Interdentum weakly developed; lateral teeth diverging, paralleling, or slightly approaching ventral margin of valve 21

21.--Length not quite twice the width, usually less than 65 mm, rarely to 75 mm . . . . . Villosa iris (Lea)
--Length more than twice the width, usually longer than 75 mm, maximum size about 175 mm . . . . . Ligumia recta (Lamarck)

22.--Posterior portion of lateral teeth approaching the ventral margin of valve. 26
--Posterior portion of lateral teeth paralleling or diverging from ventral margin of valve 23

23.--Valve usually less than 35 mm long rarely to 44 mm; periostracum dark brown, without rays, and under magnification with many very fine crowded concentric ridges between the major growth lines. . . . . Toxolasma parvus (Barnes)
--Valve normally much larger; periostracum yellow, green, or brown, usually rayed, and without crowded ridges between the major growth lines 24

24.--Umbo inflated; posterior ridge usually well developed; ventral margin curved . . . . . Lampsilis ventricosa (Barnes)
--Umbo not or very weakly inflated; posterior ridge low and rounded 25

25.--Ventral margin straight, at least for a short distance; rays irregular and usually green . . . . Lampsilis radiata luteola (Lamarck)
--Ventral margin curved; rays all narrow, brown. . . . Lampsilis fasciola Raf.

26.--Length usually less than 30 mm rarely to 35 mm; periostracum dark brown with faint pale rays . . . . . Villosa fabilis (Lea)
--Length of adult more than 30 mm; dark without rays, or pale with rays present or absent 27

27.--Periostracum without rays, dark blackish brown, except the posterior slope which is paler; valve almost round . . . . . Obovaria subrotunda (Raf.)
--Periostracum with rays, or if without, honey-brown or straw-colored; posterior slope not paler; valve usually quite asymetrical. 28

28.--Pseudocardinal teeth heavy, their dorso-ventral axis thick 29
--Pseudocardinal teeth slender, their dorso-ventral axis thin. 35

29.--Umbonal cavity shallow, not or weakly invading the base of the pseudocardinal teeth; periostracum usually with interrupted green rays. . . . . Ptychobranchus fasciolaris (Raf.)
--Umbonal cavity deep and cavernous, invading and hollowing out the base of the pseudocardinal teeth; periostracum with rays present or absent 30

30.--Umbo almost equidistant between anterior and posterior ends; valve almost round, slightly longer than broad . . . . . Quadrula pustulosa (Lea)
--Umbo anterior; valve strongly asymetrical or obviously longer than broad. 31

31.--Dorsal edge of the anterior pseudocardinal tooth (on left valve) or socket (on right valve) forming a 45° angle or more with the margin of the umbilical excavation 33
--Dorsal edge of the anterior pseudocardinal tooth (on left valve) or socket (on right valve) paralleling or slightly diverging from the margin of the umbilical excavation 32

32.--Ventral margin of valve somewhat straightened posteriorly . . . . . Fusconaia flava (Raf.)
--Ventral margin of valve concave posteriorly. . . . . Quadrula quadrula (Raf.)

33.--Posterior portion of pallial line much more distant from ventral valve margin than anterior portion, or else paralleling the margin. 34
--Posterior portion of pallial line closer to ventral valve margin than anterior portion . . . . . Obliquaria reflexa (Raf.)

34.--Periostracum dark brown. . . . . Pleurobema cordatum (Raf.)
--Periostracum pale brown with numerous darker rays. . . . . Epioblasma torulosa (Raf.)

35.--Scar of anterior adductor muscle almost at extreme apex of valve, about half of the diameter of a scar from the valve apex. 36
--Scar of anterior adductor muscle at least a scar diameter from the valve apex 37

36.--Periostracum with rays complete or absent; adult valve over 50 mm long. 24
--Periostracum with rays interrupted, supplemented by chevrons or more or less zig-zag lines; adult valve less than 50 mm long . . . . . *Truncilla donaciformis* (Lea)

37.--Posterior slope of valve without many fine ridges crossing the lines of growth . . . . . *Truncilla truncata* (Raf.)
--Posterior slope of valve with many fine ridges crossing the lines of growth . . . . . *Epioblasma triquetra* (Raf.)

SCIENTIFIC NAME	COMMON NAME
Anodonta imbecilis (Say)	Floater
Lasmigona complanata (Barnes)	White heel-splitter
Amblema plicata (Say)	Blue-point; 3-ridge
Obliquaria reflexa (Raf.)	Three-horned warty-back
Quadrula quadrula (Raf.)	Maple leaf
Quadrula pustulosa (Lea)	Warty-back; pimple-back
Potamilus alatus (Say)	Purple-shell
Leptodea fragilis (Raf.)	Paper-shell
Ptychobranchus fasciolaris (Raf.)	Kidney-shell
Lampsilis ventricosa (Barnes)	Pocket-book
Lampsilis radiata luteola (Lamarck)	Fat musket
Truncilla donaciformis (Lea)	Faun's foot
Truncilla truncata (Raf.)	Deer toe

KEY TO THE ORDERS OF OHIO CRUSTACEA

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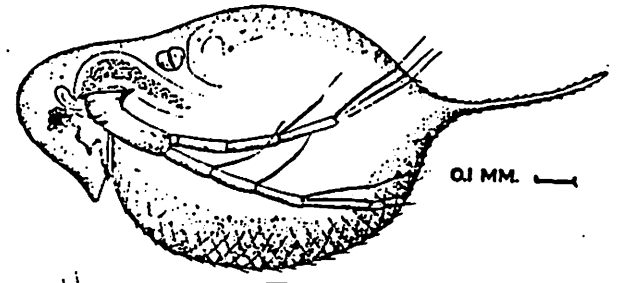
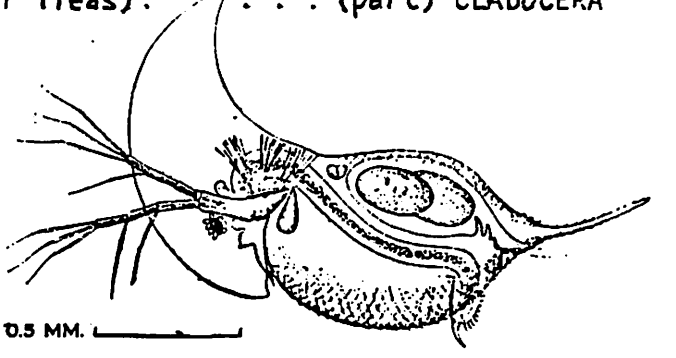
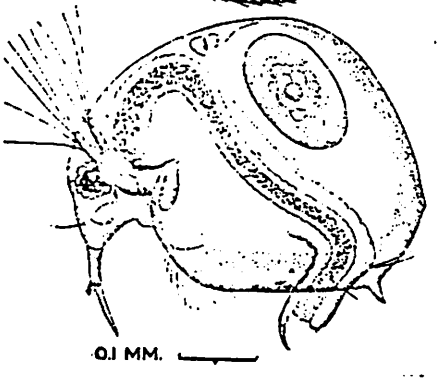
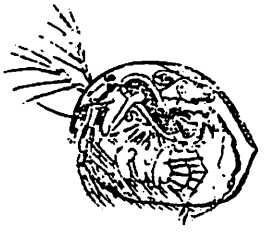
1. Bivalved shell with a dorsal hinge present 2
   Shell or carapace if present, not bivalved 4

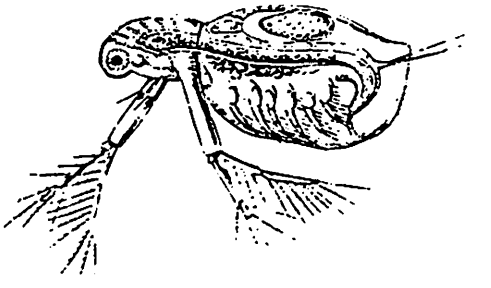
2. Shell completely enclosing the rest of the animal 3
   Shell not enclosing the head (water fleas). . . . . (part) CLADOCERA



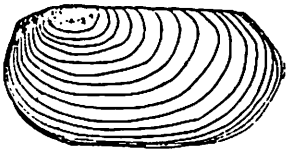


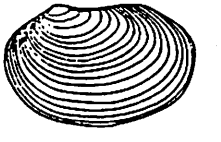




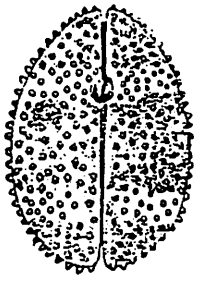


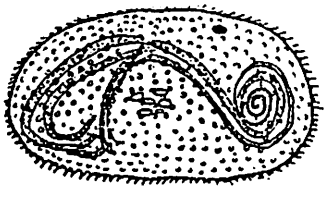
3. Ten to 28 pairs of thoraic appendages (clam shrimp) . . . CONCHOSTRACA

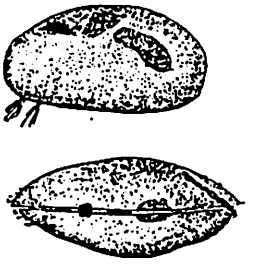




Two or 3 pairs of thoraic appendages (ostracods). . . . . PODOCOPA





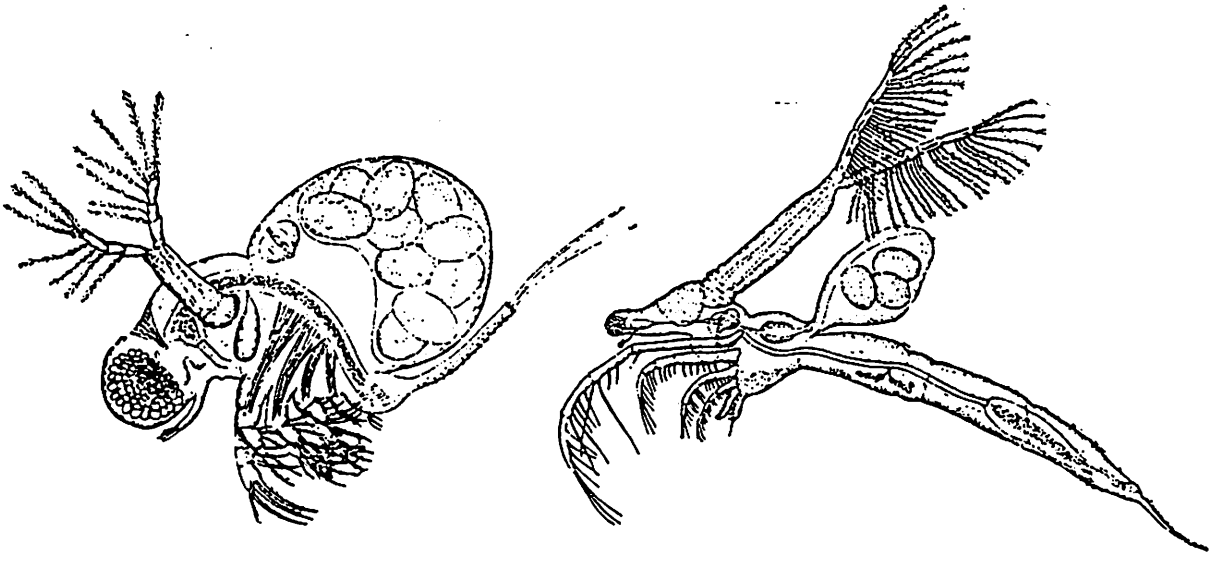


4. Eyes stalked 5
   Eyes sessile or absent. 8

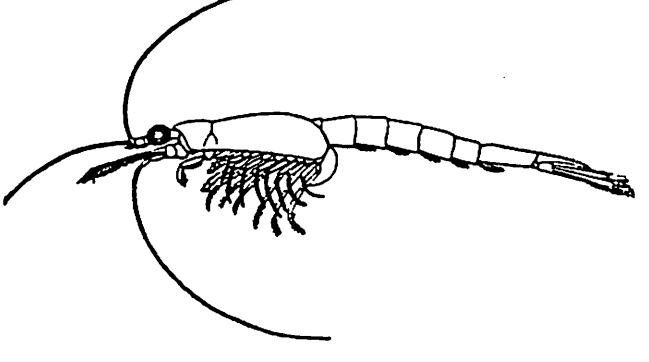
5. Carapace absent 6
   Carapace present. 7

6. Eyes paired; 11 pairs of flattened thoraic appendages (fairy shrimp). . . . . ANOSTRACA

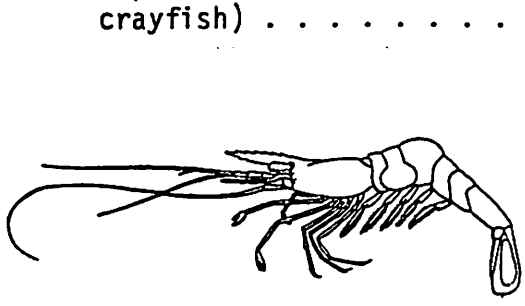
One median compound eye; 4 to 6 pairs of thoraic appendages (water fleas). . . . . (part) CLADOCERA

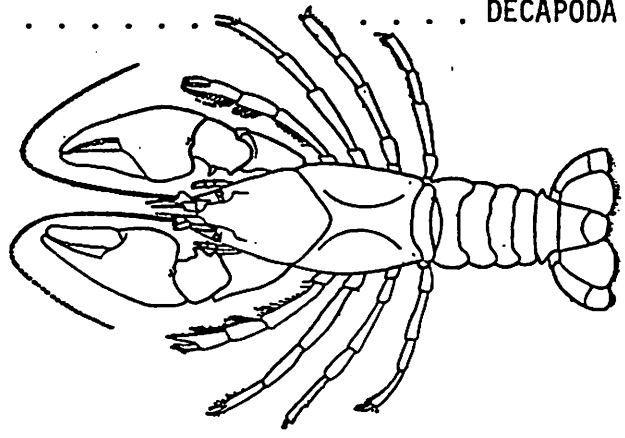


7. Carapace not attached to dorsum of posterior, four thoracic segments; no legs with chelae (opposum shrimp) . . . . . MYSIDACEA



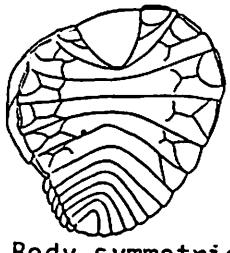
Carapace attached to dorsum of all thoracic segments; 3 pairs of thoraic legs with chelae (shrimp and crayfish) . . . . . DECAPODA





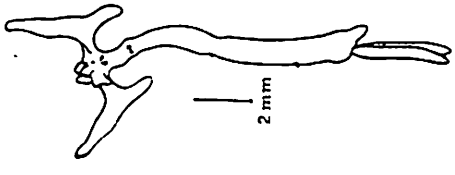
8. Body either asymmetrical, without segmentation, or without appendages; parasitic on fishes 9
Body symmetrical, segmented, and with paired appendages; a few fish parasites, mostly free-living. 11

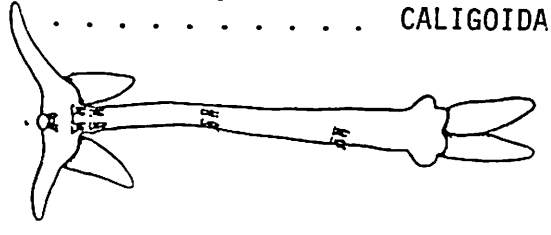
9. Body asymmetrical, segmented, legless (isopods) . . . . (part) ISOPODA



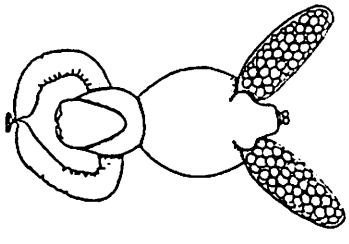
Body symmetrical, not segmented or segmentation reduced, legs present or absent (copepods). 10

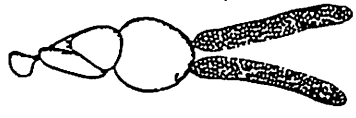
10. Body continuous with the anchor which is completely branched within the host tissue . . . . . CALIGOIDA

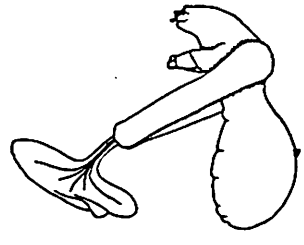




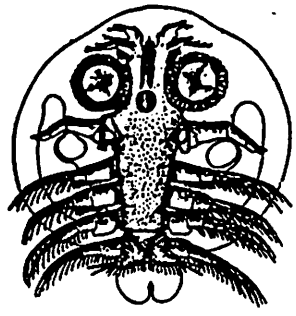
Body attached to small circular anchor by two maxillary arms . . . . . LERNAEOPODOIDA







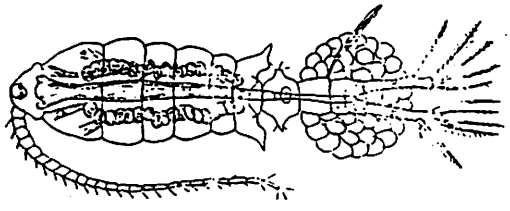
11. Carapace present; venter of head with a pair of large suction cups (fishlice). . . . . ARGULOIDA

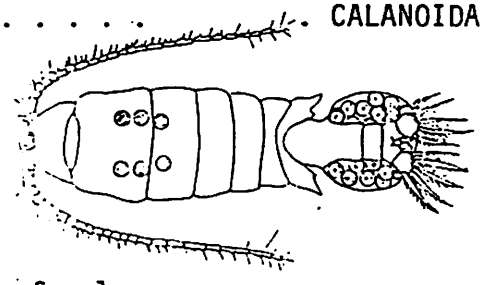


Carapace absent but anterior end of body may be swollen; venter of head without suction cups 12

12. Five or six pairs of thoracic appendages (copepods). 13
Seven pairs of thoracic appendages 15

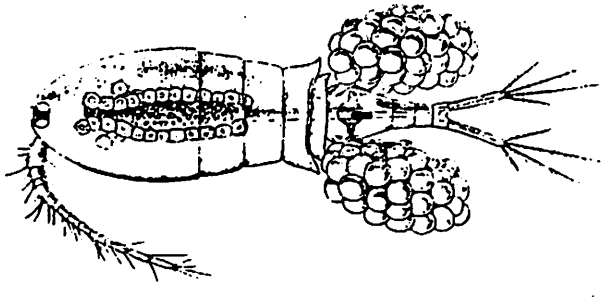
13. First antennae long, with 22 to 25 segments; urosome narrower than metasome; female with a single egg sac . . . . . CALANOIDA

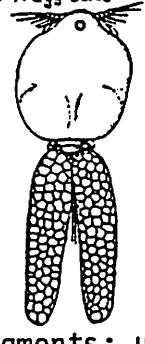


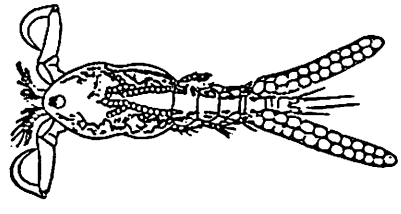


First antennae with less than 19 segments; female with one of two egg sacs. 14

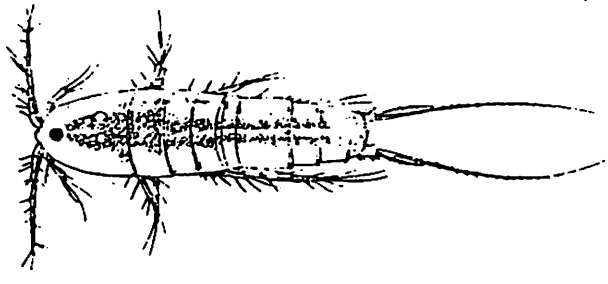
14. First antennae short with 8 to 18 segments; urosome narrower than metasome; female with 2 egg sacs . . . . . CYCLOPOIDA



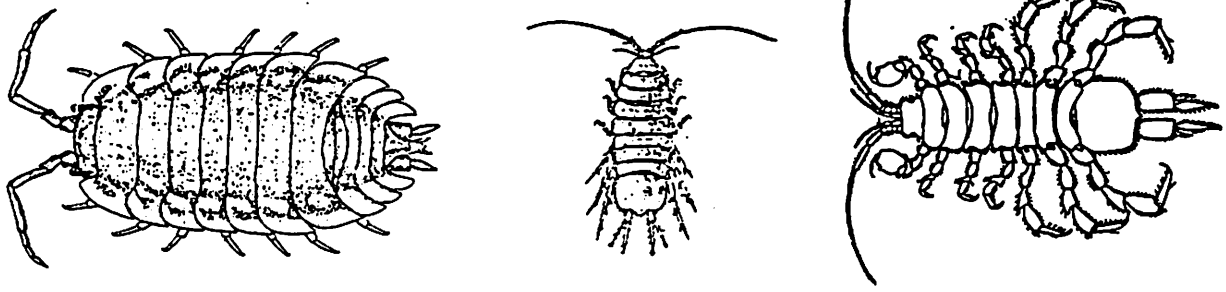




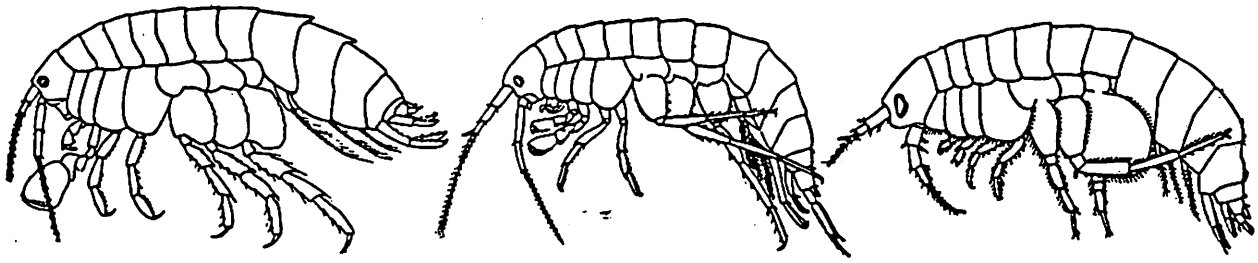
First antenna short with 5 to 9 segments; urosome not narrower than metasome; female usually with 1 egg sac . . . . . HARPACTICOIDA



15. Body depressed; abdominal pleopods similar in size and shape, and biramous (sowbugs) . . . . . (part) ISOPODA



Body compressed; abdominal pleopods of two types, the three anterior pairs not biramous (scuds). . . . . AMPHIPODA



A PROVISIONAL* KEY TO THE CRAWFISH OF THE ISLAND REGION OF LAKE ERIE

1 First pleopods developed into gonopods, annulus ventralis absent . . . (male) 2

First pleopods not developed into gonopods, annulus ventralis present (female) 10

2 Terminal processes of gonopods well-defined and corneous . . . . . (first-form male) 3

Terminal processes of gonopods ill-defined and whitish . . . . . (second-form male) 14

3 Terminal processes of gonopods 3 or 4 relatively short spines and a tuft of short hair-like processes; ischia of third and fourth pereiopods with hooks. . . . . *Procambarus acutus acutus* (Girard, 1852).

Terminal processes of gonopods long or short but only 2 without a tuft of hair-like processes; ischia of third pereiopods only with hooks 4

4 Rostrum without lateral spines; coxae of fourth pereiopods with a candomesial boss; gonopod with terminal processes bent at least 90 degrees caudally . . . . . Genus *Cambarus* 5

Rostrum with lateral spines; coxae of fourth pereiopods without a candomesial boss; gonopod with terminal processes not bent or gently curved caudally distinctly less than 90 degrees. . . .Genus *Orconectes* . . 7

5 Areola relatively wide, 3 - 5 punctations at its least width . . . . . *Cambarus robustus* (Girard, 1852).

Areola obliterated or nearly so, not over one punctation at its least width 6

6 Suborbital spine present; movable dactyl not excised at base . . . . . *Cambarus diogenes* (Girard, 1852).

6 Suborbital spine absent; movable dactyl excised at base . . . . . *Cambarus fodiens* (Cottle, 1863).

7 Terminal processes of gonopods gently curved caudally about 45 degrees. . . . . *Orconectes immunis* (Hagen, 1870).

Terminal processes of gonopods straight or nearly so 8

8 Central (anterior) process of gonopod longer than mesial (posterior) process; central projection with a shoulder at base of its anterior margin . . . . . *Orconectes rusticus rusticus* (Girard, 1852).

Terminal processes of gonopods of equal length; central (anterior) projection without a shoulder at base ot its anterior margin 9

9 Rostrum with a low median carina. . *Orconectes propinquus* (Girard, 1852).

Rostrum without a median carina . . . .*Orconectes sanborni* (Faxon, 1884).

10 Chelipeds and cephalothorax with many sharp tubercles; outer dactyl of chelae with two widely separated teeth on the inner margin. . *Procambarus acutus acutus* (Girard, 1852).

Chelipeds and cephalothorax with few or many rounded tubercles; outer dactyl of chelae with many teeth or none but not as above 11

11 Rostrum without lateral spines. . . . Genus *Cambarus* 5

Rostrum with lateral spines . . . . . Genus *Orconectes* 12

12 Rostrum distinctly attenuate from base to apex; lateral rostral spines poorly developed, near the apical spine, but present. . . . . *Orconectes immunis* (Hagen, 1870).

Rostral margins scarcely emarginate, scarcely attenuate, or straight . 13

13 Anterior surface of annulus ventralis with two well-developed tubercules which extend posteriorly over the fossa. . . . . *Orconectes rusticus* (Girard, 1852).

13 Anterior surface of annulus ventralis flat except in very old (large) females 9

14 Terminal processes of gonopods 3 or 4 in number . . . . . *Procambarus acutus acutus* (Girard, 1852).

Terminal processes of gonopods 2 in number 15

15 Rostrum without lateral spines . . . . Genus *Cambarus* 5

Rostrum with lateral spines . . . . . Genus *Orconectes* 16

16 Tips of terminal processes of gonopods both curved caudally . . . . . *Orconectes immunis* (Hagen, 1870).

Tips of terminal processes of gonopods straight 17

17 Terminal processes of gonopods not equal in length . . . . . *Orconectes rusticus* (Girard, 1852).

Terminal processes of gonopods equal in length 9

* This key is termed provisional because it was constructed from memory without recourse to specimens of the species involved. Suggestions for improvement will be expected and most welcome.

David H. Stansbery
Stone Laboratory
June, 1969

LIST OF THE CRAWFISH
OF THE ISLAND REGION OF LAKE ERIE

PHYLUM ARTHROPODA

CLASS CRUSTACEA

ORDER DECAPODA

FAMILY ASTACIDAE

SUBFAMILY CAMBARINAE

GENUS *Procambarus*
**Procambarus acutus acutus* (Girard, 1852).
GENUS *Orconectes*
Orconectes propinquus (Girard, 1852).
**Orconectes sanborni* (Faxon, 1884).
Orconectes rusticus (Girard, 1852).
Orconectes immunis (Hagen, 1870).
GENUS *Cambarus*
Cambarus robustus (Girard, 1852).
**Cambarus diogenes* (Girard, 1852).
Cambarus fodiens (Cottle, 1863).

* Extralimital species not actually found in the islands but recorded from the adjacent mainland in Ohio.

David H. Stansbery
Stone Laboratory
June, 1969

A REVISED LIST OF THE CRAWFISH OF OHIO (CRUSTACEA:DECAPODA:CAMBARIDAE)

A List Compiled from Literature and Museum Records

by

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1982

Class CRUSTACEA
Order DECAPODA
Superfamily ASTACOIDEA Latreille, 1802-1803.
Family CAMBARIDAE Hobbs, 1942.
Subfamily CAMBARINAE Hobbs, 1942.
Genus *Procambarus* Ortmann, 1905.
Subgenus *Ortmannicus* Fowler, 1912.
Procambarus acutus acutus (Girard, 1852).
Genus *Orconectes* Cope, 1872.
Section Limosus Ortmann, 1931.
Group Limosus Rhoades, 1944.
Orconectes sloani (Bundy, 1876).
Section Propinquus Ortmann, 1931.
Group Propinquus Ortmann, 1931.
Orconectes propinquus (Girard, 1852).
Orconectes sanborni (Faxon, 1884).
Orconectes erismophorous Hobbs and Fitzpatrick, 1962.
Orconectes obscurus (Hagen, 1870).
Group Rusticus Ortmann, 1931.
Orconectes rusticus rusticus (Girard, 1852).
? *Orconectes rusticus juvenilis* (Hagen, 1870).
Section Virilis Ortmann, 1931.
Group Virilis Ortmann, 1931.
Orconectes immunis (Hagen, 1870).
Orconectes virilis (Hagen, 1870).
Genus *Cambarus* Erichson, 1846.
Subgenus *Cambarus* Erichson, 1846.
Cambarus carinirostris Hay, 1914.
Cambarus sp.
Cambarus ortmanni Williamson, 1907.
Cambarus sciotensis Rhoades, 1944.
Subgenus *Puncticambarus* Hobbs, 1969.
Cambarus robustus Girard, 1852.
? *Cambarus sp.*
Subgenus *Lacunicambarus* Hobbs, 1969.
Cambarus diogenes diogenes Girard, 1852.
Subgenus *Fallicambarus* Hobbs, 1969.
Cambarus fodiens Cottle, 1863.

EXTRALIMITAL SPECIES POSSIBLY IN OHIO

Subgenus *Erebicambarus* Hobbs, 1969.
Cambarus laevis Faxon, 1914. IN
Subgenus *Jugicambarus* Hobbs, 1969.
Cambarus monongalensis Ortmann, 1905. WV
Cambarus dubius Faxon, 1884. WV

A KEY TO LARVAL FISHES FROM LAKE ERIE

by Carroll R. Norden

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[This preliminary draft of an artificial key was prepared while the author was employed by the Great Lakes Laboratory of the U.S. Bureau of Commercial Fisheries. The key is reproduced in the present form to provide a temporary aid to the identification of some larval fishes of Lake Erie, pending the publication of a more complete key which will include a detailed description and figure for each species. Recognition of the characters used in the key will be facilitated by clearing larvae (which have been preserved in 10-percent formalin) in a 3-percent solution of KOH for about 1 minute, before examination.]

1. Number of preanal myomeres more than 30 2

1a. Number of preanal myomeres less than 30 8

2. Distance from tip of snout to anus less than two times the distance from anus to end of caudal fin 3

2a. Distance from tip of snout to anus more than two times the distance from anus to end of caudal fin 5

3. No postlarval stage; yolk sac very large, comprising about 1/3 of the total length during much of the prolarval stage. Conspicuous dip in dorsal finfold at end of developing dorsal fin. - - - -Lake trout, Salvelinus namaycush (Walbaum).

3a. Postlarval stage present; yolk sac much smaller, comprising 1/5 to 1/6 of the total length during much of the prolarval stage. No conspicuous dip in the dorsal finfold. A slight rise in the region of the dorsal fin, and in the region of the developing adipose fin 4

4. A line of chromatophores on either side of the dorsal midline from head to caudal fin, regularly spaced with one per myomere. Very few chromatophores on the caudal fin.- - Lake whitefish, Coregonus clupeaformis (Mitchill).

4a. A line of chromatophores on either side of the dorsal midline from head to caudal fin, irregularly spaced (not in pairs). Chromatophores on the caudal fin are more concentrated. - - - Ciscoes and chubs, Coregonus [Leucichthys] spp.

5. Preanal myomeres 30 to 35. Chromatophores abundant on top of head and along sides of body. - - - - White sucker, Catostomus commersoni (Lacepede).

5a. More than 35 (usually more than 40) preanal myomeres. Chromatophores sparse, a few along midventral line. 6

6. A double row of dash-like chromatophores in the heart region which continue ventrally to the caudal fin. Postanal myomeres 11 to 16 (14.7). Distance from anus to tip of caudal fin comprises 1/3 or more of the total length. Indications of an adipose fin forming in the dorsal finfold.- - American smelt, Osmerus mordax (Mitchill).

6a. A single row of chromatophores in the heart region, which becomes double posterior to the pectoral girdle and ends abruptly in the region of the anus. Fewer than 10 post-anal myomeres. Distance from anus to tip of caudal fin comprises 1/3 to 1/4 of the total length. No indications of an adipose fin. 7

7. Preanal myomeres usually less than 40. Two lines of pigment spots on intestine coming together and forming a V at the pectoral girdle. Anal fin short, with 15 to 20 rays. - - Alewife, Alosa pseudoharengus (Wilson).

7a. Preanal myomeres usually more than 40. Two lines of pigment spots on intestine are widely separated and meet to form a broad oval at the pectoral girdle. Anal fin long, with 25 to 36 rays. - - - - Gizzard shad, Dorosoma cepedianum (LeSueur).

8. Preanal myomeres more than 12 (13-25). 9

8a. Preanal myomeres 8 to 12. 16

9. Number of postanal myomeres less than 17. 10

9a. Number of postanal myomeres more than 17 12

10. Head and body large and heavy. Small, round chromatophores peppered over much of the body, especially dorsally. - - - - Goldfish, Carassius auratus (Linnaeus).

10a. Body slender, head blunt or conical. Few chromatophores, arranged in a pattern along the ventral ridge and dorsal to the intestine. 11

11. Snout conical. Preanal myomeres 23. Two ventral lines of chromatophores beginning at the anus and joining just behind the anal fin to form a V at the caudal fin. - - Emerald shiner, Notropis atherinoides Rafinesque.

11a. Snout blunt. Preanal myomeres 18 to 22. Few chromatophores on top of head. Black spot appears early at base of caudal fin. - - - - Spottail shiner, Notropis hudsonius (Clinton).

12. Yolk sac very large; no postlarval stage. Barbels developing very early on either side of mouth. - - - -Channel catfish, Ictalurus punctatus (Rafinesque).

12a. Yolk sac small; postlarval stage present. No barbels. 13

13. Preanal myomeres 12 to 16. Eyes located dorsally and close together. - - - -Trout-perch, Percopsis omiscomaycus (Walbaum).

13a. Preanal myomeres 17 to 24. Eyes located laterally and rather far apart. 14

14. More than 20 (22) preanal myomeres; snout conical; intestine long. - - - -Logperch, Percina caprodes (Rafinesque).

14a. Preanal myomeres 16 to 24 (18-19); snout blunt; intestine short. 15

15. Postanal myomeres 16 to 21 (18). Intestine about twice the length of the lower jaw. Articulation of jaw located below eye. No canine teeth.- - - - Yellow perch, Perca flavescens (Mitchill).

15a. Postanal myomeres 22 to 29 (26). Intestine about equal to the length of the lower jaw. Articulation of jaw located behind eye. Canine teeth developing.- - - -Walleye, Stizostedion vitreum vitreum (Mitchill).

16. Distance from snout to anus less than 1/2 the total length. Body short, chunky; head large; vertebral column curved; fine, comb-like teeth appearing early on the jaws.- - - -Freshwater drum, Aplodinotus grunniens Rafinesque.

16a. Distance from snout to anus greater than 1/2 the total length. Body more elongate; head smaller; vertebral column straight. 17

17. Postanal myomeres 13 to 15. A pair of chromatophores at end of intestine, just before anus. Pigmentation sparse.- - - -White bass, Roccus chrysops (Rafinesque).

17a. Postanal myomeres 18. Pigmentation abundant in small, round chromatophores over much of the short, compressed body. - - - -White crappie, Pomoxis annularis Rafinesque.

WORKING KEY TO THE LARVAL FISHES DISCOVERED NEAR THE WEST SHORE OF LAKE ERIE

By

Donald Nelson
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Department of Fisheries and Wildlife

1a. Vertical fin rays formed, or nearly so. Late post-larvae. (Note: Late post-larvae were rarely captured in this study, and are therefore not included in this key. Although not all adult and juvenile fins begin to resemble the adult and may be used for diagnostic characters).

1b. Vertical fin rays not formed, or apparently incomplete 2

2a. Yolk-sac apparent. Pro-larvae 3

2b. Yolk-sac not apparent, or only vestige remaining. Early post-larvae 27

3a. Barbels present, with extremely large yolk-sac 4

3b. Barbels absent 5

4a. Yolk-sac larvae probably greater than 10 mm TL. In very early stages yolk-sac extends posterior to the vent. Caudal fin forked by at least 14.8 mm TL . . . . . Channel catfish (Ictalurus punctatus)

4b. Yolk-sac larvae probably less than 10 mm TL. Yolk-sac never extends behind vent. Caudal fin never forked . . . . . Bullheads (Ictalurus spp.)

5a. A conspicuous adhesive organ on the snout of larvae less than 14 mm TL. Very heavily pigmented rudimentary vertical fins present in the finfold . . . . . Gar (Lepisosteus :)

5b. Not as above 6

6a. Post-anal length enters pre-anal length more than or equal to 3 times, and generally more than 4 times 7

6b. Post-anal length enters pre-anal length less than 3 times 8

7a. Post-anal length enters pre-anal length from 4.7 to 5.8 times. Small oil globule present at posterior margin of yolk-sac. Eyes unpigmented at less than 5 mm TL . . . . . Gizzard shad (Dorosoma cepedianum)

7b. Post-anal length enters pre-anal length from 3.3 to 4.3 times. Oil globule not present. Eyes pigmented at hatching, but only barely so . . . . . Alewife (Alosa pseudoharengus)

8a. Pre-anal myomeres greater than or equal to 42. Yolk-sac small and extremely posterior, being noticeably behind pectoral fin buds. If present, ventral pigmentation in the form of a single row along the ventral margin. Post-anal length enters pre-anal length from 2.3 to 2.8 times . . . . Smelt (Osmerus mordax)

8b. Pre-anal myomeres less than 42, and not as above 9

9a. Yolk-sac larvae greater than or equal to 9 mm TL 10

9b. Yolk-sac larvae less than 9 mm TL 12

10a. Yolk-sac entire. Post-anal length enters pre-anal length from 2.3 to 3.0 times. Pre-anal myomeres from 35 to 40 . . . Suckers (Catostomidae); probably Catostomus commersoni

10b. Yolk-sac less than entire 11

11a. Pre-anal myomeres greater than or equal to 25 . . . . . Northern pike (Esox lucius)

11b. Pre-anal myomeres less than 25 . . . . . Walleye (Stizostedion vitreum). See 14a.

12a. Pre-anal myomeres greater than or equal to 29. Yolk-sac entire . . . . . Suckers (Catostomidae) (NOTE: probably Carpiodes cyprinus if TL less than 8.0 mm and pre-anal myomeres from 28-32 with heart or Y-shaped pigment pattern on dorsal head).

12b. Pre-anal myomeres less than 29 13

13a. Pre-anal myomeres greater than or equal to 19 14

13b. Pre-anal myomeres less than 19 18

14a. Post-anal myomeres greater than or equal to 22. Post-anal length enters pre-anal length .8 to .9 times. Yolk-sac elongate with anterior oil globule . . . . . Walleye (Stizostedion vitreum)

14b. Post-anal myomeres less than 22 15

15a. Yolk-sac entire, with no anterior oil globule 16

15b. Yolk-sac less than entire, with anterior oil globule 17

16a. Post-anal length enters pre-anal length less than or equal to 1.9 times. Body slender and may be only lightly pigmented. If pigmentation present, ventral chromatophores commence at base of caudal and extend anteriorly on the ventral side of the yolk-sac. Gas bladder, if present, only lightly pigmented. Few chromatophores on dorsum . . . . . Shiners (Notropis spp.). See 46b. (NOTE: Difficult to separate species. Spottail shiners (N. hudsonius) collected from Lake Michigan and Lake Erie are pigmented as described above. Pro-larval emerald shiners (N. atherinoides) were not collected, however, later staged specimens as small as 5.7 mm TL were collected. These specimens were extremely slender, with eye pigment and chromatophores lacking. No common shiners (N. cornutus) were identified).

16b. Post-anal length enters pre-anal length greater than 1.9 times. Body thick and moderately pigmented. Ventral chromatophores commence at base of caudal and extend anteriorly on the dorsal side of the yolk-sac. Gas bladder heavily pigmented. Ventral line of chromatophores may extend through the gas bladder into the opercular region where a "Y" may be formed. Dorsum with scattered chromatophores . . . . Carp (Cyprinus carpio) and Goldfish (Carassius auratus) (NOTE: Separation of carp and goldfish is difficult. Separation of these two species is probably dependent on the more precocious nature of the goldfish, which is generally smaller at acquisition of specific developmental characteristics).

17a. Gut longer, such that post-anal length enters gut length more than or equal to .9 times. Post-anal length enters pre-anal length more than or equal to 1.2 times. Ventral pigmentation restricted to 4 to 10 chromatophores on ventral margin . . . . . Log perch (Percina caprodes)

17b. Gut shorter, such that post-anal length enters gut length less than .9 times. Post-anal length enters pre-anal length less than 1.2 times. Ventral pigmentation more scattered with numerous, small chromatophores along most myoseptums . . . . . Yellow perch (Perca flavescens)

18a. Post-anal myomeres greater than or equal to 22 . . . . . Walleye (Stizostedion vitreum). See 14a.

18b. Post-anal myomeres less than 22 19

19a. Yolk-sac entire 20

19b. Yolk-sac less than entire 21

20a. Post-anal length enters pre-anal length more than 1 time . . . . . Common shiner (Notropis cornutus) (NOTE: Highly unlikely, however Fish (1932) reports this species with only 14 pre-anal myomeres).

20b. Post-anal length enters pre-anal length less than or equal to 1 time. Head large. One very large oil globule or several smaller ones located posteriorly, generally causing the larvae to float inverted in the surface film. Several large, round or stellate chromatophores on ventral surface of yolk-sac. Eyes colorless at hatching . . . . . Freshwater drum (Aplodinotus grunniens)

21a. Post-anal length enters pre-anal length less than 1 time. (NOTE: May be slightly greater than 1 if specimen is extremely pigmented and stocky) 22

21b. Post-anal length enters pre-anal length more than or equal to 1 time 26

22a. Total myomeres less than or equal to 28. Total length less than or equal to 6.0 mm . . . . . Freshwater drum (Aplodinotus grunniens). See 20b.

22b. Total myomeres greater than 28 23

23a. Relatively stocky with greatest depth entering total length approximately 5 times. Heavily pigmented with round chromatophores over most of body. Post-anal length may enter pre-anal length slightly more than 1 time . . . . . Smallmouth bass (Micropterus dolomieui) or Rock bass (Ambloplites rupestris)

23b. Less stocky than above, with greatest depth entering total length more than 5 times. Not heavily pigmented over entire body, but may have moderate pigmentation on ventral aspect.

24a. Many large, round chromatophores on ventral aspect of the large, round yolk-sac. Ventral pigmentation between vent and caudal region consists of a single line (which may appear double) of round chromatophores on approximately every third myomere. Urostyle oblique at hatching. Eye small and elliptical on horizontal axis, such that vertical length of eye enters greatest depth of head approximately 3 times. Snout blunt. . . . . Trout perch (Percopsis omiscomaycus)

24b. Ventral pigmentation not as above, and much reduced. Urostyle not oblique on pro-larvae. Eye generally round and enters greatest depth of head approximately 2 times 25

25a. Gut short such that post-anal distance enters pre-anal distance less than .7 times. Gas bladder if apparent extends posteriorly almost to vent. Pro-largae small and may be less than 4 mm TL . . . . . Crappie (Pomoxis spp.)

25b. Gut longer than above. Post-anal distance enters pre-anal distance generally more than .7 times. Gas bladder if apparent is well anterior to vent. Pro-larvae may be as large as 5 mm TL. . . . . Sunfish (Lepomis spp.) (NOTE: Largemouth bass (Micropterus salmoides) may also key here).

26a. Post-anal myomeres less than or equal to 14. Gas bladder apparent at approximately 3.5 mm TL. Pigmentation restricted to several round or stellate chromatophores on ventral aspect of yolk-sac and gut, and 4 or more long, slender chromatophores on ventral margin between vent and caudal region . . . . . White bass (Morone chrysops)

26b. Post-anal myomeres greater than 14. Ventral pigmentation between vent and caudal region consists of many small chromatophores on each myoseptum . . . . . Yellow perch (Perca flavescens). See 17b.

27a. Barbels present 28

27b. Barbels absent 29

28a. Tail forked . . . . . Channel catfish (Ictalurus punctatus)

28b. Tail not forked . . . . . Bullheads (Ictalurus spp.)

29a. Post-anal length enters pre-anal length more than or equal to 3 times . . . . .Gizzard shad (Dorosoma cepedianum) and Alewife (Alosa pseudoharengus) (NOTE: Difficult to separate. Perhaps the most useful characteristic is the more anterior vent of the alewife. Post-anal length enters pre-anal length only 3 to 4 times for the alewife, and generally over 5 times for the gizzard shad. Although pigmentation is remarkably similar, alewife appear to have chromatophores both above and below the notochord in the caudal region, while chromatophores are primarily restricted to below the notochord in gizzard shad. This characteristic must be viewed cautiously, however. Smelt (Osmerus mordax) may also key here, however, they are distinguished by a single row of chromatophores on the ventral aspect of the gut, rather than the double row in gizzard shad and alewife).

29b. Post-anal length enters pre-anal length less than 3 times 30

30a. Pre-anal myomeres greater than or equal to 40. Ventral chromatophores restricted to a single row. Three or more very conspicuous chromatophores present between vent and caudal region on ventral aspect. Gas bladder, if apparent, is extremely posterior (only slightly forward of mid-body) and pigmented dorsally . . . . . Smelt (Osmerus mordax)

30b. Pre-anal myomeres less than 40 31

31a. Size of early post-larvae greater than or equal to 14 mm TL 32

31b. Size of early post-larvae less than 14 mm TL 37

32a. Post-anal length enters pre-anal length less than 1.5 times 33

32b. Post-anal length enters pre-anal length more than or equal to 1.5 times 34

33a. Pre-anal myomeres less than or equal to 16. Gut extremely coiled. Several very conspicuous chromatophores on ventral margin, just anterior to the caudal region . . . . . White bass (Morone chrysops). See 40a.

33b. Pre-anal myomeres greater than 16. Gut not extremely coiled 38

34a. Greatest depth enters total length less than 5 times . . . . . Carp (Cyprinus carpio) and Goldfish (Carassius auratus). See 46a.

34b. Greatest depth enters total length more than 5 times 35

35a. Post-anal length enters gut length more than 1.2 times . . . . . Northern pike (Esox lucius)

35b. Post-anal length enters gut length less than or equal to 1.2 times 36

36a. Post-anal length enters pre-anal length more than 2 times . . . . . Suckers (Catostomidae). See 37a.

36b. Post-anal length enters pre-anal length less than or equal to 2 times . . . . . Gar (Lepisosteus spp.)

37a. Pre-anal myomeres greater than or equal to 29. Chromatophores numerous on both ventral and dorsal margins, and generally organized into a double series. Larger specimens with pigmentation along lateral line . . . . . Suckers (Catostomidae)

37b. Pre-anal myomeres less than 29 38

38a. Pre-anal myomeres less than or equal to 16 39

38b. Pre-anal myomeres greater than 16 44

39a. Post-anal length enters pre-anal length 1 or more times 40

39b. Post-anal length enters pre-anal length less than 1 time. (NOTE: If extremely pigmented over entire body it may be slightly more than 1 time) 41

40a. Post-anal myomeres less than or equal to 13. Gut extremely coiled. On larger specimens there may be several very conspicuous chromatophores anterior to the caudal region on the ventral margin. . . White bass (Morone chrysops)

40b. Post-anal myomeres greater than 13. Probably with a single row of chromatophores (which may appear double) on approximately every third myomere between vent and caudal region on ventral margin . . . . Trout perch (Percopsis omiscomaycus)

41a. Post-anal myomeres less than 14. Gut extremely coiled and bent abruptly downward near vent. Head extremely large with small, darkly pigmented eyes located dorso-laterally. Dorsal finfold persistent. . . Freshwater drum (Aplodinotus grunniens)

41b. Post-anal myomeres more than or equal to 14. Not as above 42

42a. Heavily pigmented over most of body. Relatively stocky, with greatest depth entering total length approximately 5 times. Gut relatively straight and thick. . . Bass (Micropterus spp.)

42b. Not heavily pigmented. More slender than above, with greatest depth entering total length more than 5 times 43

43a. Vent extremely anterior with post-anal length entering pre-anal length less than .7 times. Gas bladder extends behind vent on specimens larger than 8 mm TL, and nearly so no smaller specimens . . . . . Crappie (Pomoxis spp.)

43b. Vent not extremely anterior with post-anal length entering pre-anal length more than or equal to .7 times. Gas bladder does not extend behind vent . . . . . Sunfish (Lepomis spp.)

(NOTE: Early post-larval Trout perch (Percopsis omiscomaycus) which were not collected in this study will probably also key here, but should be distinguished by more chromatophores on ventrum and development of adipose fin in later stages).

44a. Post-anal myomeres less than or equal to 16 45

44b. Post-anal myomeres greater than 16 47

45a. Post-anal length enters pre-anal length nearly 1 time, or only slightly more or less . . . . . Yellow perch (Perca flavescens)

45b. Post-anal length enters pre-anal length noticeably more than 1 time 46

46a. Post-anal length enters pre-anal length more than or equal to 2 times. Not extremely slender with greatest depth entering total length less than 6.5 times. May have a heavily pigmented row of chromatophores extending from caudal region anteriorly on ventral margin, over gut, and to opercular region where it forms a "Y". Head heavily pigmented on dorsal aspect . . . . . Carp (Cyprinus carpio) and Goldfish (Crassius auratus). See comment at 16b.

46b. Post-anal length enters pre-anal length less than 2 times. Relatively slender with greatest depth entering total length more than or equal to 6.5 times. Pigmentation variable, but with no "Y" in opercular region. . . . . Shiners (Notropis spp.) (NOTE: Difficult to separate species. See also comments at 16a. Tentative identification of spottail shiner (N. hudsonius) indicates chromatophores on ventrum which may be somewhat scattered or consolidated into a double series posterior to the vent. Dorsal pigmentation generally a double series. Larvae are not extremely slender and appear rather blunt. Gas bladder very apparent and pigmented. Yolk material present until 6.0-6.5 mm TL. Tentative

emerald shiners (N. atherinoides) appear to be less pigmented. At total lengths of less than 5.5 mm even the eyes are pigmentless. In later stages a single line of pigmentation appears on ventrum, as well as several large chromatophores on top of head. At approximately 9 mm TL the chromatophores between vent and caudal region form a double series which meet posteriorly. Pigmentation along lateral line also develops at this stage. Larvae are more slender than above, with a gas bladder which is less evident at early stages).

47a. Gut long, straight and relatively thick: Post-anal length enters gut length more than or equal to .8 times. May have 4 to 10 chromatophores on ventral margin. . . . . Log perch (Percina caprodes)

47b. Gut shorter and thinner. Post-anal length enters gut length less than .8 times. May be more heavily pigmented 48

48a. Post-anal myomeres less than 21. . . . Yellow perch (Perca flavescens)

48b. Post-anal myomeres greater than or equal to 21 . . . . . Walleye (Stizostedion vitreum)

TAXONOMIC LISTINGS OF LAKE ERIE ISLANDS REGION BIOTA

The Recent Higher Taxa of Ohio Animals

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Phylum PORIFERA (sponges)

Class Demospongiae
Order Haplosclerida (Family Spongillidae)

Phylum COELENTERATA (=CNIDARIA) (polyps & jellyfishes)

Class Hydrozoa
Order Limnomedusae (Family Olindiiae: Craspedacusta)
Anthomedusae (Family Hydridae: Hydra and Chlorohydra, and
Family Clavidae: Cordylophora)

Phylum PLATYHELMINTHES (flat worms)

Class Turbellaria
Order Catenulida
Macrostomida
Rhabdocoela
Alloeocoela
Tricladida (planarians)
Class Trematoda (flukes)
Subclass Monogenea
Order Polyopisthocotylea
Monopisthocotylea
Subclass Aspidogastrea

Subclass Digenea

Class Cestoda (tape worms)
Order Proteocephalidea
Cyclophyllidea
Pseudophyllidea
Caryophyllidea

Phylum NEMERTINA (nemerteans)

Class Nemertinea
Order Hoplonemertea (Family Tetrastemmatidae: Prostoma)

Phylum GASTROTRICHA (gastrotrichs)

Class Chaetonotoida
  Order Chaetonotoidea

Phylum ROTIFERA (rotifers)

Class Bdelloidea
  Order Bdelloida
Class Monogononta
  Order Ploima
    Floscullariaceae
    Collothecaceae

Phylum NEMATODA (nematodes)

Class Adenophorea (=Aphasmida)
  Order Chromadorida
    Araeolaimida
    Monhysterida
    Desmodorida
    Enoplida
    Dorylaimida
    Mononchida
    Trichiuroida
    Dioctophymatoida
Class Secernentea (=Phasmida)
  Order Tylenchida
    Rhabditida
    Strongylidida
    Ascarida
    Oxyurida
    Spirurida

Phylum NEMATOMORPHA (horsehair worms)

Class Gordiacea
  Order Gordioida

Phylum ACANTHOCEPHALA (spiney-headed worms)

Class Eoacanthocephala
  Order Gyracanthocephala
    Neoacanthocephala
Class Metacanthocephala
  Order Paleacanthocephala

Phylum ENDOPROCTA

Class Calyssozoa
  Order Pedicellinida (Family Urnatellidae: Urnatella)

Phylum ECTOPROCTA (bryozoans)

Class Gymnolaemata
  Order Ctenostomata (Family Paludicellidae)
Class Phylactolaemata
  Order Lophopoda

Phylum MOLLUSCA (molluscs)

Class Gastropoda (snails and slugs)
  Order Mesogastropoda (aquatic Families Pleuroceridae, Amnicolidae, Viviparidae, and Valvatidae)
    Stylommatophora (9 terrestrial families)
    Basommatophora (terrestrial Family Carychiidae and aquatic Families Physidae, Lymnaeidae, Planorbidae, Ancylidae)
Class Pelecypoda
  Order Eulamellibranchia (Families Sphaeridae, Corbiculidae, Margaritiferidae, and Unionidae)

Phylum ANNELIDA (segmented worms)

Class Polychaeta (polychaetes)
  Order Sedentaria (Family Sabellidae: Manayunkia)
Class Oligochaeta (oligochaetes)
  Order Plesiopora
    Opisthopora (most earthworms)
    Prosopora (Family Lumbriculidae)
Class Branchiobdellida (branchiobdellids)
  Order
Class Hirudinea (leeches)
  Order Rhynchobdellida
    Arhynchobdellida

Phylum TARDIGRADA (targigrades)

Class Tardigradida
  Order Heterotardigrada
    Eutardigrada

Phylum PENTASTOMIDA (tongue worms)

Class Linguatulida
  Order Cephalobaenida
    Porocephalida

Phylum ARTHROPODA (arthropods)

Class Arachnida
- Order Pseudoscorpionida (pseudoscorpions)
- Phalangida (daddy-long-legs)
- Acari (mites)
- Araneida (spiders)

Class Crustacea
- Subclass Branchiopoda
  - Order Anostraca (fairy shrimps)
  - Conchostraca (clam shrimps)
  - Cladocera (waterfleas)
- Subclass Ostracoda (seed shrimps)
  - Order Podocopa
- Subclass Copepoda (copepods)
  - Order Calanoida
  - Cyclopoida
  - Harpactacoida
  - Caligoida
  - Lernaeopodoida
- Subclass Branchiura (fishlice)
  - Order Arguloida
- Subclass Malacostraca
  - Order Mysidacea (mysids)
  - Amphipoda (scuds)
  - Isopoda (pillbugs)
  - Decapoda (crayfishes, shrimps, etc.)

Class Chilopoda (centipedes)
- Order Scolopendrida
- Geophilida
- Lithobiida
- Scutigerida

Class Symphyla (garden "centipedes")
- Order Cephalostigmata

Class Diplopoda (millipedes)
- Order Polyxenida
- Polydesmida
- Chordeumida
- Julida
- Spirobolida
- Spirostreptida
- Cambalida
- Polyzoniida

Class Pauropoda (pauropods)
- Order Heterognatha

Class Insecta (insects)
- Order Protura (proturans)
- Collembola (springtails)
- Diplura (diplurans)
- Microcoryphia (bristletails)
- Thysanura (silverfish)
- Ephemerida (mayflies)
- Odonata (dragonflies, damselflies)

Orthoptera (grasshoppers, crickets, etc.)
Phasmida (walking sticks)
Dictyoptera (mantids and cockroaches)
Isoptera (termites)
Dermaptera (earwigs)
Plecoptera (stoneflies)
Zoraptera (zorapterans)
Psocoptera (book and bark lice)
Mallophaga (biting lice)
Anoplura (sucking lice)
Hemiptera (true bugs)
Homoptera (homopterans)
Thysanoptera (thrips)
Megaloptera (dobsonflies)
Neuroptera (lacewings, antlions)
Coleoptera (beetles and weevils)
Mecoptera (scorpionflies)
Trichoptera (caddisflies)
Lepidoptera (butterflies, skippers, and moths)
Diptera (true flies)
Siphonaptera (fleas)
Hymenoptera (sawflies, wasps, ants, bees)

Phylum VERTEBRATA (vertebrates)

Class Agnatha
  Order Petromyzontiformes (lampreys)
Class Teleostomi (bony fishes)
  Order Acipenseriformes (paddlefishes and sturgeons)
    Semionotiformes (=Lepidosteiformes) (gars)
    Amiiformes (bowfins)
    Anguilliformes (eels)
    Clupeiformes (gizzard shads, alewives)
    Salmoniformes (trout, cisco, smelt, mudminnows, pickerel, pike)
    Osteoglossiformes (goldeneyes, mooneyes)
    Cypriniformes (suckers, carp, goldfishes, dace, chub, minnows, shiners)
    Siluriformes (catfishes)
    Percopsiformes (troutperch, pirateperch)
    Gadiformes (burbot, ling)
    Atheriniformes (=Cyprinidontiformes plus Mugiliformes) (topminnows, killifishes, silversides)
    Gasterosteiformes (sticklebacks)
    Perciformes (perch, basses, sunfishes, crappies, walleyes, darters, drums)
    Scorpaeniformes (sculpins)

Class Amphibia (amphibians)
- Order Anura (=Salientia) (frogs and toads)
- Urodela (=Caudata) (salamanders)

Class Reptilia (reptiles)
- Order Chelonia (=Testudinata) (turtles)
- Squamata (lizards and snakes)

Class Aves (birds)
- Order Gaviiformes (loons and divers)
- Podicipediformes (grebes)
- Pelicaniformes (pelicans, gannets, and cormorants)
- Ciconiiformes (herons, egrets, bitterns)
- Anseriformes (swans, geese, ducks)
- Falconiformes (hawks, eagles, vultures)
- Gruiformes (cranes, rails, coots, gallinules)
- Charadriiformes (snipes, sandpipers, phaleropes, gulls, terns, plovers, killdeers, turnstones)
- Columbiformes (pigeons, doves)
- Cuculiformes (cuckoos)
- Strigiformes (owls)
- Caprimulgiformes (whip-poor-wills, nighthawks)
- Apodiformes (swifts, hummingbirds)
- Coraciiformes (kingfishers)
- Piciformes (woodpeckers, flickers)
- Passeriformes (kingbirds, flycatchers, larks, swallows, jays, thrushes, blackbirds, finches, shrikes, starlings, ravens, crows, titmice, wrens, warblers, sparrows, cardinals, tanagers, vireos, ovenbirds)

Class Mammalia (mammals)
- Order Marsupialia (opossums)
- Insectivora (shrews, moles)
- Chiroptera (bats)
- Primates (man)
- Lagomorpha (rabbits)
- Rodentia (porcupines, squirrels, beavers, woodchucks, rats, mice, voles, muskrats)
- Carnivora (wolves, coyotes, dogs, foxes, bears, raccoons, weasels, minks, martens, skunks, wolverines, badgers, otters, cats, lynxs)
- Perissodactyla (horses, asses)
- Artiodactyla (pigs, deer, wapiti, moose, bison, goats, cattle, sheep)

FISH SPECIES IN THE LAKE ERIE ISLANDS[1]

PETROMYXONTIDAE	
Ichthyomyzon unicuspis	Silver lamprey
Petromyzon marinus	Sea lamprey
ACIPENSERIDAE	
Acipenser fulvescens	Lake sturgeon
POLYODONTIDAE	
Polyodon spathula	Paddlefish
LEPISOSTEIDAE	
Lepisosteus osseus	Longnose gar
Lepisosteus oculatus	Spotted gar
AMIIDAE	
Amia calva	Bowfin
ANGUILLIDAE	
Anguilla rostrata	American eel
CLUPEIDAE	
Alosa pseudoharengus	Alewife
Dorosoma cepedianum	Gizzard shad
HIODONTIDAE	
Hiodon tergisus	Mooneye
SALMONIDAE	
Coregonus artedii albus	Lake Erie cisco
Coregonus artedii artedii	Great Lakes cisco
Coregonus clupeaformis	Lake whitefish
Oncorhynchus kisutch	Coho salmon
OSMERIDAE	
Osmerus mordax	Rainbow smelt
UMBRIDAE	
Umbra limi	Central mudminnow

ESOCIDAE	
Esox lucius	Northern pike
Esox americanus vermiculatus	Grass pickerel
Esox masquinongy	Muskellunge
CYRPINIDAE	
Campostoma anomalum	Stoneroller
Carassius auratus	Goldfish
Cyprinus carpio	Carp
Hybopsis amblops	Bigeye chub
Hybopsis storeriana	Silver chub
Nocomus biguttatus	Hornyhead chub
Nocomus micropogon	River chub
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner
Notropis cornutus	Common shiner
Notropis emiliae	Pugnose minnow
Notropis heterodon	Blackchin shiner
Notropis hudsonius	Spottail shiner
Notropis rubellus	Rosyface shiner
Notropis spilopterus	Spotfin shiner
Notropis umbratilis	Sand shiner
Notropis volucellus	Mimic shiner
Pimephales notatus	Bluntnose shiner
Pimephales promelas	Fathead minnow
Rhinichthys atratulus	Blacknose dace
Semotilus astromaculatus	Creek chub
CATOSTOMIDAE	
Carpiodes cyprinus	Quillback
Catostomus catostomus	Longnose sucker
Catostomus commersoni	White sucker
Erimyzon sucetta	Lake chubsucker
Hypentelium nigricans	Northern hog sucker
Ictiobus cyprinellus	Bigmouth buffalo
Minytrema melanops	Spotted sucker
Moxostoma anisurum	Silver redhorse
Moxostoma duquensnei	Black redhorse
Moxostoma erythrurum	Golden redhorse
Moxostoma macrolepidotum	Shorthead redhorse
ICTALURIDAE	
Ictalurus catus	White catfish
Ictalurus melas	Black bullhead
Ictalurus natalis	Yellow bullhead
Ictalurus nebulosus	Brown bullhead
Ictalurus punctatus	Channel catfish
Noturus flavus	Stonecat
Noturus miurus	Brindled madtom
Noturus gyrinus	Tadpole madtom
Pylodictis olivaris	Flathead madtom

PERCOPSIDAE	
Percopsis omiscomaycus	Trout-perch
GADIDAE	
Lota lota	Burbot
CYPRINODONTIDAE	
Fundulus diaphanus	Banded killifish
ATHERINIDAE	
Labidesthes sicculus	Brook silverside
GASTEROSTEIDAE	
Culaea inconstans	Brook stickleback
PERCICHTHYIDAE	
Morone chrysops	White bass
CENTRARCHIDAE	
Ambloplites rupestris	Rock bass
Lepomis cyanellus	Green sunfish
Lepomis gibbosus	Pumpkinseed
Lepomis humilis	Orangespotted sunfish
Lepomis macrochirus	Bluegill
Lepomis microlophus	Redear sunfish
Micropterus dolomieui	Smallmouth bass
Micropterus salmoides	Largemouth bass
Pomoxis annularis	White crappie
Pomoxis nigromaculatus	Black crappie
PERCIDAE	
Ammocrypta pellucida	Eastern sand darter
Etheostoma blennioides	Greenside darter
Etheostoma exile	Iowa darter
Etheostoma flabellare	Fantail darter
Etheostoma nigrum	Johnny darter
Perca flavescens	Yellow perch
Percina caprodes	Logperch
Percina copelandi	Channel darter
Percina maculata	Blackside darter
Percina shumardi	River darter
Stizostedion canadense	Sauger
Stizostedion vitreum vitreum	Walleye
Stizostedion vitreum glaucum	Blue pike
SCIAENIDAE	
Aplodinotus grunniens	Freshwater drum

E	
;tus bairdi	Mottled sculpin
ttus ricei	Spoonhead sculpin

Data Sources:

Nash, 1950
Reutter and Herdendorf, 1976
Stone Laboratory Collection, 1960
Stone Laboratory Class Records, 1960
Trautman, 1957
Van Meter and Trautman, 1970

[1]Nomenclature follows American Fisheries Socity, Special Publication No. 6, 1970.