Identification And Life History Of Common Aquatic Invertebrates

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POND MANAGEMENT

Langston University
Aquaculture Program

Langston University
School of Agriculture
And
Applied Science

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Of Common
Aquatic Insects

By Kenneth Williams
Illustrations by the author

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Table of Contents

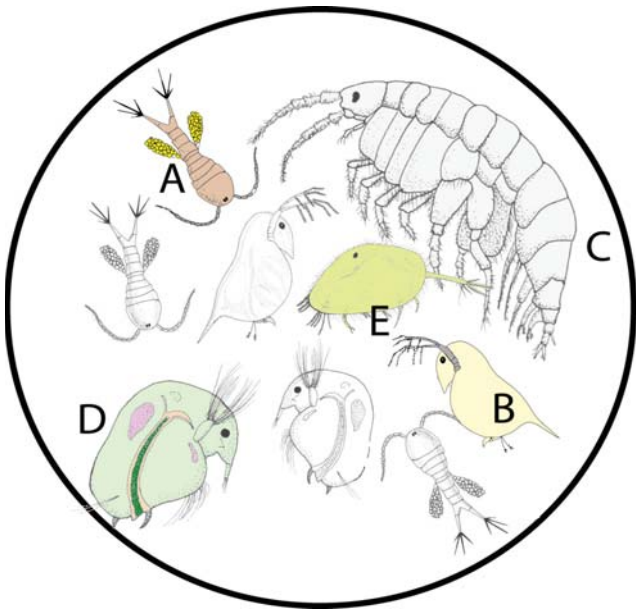
Common Aquatic Pond Invertebrates

Many pond owners develop a fascination for the myriad small aquatic creatures found inhabiting the pond. Some, like the crayfish are edible delicacies: others are useful to humans or play important parts in the aquatic community. Many are microscopic. Some of the more common, readily observed species are discussed below.

Zooplankton

Zooplankton Are very small to microscopic organisms that live in the water column. Large populations of these creatures can best be seen in clear, green ponds during the summer. Many species of zooplankton migrate daily, spending time in cooler less well lit areas of the pond during the day and rising to the surface at night. Zooplankton often lack pigmentation or other protection from the ultraviolet rays of the sun and would die if continually exposed to strong sunlight. Also, predators are less likely to find zooplankton that remain in darker depths of the pond during the day. In daylight hours most zooplankton will be found in shaded areas of the pond.

A plankton net made to catch these creatures can be purchased from a biological supply house or made from the leg of a pair of pantyhose or women's stockings. Attach one end of the stocking to a wire hoop about 12 inches in diameter. Cut the stocking to about a length of 2 feet and tie a knot in the bottom. To use the net, sweep several times just below the water surface. Evert the stocking over a wide mouth jar and rinse the contents into the jar with a little pond water. Hold the jar of water in the light. Plankton large enough to be visible will be seen as gray to white, pinhead or smaller organisms moving about in the water. They eventually concentrate near the bottom of the container. Zooplankton can be more closely observed by using a magnifying glass or low power microscope. Protozoa and other tiny planktonic organisms require use of a microscope to be seen.



Representative groups of zooplankton. **A** - copepods, **B** and **D** cladocerans, **C** - amphipod, **E** - ostrocods

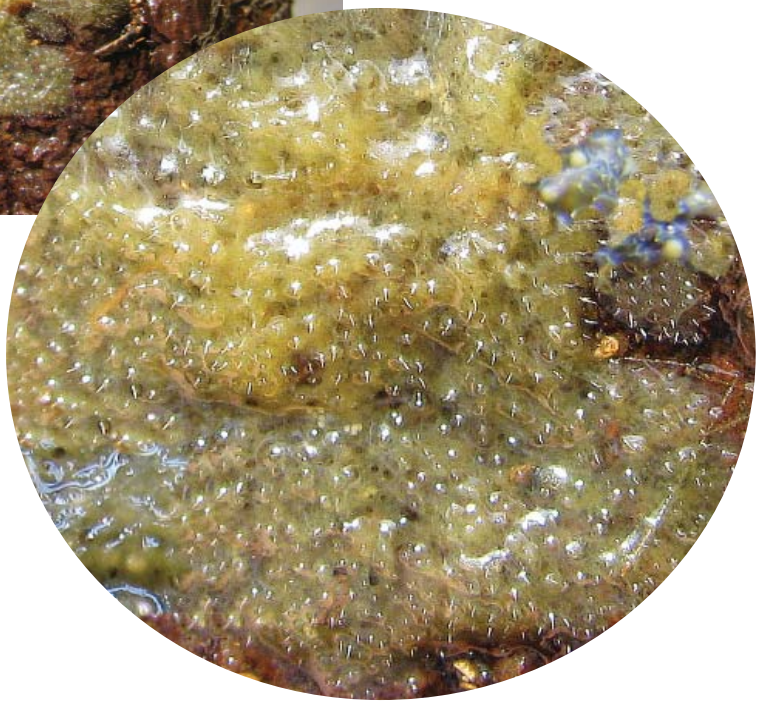
Zooplankton are primary consumers. They feed on phytoplankton (microscopic plants), detritus other zooplankton and bacteria. They are also an important food item for larval fish and other aquatic organisms.

Zooplankton are comprised of a very diverse group of animals including protozoa, rotifers, nematodes, crustaceans and other arthropods. Most of the zooplankton visible to the naked eye or with a small magnifying glass are crustaceans including ostracods, copepods, cladocerans and amphipods.

Fresh-water sponges

There are about 30 species of fresh-water sponges in the U.S. Usually no more than 2-3 species will be found in the same location. The most common species is *Spongilla lacustris*. The sponges are highly variable in color, often brown, gray, yellow or greenish when in sunlight. The green color is due to ingested algae that continue to live for awhile and may even multiply before being digested in the body of the sponge.

Spongilla lacustris - Fresh-water sponge on a branch.



Enlargement showing spicules, oscula and gemmules.

Sponges vary in size from a few cm^2 to over $40m^2$, depending on age and environmental conditions. Living tissue of the sponge is only about 1-4 mm thick but it can look much thicker due to successive layers of new growth accumulating over dead tissue in the same location over a period of several years.

Growth forms may be mat-like or the sponge may have branches or lobes depending on substrate and environmental conditions. Sponges can be found attached to any firm substrate, most commonly, branches, stones, logs and other aquatic debris.

Sponges are not often found in polluted or silt laden waters, or on muddy pond bottoms. Intolerance to water pollution has brought about the extinction of several species.

On close examination with a magnifying glass or low power microscope, the sponge can be seen to have two general sizes of pores on the body surface. Small pores are called ostia and the large pores are called oscula. Flagellated cells in the interior of the sponge create a current that brings water into the sponge through the ostia. The water enters incurrent canals that go to spherical chambers lined with flagellated cells. Food is collected and absorbed by cells lining the chamber called amoebacytes. Water leaves the chamber through the excurrent canal located opposite the incurrent canal. The excurrent canal leads to an expanded chamber that terminates in the osculum, the opening through which water exits the sponge.

The sponge maintains its form by means of silicate structures called spicules. Spicules are often rod shaped and pointed at both ends, however other shapes may also be found in the organism. Spicules are found bundled into columns and also randomly distributed throughout the sponge body.

Sponges feed on microscopic detritus, algae, bacteria

and tiny protozoans that enter the sponge body with the water current.

Sponges are preyed upon by crayfish, particularly of the species *Orconectes, Spongilla fly larvae and other aquatic insect larvae.*

Reproductive structures called gemmules form in the body of the sponge, most often in the autumn but they can form anytime during the year. Gemmules are round, flattened disks, about the size of a pin head, containing the necessary materials to regenerate a new sponge. In cold weather the sponge begins to disintegrate, leaving the gemmules to fall to the bottom or remain in place. In spring the gemmules open through a small pore and the sponge material flows out, covering the gemmule and forming a new sponge.

Sexual reproduction also occurs through the warm months. Individuals may be of both sexes or a single sex. Sperm and eggs are formed in the sponge body and released through the osculum into the environment where they enter other sponges through the ostia. Fertilized eggs develop and migrate to the oscula where they are released and form new sponges.

Hydra

Hydra are interesting and often unnoticed aquatic organisms that can be found in most ponds. When viewed with the unaided eye they appear as white, brown or light green colored threads about ½ inch or less in length. Most hydra are less than a 1/4 inch long when fully extended. When viewed with a magnifying glass or microscope, the tentacles and sometimes, reproductive buds become visible.

A group of Hydra.

Hydra attached to snail shell.

Hydra have 4-12 tentacles that are used to capture prey. Zooplankton or microscopic aquatic animals are the main food source of the hydra although they can capture insect larvae, larval fish and tadpoles.

The hydra looks like a flexible hollow tube with tentacles attached at one end. The mouth is located in the center of the ring of tentacles.

The tentacles are covered with wart-like bumps that contain nematocysts or stinging cells. When prey come into contact with the tentacles the nematocysts resembling long threads are released. These threads are sometimes barbed and can pierce the prey.

Chemicals contained in the nematocysts paralyze the prey which is then guided to the mouth by the tentacles. Food is digested in the gastrovascular cavity. Indigestible food is ejected through the mouth.

Tentacles are also used for locomotion. Hydra can move by tumbling from its up right position onto its tentacles and back to the upright position coming to rest on to its basal disc which usually anchors the organism.

When the hydra is disturbed or inactive the tentacles and body shorten. Tentacles and body extend during feeding periods or when the hydra is moving.

Reproduction

Sexual reproduction usually occurs during the fall although it can happen at other times of the year. Hydras are dioecious. Spermaries and ovaries develop as bumps on the outer body wall. A single egg develops in each ovary and is exposed to the water. Sperm are released from the spermaries into the water where they contact the egg and fertilize it. The egg forms a protective shell and drops off the parent. The embryo remains in the shell through the winter until it hatches in the spring.

Hydras reproduce asexually during the summer by budding. A bud begins as a bump on the outer body wall of the hydra. A new body, mouth and tentacles form from the bud. It eventually develops into a mature individual that breaks off of the parent and lives as a separate organism.

Collecting hydra

Hydra can be found attached to the underside of the floating leaves of aquatic plants such as pond weed, water lilies and duckweed. Hydra prefer cool water in shaded locations. They may appear as small jelly-like bubbles or threads on the undersides of leaves to the unaided eye. Places some leaves in a clear glass jar and let it set for a few hours in a cool, shaded location. Observe the sides of the jar with a magnifying glass after the water has settled. Hydra may be found attached to the jar.

If a dissecting microscope or other low power microscope is available, use it to observe the hydra. Place a leaf and some pond water in a petri dish. Use a low power lens to locate the hydra. They may be found attached to the leaf or bottom of the dish. Larger numbers of hydra can be collected by placing about ½ gallon of aquatic vegetation in a 10 gallon aquarium. Fill the aquarium with pond water from the collection site. It will contain sufficient protozoa to feed the hydra for a few days. Aerate the aquarium gently but do not use filtration. Many of the hydra will collect on the sides and floor of the aquarium, others will be seen attached to vegetation in the tank.

Fresh-water jellyfish

Craspedacusta sowerbyi, the fresh-water jellyfish is related to the hydra. It was not realized that it's hydroid form and medusa form, what is commonly thought of as a jellyfish , was the same animal until 1924.

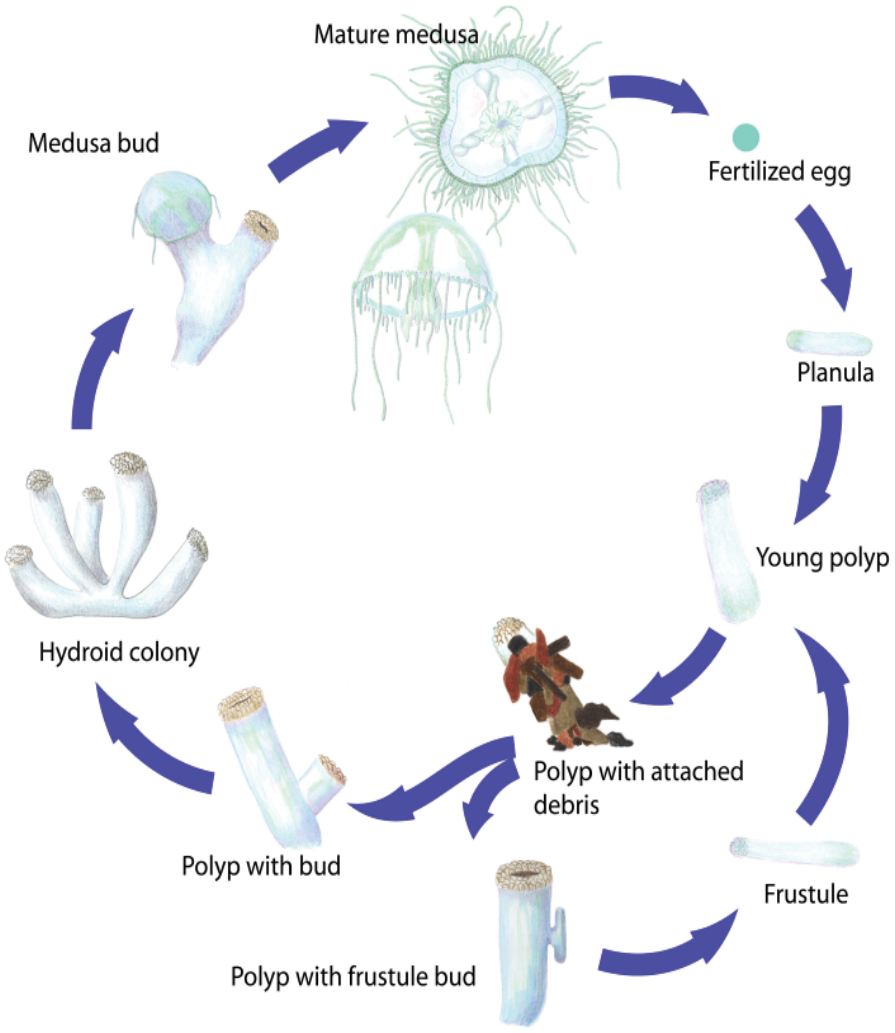
The hydroid form usually consists of 2-4 individual but connected animals although some hydroid

Craspedacusta sowerbyi -fresh-water jellyfish

colonies may be comprised of up to 10 hydroids. An individual can break off from the colony and move slowly about the substrate under its own power. A single individual is usually less than 2 mm long. It has no tentacles, however it does have nematocysts or stinging cells around the mouth. Nematocysts sting and immobilize prey. The body of hydroids secretes a sticky mucus. Substrate debris clings to the mucus coat and provides a camouflage covering over the creature. The hydroid feeds on zooplankton and other small organisms living on the pond bottom.

Like the hydra, the hydroid form of the fresh-water jellyfish produces buds that break off to form other hydroid forms. At occasional, unpredictable intervals, most often from July through October, a bud producing a medusa will form and break free. Medusa often appear in the water in large numbers and are quite noticeable when they occur.

The young medusa forms are about 0.4 mm in diameter and have 8 tentacles. They grow and mature rapidly, reaching a size up to 22 mm or about the size of a penny. The medusa can swim in all directions using its bell for propulsion.



A mature medusa may have 50-500 tentacles of various lengths. Shorter tentacles are used in feeding. It is believed that long tentacles help stabilize the organism in the water.

Nematocysts are found on the tentacles, around the mouth and around the edge of the bell. The fresh-water jelly fish feeds on zooplankton from about 0.2 - 2 mm in size. It may consume some larval fish but is not considered an important predator. Crayfish are known to eat medusae that are found resting on the pond substrate.

The medusa reaches sexual maturity quickly. Usually, only males or females are observed in a single population. Sperm or eggs are released and fertilization occurs in the water. The fertilized egg develops into a hydroid colony about 2-8 mm in size on the pond bottom.

Fresh-water jelly fish are found in ponds, small lakes and sluggish streams throughout the United States except for the northern New England area.

Flat worms

Flatworms are a group of organisms that include parasitic tapeworms, flukes and free swimming, non-parasitic turbellarians. Turbellarians may be familiar from their use in biology classes and are often known by a species name, Planaria. Many species exist., most of them less than 4 mm in length. Ones most likely to be encountered in the pond are much larger, 5 - 30 mm in length. They may be one of several species,One of the more common being *Dugesia sp.*

These ribbon-like worms are colored brown, black, dark yellow, olive green or gray and may be mottled, striped or spotted. The head has two eye-spots that are black and somewhat bean shaped. Ear-like flaps at the sides of the head are used to detect water currents.

The Mouth is found near the center of the body on the ventral side. A feeding tube, the pharynx, can be extended through the mouth and is used to suck up food items.

Turbellarians feed on soft tissues of small invertebrates and dead animal matter. Flatworms are not a significant food item of other organisms in t he pond.

Cilia, or microscopic hairs cover the ventral surface of the worm and help it move along the substrate. In some species cilia cover the entire surface of the worm. Flatworms move by secreting a film of mucus onto the substrate and use their cilia to help glide

Dugesia sp. - flatworms on the stem of a southern niad, an aquatic plant.

over this substance. Most flatworms cannot freely swim in the water.

Flatworms generally are to be found in shallow water away from direct sunlight. Look for them on the underneath side of leaves, stones or other debris. Flatworms inhabit streams, ponds, springs, marshes and most other bodies of water. They obtain oxygen and release carbon dioxide through their epidermis. Most species require oxygen levels in the water of at least 70% saturation.

Flatworms reproduce both sexually and asexually. Asexual reproduction is by means of fission. The worm's body pinches near the center, gradually splitting into two separate halves that become separate individual worms. Experiments have shown that the worms also can be split longitudinally or cut in half and the separated sections will form new worms. Species that can reproduce by fission have been kept alive up to 11 years in the laboratory.

Sexual reproduction usually requires an exchange of sperm from one worm to another. Both sexes are present in each individual. Up to 20 fertilized eggs are laid in a cocoon that is about 2-4 mm in diameter and brown to black in color. In some species the cocoon is attached to the substrate by a stalk. Young worms are 1-3 mm in length and develop without undergoing any larval stages.

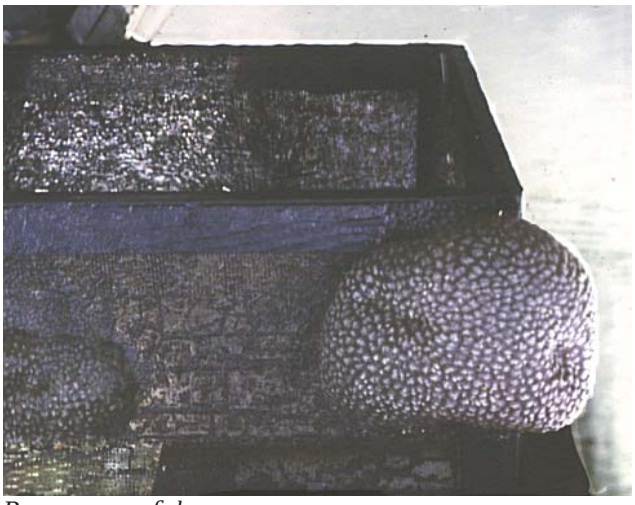
Eggs may over-winter in the cocoon or hatch in about 2 weeks depending on environmental conditions. Flat worms live for a few weeks to months, rarely more than 1 year.

Flat worms can be collected easily. Place a piece of raw meat in a jar. Punch several small holes about 1/8 inch in diameter in the lid of the jar. Cover the jar with duct tape or use a dark colored glass. Place it in a shaded area of the pond in water 6-18 inches deep. Worms may find the bait within an hour but more will be captured if the jar is left over night. The flat worms can be washed off the meat into a dish for closer examination.

Bryozoa

Bryozoa are colonial animals. These groups of organisms can be found from late spring to early fall. They attach themselves to submerged objects such as tree limbs piers, rocks or submerged vegetation.

The more common species form gray, gelatinous,



Bryozoa on a fish cage.

globular shaped colonies that are often round or take on somewhat the shape of the object to which they are attached. Colonies commonly attain the size of a basketball but may be as much as several feet in diameter. The living part of the colony called the zooids are located near the surface of the colonial structure. Tentacled and cilliated filter feeding structures called lophophores extend through an opening in the surface of the colony. The "U" shaped Lophophores retract into a tentacular sheath when not in use. The inside and base of the colony consists of a mass of gelatinous material. Each zooid shares coelomic (body cavity) fluid with other zooids through pores or incomplete cell membranes. Colonies grow best in low light or dark conditions, although enough single cell algae and organic detritus must be present to sustain the organisms.

Statoblasts, the asexual reproductive phase of freshwater bryozoans, can be found floating in ponds and lakes during summer and fall. Several hundred may be found drifting against rocks or the shoreline. Some drifts of statoblasts can number in the hundreds of thousands. These round gelatinous balls are often puzzling enigmas to those who find them. Newspaper reports have even suggested that they are "alien beings".Statoblasts are able to survive drying and freezing while remaining dormant for varying lengths of time. When conditions become favorable, the statoblasts develop into new colonies.

Leeches

Leeches are very closely related to the common earth worm. Leeches are usually .5-2 in. long, however, the longest can be up to 18 inches. Leech species are either ectoparasitic and feed on blood of their hosts or are predaceous and feed on small invertebrates such as insect larvae, flatworms, snails and nematodes. Leeches are found in freshwater in temperate regions of the world but can also be found in tropical terrestrial environments that are moist and there also are marine species.

Predaceous species usually swallow prey whole and feed relatively often. The blood sucking leeches must feed only occasionally, 6-9 months between feedings is common. The blood sucking leeches are equipped with 3 semicircular, toothed, cutting plates located in the mouth which is found inside the anterior sucker. The teeth form a triangle inside the mouth.

Hirudo medicinalis - Medicinal leeches

Glands in the pharynx of the leech excrete an anesthetic that numbs the bitten area. People that have been bitten by leeches report being unaware of the leeches presence on their bodies until they were seen. Glands in the pharynx also secrete an anticoagulant called **hirudin** which prevents blood from clotting. The hirudin causes leech wounds to bleed profusely until the anticoagulant is washed out of the wound. Leech bites can continue to bleed up to 6 hours after the animal has been removed.

Bloodsucking leeches can take in a large quantity of blood. Many species can consume 6-10 times their own body weight at a single feeding which lasts about 45 minutes. Blood is digested in the leech very slowly , up to 9 months are needed after ingestion to

Leech On Small pebble,

completely digest the meal. Unlike most organisms that rely on secreted acids and enzymes to digest food, many leeches have specific, symbiotic bacteria in the digestive tract that excrete enzymes that digest the blood. These bacteria prevent other bacteria from growing in the gut and help preserve the blood from decomposition during the long digestive period.

Leeches in medicine

Leeches have a long history of use in medicine stretching back at least to the Greek, Nicander of Colophon (c 130 BC). Bleeding patients with leeches was once thought to remove disease and excessive "humors" from the blood. It is estimated that about 100,000 leeches per year are currently used in many hospitals for research and for certain medical procedures. The anticoagulant and vasodilators in the leech saliva can help maintain circulation in small capillaries during reattachment surgery and tissue grafts; opening clogged capillaries and veins. This effect can last for up to 48 hours after the leech detaches.

Finding and observing leeches

Most freshwater leeches prefer shallow water bordering ponds and lakes or sluggish streams. Many species are nocturnal. They feed at night and often hide during the day. The best places to search for leeches are under rocks and logs in shallow water during spring and summer. Some species of leeches prefer to feed mostly on one species or class of organism such as frogs, turtles or fish. Other leeches are opportunistic and will feed on whatever is available.

Examine captured vertebrate specimens and look for leeches on the soft tissues.

Some species of leeches can be captured by tying a piece of liver to a string and tossing it into 1-2 feet of water near the shore of a pond. This is best done in the evening or at night. Check the bait periodically to remove crawfish or turtles. Examine the liver for leeches about every 15 minutes because leeches will drop off the liver when they have finished their meal.

Crayfish

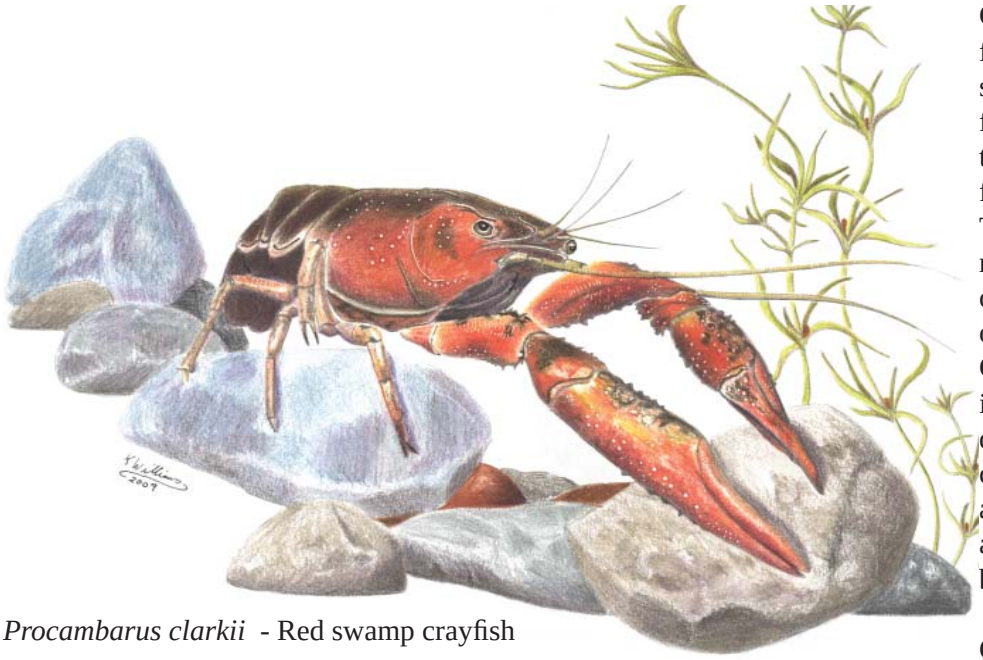
Crayfish, also known as crawfish, crawdads or mud bugs, are easy to catch in many ponds. Many people have become familiar with these crustaceans because of their availability in numerous seafood and Cajun style restaurants. The tail is usually the portion of the crawfish that is eaten, although many people "suck the heads" or eat the internal organs as well. Large "pinchers" also contain a portion of meat. Crayfish taste much like lobster or shrimp.

The two most common pond crayfish are the northern crayfish, *Orconectes virilis* and the red swamp crayfish, *Procambarus clarkii*.

Coloration is variable among and within species and may be red, brown, blue, green, orange or mottled in appearance.

Crawfish pond

The body consists of a fused head and thorax called the cephalothorax. The hard outer covering is the carapace. Feathery gills are located under the carapace just above the first joints of the legs.



Procambarus clarkii - Red swamp crayfish

Internal organs are located in the body cavity within the carapace.

Appendages of the crayfish are specialized for different tasks. The first sets of appendages are the two sets of antennae located at the anterior end of the head. Antennae are use for finding food and sensing the environment.

The next set of appendages comprise the mouthparts used for mincing and tearing small bits of food. The claws or chela are the first legs. Chelae are used in defensive and offensive behaviors as well as for grasping and crushing food. The second and third sets of legs have small pinchers used in handling and mincing food items. These legs are also used in walking. The 4th and 5th set of legs are used primarily for walking.

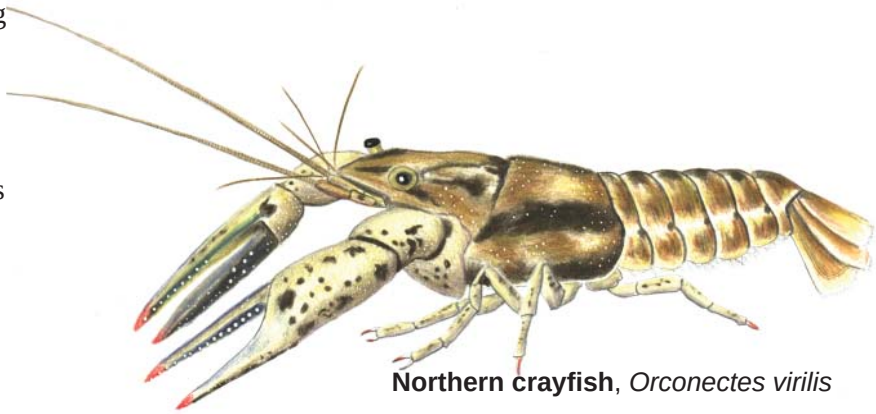
Appendages of the abdomen called pleopods are used for egg attachment sites in the female. The first two pair of male pleopods are modified for sperm transfer.

The terminal appendages are the uropods and telson. Uropods are located on either side of the telson and this fan - shaped appendage is used in locomotion.

Crayfish are most active from dusk to dawn. Many species do not venture from their burrows until the sunlight is reduced from cloudiness or night. These creatures are very mobile. They walk about on the pond bottom or through vegetation. Crayfish are usually found in water less than 1 m deep. If disturbed, crayfish can quickly flex their abdomen and with the aid of the tail dart away backwards.

Crayfish mainly eat dead vegetation and the plants and animals that inhabit this detrital material. They also eat fresh aquatic vegetation, aquatic insects, small fish, snails and commercial fish rations.

Crayfish are very adept at capturing small fish with their chelae (pinchers), and can catch fish up to 2 inches in length. Those fish that are caught but escape can be damaged. Wounded areas on fish can develop bacterial or fungal infections that may eventually kill the fish. It is not necessary to feed crawfish in the pond unless you plan to raise large quantities for the home freezer or for sales.



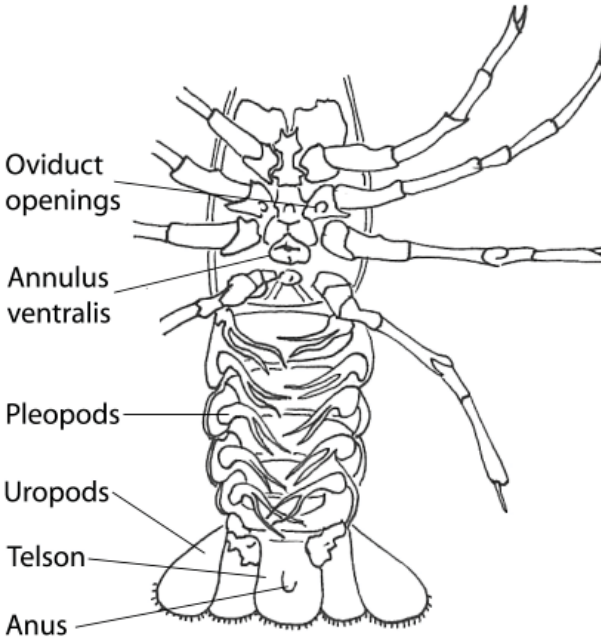
Northern crayfish, *Orconectes virilis*

Crayfish are generally classed as detritovores,

scavengers or omnivores and feed low on the food chain. They recycle detrital material into animal flesh that is consumed by many fish species, turtles, frogs, wading birds, snakes alligators and raccoons. When available, crayfish are often the most important food item of the largemouth bass and are a very good fishing bait for this species and other fish.

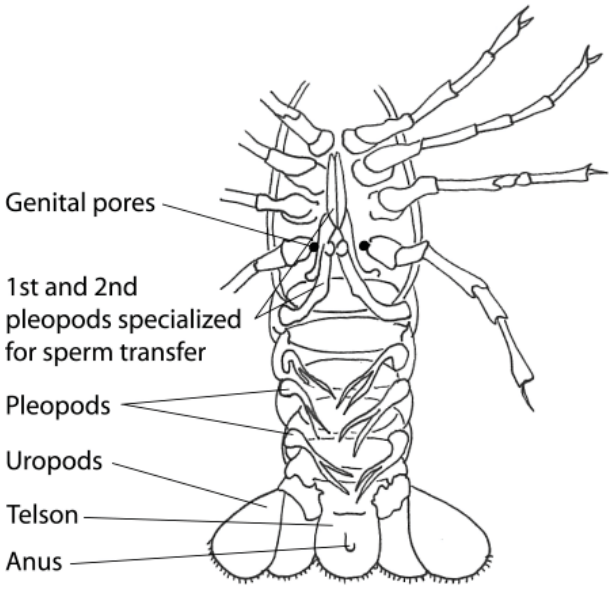
Crayfish reproduction

Breeding usually occurs between early spring and autumn. Males capture females and then using the modified appendages of the first two pair of pleopods, release sperm into the annulus ventralis of the female where it is stored untill needed. Females begin to lay eggs several weeks to more than a month after breeding.



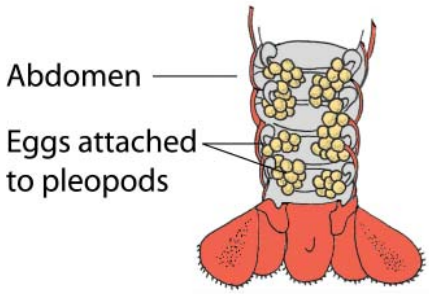
Female crayfish external anatomy

The egg laying process begins when the female releases a sticky substance called “glair” from glands located on the ventral side of the abdomen. Glair covers the abdomen, pleopods and tail. Stored sperm are released from the annulus ventralis into the glair. The female then rolls over, curls her abdomen and begins releasing eggs from genital pores located at the base of the 3rd pair of walking legs. Twisting movements of the female spread eggs through the glair where they are fertilized. Eggs become attached to the pleopods by a capsule or a short stock.



Male crayfish external anatomy

Most females carry 10-700 eggs attached to the abdomen in this manner in March through June. Eggs are aerated by the pleopods and survival rate is high. Eggs hatch in 2-20 weeks and go through 6-10 molts and reach sexual maturity by autumn. Life span of the crayfish is usually less than 2 years.



Female crayfish with eggs

Burrows

Burrows are dug into banks along the streams, ditches, ponds and other bodies of water inhabited by the crayfish. Burrows can also be found in marshy areas and wet pastures. Some species living in permanent waters do not build burrows, although they may scoop out a slanted depression in the substrate to rest in during the day.

Burrows are constructed in autumn or at any time when water level begins to fall and are built at night. Each burrow usually contains only one crayfish except during breeding season. However, young crayfish also may occasionally stay in a burrow inhabited by an adult.

Length and depth of the burrow depends on distance to the water table. Some burrows are over 3 feet deep. Burrows are dug horizontally into the bank or may be constructed at a sharp angle downward. Burrows end in a chamber where the crayfish spends most of the day. The chamber must be at least partially filled with water.

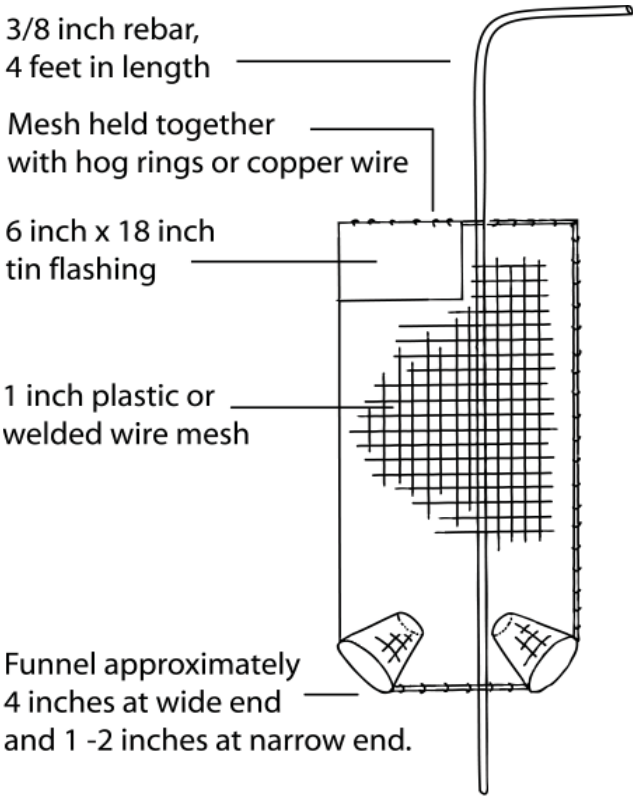
Chimneys at the mouth of burrow are created as a result of burrow construction. Soil dug by the crayfish is formed into a ball or oblong pellet and carried to the surface where it is deposited around the entrance. Material naturally accumulates and forms the chimney. The chimney has no known function however, it has been suggested that it may aid in ventilation of the burrow.

Harvesting crayfish

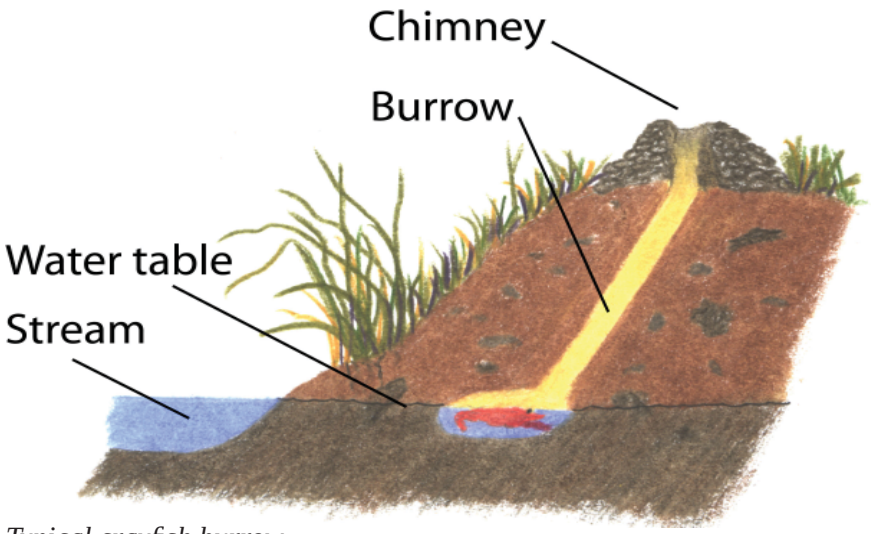
Crayfish can be harvested in the traditional way by tying about ½ of a bacon strip or other fresh meat onto a length of string, casting it into shallow water that contains rocks or weed beds and waiting for the crayfish to grab the bait with its pinchers. When the crayfish "bites", slowly pull in the string and it will continue to hold the meat in the pinchers. When the creature is near enough to shore, scoop it with a small dipnet.

Funnel traps can also be used to catch crayfish. These traps are constructed of chicken wire, plastic mesh or hail screen. Plastic mesh or plastic coated welded wire have the greatest life span.

Form the mesh into a cylinder about 12 inches in diameter and 3 feet long. Construct a round mesh floor at one end of the cylinder. Attach the floor to the cylinder with wire. Two funnel shaped openings are placed at the bottom edge of the trap. The small end of the funnel is approximately 1 inch in diameter. The funnel extends into the trap about 4-6 inches and the funnel opening is about 2-3 inches in diameter. The top of the trap cylinder can be pressed flat and secured with wire or string to prevent crayfish escape but allow for the trap to be opened and crawfish harvested. Bait the trap with large dog biscuits, dead fish or any similar item. Place the trap in 1-4 feet of water near rocky areas or weed outcrops. Stake upright with a length of 3/8 inch diameter rebar or other suitable material. Traps should be harvested daily.



Crawfish Trap Construction



Typical crayfish burrow.

Handling crayfish

Crayfish pinchers are quick and strong. In many species there is a spine at the tip of each pincher used to hold prey. The spines will easily pierce skin and may cause a little bleeding. Adult crayfish can give a nasty pinch to the unwary. The easiest way to handle these creatures is to net them with a small dip net. They can be picked up without pinching if they are firmly grasped by the thumb and index finger on both sides of the carapace.

Crayfish need well aerated water to survive and reproduce. In natural situations where dissolved oxygen values in water fall below 4-5 ppm, the crawfish will often climb out of the water to better aerate their gills and may begin traveling overland in search of a more favorable environment.

Commercial production

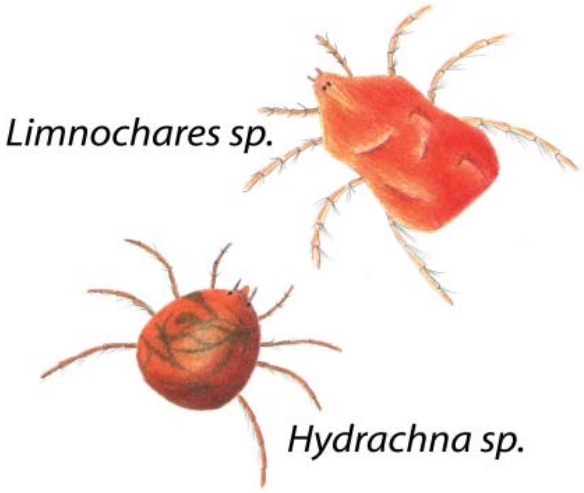
Commercial production of crayfish in the U.S. is centered in Louisiana. It is often part of a field rotation with rice production. Crawfish are stocked at a rate of 20-100 lb/acre depending on the presence of existing stocks. Harvest varies with management intensity. Well managed open ponds can consistently produce 800-1500 lb/acre of crayfish annually. Rice ponds produce 300-500 lb/acre /year while marsh ponds can produce up to 300 lb/acre/year of crayfish.

Water mites- the hydracarina

Hydracarina is not a taxonomic classification but a term of convenience for a group of over 600 species of similar, spider-like organisms. Water mites are 0.4 -3mm in diameter, about the size of a pinhead. They are often brilliantly colored, red, blue, green, yellow or a combination of these colors. Many of the mites are also mottled and brown in color.

The head, thorax and abdomen are fused into a singular body that is round, ovoid or globular in shape or sometimes flattened. The body may be soft or consist of leather-like plates.

Mites breathe through the skin. Many species have swimming hairs on the legs to assist with movement through the water. Most species have poor or little swimming ability and are active during daylight hours.

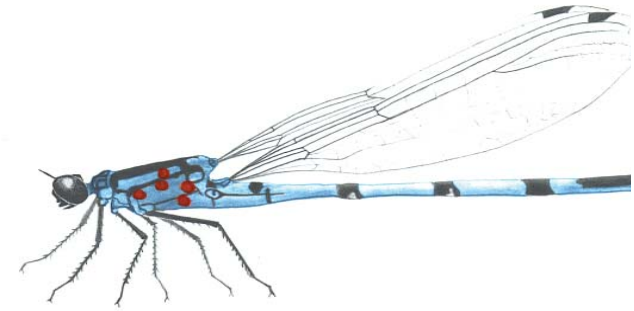


Two common species of water mites.

Water mites are found in streams, lakes, ponds and other kinds of aquatic habitat. They are most often found in littoral regions in densely vegetated water less than 2 m deep. Many species live on the bottom but are less likely to be seen than brightly colored species living in the vegetation or attached to aquatic insects.

Newly hatched larvae have 6 legs and spend a short quiet period in the water before parasitizing a host, usually an aquatic insect. The parasitic phase of the mite feeds off bodily fluids and may inject the host with digestive juices that liquify host tissues. Parasitized hosts seem unharmed by the mites.

Mites remain attached to insects such as dragonfly larvae even when they molt, become adults and fly away. After feeding on the host, the mite enters a brief resting period followed by metamorphosis into a nymph and falls off the host insect. It must land



Mites attached to the body of a damsel fly

in the water to survive and reach sexually mature adulthood.

Most nymphs mature in autumn. Eggs are deposited on stones or other bottom debris in groups of 20-400. Eggs are usually red and may be deposited singly or embedded in a gelatinous mass. Hatching takes place in 1-6 weeks. Mites probably live less than 1 year.

Adult mites feed on dead worms, small aquatic insects, ostracods, and other planktonic crustaceans. Mites are preyed on by carnivorous insects and hydra. They are not an important diet item of fish.

Mites can be collected by washing them off vegetation placed in an enamel pan or by stirring up pond bottom debris and straining the suspended material in a small, fine mesh dipnet.

Snails

Snails of many species are commonly found in ponds. Usually more snails can be found in heavily vegetated ponds than in bare, muddy ponds. Although large snail populations can be found in turbid aquaculture ponds where they feed on waste fish food rather than their natural diet of algae and aquatic plants.

Snails are a diet item for redear sunfish and freshwater drum. The redear sunfish, also known as the “shell cracker”, is often stocked into ponds to control excessive snail populations. Snails of the genus *helisoma* are intermediate hosts of both the yellow and black grubs often found in sportfish taken from heavily vegetated ponds. Reducing snail populations and aquatic vegetation reduces grub infestation in sportfish.

Taxonomically, snails are divided into several large and complex groups. For the purposes of this article the main group of interest is the prosobranchs or Mesogastropoda which have a gill; and often, an operculum or door to close off the shell. Freshwater representatives of this group are found in rivers and lakes. Within the prosobranchs is a group called the Pulmonata, This group of snails have a sac-like lung and no operculum. These snails are by far the more common group in most ponds.

Pulmonate snails can breathe air at the surface through the rudimentary lung but can also survive indefinitely underwater by taking oxygen in through the skin. They prefer dissolved oxygen levels of at least 2 mg/l but can survive short periods of oxygen depletion by coming to the surface for air.

Snails lay eggs in gelatinous masses on the underside of leaves, sticks, stones and other debris found in the pond.

Snails inhabit and feed on aquatic vegetation and are usually found in shallow water but may be found at the lowest depths of aquatic vegetation growth. Snails scrape and shred plant material with a file-like tongue called a radula. The radula is covered with rows of microscopic teeth. Radula structure is one of the key identifiers currently used to classify snails into taxonomic groups.

Snails move by gliding on a film of slime secreted in their foot. Slime may function as a lubricant or is involved in some other way with locomotion. Muscles of the foot contract in waves that propel the creature forwards or backwards. Cilia, small hairs located on the bottom of the foot may also be involved in snail movement. Exact means of locomotion are unknown.

Lymaea sp. , Physella sp. and *Helisoma sp.* Also move through the water by “spinning”. The snail attaches slime to an object on the surface or on the substrate. It curls its foot laterally into a tube and emits a trail of slime as it moves toward the surface or bottom of the pond. The particular snail or other snails may use this slime track to move up and down through the water column until it becomes brittle and breaks apart.

Physella sp. Tadpole snail

Three pulmonate

families are most likely to be found in ponds, the Physidae, Lymnaeidae and Planorbidae.

The Physidae family, genus *Physella sp.* are by far the most common group of snails to be found in most ponds. The *physella sp.* Have many common names including: pond snails, pouch snails, tadpole snails and bladder snails. These snails can be up to 12 mm in length but are more often 6-8mm or less. Shell color is cream, through gray to black. The snail is most easily identified by the sinistral curve of the shell. If the shell is held facing you, the opening will be on the left hand side.

The Lymnaeidae are the largest of the pond snails. The genus *Lymnaea* is known as the great pond snail and can attain a length of 45- 60 mm. The shell opens dexterally or on the right side of the shell when the opening is viewed facing the observer. *Lymnaea* species a have long tapered spire and are colored yellow gray to black.

Lymnaea sp. Great pond snail

Genus *Helisoma sp.* Is also known as the ram's horn snail. Other snails in the family Planorbidae also go by this common name. *Helisoma sp.* Are 11-15 mm in diameter. They are colored yellow-gray to black. This genus is parasitzed by larval stages of an avian tapeworm that is responsible for yellow grubs in fish. The tapeworm larvae burrow into the snail and feed on the digestive gland and other internal organs. Although much damage to the snail may result, the larvae do not often kill the snail and burrow out again after going through a further developmental stage.

Helisoma sp. Ram's horn snail

Mussels

A variety of mussel species are to be found in North American freshwaters. Common native varieties include: ***lampsilis sp.***, Muckets, pinks, razorbacks and washboard, ***Corbicula fluminea*** the Asiatic or fingernail clam and the recently introduced exotic species, ***Dreissena polymorpha***, the zebra mussel.

Freshwater mussels.

Mussels are bottom dwelling organisms that filter water to get their food. Water enters the mussel through the incurrent siphon and circulates over the gills and labial palps before exiting at the excurrent siphon. The labial palps direct particles of food such as phytoplankton and zooplankton into the mouth. Larger particles are passed out of the creature through the excurrent siphon.

The filtering action of mussels can have a profound effect on water clarity. Large mussel beds can remove much of the turbidity in water caused by plankton and suspended sediments. Resulting low levels of phytoplankton can reduce the productivity of the aquatic ecosystem because phytoplankton are a key component of the base of the aquatic food web.

Normally, mussels do not reach concentrations that adversely affect the environment, however, exotic species such as the zebra mussel, can out compete native species and reach population levels that impact the environment. In polluted aquatic environments where phytoplankton levels are very high, mussels can have a beneficial effect by filtering the water and

removing many of these organisms.

Collecting Mussels

Mussels can be found in most aquatic environments. Large muckets can be found half to almost completely buried in silt or mud. They are easiest found when water levels in streams drop during mid to late summer. Freshly opened shells lying in the edge of the stream or on the banks indicate that raccoons or other animals may have been feeding on them recently. Look in nearby shallow water to find living specimens.

Their trails through mud are also visible during periods of low water flow. A sturdy garden rake can be a useful tool for finding mussels in mud or silt.

Look in a variety of aquatic habitats to increase the number of species be found. Some mussels prefer swift flowing water and a hard gravelly stream bottom. Others prefer slow water flow and a sand silt or mud substrate. Mussels will remain alive and can be transported in buckets without water for several hours if they are kept cool.

Corbicula fulminea, the asiatic or fingernail clam, can be found around the shores of many lakes. They congregate near, and in areas where water is flowing into the lake or pond. Large concentrations of these mussels can be found below outflow pipes or other areas where water is regularly discharged.

This mussel has commercial value in the "health food" industry. The entire mussel is boiled and the resulting broth is dried, powdered and made into capsules or tablets. It is sold as a health food supplement called "Corbicula" that is said to be good for your liver. Each teaspoon equals about 100 fresh mussels.

Reproduction

Most mussels are dioecious, both sets of sex organs are found in each individual. Fresh water mussels of the family Unionidae brood their eggs in the gills of the mussel until they reach the glochidia stage (immature larval stage). The **glochidium** leave the mussel through the excurrent siphon or the gill chamber and drift to the bottom. The glochidia look much like small bivalves except that some have a sharp hook on each valve.

When a fish swims by, the glochidia attach themselves to the fins of the fish or are inhaled by the fish where they become attached to the gills. A cyst forms over these larvae and they feed on the host fishes tissues until they mature, break free of the cyst and sink into the bottom sediments where they begin the adult part of their life cycle. Larval mussels rarely harm the host fish even though some fish have harbored up to 3,000 glochidia.

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