For 4-H Club Bulletin

Original: Fish Division
cc: Education-Game
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INSTITUTE FOR FISHERIES RESEARCH
DIVISION OF FISHERIES
MICHIGAN DEPARTMENT OF CONSERVATION
COOPERATING WITH THE
UNIVERSITY OF MICHIGAN

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July 31, 1941

REPORT NO. 683

SUGGESTED MATERIAL FOR AQUATIC INSECT SECTION OF 4-H CLUB BULLETIN

by

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Aquatic insects, by which we mean those insects which spend all or a part of their life on or in fresh water, are of great importance to our inland fisheries. At one time or another, practically every game or rough fish derives the bulk of its nourishment from the supplies of lake- and stream-inhabiting insects. Many game fish, including trout and bluegills, feed almost exclusively on such fare.

Anyone interested in fishing will find it to his advantage to learn a few of the basic requirements of aquatic insects, and to be able to recognize some of the various kinds at sight. By far the greatest majority of these insects belong to one of the following general groups: Mayflies; dragon- and damselflies; stoneflies; alder, dobson and fish flies; true bugs; beetles; caddisflies; and true flies.

The transformations undergone by such insects are even more striking than the familiar caterpillar, chrysalis and winged stages of butterflies and moths. Upon hatching from the egg, mayflies, dragon- and damselflies, and stoneflies

go through two life-history stages: nymph and adult. The nymphal stage is always spent in water. While a nymph, the insect feeds constantly, shedding its skin as it grows; and as it grows, its wings start forming in inconspicuous pads or pockets on the back. After growth is completed, the nymph either climbs out on shore or floats to the surface. Then the skin splits down the back, the wings are drawn from their pockets and expanded, and the adult insect flies away.

In the case of bugs, there is little change in shape as growth proceeds, except for the gradual development of wings.

Alder flies, dobson flies, fish flies, beetles, caddis and true flies all go through three growth stages after hatching from the egg. In the first of these stages, called the larva, the insect appears grub-like or worm-like. The second stage, or pupa, is generally spent in a protective case, like the chrysalis of a butterfly. Pupae of midges and mosquitoes are exceptions, for they lack a protective covering and remain free and active in the water. During the pupal stage the tissues of the larva melt and alter to form the distinctive structures of the adult, which emerges through a split in the pupal skin.

There follows a series of brief descriptions which, together with the illustrations, should make it possible for the reader to place common adult or immature aquatic insects in the proper group.

Mayflies (Order Ephemeroptera)

Nymphs of nearly all lake-inhabiting mayflies possess three long, slender tails at the end of the body. All bear a series of leaf-like or forked gills on the sides of some of the segments of the abdomen. In nearly fully grown specimens, the developing wings will be seen in two small pads or pockets

on the middle of the back where the abdomen and thorax meet. Fully grown nymphs range in size from about one-fourth of an inch to nearly two inches. Largest of all are the burrowers, which are found tunneling through silt bars. These are the "wigglers", favorite winter bait for bluegills.

The mayfly is the only insect to shed its skin after it acquires functional wings. From the nymph, the so-called subimago emerges, which resembles the adult fly except that its wings are dull and cloudy, its body colors hazy, and its legs somewhat shorter than those of the adult. After a variable length of time, from a few minutes to a day or more, depending on the species, the subimago molts and the imago, or adult, emerges. Fishermen know the subimagos as "duns", the adults as "spinners". Adult mayflies are proverbially short-lived. As a rule, they survive only long enough to mate and lay their eggs. They cannot take food as adults, for their mouthparts and alimentary tract are shrunken and functionless. Vast windrows of lifeless bodies are often thrown up on the shores of lakes, sometimes in such quantities as to necessitate their removal in truck-load lots.

Mayflies are one of the three most important groups of aquatic insects in the diet of fishes.

Dragonflies and Damselflies (Order Odonata)

Although quite different in size and general appearance, dragonflies and damselflies are so much alike structurally that they are classified in the same order. The nymphs have one striking feature which serves to separate them at a glance from all other insects. This is their remarkably modified and specialized lower lip, which bears considerable resemblance to an arm. This "arm" originates under the head. It is provided with an "elbow", and at the outer end with a "hand" which bears two large, toothed lobes lined with

sharp spines which perform the grasping functions of fingers and thumb. When at rest, the "elbow" is bent so that the "hand" fits against the under part of the head. But when desirable prey is sighted within reach, the "arm" flashes out like lightning, and its terminal claws clutch the unwary victim which is then drawn back to the waiting jaws.

Damselfly nymphs have three blade-like gills at the end of the body. Dragonfly nymphs lack these, their gills being internal. By drawing water into the gill chamber and forcibly ejecting it, the dragonfly nymph is able to propel itself through the water by using its legs, and thus would seem to be the originator of the principle of the rocket car.

Adult dragon- and damselflies are so familiar as to scarcely need description. Damselflies are generally weak fliers and rather retiring in their habits. Dragonflies, confident in their strength and keen vision, appear quite fearless. A dragonfly was once timed with a stop-watch and its speed calculated as 63 miles per hour. Powerful wing muscles and four strong wings enable these insects to perform intricate aerial maneuvers, including the rare feat of flying backward for short distances.

Both nymphal and adult Odonata are often found in fish stomachs. Nymphs of some of the larger species sometimes feed on young fish in hatchery ponds, and require periodic control measures.

Stoneflies (Order Plecoptera)

Stoneflies are not of frequent occurrence in lakes, However, nymphs of a few species may be found on rocky, wave-swept shoals. Stonefly nymphs are characterized by the presence of two slender tails at the end of the body. The entire body and legs are considerably flattened, to reduce resistance to wave and current action. Tufts of white, slender, finger-like gills are sometimes visible. Depending on the species, these may be located on either side of

the neck, at the bases of the legs, on the under side of the abdomen, or between the bases of the tails. All stonefly nymphs in this region are very dark in color. A few bear rather brilliant yellow or cream markings on the back. In size, fully grown nymphs range from the tiny Capnia, about one-fourth of an inch long, to the huge Pteronarcys which may attain a length of three inches.

Adult stoneflies are slender, dark-colored insects. When at rest, their four net-veined wings are folded flat over the back like those of a cockroach. Adults of some species are among the first insects to emerge in the spring. In fact, it is not at all unusual on a mild day in February or March to see adult stoneflies creeping about over the snow near a stream.

Stoneflies seldom enter into the diet of lake fishes, but are often of considerable importance in that of stream-inhabiting species, especially trout.

Alder flies, Dobson flies, and Fish flies (Order Neuroptera)

Three common genera represent this order in Michigan: Alder flies (Sialis); dobson flies (Corydalis); and fish flies (Chauliodes). All have similar life-histories, embodying the stages of egg, larva, pupa and adult. Larvae of the larger forms are known to fishermen as "hellgrammites", and are a popular bass bait. They may attain a length of three inches. Their most noticeable recognition character is a series of fleshy filaments extending from the side of each abdominal segment. In the two larger forms, a pair of short, strong hooks are at the end of the abdomen. In the smaller (Sialis), there is, instead, a single slender tail.

When larvae growth is completed, pupation takes place in a cell excavated in soil along the shore, out of water.

Adults of all three forms have four wings, but are rather weak fliers, and seldom range far from water. Adult Sialis are black in color, and carry

the wings folded tent-like over the back. Adults of Corydalis and Chauliodes fold the wings flat over the back. The wings of Corydalis are gray with darker markings. Those of Chauliodes are dark brown ornamented with large white patches. The head of the adult male of Corydalis bears two ferocious-looking, elongated jaws, but the insect is quite harmless.

All three forms are useful as fish food.

True Bugs (Order Hemiptera)

A considerable number of true bugs live in or on the water. Those having some value as fish food are listed briefly below:

Water boatmen (Corixidae). Brownish, flattened insects ranging from one-fourth to five-eighths of an inch. Hind legs long, fringed with swimming hairs. Common in shallow water over shoals, in whose surface they burrow when alarmed. Unlike the remainder of this series, water boatmen feed on plant material.

Back swimmers (Notonectidae). These insects may be recognized at a glance by their habit of swimming on their backs, which are V-shaped in cross-section. Various species range in length from a quarter of an inch to an inch. They should be handled carefully, as their beak is capable of inflicting a painful sting.

Water striders (Gerridae). A dense coating of waterproof hairs on the feet makes it possible for water striders to skim over the surface of the water with great speed and agility, the two hind pairs of legs being used for propulsion while the front pair is held in readiness to seize other insects as prey. The long, slender body is usually black with a contrasting white margin. Our common species are usually from half to three-quarters of an inch long.

Giant water bugs (Belostomatidae). The name "giant" is well deserved by

these bugs, which are our largest aquatic insects. They may exceed three inches in length. Although they commonly feed on other insects, they are strong enough to capture and devour fish up to four or five inches in length. Clinging to their prey with stout forelegs, the juices of the prey are sucked out through the sharp, hollow beak of the insect. One of the smaller relatives of the giant water bug has an interesting habit. The female lays her eggs on the back of the male. Thus it becomes his duty to protect the eggs, which are deposited in such a way as to seal his wings shut and prevent him from flying away.

Beetles (Order Coleoptera).

Adult beetles are distinguished from all other insects by their possession of horny front wings which serve as covers for the membranous hind wings. Many beetles are aquatic in habit. A few of the more common ones are mentioned below:

Predacious Diving Beetles (Dytiscidae). The larvae of this family are sometimes known as "water tigers". Their slender bodies may attain a length of three inches. Their head is armed with a pair of sharp, sickle-shaped jaws. The larger species sometimes kill small fish. After pupating ashore, the adult returns to the water. Our larger species are shiny black with a yellowish band around the body and a light diagonal bar across the hind part of the wing covers.

Water Scavenger Beetles (Hydrophilidae). These beetles closely resemble the foregoing family, but are vegetable feeders. Adults of the better-known species are uniformly black, without light markings.

Whirligig Beetles (Gyrinidae). Everyone is familiar with these medium-size beetles which are often seen in groups whirling dizzily over the surface of the water. They are sometimes called "mellow bugs", for they give off an odor similar to that of ripe apples.

Caddisflies (Order Trichoptera).

Caddisflies are one of the three most important groups of aquatic insects entering into the diet of fishes. They occur generally in all fresh-water situations.

Caddis larvae are notable for their ingenuity in constructing tube-like cases. The cases are made by cementing together, with silk secreted by the larva, bits of wood, sand, leaves, or small shells. The case protects the soft body of the larva, while the head and legs protrude, enabling it to crawl about over the bottom seeking food, which may be either plant or animal. Larvae of the larger species which may approach a length of two inches, are often used as bait by winter bluegill fishermen.

Pupation generally takes place under water, sometimes in the larval case, sometimes in a new cocoon.

Adult caddisflies have powdery wings much like those of moths, for the wings are densely covered with fine hairs. At rest, the wings are folded roof-like over the back. The antennae or feelers are long, often longer than the body. Caddisflies resemble moths; but moths have a long, tube-shaped proboscis enabling them to feed on liquids and nectar. The caddisfly has no functional mouthparts and does not feed in the adult stage.

True Flies, (Midges, Mosquitoes, etc.)(Order Diptera).

With the mayflies and caddisflies, the true flies share the position of greatest importance in the diet of fishes. A great many different kinds of flies occur in water during their immature stages. The more important ones, from the standpoint of fish, are listed below:

Craneflies (Tipulidae). In general shape, adult craneflies resemble mosquitoes. In size, they range from tiny, delicate insects, less than half

an inch long to large, robust species with bodies over two inches long. Like all true flies, they have but one pair of wings. They do not bite. The larvae are soft-bodied and fleshy, without legs. Small, finger-like gills are often present at the end of the body. Some pupate in water, others go ashore for this purpose.

Midges (Chironomidae). The midges are utilized by fish in greater numbers than all other true flies combined. Midge adults closely resemble mosquitoes in both size and shape. Fortunately, they do not bite. The larvae are long and slender, with a short leg under the head, which is usually yellow or dark brown. Some larvae are red in color, for they alone, of all insects, have hemoglobin in their blood as do humans. Others are variously white, green or brown in color. The pupae are free swimming in the water.

Mosquitoes (Culicidae). Mosquitoes are too familiar to require description. But it should be borne in mind that, despite their role as carriers of such diseases as malaria and yellow fever, and the extreme annoyance caused by their bites, they are of value to our fisheries, as fish food. The larvae are familiar from their habit of hanging from the surface film of the water, with their short breathing tube protruding into the air.

Illustrations for the different aquatic insects not included here are on file in the Education Division. They were used in the May and July numbers of Michigan Conservation, 1936.

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