Would anyone who fished an aquatic beetle pattern within the past year please raise your hand? Hmm; I don't see many hands. Would anyone who at least saw some species of aquatic beetle during the past year please raise your hand? I see a few more hands, but still not many.

I'm not surprised by the meager show of hands. Most anglers know very little about aquatic beetles. Trout, however, know a lot about them, if only because beetles are astonishingly prolific.

If you want something to occupy you for the rest of your life, become a beetle specialist. The number of beetle species exceeds the number of species of any other group of animals. New estimates, based on work in the rain forests, put the number at over 500,000! If you were to look at one new beetle species every day it would take you about 1,300 years to check them all out—now that's job security! The number of aquatic beetle species is about 5,000 worldwide, and about 1,000 in North America.

Such diversity demonstrates that beetles have found a way to live in nearly every habitat imaginable. Their range of special adaptations is impressive: both the largest and smallest known insects are beetles. Beetles have found ways to live as parasites, predators, plant pests, house pests, and, of course, carrion feeders—some like to dine on fly-tying material! Beetles are key pollinators of many plants, and the dung beetle keeps the world from piling up with you-know-what! The planet would not be the same without beetles.

Meet the Beetles
by Rick Hafele

Aquatic beetles, that is.
Most anglers have never thought about aquatic beetles as fish fodder.
But trout sure think about them.

Despite such diversity, beetles, especially adults, are easy to recognize at the order level. The most distinguishable feature of an adult beetle is its front wings, which form a hard, shell-like covering over the hind wings and abdomen. During flight, these modified front wings, or elytra, are held out at right angles to the body. They may provide some lift, as beetles are generally strong fliers.

Adult beetles also have well-formed antennae that vary widely in length and shape. In some species they form short clubs held under the head; the antennae of other species are as long as their bodies and brightly colored. Nearly all adult beetles have chewing mouth parts. Water boatmen and backswimmers (aquatic Hemiptera, or true bugs) are the aquatic insects most easily confused with adult beetles. To avoid confusion, note that water boatmen and backswimmers have sucking mouth parts, short peg-like antennae, and leathery front wings with membranous tips, not the completely hardened front wings found on beetles.

Beetle larvae are harder to identify than are the adults, and are easily confused with other aquatic insects. On most larvae, the antennae are shorter than the head is wide. Most have chewing mouth parts, though the mandibles of some are hollow and are adapted for piercing and sucking. Gills, when present, will be found on the abdomen.

Alderflies, hellgrammites, and caddisfly larvae all have some similarities to beetle larvae. To avoid confusion, first look for anal hooks. Caddisflies have two and hellgrammites have four, while alderflies and beetles have none. If there are no anal hooks, then look at the gills. Alderflies always have a pair of filament-like gills on each abdominal segment, with the tip of the abdomen ending in a single tapering gill filament. Many beetle larvae breathe air, and have no filament-like gills on their abdomens. Larvae that breathe underwater and have gills do not have single tapering filaments at the tips of their abdomens; rather, they have a pair of short tails or nothing at all.

Beetles belong to the
holometabolous group of insects, which means they undergo complete metamorphosis and pass through egg, larval, pupal and adult stages. Aquatic beetles typically lay their eggs in the spring. The larvae then develop through the summer, and pupate in the fall. Adults emerge in the fall and winter over, then mate and lay eggs the following spring, completing one generation per year. This general scheme, however, has many variations. Some species winter over as larvae, others as pupae, and still others as eggs. Most species complete one generation per year, but for some the cycle is completed in just a few months, while other beetles take several years to grow from egg to egg-laying adult.

The duration of each stage is quite variable. Eggs normally hatch after one to three weeks, but some last several months. Larvae typically live the longest, requiring six to eight months to mature; some, however, live only a month, and others as long as two to three years. I suppose that everyone has seen adult beetles, and that almost everyone has seen beetle larvae, but few people have seen beetle pupae. That's because the pupae hide. Look for them under rocks, in cracks in trees, between leaves, inside fallen wood, or anywhere safety and comfort can be found. Most aquatic beetles leave the water to pupate, and find protected places along the shore. A few pupate underwater. In general, the pupal stage lasts two to three weeks, but two to three months is possible for some species. Adult beetles are long lived compared to most other aquatic insects. Two to three months is common, with the extremes being as short as a week or as long as two or three years.

So which aquatic beetles should the fly fisher know about and imitate? I just finished looking through four books on fly fishing in lakes, and not one mentioned aquatic beetles. This could lead an angler to conclude that aquatic beetles aren't important enough to worry about, but it shouldn't; beetles are often a significant food source for fish. Places such as beaver ponds, small lakes with forested shorelines, high mountain lakes that often have little for fish to eat, and sloughs or backwater areas may all have good populations of aquatic beetles. Fish feed most actively on aquatic beetles in the late spring when adult beetles congregate for mating and egg laying, and in the late summer or early fall when larvae migrate to shoreline areas to pupate.

The Elmidae, or riffle beetles, are the most common in streams and rivers. But they're generally too small and hidden for fish to find or fly fishers to imitate, as are hundreds of other beetles that surround you when you fish.

Three families of aquatic beetles are important to anglers: the Gyrinidae, or whirligig beetles; the Hydroporinae, or water scavenger beetles; and the Dytiscidae, or predacious diving beetles.

Gyrinidae. This family is one of my favorites. Gyrinidae are called whirligig beetles for the behavior of the adults, which swim in frantic circles on the surface of quiet water in streams or lakes in search of food. Small insects landing on the surface or caught in the film are quickly grabbed and consumed. A unique evolutionary feature of adults is the (Continued on page 14)
(Continued from page 11) presence of four eyes—two to look for prey on top of the water, and two to search below the surface. Eggs are laid in the spring, and the larvae crawl about on submerged vegetation and debris in search of small prey such as midge larvae. Pupation occurs on shore above water level.

Both adults and larvae are available to fish, but the larvae may be more important. The non-stop action of adults makes them difficult targets for fish, and even more difficult for a fly fisher to imitate. The larvae present themselves to fish as they climb over vegetation in search of prey. They also sometimes swim with an undulating motion of the abdomen. The larvae have prominent paired gills on each abdominal segment. A size 10 or 12 Woolly Worm in olive or gray makes an effective imitation when fished slowly near weedbeds or just above bottom debris.

Hydrophilidae. The family Hydrophilidae, known commonly as the water scavenger beetles, contain more than 230 species in North America. They are dominant in many ponds and lakes, but do not occur regularly in streams. Larvae are relatively short-lived, requiring only one to three months to mature. During this time they crawl through submerged vegetation searching for prey, much like whirligig beetles. Most hydrophilid
larvae, however, breathe surface air through spiracles (small openings) at the ends of their abdomen. This restricts them to shallow water near shore, and makes them less available than whirligig larvae to fish.

Adults live through most of the year. They move underwater, but are not strong swimmers and must return periodically to the surface to renew the air bubble that supplies them with oxygen while submerged. They feed on a wide variety of live and dead material. Because the adults lead long, active lives, they are often important fish food. Most adults are dark brown or black and range in size from very small (size 20 or less) to large (size 10).

Twitching a size 12 or 14 adult-beetle imitation up to the surface to imitate a natural returning for air is an effective technique in quiet areas of ponds and lakes, where the adults are most abundant.

Dytiscidae. This is the most diverse and abundant family of aquatic beetles, with more than 500 species in North America. Their common name, predacious diving beetle, applies to both the larval and adult stages, as both stages feed on a wide range of prey. Most larvae possess special mandibles with hollow chambers. When prey is caught, the mandibles are thrust into it and the hapless victim's internal fluids are sucked out. Some species are large enough to eat small fish.

Both larvae and adults get most of their oxygen from surface air, and therefore make regular trips topside. The larvae of a few species have gills and are able to breathe underwater. In general, the behavior of both larvae and adults exposes them to fish, and imitating either stage can be effective. The larval stage lasts one to three months, followed by a brief pupal stage, which occurs near shore above the waterline. Adults can be found through most of the year. The size of dytiscids varies widely among species, ranging from 1 to 40 mm (or, in fly-tying terms, from size 26 to size 8). Adults are excellent swimmers and flighters, and are often the first to colonize newly formed ponds or lakes. Some species of dytiscids are also common in streams and rivers, but primarily in slow currents.

Dytiscids are the most common aquatic beetles anglers encounter, and both larvae and adults are important to imitate, because both are available to fish. While size varies widely, patterns ranging from 10 to 14 are good bets. Larval color will generally match the color of the bottom. Adults are mostly brown to black, though some species are dark green. Using a floating line and a sinking fly switched up toward the surface is a good technique for both larval and adult patterns, since both stages swim to the surface to breathe. Woolly Worms often prove useful as larval imitations. Adults can be matched with patterns similar to water boatmen or backswimmers; just adjust the color and size.

Aquatic beetles are not well known or frequently imitated by fly fishers. This mostly reflects their relative invisibility, rather than any lack of diversity or importance as a food source for gamefish. A savvy angler will school himself in their habits and appearance, and use that knowledge to catch fish wherever beetles roam.

Rick Haefle never fails to leave us agog at his manifold talents. He's not only a professional entomologist and fearless nymph fisherman, but, as we learned recently, a professional drummer, making him a member of the elite group that understands both palaeothebaphobia and paradiddles. Rick is a newby, too, and all of us at American Angler with him and his bride Donna, all the best. (The editor's wife, who knows what it's like to love a man who's both a fly tier and a drummer, had only this to say: "That poor woman.")