Environmental Research and Education
Technology for Conservation

News from..

Hudsonia

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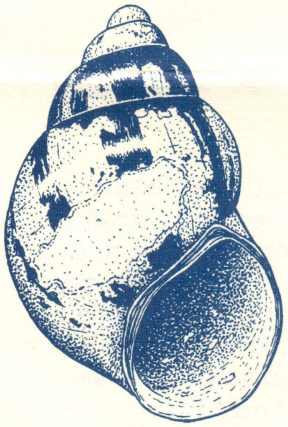
EPIBENTHIC LIFE IN THE HUDSON RIVER

Many of us enjoy the bounty of the Hudson River - the myriad of plants, birds, and mammals of its marshes, or the fish we coax from its teeming depths. But how many of us are aware that the top layer of the mud and the creatures inhabiting it, the "epibenthos", are responsible for much of this productivity? Hudsonia scientists have walked, crawled, fallen and floundered in this mud as much as anyone, and we would like to share with you some ecological impressions of it.

What is mud, anyway? Grossly speaking it is a mixture of inorganic (non-living) clays and silts washed into the river; organic matter from plants and other once-living things; living organisms, many of them microscopic; lots of water; and, in the Hudson at least, a variety of pollutants and garbage of all descriptions. Clay, consisting of microscopic water-absorbing particles, gives the mud its sticky shoe-grabbing texture. Silt particles are somewhat larger, and in addition there is a scattering of even larger sand and gravel. An occasional rock is present, rafted and dropped by the ice or heaved in by a visitor. Organic matter comprises about 8% of the shallow subtidal mud shown in the centerfold. (By comparison, the agricultural soils of the world average 1% organic matter, and the high marsh sediments of the Hudson as much as 30%.) Organic matter, which is mostly microscopic particles of dead plant material, is the food or energy source for most of the creatures of the mud. The pollutants, at least in the Hudson, include PCB, lead, chromium, petroleum compounds, and others, in amounts that are small but toxic to some organisms. Varied trash reflects the history of our human proclivity to toss things into the river, out of our sight. On an average day one might find cinders from the old coal-burning locomotives, bottles, some unidentified plastic pellets, a discarded shoe, a shopping cart, or a plastic doll's arm.

The location of our benthic panorama is the shallows between Cruger Island and Magdalen Island. This area is off Tivoli North Bay, but with a change of a species or two, it could be almost any quiet shallow area between Newburgh and Albany. In fact, we have thrown in a few interesting creatures, such as the white sucker, that are abundant in the Hudson but whose habitat is simply not known! Farther downriver, one might see grass shrimp, blue crabs, and other creatures characteristic of brackish (somewhat salty) water, and some of the creatures shown here in the freshwater tidal benthos would be absent. The Tivoli Bays area is part of the Hudson River National Estuarine Research Reserve and is the focus of several Hudsonia research projects; the North Bay marsh was featured in **News from Hudsonia** (#2).

Vallisneria americana, or **water-celery** is the the waving tape-like plant shown in the centerfold. It is a common native species in the Hudson, where it grows in dense pure beds or mixed with other species. The small water-celery tubers, buried in the mud, are a favorite food of many waterbirds, especially the canvasback duck. Many small algae, insects, and other tiny creatures live attached to the water-celery leaves. These leaves break off in late summer or early fall and form a tough and persistent component of the river's detritus.



Bithynia tentaculata

The **snail** shown is *Bithynia tentaculata*, a species that was probably introduced to North America by early colonists. These animals graze on rock or plant surfaces, scraping off organic material with their rasping tongue (known as a radula). Individuals of *Bithynia* can also feed by filtering, using their gill to strain organic material and algae from the water. Filtered material becomes embedded in mucus, which passes out of the gill chamber and comes near the right side of the animal's head. If you watch specimens in an aquarium, you can observe the snails turning their heads and ingesting the filtered material entrapped in a mucus strand. Very few snails can both graze and filter feed.

The **freshwater mussel**, *Elliptio complanata*, is common in the shallows where it pulls itself through the mud while filtering particles of detritus (dead plant material) and algae from the water. These mussels are eaten by muskrats, and probably by snapping turtles and fish. Their shells have been found in Indian middens along the edge of the river. One of us ate one once, but after the thorough cooking felt necessary to disinfect it, the meat was too leathery to be appealing.

Catostomus commersoni, the **white sucker**, is a sorely neglected fish. Suckers are very abundant, quite tolerant of pollution, and likely to be brought home and eaten by young people fishing in the Hudson Valley. There is a NYS Health Department Health Advisory about consuming fish and crabs from the Hudson River. Please consult your regional DEC office for the latest information about eating your catch. Suckers have baleen-like teeth in their throat that are capable of straining tiny organisms such as midge larvae or even diatoms from the mud in great quantities. The mouth is extended downward to virtually wet-vacuum the bottom, hence the name "sucker". We do not yet know for sure where suckers feed or what they eat in the Hudson. Soon after ice-out in spring, white suckers migrate into stream mouths where the males with their bright breeding stripes can be seen accompanying the larger females in the riffles of the spawning habitats.

One of the Hudson's most important fish food organisms is the **scud**, or amphipod, *Gammarus*. These miniature shrimplike animals crawl on the mud surface, as well as crawling on plants and swimming (after a fashion). Thus they are "part-time" benthos. The scud's body is flattened from side-to-side, whereas the water sowbug's body is flattened from top-to-bottom. The **water sowbug**, or isopod, *Asellus*, spends its time crawling on the bottom. Both water sowbug and scud consume detritus from the mud surface.

Trash interacts with the estuarine ecosystem in many ways, not all of which are bad. Large objects often provide stable places for small organisms to anchor, and protected places for larger animals to live. On the other hand, some flot-

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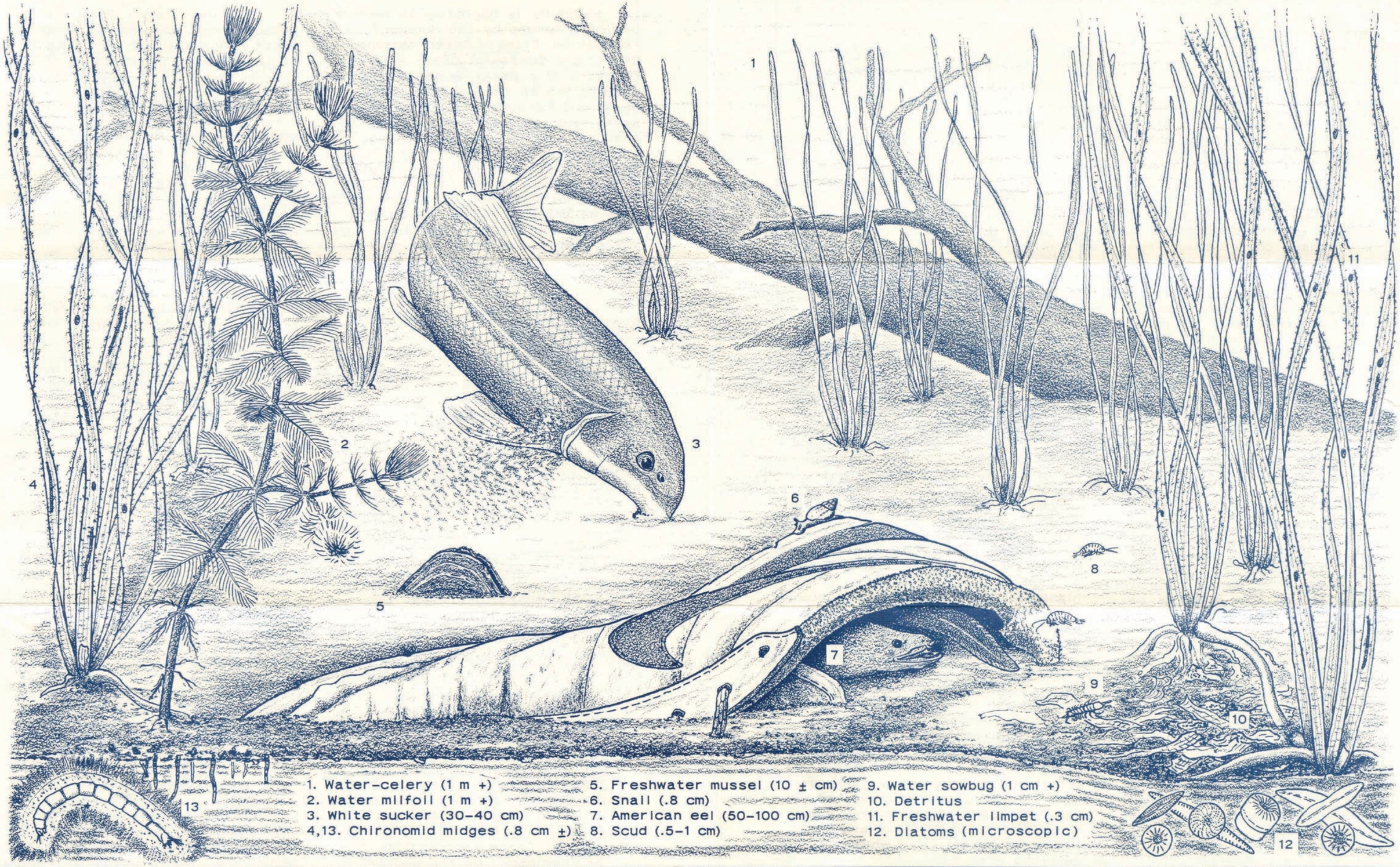
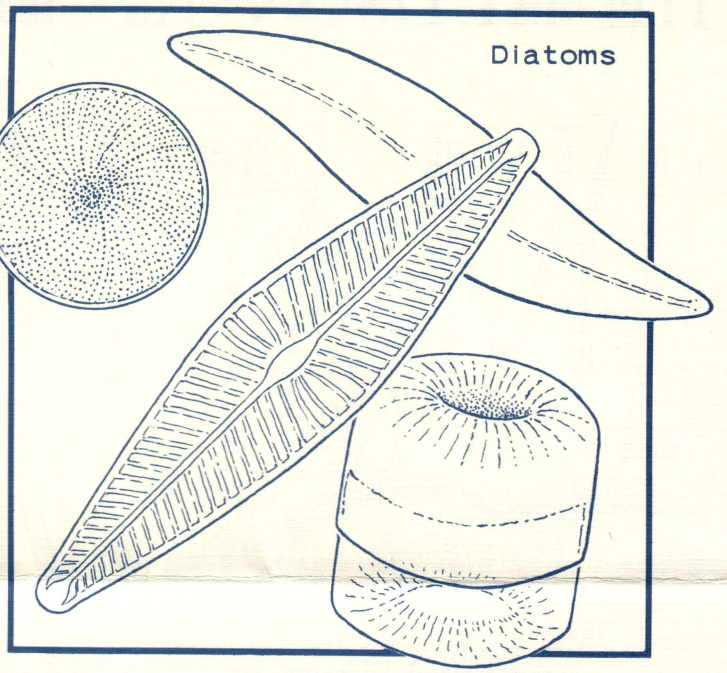


1. Water-celery (1 m +)
2. Water milfoil (1 m +)
3. White sucker (30–40 cm)
4,13. Chironomid midges (.8 cm ±)
5. Freshwater mussel (10 ± cm)
6. Snail (.8 cm)
7. American eel (50–100 cm)
8. Scud (.5–1 cm)
9. Water sowbug (1 cm +)
10. Detritus
11. Freshwater limpet (.3 cm)
12. Diatoms (microscopic)

sam injures or kills animals, strangling fish and water birds, for example. Toxic elements and organic chemicals from the breakdown of garbage adds to the pollution burden of the river. Trash is also hard on field gear and researchers' feet.

One of the most numerous Hudson River fishes is the **American eel**, *Anguilla rostrata*. Tiny translucent eels come out of the Gulf Stream and up the Hudson. They may remain in the river, or ascend way up tributaries, crawling over and around dams and waterfalls at night. Later on, the fully grown eels descend the waterways again, change color from yellowish to silver, and swim to the vicinity of the Sargasso Sea (east of the Caribbean) where they spawn. Decades ago, there was an important commercial eel fishery in the Hudson. Eels were caught in funnel traps (eelpots) baited with mussels, horseshoe crabs from the coast, or other animal matter. Heavy PCB contamination in this oily fish now precludes safe use as food. Eels burrow in the mud or under rocks, where they wait for food to pass by; nearly any live or dead animals of the correct size serve as food.

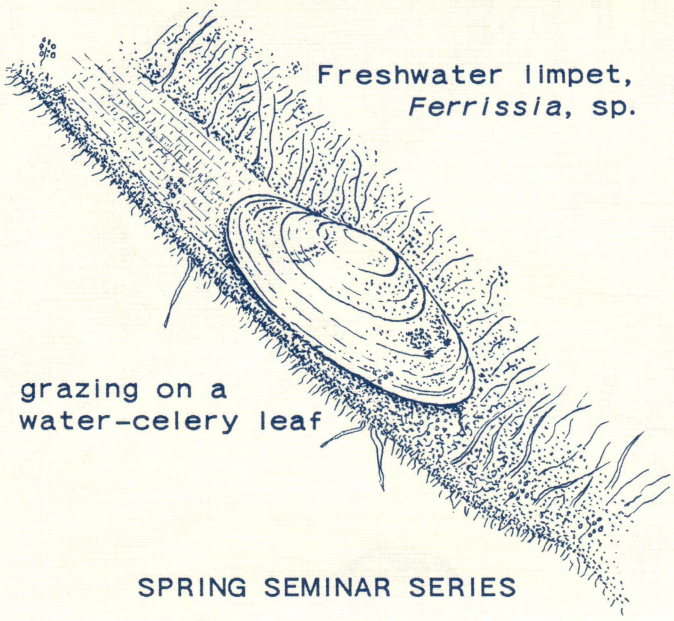
Chironomid midge larvae are frequently overwhelmingly numerous in the muds of estuaries, streams and lakes. Some species ("bloodworms") contain a hemoglobin-like compound in their blood, which allows them to survive in oxygen-poor mud. Larvae of many species live in silk-like tubes in the mud. Adult chironomids are small delicate flying insects, superficially mosquito-like but without biting mouthparts. They "hatch" (emerge as adults) from the river in immense numbers at intervals through the summer. Since they are attracted to lights, they often accumulate around buildings. At the Bard College Field Station, Hudsonia's home, there is an intriguing food chain of adult chironomid to spider to mud dauber wasp to black-capped chickadees and other small birds. In the river, chironomid larvae are very important food for a variety of fish.



Microorganisms constitute a complex community in the mud surface and on particles of detritus. They are at the bottom of the food chain and produce food for themselves and other organisms in two important ways. Algae (in this case diatoms) in the very top layers of mud photosynthesize their own food in the presence of light. The organic matter that they produce will be passed on when they are eaten or decompose. Bacteria and fungi, on the other hand, cannot manufacture their own food and instead decompose organic matter that is present in the detritus, releasing nutrients that can be used by other organisms and higher plants. Electron microscope studies of dead leaves show a very rapid colonization of the leaf by these bacteria and fungi, which will in turn support populations of various protozoans and higher animals. Many of the medium-size organisms in and on the bottom eat dead plant matter. Chironomid larvae, aquatic earthworms, snails, and mussels eat mostly detritus and algae. It is thought, however, that much of the actual nutrition of the detritivores comes from the microorganisms attached to the detritus particles rather than from the cellulose fibers and other resistant materials of which the detritus is made.

OTHER HUDSONIA PROJECTS

Hudsonia is beginning three new projects funded by the Hudson River Foundation. Fishkill Creek, Moodna Creek, and Quassaick Creek are the subjects of a **Baseline Assessment of Tributaries to the Hudson (BATH)**, which will measure water quality, insects, fish, and diatoms. A study of anadromous fish will examine the contribution of Hudson River tributaries to larval production of alewife, blueback herring, and rainbow smelt. Another study in the confluence of the Croton and Hudson Rivers will focus on the life history of grass shrimp and their role as food for Hudson River fish.



Freshwater limpet, *Ferrissia*, sp. grazing on a water-celery leaf

SPRING SEMINAR SERIES

"With Lenses, Nets, and Numbers; the River through a Scientist's Eyes" will be held at the Kingston Maritime Museum, Wednesdays at 7:30 P.M. The series is cosponsored by Hudsonia and Clearwater and is free:

March 2: Stuart Findlay - "Wetlands: Form and Function"
March 9: Robert Schmidt - "Water Chestnut Stands in the Tidal Hudson River"
March 16: John Lucas - "Tips and Travels: Bass Movement in the River"
March 23: Donna Vargo -"7000 Yrs of Prehistory on the Hudson"

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Hudsonia is a non-profit corporation founded to promote better scientific understanding of human-environment interactions in the Hudson Valley. Donations are tax-deductible; we welcome your support.