FRESHWATER SPONGE IN KANGAROO LAKE

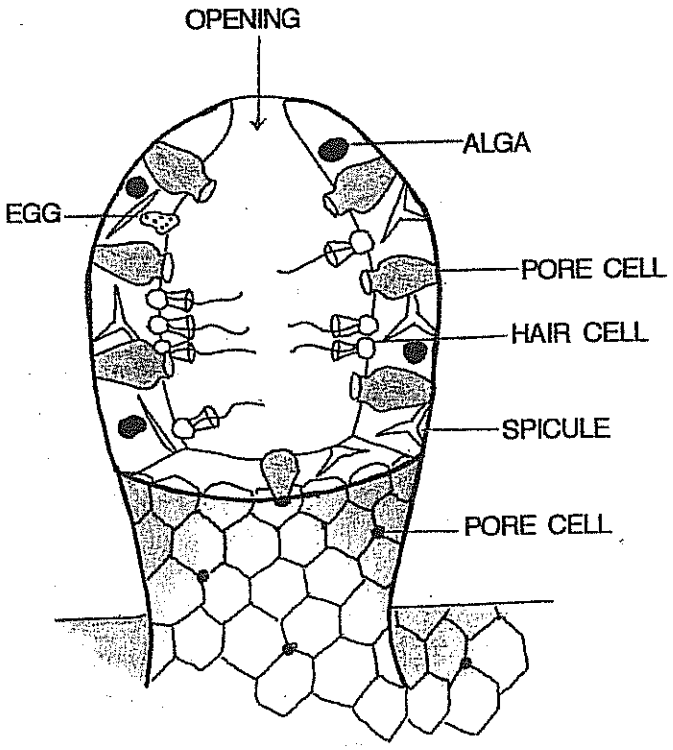
During our Eurasian Water-milfoil survey this fall we came upon a little known animal growing on the lake bottom. It is call a freshwater sponge (Spongilla lacustris L.), and because it contains an alga it is *green* in color. It snagged on the sampling rake at only one of over 530 GPS sites examined in the survey. It doesn't swim or hop, rather it attaches to a log or perhaps a rock, and begins growing to form a vase-like structure less than ¼-inch in size with a small opening (osculum) at its top. Many sponges join together to form a meshwork, like an onion bag; this one was about 6 inches long.

There are about 5,000 species of sponges worldwide in fresh and salt water, but about 27 occur in North America and probably only a few in Wisconsin lakes. Since little is known about them in Wisconsin the DNR is currently studying the species and their distribution in our lakes.

The body wall of this vase-shaped sponge consists of 3 layers: an inner layer of hair cells each with a long hair (flagellum), an outer surface layer of cells, and a gelatinous middle layer containing several kinds of cells. Numerous pores are formed in the body wall. Lake water flows through the pores into the central chamber aided by the beating hairs of hair cells. Certain cells in the middle layer produce a kind of body framework of numerous loosely arranged mineralized spicules shaped like Y, T or toothpicks. They are loosely joined together into a network with proteinaceous glue. The sharp spicules also may provide protection from predation.

Bacteria and protozoa in lake water are sources of food for sponges. They are drawn through the pores into the central chamber, where they are digested and absorbed by the hair cells. Excess water is passed out the opening (osculum) as new water is pulled into the chamber.

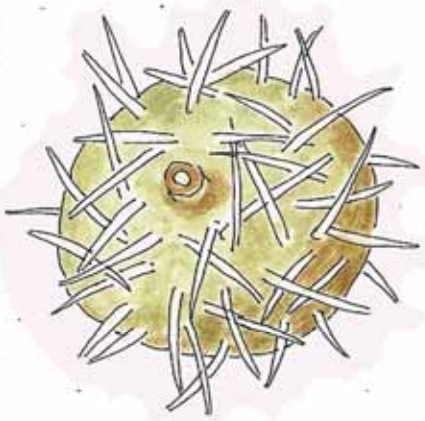
This animal is unique in its lifestyle. Rather than search for all its food, it evolved the approach of incorporating an abundance of a specific green alga into its body. Thus, the sponge is green! Otherwise it would be colorless. The sponge deposits the particular alga, which normally grows in the lake, in the middle gelatinous wall layer. There the algae produce carbohydrate food for the sponge by photosynthesis (carbon dioxide + water + light). In return, the sponge provides the alga cells with protection, minerals, and a reasonably safe place to live.



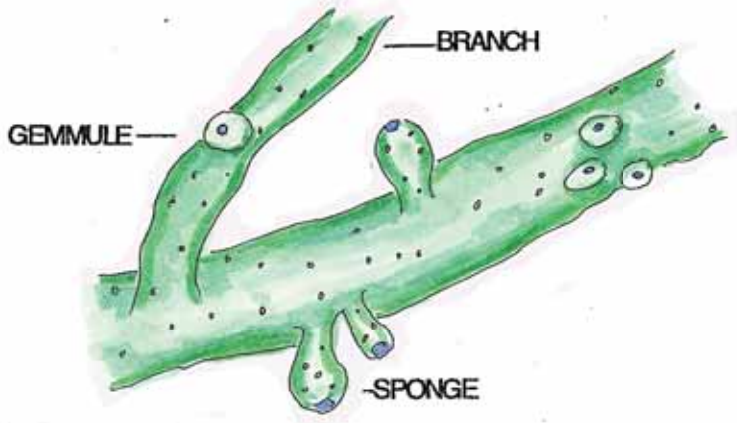
SPONGE

Sexual reproduction. During growth, a particular cell in the middle wall layer differentiates into an egg cell that protrudes slightly into the central chamber; another cell type forms a sperm-producing cell. Swimming sperms are released into the lake and travel to another sponge. There they enter the central chamber and one will fertilize an egg cell. The fertilized egg (zygote) then is released into the lake through the chamber opening. The zygote swims to a new site, attaches to a substrate and grows into a new sponge.

Another way for sponges to reproduce is by asexual reproduction. A sponge commonly forms an over-wintering structure call a gemmule, about 1/32-inch in size, along its meshwork. Gemmules form late in summer in response to cooling water temperatures. A gemmule is like a round, flattened vase with a plugged opening. Its wall also is three-layered, but the outer one is crusty and hard with numerous spicules. The inner one is thin and membranous. The middle cell layer is wide and gelatinous, and contains different types of cell, along with algal cells. During gemmule development this middle layer fills the plugged chamber with these special types of cells, called archeocytes, which can grow into any kind of sponge cell. The gemmule overwinters in this condition.



GEMMULE



In spring the plug in the opening dissolves away, and archeocyte cells grow out through the opening. These cells begin to organize a new sponge. The first cells form a basal region to attach the young animal to a substrate. As cell multiplication continues, other cells organize into the vase-shaped structure of a typical sponge. It will coat its entire body with spicules, much as shown on the gemmule, but for clarity of sponge structure, the spicules have been excluded from the other illustrations shown above.

We will continue to search for sponge species as well as other lesser-known organisms in the lake to learn more about their presence and distribution. If you come upon some unusual animal, plant or geological material in the lake, collect a sample, if possible, so that we can identify and record your finding in the lake records.

References:
Buchsbaum, R. 1938. Animals without backbones. Univ. Chicago Press, Chicago.
LaLiberte, G., Wisconsin Department of Natural Resources, identified the sponge.
Watermolen, D. 2006. Lake Tides 31 (3): 8-9.
See also web: wikipedia/wiki/sponge
Article prepared and illustrated by Paul and Marilyn Mahlberg.