The Biology and Fishery of Florida's Commercial Sponges

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Sponge History

Since the time of the ancient Greeks, man has recognized the usefulness of the natural sea sponge. Synthetic sponges are not nearly as absorbent or durable as natural sponges and are harder to clean. Because of their ability to absorb water and soft compressible nature, natural sponges have been used for a variety of purposes ranging from personal bathing to a number of industrial applications. Today sponges are in demand in industrialized nations by consumers willing to pay a premium price for a superior natural product.

Until the mid 19th century, the world's sponge supply came from the Mediterranean Sea. However, suitable sponges were found at that time in Florida and the Caribbean. Important sponge fisheries were quickly developed with Florida, Cuba, and the Bahamas becoming the primary producers. Until the 1890s all of Florida's sponges were harvested from the Florida Keys, but the discovery of commercial sponges in the northern Gulf of Mexico, along with the introduction of Mediterranean deep diving techniques, led to the rapid growth of the industry in Tarpon Springs, Florida. During the early part of this century the sponge fishery was very important. However, a mysterious disease in the late 1930s, red tides, over-fishing, and introduction of synthetic sponges during the 1950s, reduced the fishery to a small fraction of its former importance.

Worldwide over 9,000 species of sponges have been described, but only a few species are of economic importance. Only those species that have a skeleton made of spongin fiber (a protein-like substance somewhat similar to hair) and arranged in a particular pattern, are durable, soft, and able to absorb water. In general, these species are not found in coral reef areas and research has shown that they represent a very small part (2.4 percent) of the sponge community in habitats where they are harvested (Figure 1).

Five species in Florida are harvested commercially. Three of these, sheepswool sponge, yellow sponge, and the grass sponge are the primary marketed sponges. Sheepswool is the most important species because it is the softest and most durable (Figure 2). Two other species, the glove sponge and finger sponge easily fall apart when used and only very small numbers are harvested for ornamental purposes.

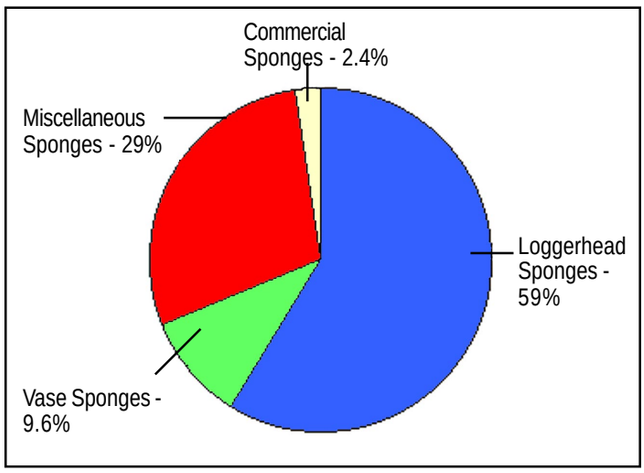

Figure 1. Sponge community biomass - Florida Keys sponge grounds.

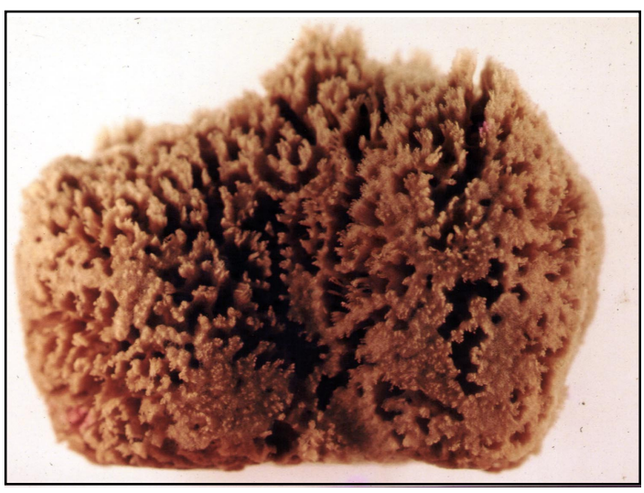

Figure 2. Sheepswool sponge.

Sponge Biology

Sponges obtain their food by filtering microscopic food particles from the water. They are somewhat unique from other filter feeding organisms (clams, barnacles, sea squirts, etc.) in that they can filter even smaller food particles down to the size of bacteria. Water is pumped through small openings on the side (ostia), filtered through a maze of canals and chambers, and then expelled through larger openings on the top of the sponge (Figure 3). Water is driven through the sponge by special cells equipped with a twirling whip-like filament (flagellum). In many habitats, sponges are an important consumer of microscopic food particles in the water.

The canals and chambers of sponges provide habitat for a myriad of small shrimp-like and worm-like organisms. In a way, they can be thought of as apartment buildings for these organisms. These sponge inhabitants do not appear to have any deleterious effects on the sponge.

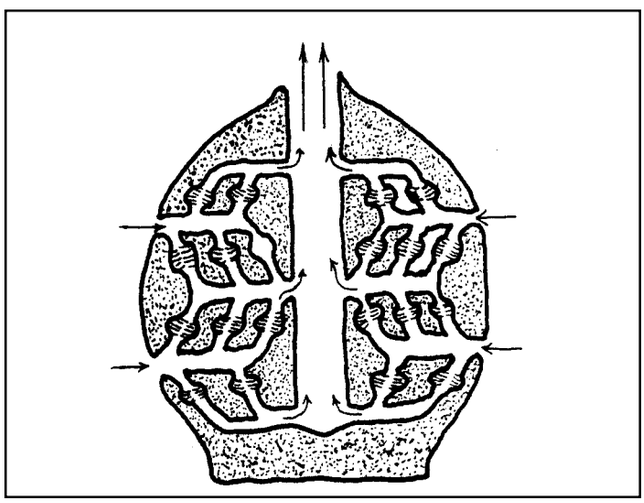

Figure 3. Diagram of the canal system of a sponge.

Sponge Production Methods

The living sponge is much different in appearance than the cured commercial sponge. A living sponge is covered with a black 'skin' (Figure 4 inset). Commercial spongers are very adapt at differentiating the commercial varieties from other sponge species.

Prior to World War II, Florida annually produced approximately 600,000 pounds of sponges. On average there are approximately 13 sponges to the pound. In recent years, Florida production has been 60,000 - 70,000 pounds of sponges annually, a fraction of the quantity harvested at the peak of the fishery.

In the Florida Keys sponges are harvested by hooking. When the water is clear and the wind is calm, fishermen working from small boats (sometimes associated with a larger "mother" ship) scan the bottom until they have spotted a sponge. They use a long pole with a hook (Figure 4) to tear the sponge free from the bottom. The hook is 5 inches across and is used to measure the sponge to insure it is legal size.

In the northern Gulf, sponges are found in deeper water and diving gear is allowed to harvest sponges. In the past divers used a hook to tear the sponge free, but now many divers use a knife to cut the sponge free, thereby increasing the chances the sponge will regenerate. Research results have shown that if sufficient sponge tissue is left attached to the substrate, the sponge can survive and regenerate (Sea Grant Technical Paper - 38, 1986). Because diving for sponges is prohibited in the Keys, cutting sponges is not practical in this area. However, even when a hook is used, sponges still grow back about one-third of the time.

To clean the sponges, they are removed from the water to allow the living tissue to die. Sponges are then kept under wet burlap or returned to the water to allow a rotting process to continue for several days. This helps in the removal of the outer "skin" and other non-skeletal tissue. The final step is to squeeze, or paddle, the sponges so the remaining skin and tissue is eliminated and only the sponge skeleton remains.

The remarkable regenerative ability of sponges led to attempts to "farm" sponges. A sponge could be cut into pieces, attached to a concrete disk, and the sponge would grow to a commercially valuable product. However, slow growth rates, poaching, and most importantly, periodic episodes of sponge disease, killed the densely "planted" sponges.

Figure 4. A hook on a long pole is used to retrieve sponges.
Inset - A live sheepswool sponge.

Sustaining the Sponge Resource

In addition to leaving enough sponge tissue intact to encourage regeneration, there are several fisheries management measures intended to protect the sponge fishery.

- Minimum Size: All sponges must have a minimum dimension of 5 inches.
- Sanctuaries: Sponge harvesting is prohibited in Everglades National Park and Biscayne National Park.
- Diving for sponges is prohibited in the clear shallow waters of the Florida Keys.

Future Miracles from the Sea?

This fact sheet has focused on commercial sponges. However, some non-commercial sponges may contain the secrets for future important pharmaceutical break-throughs. Many of the biologically active compounds isolated from sea dwelling creatures, and that are the subject of medical research, come from sponges. It is thought that because sponges are sessile creatures (cannot move) they have evolved chemical defenses to deter predation and enable them to compete with other organisms for living space. Sea Grant researchers are currently working on identifying and manufacturing new drugs from sponges.

Interesting Sponge Facts

- One of the first drugs for successfully treating cancer, cytosine arabinoside, was isolated from a sponge.
- Sponges are remarkable pumping 'machines.' In general, considering the different types of sponges there are, sponges can pump 10,000 times their own size (volume) in water in one day. A sponge the size of a gallon milk container could pump enough water to fill a residential small size swimming pool within one day.

This fact sheet , SGEF-119, was produced by John Stevely, the Florida Sea Grant Marine Agent for Manatee, Sarasota, Hillsborough and Collier Counties, and Don Sweat, the Florida Sea Grant Marine Agent for Levy, Citrus, Hernando, Pasco, and Pinellas Counties. For more information, contact the Florida Sea Grant College Program at, 352-392-5870 or check out the Florida Sea Grant web site at: WWW.FLSEAGRANT.ORG.

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