SPONGE FARMING FOR A SUSTAINABLE AQUACULTURE

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INTRODUCTION

Marine sponges (*phylum porifera*) represent an important part of the benthic biomass and diversity in many areas and provide several important ecosystem functions such as shelter, food or regulating substrate settlement. Commercial horny sponges have been harvested and utilised as bath sponges since ancient times: Phoenicians and Egyptians used to collect stranded sponges along the seashores, while the millenary history of sponge fishery take roots in the ancient Greek civilisation. With the traditional fishing method, fishermen utilised an heavy stone as ballast to reach easily the sea bottom and a net basket to gathered sponges.

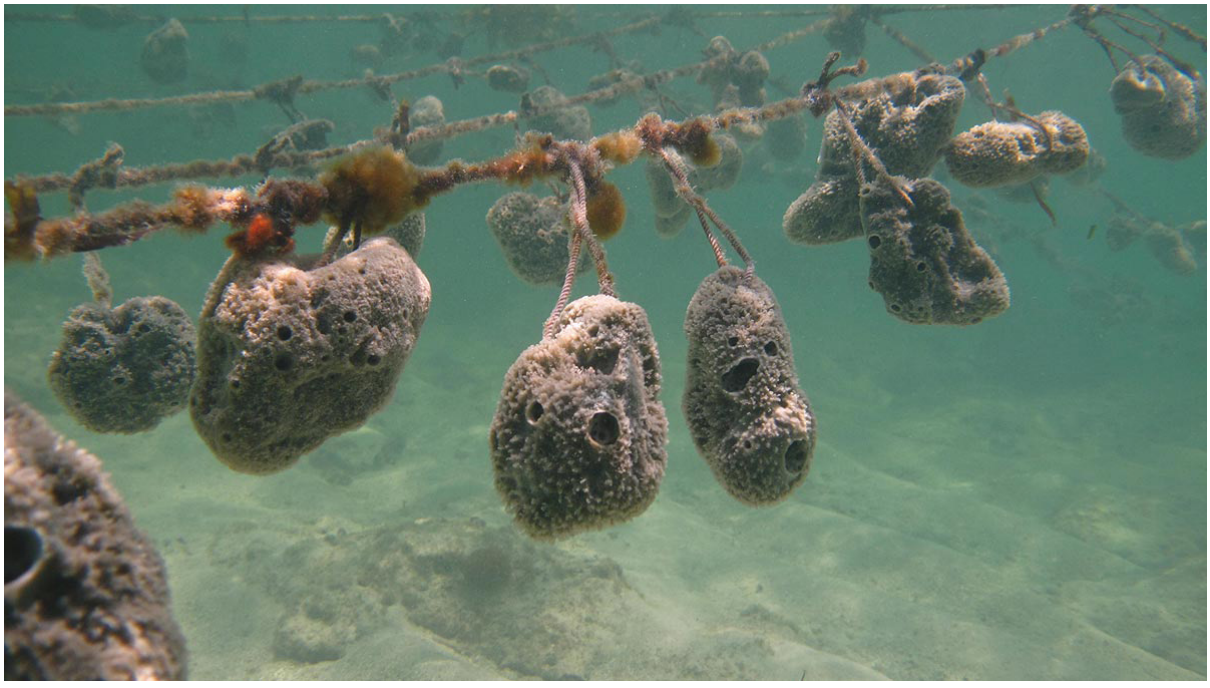
Fortunately, sponge ability to colonize adjacent similar biotopes in optimal specific conditions can be presumed. Their elevated dispersion rate, exceptional abundance in benthic communities and impact on the cycling rates of nutritive compounds, while ensuring natural stocks preservation and expenditure, are making them highly favorable for aquaculture process. Farming sponges for chemical extraction is a consideration that experienced great advances in the last century. For some sponge-related compounds, aquaculture was even reckoned as the only viable medium-term option to start pre-clinical tests towards drug development. Many metabolites have already been described in the literature; indeed, marine sponges and sponge microbiome are considered as the most prolific oceanic source of new bioactive substances. In the past 50 years, more than 9700 novel molecules were discovered and isolated from sponge extracts, including their associated microbial communities, which nearly represents 30 % of all marine molecules discovered to date. Recent large-scale biological screening experiments have highlighted the potential of bioactive metabolites present in such extracts for applications in biotechnologies and the pharmaceutical industry.

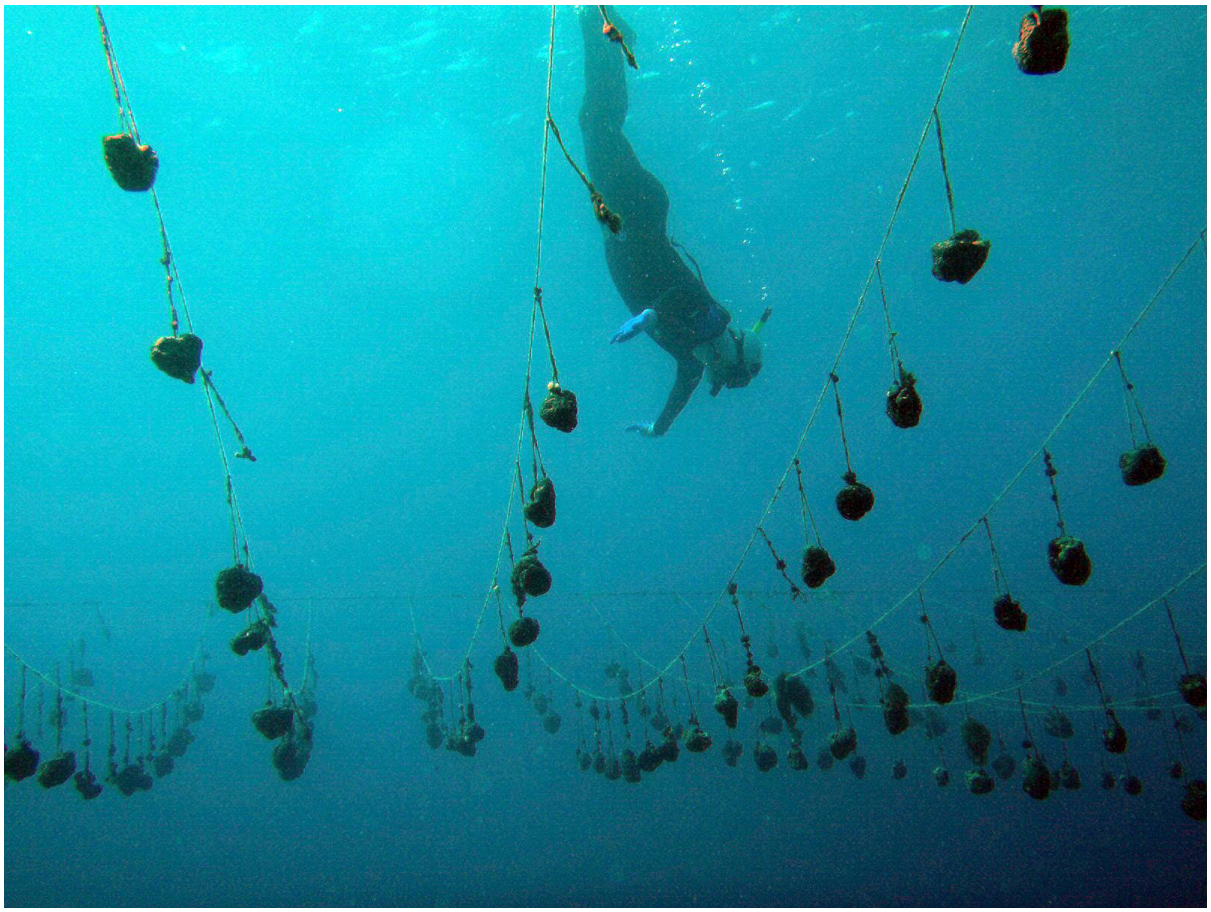
PLANNING A SPONGE FARM

1. **Finding a suitable location:** The best location for a sponge farm in Micronesia is in the lagoon just offshore from the farmer's home, This situation allows the farmer to work on the sponge crop at his own discretion, and shortens the amount of time spent traveling back and forth to the farm. The following factors must also be considered when selecting a farm site;
   - Keep the sponges away from fresh water
   - Depth of the water
   - Tidal change

2. **Choosing a sponge farm support grow out method:** There are many different growing techniques that can be used to produce a large and healthy sponge crop. As a result, the selection of a method is usually based on the cost of the materials, the ease with which a farmer can work on the sponges, and the adaptability of the technique to different reef conditions. One method that has been used in the past involves attaching sponges to concrete discs along the bottom of the ocean. Japanese sponge farmers in Micronesia have also hung sponges on vertical lines extending from bamboo crafts, and along lines attached to beer bottle floats. However, the horizontal line method, which is currently being used by most sponge farmers in Micronesia, is probably the cheapest, easiest, and most versatile way to culture sponges developed to date. Basically, the horizontal line method consists of attaching heavy support lines to coral anchors that are roughly parallel to each other. Lighter "growing" lines are strung between these support lines, and the sponges themselves are hung from these growing lines, If the horizontal line method is not suitable for your site, contact one of the experts identified at the back of this manual to design alternative methods.

3. **Setting up the farm:** The horizontal line method is set up by attaching "heavy" support lines polypropylene rope, to coral anchors that are roughly parallel





to each other. Lighter "growing lines" 50 lb. test, are strung between support lines, and the sponges themselves are hung from the growing lines on 50-60 lb. test line. It is important to note that the horizontal line method does not require the use of SCUBA diving equipment; all work can be done in shallow water. The cutting of the sponges is done on the adjacent reef flat. Planting is also done in shallow water because the sponge lines, which normally sink to a depth of 20-30 feet, can be brought to the surface using two to four floats.

4. **Finding the brood stock:** A sponge farmer must find a supply of parent sponges, or brood stock, before he can begin planting his first crop. As stated earlier, when a parent sponge is cut into pieces, each cutting will grow into a new, full-sized sponge, provided the environment is suitable. Brood stock can be obtained from wild stocks, donated by government nurseries, or purchased from other sponge farmers in the region. It is highly recommended that farmers purchase cultured, rather than wild sponges as brood stock because they are already the right variety of sponge, it is easier to obtain a consistent supply of these cultured sponges, and the brood stock is coming from proven good growing stock. Hours can be wasted searching for wild sponges that are commercially valuable. Moreover, the use of cultured sponge brood stock minimizes harvesting pressures currently being placed on depleted wild sponge stocks. After the second year of growth, a sponge farmer should save some of the larger sponges from that year's crop to make the next year's cuttings. Using larger sponges as brood stock will minimize the size differences in later generations, and produce sponges of a more marketable size, in less time.

5. **Making the sponge cuttings:** The parent sponge should be cut into small pieces, usually square, oval, or triangular in shape, with an approximate wet-weight of 1SO-300 grams, The sponges should be cut in shallow water on the reef flat. At least one side of each cutting must be covered by the sponge's outer black skin. When making cuttings, the more black skin covering the surface of a cutting, the smaller that sponge piece can be. The opposite of this statement also holds true, and thus the less black skin on the outside of a cutting, the larger that cutting needs to be in order for it to grow successfully.
   - Don't remove sponge cuttings from the water.
   - Don't squeeze the sponges
   - Use only razor-sharp knives when making cuttings.

6. **Attaching the sponge cuttings:** A 50-60 pound, tarred, nylon test line, approximately 20 24 inches long, is threaded through the cutting with a razor-sharp knitting needle, knife, or other tool and the ends of the line are tied, making a loop, This loop is then placed over the growing line nylon, 150-pound test! and the cutting is pulled back through the loop. While a non-tarred line can be used to attach the sponge cuttings, knots tied with tarred lines seem to hold together better in various ocean conditions

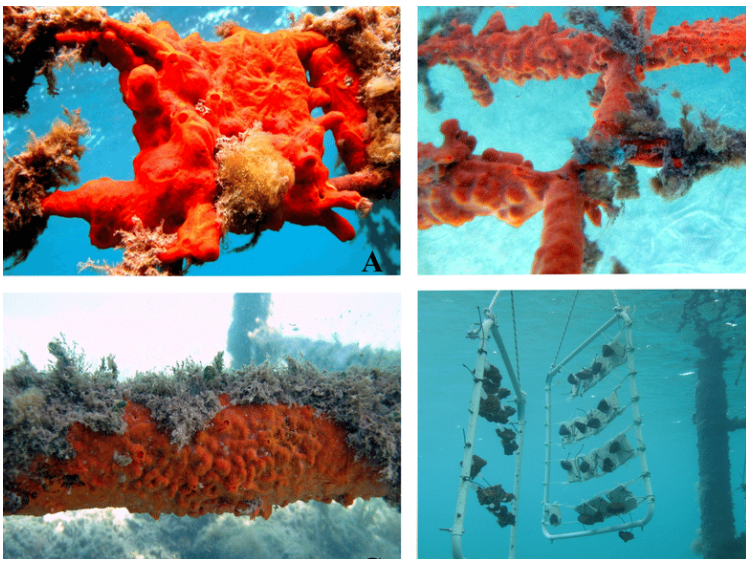
7. **Harvesting:** Sponges should be harvested when they reach commercial size (800 gms) only medium and large sized sponges are currently being marketed. Sponges can reach commercial size in two to three years.

APPLICATIONS OF SPONGE FARMING

1. **Bioremediation:** Sponges, both natural and synthetic, have been investigated for their potential to absorb and filter pollutants from water. They can be used to clean up contaminated water sources by removing impurities.

2. **Medical and Biotechnological Uses:** Certain sponge species produce bioactive compounds with potential pharmaceutical applications. These compounds may have antimicrobial, anti-inflammatory, or other therapeutic properties.

3. **Water Treatment:** Sponges, particularly synthetic materials designed for water absorption, can be used in



water treatment processes. They may help in removing impurities, chemicals, or excess nutrients from water sources.

4. **Novel Materials:** Advances in material science have led to the development of sponge-like materials with unique properties. These materials can be used in various industries, such as absorbent materials in hygiene products, filtration systems, and even as scaffolds for tissue engineering.

5. **Aquaculture:** In the context of sea sponges, there could be potential applications in aquaculture. Sea sponges provide habitats for various marine organisms, and sustainable harvesting or cultivation practices may be explored.

6. **Cleaning and Household Products:** Natural sea sponges have been used historically for cleaning purposes. While synthetic alternatives are more common today, there may still be niche markets for sustainably harvested or cultivated sea sponges.

CONCLUSION:

In conclusion, the technology and applications related to sponge farming or sponge-like materials have the potential for positive impacts in areas such as bioremediation, medical and biotechnological research, water treatment, and the development of novel materials. Future developments may explore sustainable practices for cultivating sea sponges or the creation of synthetic sponge materials with enhanced properties for specific applications.
It's advisable to check more recent sources for any updates or advancements in sponge farming or related technologies, as the field of materials science and biotechnology is dynamic and continually evolving.