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# Differential Growth Rate Studies in Cultured Commercial Sponges

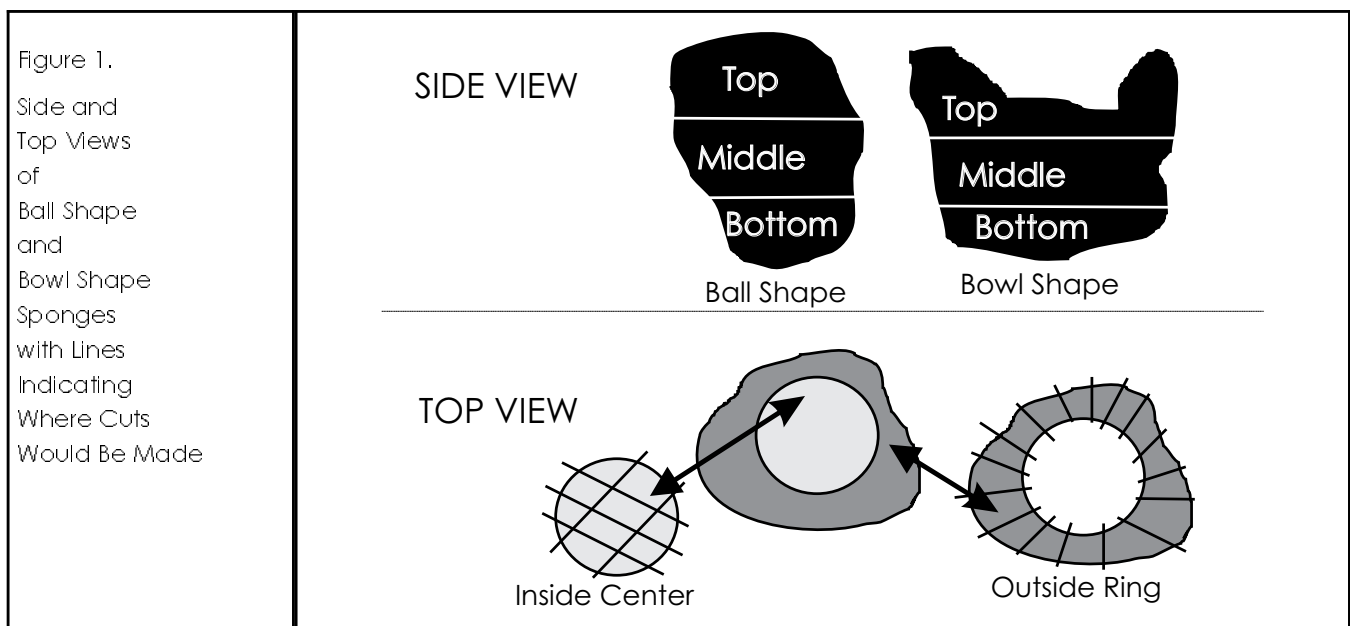
April 14, 1994, through April 14, 1995

## Principal Accomplishments

Objective: Improve the efficiency of commercial sponge farms by conducting several simultaneous studies at the demonstration farm in Pohnpei, Federated States of Micronesia.

The first of these studies is examining the cause of large variation in growth rates of cultured commercial sponges. The hypothesis in this study is that the variations result from certain sections of the parent sponge growing more rapidly than others. This hypothesis is based on data that one sponge cutting may grow 3 percent per month while a cutting planted three feet away on the same line may grow 18 percent per month.

- Ball-shaped and bowl-shaped parent stock were each cut into a top layer, a middle layer and a bottom layer. The center of each layer was cut out, resulting in a donut-shaped outside section and a disk-shaped inside section (although the top layer of a bowl-shaped sponge does not have an inside section). The resulting 1,100 cuttings were then segregated into



11 groups, tagged and planted together. The first 12 months of growth data are summarized in Tables 1 and 2.

Table 1. Cuttings from Ball-Shaped Sponges						
	Top Layer		Middle Layer		Bottom Layer	
	Inside	Outside	Inside	Outside	Inside	Outside
Average Size	324 g	346 g	354 g	353 g	323 g	389 g
Maximum Size	555 g	475 g	575 g	490 g	705 g	580 g
Minimum Size	190 g	250 g	240 g	255 g	220 g	270 g
Average Monthly Increase	4%	5%	6%	6%	4%	7%
Range of Growth Rates	-2% to 12%	1% to 11%	1% to 15%	2% to 14%	1% to 16%	2% to 15%

Table 2. Cuttings from Bowl-Shaped Sponges						
	Top Layer		Middle Layer		Bottom Layer	
	Inside	Outside	Inside	Outside	Inside	Outside
Average Size in Grams	Top layer does not have any inside cuttings	326 g	315 g	323 g	320 g	324 g
Maximum Size in Grams		695g	480 g	515 g	505 g	465 g
Minimum Size in Grams		240g	220 g	240 g	235 g	255 g
Average Monthly Increase		5%	4%	5%	5%	5%
Range of Growth Rates		1% to 18%	1% to 12%	2% to 13%	1% to 12%	2% to 11%

- Tagged sponges from both the bowl-shaped and ball-shaped parent stock grow an average of 4 to 7 percent monthly. The growth rates of all 11 groups of sponge cuttings range widely: from a low of -2 percent to a high of 18 percent. This may be attributable to the die-back of portions of some of the cuttings. If so, the lower growth rates should climb during the next 12 months, and the range of growth rates should narrow.
- At least twice as many cuttings from the inside section of the top, middle and bottom sponge layers showed negative growth as cuttings from the outside layer. This may be because the inside cuttings do not have any of the black "skin" that covers the outside of sponges and probably protects the cuttings.

The second study is examining whether sponges with high growth rates will retain those high growth rates after being cut into smaller pieces. One

hundred forty cuttings from sponges with monthly growth rates of 15 percent or more were tagged, weighed and planted on their own lines adjacent to cuttings from low-growth parent stock. The difference in size is quite noticeable. During the 17 months since planting, most of the cuttings grew at the same or higher rates as the parent stock, and many of the high growth rate cuttings have already reached the minimum sale size of 600 grams live, wet weight (see Table 3). Data indicate that these would be the sponges farmers would use to replant and expand their farms.

Table 3. Cuttings from High-Growth Rate Sponges	
Average Size in Grams	539
Maximum Size in Grams	815
Minimum Size in Grams	385
Average Monthly Growth Rate	11%
Range of Monthly Growth Rates	7% to 20%

The third study is examining whether cutting sponges with low growth rates stimulates growth. Sponges that showed average monthly growth rates of 5 percent or less were divided, tagged, weighed and planted. This

Table 4. Cuttings from Low-Growth Rate Sponges	
Average Size in Grams	324
Maximum Size in Grams	520
Minimum Size in Grams	170
Average Monthly Growth Rate	5%
Range of Growth Rates	3% to 9%

group of 197 cuttings continued to grow at monthly rates ranging from 3 to 9 percent and averaging 5 percent (Table 4).

Objective: Maintain the existing demonstration farm.

A colonial tunicate continues to foul the sponge growing lines and the sponges, causing them to be irregularly shaped. The tunicate is cleaned off the sponges and lines monthly. Broken growing lines and main suspension lines are replaced as needed.

Objective: Obtain additional biological data.

A sponge systematist and ecologist who was hired as a project consultant identified the sponge being cultured as *Coscinoderma mathewsi*.

The Pohnpei lagoon is home to four wild sponge morphotypes: the ball-shape, the bowl-shape, the ring-shape and the digitate. An experiment to examine whether the final morphology of cultured sponges is determined by the morphology of the parent stock or by the physical and biological environment of the cuttings during the culture period is being set up.

- At least 10 cuttings were taken from the six areas of each parent sponge. For statistical purposes, at least three parent sponges of each type were required for replication. The cuttings were tagged, the circumference of each was measured and the live, wet weight of each was determined. They will be measured at six-month intervals.
- By mid-April, the necessary parent stock had been gathered, and 800 to 900 cuttings had been made, tagged, measured and planted on growing lines.

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## Investigators

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