

Comparison of Homing Patterns of Strombus gigas and
Strombus costatus in Greater Lameshur Bay.

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COMPARISON OF HOMING PATTERNS OF STROMBUS GIGAS AND
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ABSTRACT

Greater Lameshur Bay there are two populations of the conch Strombus, Strombus gigas and Strombus costatus. The daily movements of five representatives of each species were followed for six consecutive days to monitor the possibility of a homing instinct. It was found that the conch were significantly ($p < .05$) moving towards their home. The S. gigas moved eastward and the S. costatus moved westward.

INTRODUCTION

The queen conch, Strombus gigas, and the milk conch, Strombus costatus are two species of large marine gastropods found throughout the Caribbean. Both conch have similar life cycles, breeding patterns, and diets consisting of epiphytes scraped off of seagrasses and macroalgae (Webb 1985). The genus Strombus moves over the bottom in a very unique "pole vaulting" fashion. It uses its foot and claw-like operculum to dig into the sand and propel itself forward in a hop. Both species are found in abundance in Greater Lameshur Bay, St. John.

In recent years the population of Strombus gigas has been threatened by overharvesting throughout the Caribbean. S. gigas has been harvested as an important food source for Caribbean people as well as for its beautiful pink shell. There is currently a five year moratorium to protect S. gigas in St. John and St. Thomas. This law forbids any collection of the queen conch until December 31, 1992. The purpose of the moratorium is to allow the population to regenerate. However, this five year protection will have no long-term benefit unless research is done to find out how to properly manage the harvesting of conch once the moratorium is lifted. Studies have been conducted on the habitat selection, reproduction, feeding, distribution, and migration of S. gigas. Not as much research has been done on Strombus costatus because it has only minor economic importance. Only recently has its life cycle been analyzed. S. gigas inhabits the shallower areas of the grass beds that are densely populated by the sea grass Thalassia testudinum, while S. costatus are found in deeper, sandier areas of the bay (Apledoorn 1985).

The purpose of my project was to compare and contrast the daily roaming patterns of the queen conch Strombus gigas and the milk conch Strombus costatus. Five queen conch were taken from a grassy area to a sandy area and five milk conch were taken from a sandy area to a grassy area. The null hypothesis was that the movement of the conch would be random although they had been moved from their homes. By better understanding the homing patterns of these two conch species in Greater Lameshur Bay, it may be possible to set up protective areas to save the populations from extinction once the moratorium is lifted.

~~MATERIALS AND METHODS~~

Materials and Methods

Research was collected in the grass beds of Greater Lameshur Bay in the 15 to 20 feet deep areas close to Donkey Bight. SCUBA was used to collect the data. Five conch monitoring stations were set up on an east to west line with 15 meters between stations (see map of St. John). Each station consisted of a two foot tall metal re-bar driven into the sand with a spool of nylon line on it. A plastic cup with a hole for the pole to fit into was placed upside down over the pole to create a sand-free pedestal for the spool. The spool was constructed by winding 50 feet line onto an 8 inch length of P.V.C. pipe. One end of the line was tied to the spool and the other end was tied to the conch with a simple slip knot. The knot was tied between the spiracles of the queen conch and tied around growths of epizootic macroalgae on the milk conch. Data on movement was collected for six consecutive days with five Strombus gigas and then a week later for six consecutive days with five Strombus costatus. For each day in the study, two divers used SCUBA to measure the distance from the pole to the conch and measure the direction of travel using a compass. Then the conch was placed back on the north a side of the pole. The net distance traveled was calculated by measuring a straight line between the conch and the pole in case the conch got the string tangled in tall grasses.

RESULTS

The results indicate that the direction traveled by both conch species was not random. For the analysis of data, the compass was divided into four quadrats: north (315-45), east (45-135), south (135-225), and west (225-315). For Strombus gigas, out of 27 measurements for the direction traveled, 15 headed west, 4 headed west, 4 south, 4 east, and 3 north. The average distance traveled per day was 8.44m. (See table 1.)

Table 1: Chi-Square test for Strombus gigas homing data in Greater Lameshur Bay, St. John USVI fall 1989.

North= 315-45, East=45-135, South= 135-225, West=225-315

<u>QUADRAT</u>	<u>NORTH</u>	<u>EAST</u>	<u>SOUTH</u>	<u>WEST</u>	<u>TOTAL</u>
Observed	6	15	2	4	27
Expected	6.75	6.75	6.75	6.75	27
X ²	.083	10.08	3.34	1.12	14.62

The results of the Chi-Square analysis show that the Strombus gigas had a significant preference ($X^2 = 14.62$, $df = 3$, $p < .05$) to traveling into the west quadrat.

The results for the Strombus costatus showed that with the same divisions of the compass, 6 conch traveled to the north, 15 east, 2 south, and 4 west. The average distance traveled per day was 6.65m. (See table 2.)

Table 2: Chi-Square test for Strombus costatus homing data in Greater Lameshur Bay, St. John USVI fall 1989.

<u>QUADRAT</u>	<u>NORTH</u>	<u>EAST</u>	<u>SOUTH</u>	<u>WEST</u>	<u>TOTAL</u>
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	<u>NORTH</u>	<u>EAST</u>	<u>SOUTH</u>	<u>WEST</u>	<u>TOTAL</u>
OBSERVED	3	4	4	15	27
EXPECTED	6.75	6.75	6.75	6.75	27
χ^2	1.88	1.12	1.12	10.08	14.2

The results of the Chi-Square analysis show the Strombus costatus had a significant preference ($\chi^2 = 14.2$, $df = 3$, $p < .05$) to traveling into the east quadrat.

Discussion

The results reject my null hypothesis that the daily direction traveled by Strombus gigas and Strombus costatus would be random. In fact it seems that they were moving in the direction of the places they inhabited prior to the study. The queen conch moved in the direction of the shallower, denser grass areas while the milk conch moved towards the deeper, sandier areas. This proves ($p < .05$) that the conch have a preference to move towards their homes. In Greater Lameshur Bay the two species that were compared had different homes and therefore moved in different directions.

There are many possible explanations for why these two closely related conch populations inhabit different niches in Lameshur Bay. One possibility is that the milk conch selectively settle in or move to the areas of sparse seagrasses.

They may find it easier to move around or bury themselves into these sandy area, unhindered by the long, thick grasses in shallower areas of the bay (Appeldoorn 1985). Interspecies competition could also play a role in the distribution pattern (Bredenberg 1988). Appeldoorn (1985) observed that juvenile milk conch burrow more than juvenile queen conch. This may account for the separation of the species and the occurrence of milk conch in the sandy areas. The queen conch like to eat off of Thalassia testudinum (Stoddard 1987). However, this does not mean that the milk conch do not equally enjoy eating T. testudinum grasses, there is the possibility that the queen conch are dominating the areas that are dense with grasses and the milk conch are out-competed from these areas.

If it is true that the milk conch are competitively excluded from the optimal feeding area of the tick grassbeds by the queen conch, this could become relevant if in the future the queen conch population is drastically reduced by harvesting. Hopefully the research done on Strombus gigas during the moratorium will provide information for a management plan to maintain the queen conch population in the Bay. If this does not occur and the queen conch population decreases, we could see a shift in the milk conch location in the bay if they had the chance to fill the vacated niche (Bredenberg 1988).

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Figure 1: Map of research site.

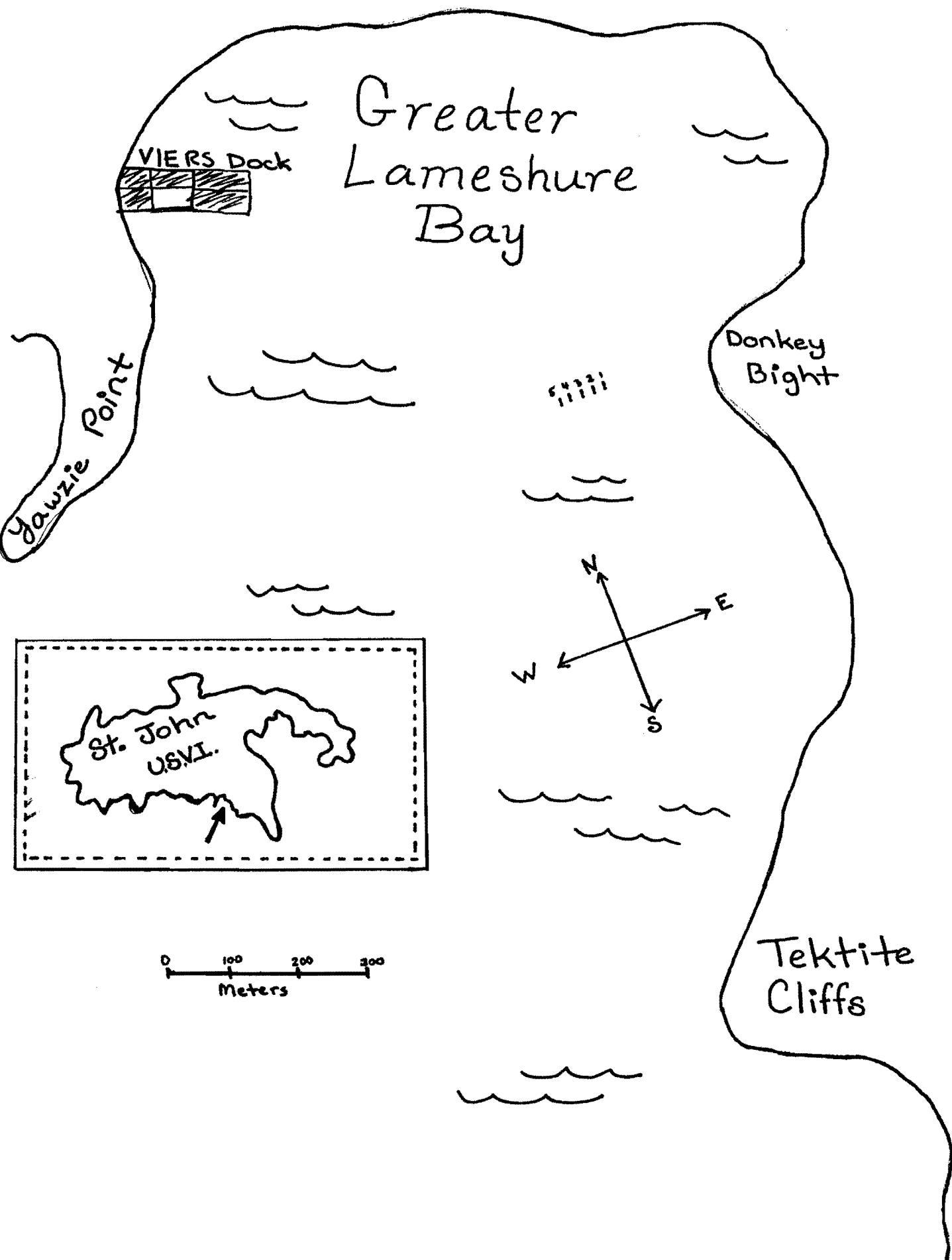


Figure 2: Data collected on daily movements of Strombus gigas and Strombus costatus.

S. costatus

Conch #	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
1	5.5m/260°	6.7m/280°	6.6m/260°	11.9m/310°	.7m/20°	1m/350°
2	12.4m/315°	11.2m/280°	10.9m/280°	4.8m/250°	14.9m/260°	.9m/280°
3	3.2m/120°	7.8m/211°	10.4m/280°	7.4m/210°	6.6m/210°	9.0m/280°
4	.2m/269°	8.2m/120°	7.9m/110°	5.7m/350°	9.6m/290°	1.4m/50°
5	Tangled	Tangled	10.2 m/70°	5.8m/210°	7.1m/290°	Escaped

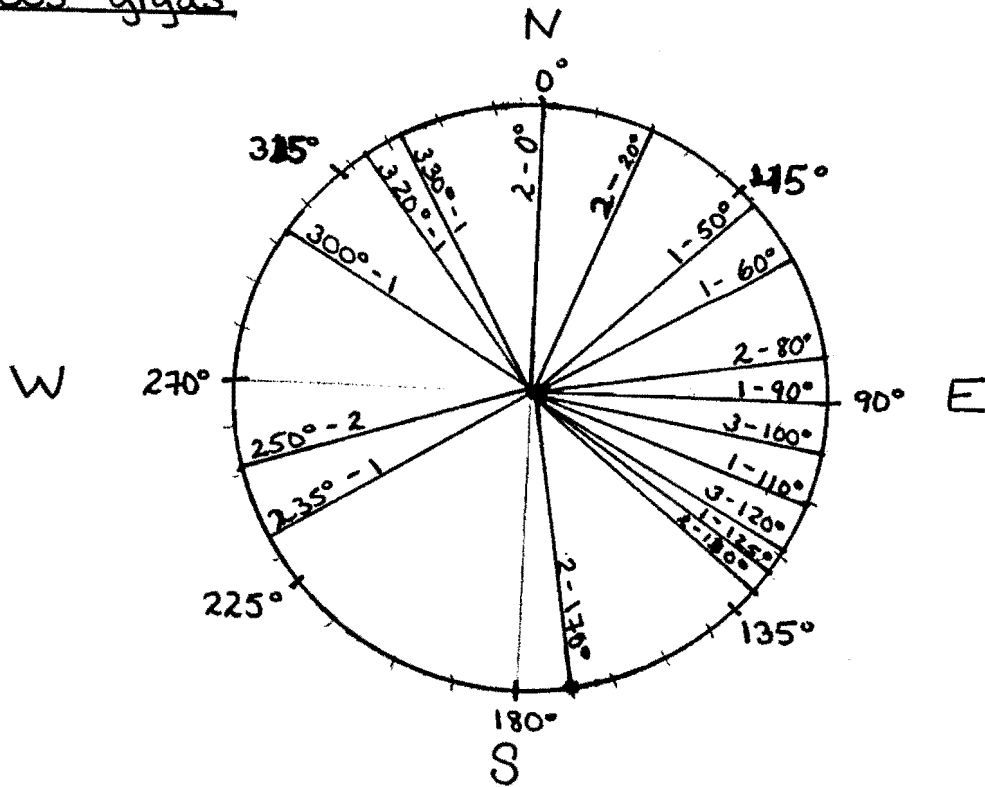
S. gigas

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
1	4.2m/125°	2.9m/50°	6.2m/250°	1.1m/130°	3.4m/120°	2.2m/100°
2	15.2m/60°	7.5m/100°	5.5m/120°	3.3m/250°	10.7m/100°	15.2m/80°
3	9.7m/0°	4.3m/0°	7.3m/20°	Escaped		
4	8m/300°	5.5m/235°	4.8m/320°	3.8m/170°	4.6m/120°	15.2m/90°
5	11.3m/20°	15.2m/130°	15.2m/170°	15.2m/330°	15.2m/80°	15.2m/110°

Figure 3: Map of the daily movements of Strombus gigas and Strombus costatus as they fit into the degrees of a compass. Each line represents a direction that a conch moved. The inside number on the line represents the number of conch that traveled in this direction.

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Conch Homin

Strombus gigas



Strombus costatus

