

# Large-Scale Distributional Patterns in Queen Conch: A Five Hundred Year Record

## *Progress Report*

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## INTRODUCTION

The general life history of queen conch (*Strombus gigas*,) in the Caribbean region is relatively well known (Randall, 1964; Brownell and Stevely, 1981; Berg, 1989). Queen conch are known to be associated with seagrass meadows as juveniles, and move from shallow inshore sites to deeper habitats with age (Laughlin and Weil, 1984). Despite the fact that the species is commercially important throughout its geographic range, large-scale distributional patterns are poorly understood. Mapping is labor intensive and distributional patterns today (particularly for adult conch) may not be natural because of heavy fishing pressure.

Here we describe a novel approach to the analysis of large-scale and long-term distributional patterns in queen conch. The analysis is not complete; therefore, we will describe the rationale for the approach, with general observations on systems within the Exuma Cays.

## CONCH SHELL MIDDENS

Except for the last 10 to 15 years of a more than 500 year old fishery for queen conch, the fishery methods have remained more or less the same. Fishing has been done from the shore or from small boats, hooking or diving the animals to the surface. In most cases, even in recent years, the conch are carried to the nearest shore where the conch are "knocked" to remove the meat from the shells. Conch are transported long distances in the shell only by large fishing boats and only in recent years. The result of traditional fishing methods is the creation of shell middens in direct proportion to the size of adjacent conch populations in relatively uninhabited areas (Stoner and Armstrong, in prep. a).

## STUDY SITE

The Exuma Cays, in the central Bahamas, were chosen for analysis of shell midden distribution. The Cays are a 250 km long island chain with a total human population of about 5000 persons, living primarily on the island of Great

Exuma in the south (Figure 1). Despite the low human population, the Exumas are the source of a large percentage of the total conch fishery in the Bahamas.

In 1989, the 150 km long section of the Cays from Rat Cay to Sail Rock (excluding the large southern islands of Great Exuma and Barraterre) was surveyed. One hundred and one sites with shell volumes greater than 1.0 m<sup>3</sup> were found, measured, and mapped. The replicated structure of islands and passes in a chain permits an examination of habitat associations in 26 different tidal pass systems.

## RESULTS AND DISCUSSION

Digital data from the Thematic Mapper of Land Sat satellites are being corrected for depth and classified by major habitat type. Although the data are not fully analyzed, it is possible to make some general observations using extreme cases.

Virtually all of the conch shells were located in close proximity to the tidal inlets between islands. Few or no shells were found on the bank sides of large islands such as Great Guana Cay, Shroud Cay, or Norman's Cay except near the inlets; thus, a strong tidal pass association was established. This corroborates the findings of Stoner and Armstrong (in prep. b) that most nursery populations are found between 2.5 and 5.0 km of a tidal inlet, and that hydrography may have a great deal to do with conch distribution.

Second, there was no association between shell volume and settlement size. When midden volumes were examined on the basis of individual tidal systems, the five systems with highest volumes of shells had no human settlements. In fact, some of the lowest volumes were found near settlements suggesting that human habitation is not a major source of bias in shell abundance.

Systems with very large midden volumes such as Conch Cut, Wax Cay Cut and Rat Cay Cut are similar in having broad unrestricted and deep passes from the Exuma Sound to the bank through which larvae pass from the offshore reproductive sites (Stoner *et al.*, in review). Just inside the passes are extensive sand shoals which may provide the initial settlement site for larval conch and for the first months of infaunal existence (Sandt and Stoner, in prep.). Adjacent to the sand shoals are extensive seagrass beds of moderate density; these beds serve as the preferred habitat for one- and two-year old conch (Stoner and Waite, in review).

Systems with few shells, such as those near Sampson Cay are characterized by constricted and/or shallow inlets, extensive sand flats, and small amounts of seagrass, within a radius of 5.0 km from the inlets. We predict a correlation of conch and midden distribution with habitat characteristics measurable by remote-sensing. A combination of habitat features is probably required for an area to yield a productive conch fishery because of the complexities of larval transport and recruitment dynamics, and because of ontogenetic shifts in habitat

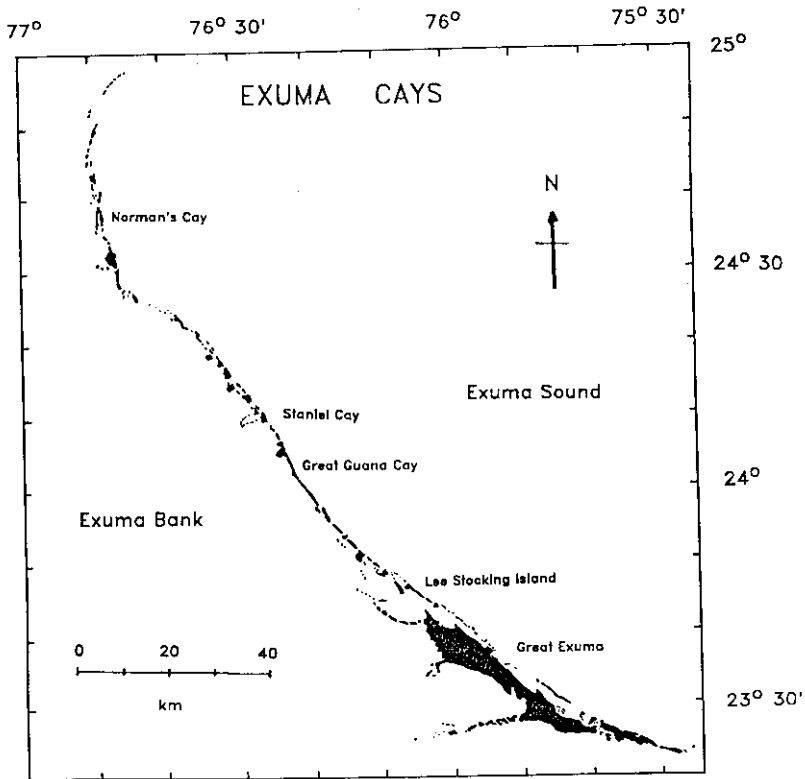


Figure 1: The Exuma Cays, Bahamas. Site of shell midden surveys, 1989.

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requirements.

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