Vertical Migration and Distribution of Queen Conch Veligers

Progress Report

JOY CHAPLIN[1,2] and VERONIQUE J. SANDT[2]
[1]*Department of Natural Sciences*
The College of the Bahamas
Nassau, Bahamas
[2]*Caribbean Marine Research Center*
100 E. 17th Street
Riviera Beach, FL 33404, U.S.A.

INTRODUCTION

Although hatchery and laboratory work have provided information on queen conch (*Strombus gigas*) larvae (Brownell, 1977; Brownell and Stevely, 1981; Iversen *et al.*, 1987), very little is known about the veligers in the field. During the summer of 1989 a study was made to consider aspects of larval distribution; both vertical migration, and horizontal (geographic) dispersion were examined.

The larvae hatch from the egg mass after about five days (D'Asaro, 1965; Brownell, 1977). Laboratory experiments show that the larvae spend 18 to 40 days in the water column before settlement and metamorphosis (Brownell, 1977; Davis and Dalton, 1991).

The research was carried out at Lee Stocking Island, Exuma Cays, Bahamas (23°46′ N, 76°06′ W). Lee Stocking Island is one of the Exuma Cays found on the boundary between the east rim of the shallow Great Bahama Bank and the deeper waters of Exuma Sound. Tidal channels connect waters of the Exuma Sound with the Bank waters, water moving onto the Bank during flood tide and reversing during ebb tide. Water on the Bank further away from the Bank/Sound interface is generally subject to wind driven circulation and does not exchange with the Sound on a regular tidal basis (N.P. Smith, pers. comm.).

METHODS

It is thought that deeper water reproductive populations in the Exuma Sound are the primary source of larvae for the juvenile populations that are found almost exclusively on the Bank, being brought onto the Bank by tidal currents flowing through the island chain. The geographical distribution of the larvae was studied at four stations along a current flow field onto the Bank created by the flooding tide, plus two sample stations on either side of the main flow regime. Sampling was carried out on a flooding tide within two hours prior to high tide. The vertical distribution as a day/night comparison was examined in the tidal channel, and a further day/night comparison was undertaken on the Bank in shallower waters. Collections were made during the maximum flood period. Plankton samples were made using a conical net with an open diameter of 0.5 m, length of 2.5 m, and 202 µm mesh. The volume of water passing through the net was calculated from a flowmeter suspended off centre in the mouth of the net. The sampling period was generally 15 – 20 minutes.

RESULTS AND DISCUSSION

The geographical distribution was determined from the results of 50 plankton tows at six different sites. The number of larvae in the water increased after the first week in July showing a seasonality in larval abundance. Larval density at five of the sites was not statistically different between the sites showing a random distribution of larvae which correlates with what is known about currents on the Bank. Virtually no larvae were found at the site separated from the main tidal flow regime by a large sand bar suggesting physical barriers that influence current directions will also effect larval distribution. Under turbulent weather conditions the number of larvae found in the surface tows was lower than that during calm periods.

Five day/night comparisons of larval density showed the number of larvae was between one and two orders of magnitude greater during the day than at night. Day/night comparisons of the vertical distribution of larvae in the tidal channel resulted in the greatest numbers being found in the surface one meter during the day. The larvae of *S. gigas* appear to show a diel vertical migration pattern that is reverse the usual pattern for meroplankton, and have significant control over their position in the water column.

Conch larvae greater than 600 µm in shell length were not found in any of the plankton samples. Laboratory generated growth curves show that all of the larvae were early stage veligers. Conch larvae, therefore, probably show an ontogenetic shift in their position in the water column in addition to vertical migration in the early stages.

We conclude that:

1. Conch larvae control their position in the water column, thus modeling of conch larvae will require consideration of complex larval behavior, as well as hydrographic data.
2. Larval transport may occur over much shorter distances than has been hypothesized.
3. Benthic populations of queen conch may be recruitment limited at particular sites.

LITERATURE CITED

Brownell, W.N. 1977. Reproduction, laboratory culture and growth of *Strombus gigas*, *S. costatus* and *S. pugilus* in Los Roques, Venezuela. *Bull. Mar. Sci.* **27**:191-199.

Brownell W.N. and J.M. Stevely. 1981. The biology, fisheries and management of the queen conch, *Strombus gigas*. *Mar. Fish. Rev.* **43**:1-12.

D'Asaro, C.N. 1965. Organogenesis, development and metamorphosis in the queen conch, *Strombus gigas*, with notes on breeding habits. *Bull. Mar. Sci.* **15**:359-415.

Davis M. and A. Dalton. 1991. New large scale culturing techniques for *Strombus gigas* post larvae in the Turks and Caicos Islands. *Proc. Gulf Carib. Fish. Inst.* **40**:257-266.

Iversen, E.S., E.S. Rutherford, S.P. Bannerot, and D.E. Jory. 1987. Biological data on Berry Islands (Bahamas) queen conchs, *Strombus gigas*, with mariculture and fisheries management implications. *Fish. Bull. U.S.* **85**: 299-310.