Queen Conch Management and Culture in the Netherlands Antilles

ROBERTO R. HENSEN
Department of Agriculture and Fisheries
Bonaire, Netherlands Antilles

Several institutions throughout the Caribbean have recently started mariculture schemes with the express purpose of cultivating queen conch, *Strombus gigas*. One aim is to produce large numbers of juveniles to plant in areas where conch have been fished out (Adams, 1970; Hesse, 1975; Brownell et al., 1977; Brownell, 1978; Stevely and Warner, 1978; Brownell and Stevely, 1981). By rearing larval and juvenile conch to a size suitable for seeding in the natural environment, together with some proper management, it is hoped that stocks can be restored to some harvestable level.

In April of 1981 construction commenced on a laboratory on the island of Bonaire. This laboratory was designed to cultivate queen conch for reseeding the waters of the islands of Aruba, Bonaire and Curacao. Conch is a traditional food in the Netherlands Antilles and currently it commands a price of Nafl 25/kg (US$14/kg).

In May 1982 the first egg masses of queen conch were collected in Bonaire and cultivation commenced. This year work in Bonaire has been directed towards the development of a successful mariculture system for this island and to organize a comprehensive management plan for present and future stocks of conch and protection of their environment.

MATERIALS AND METHODS

Egg masses were collected on breeding grounds around Bonaire in depths ranging from 35 to 45 m. Those which were in process of being laid were preferred. They were transported in polyethylene containers to the laboratory, where they were transferred to a 20-*l* glass aquarium containing fresh, filtered, seawater. The masses were treated with a 0.5% solution of Chlorox for 45-60 seconds to eliminate protozoans and bacteria and subsequently thoroughly rinsed. The egg masses were gently pulled apart to separate strands from one another and examined under a dissecting microscope for number of eggs per unit strand length, embryological development and associated organisms.

After treatment and examination, the egg masses were transferred to 220-*l*, 90-cm high, polyethylene containers where they hatched in about 5 days. These containers were filled with seawater collected at a 100 m depth over a coral reef, filtered through a 10μ m screen and kept at a temperature of 26.5 ± 0.5°C. These containers were equipped with an airlift system and covered. Readings were taken every morning and afternoon of the pH, temperature and oxygen. Further, the approximate concentration of larvae/*l*, and hence the mortality, was also calculated daily by dipping a 25-ml flask in the culture vessel several times, counting the number of larvae caught and extrapolating from the average. Simultaneously the larvae were examined for their overall health and development. The tanks were siphoned every 3 days and refilled with sea water of the same temperature. The veligers were collected on a sieve of 110 mesh Nitex screen. The larvae were then poured onto shallow trays constructed of glass tubing and Nitex screen and after several hours the trays were removed. Most live larvae swam off the trays. The remainder, dead shells and live larvae, were sorted under a dissecting microscope. Three types of phytoplankton were used as food for the larvae: Tahitian *Isochrysis*, *Tetraselmis chuii* and *Duniallela tertiolecta*. The algae were cultivated by the batch method utilizing Guillard's F2 medium (Guillard and Ryther, 1962).

RESULTS

Eight cultures were run. The first three runs were tests to find the best larval concentration, feeding scheme and in general to gain experience with growing conditions in Bonaire. These tests showed that the best concentration at hatching was approximately 3500 larvae/*l*. This was reduced through mortality to between 200 to 600 larvae/*l* by day 28, just before metamorphosis (Fig. 1).

Several cultures were lost from power failures during the breeding season. (Ironically the two worst blackouts occured just after 50000 larvae had metamorphosed, resulting in a 100% mortality. An electrical generator was ordered in a hurry.) The laboratory is maintained at a constant temperature. When the air conditioning stopped during the day-time, long enough to cause temperatures of the culture tanks to surge, it resulted in severe mortality among the veligers and post-metamorphosis juveniles (Fig. 2). Two cultures were lost due to an infection by a "red blotch organism." This was contained by utilizing more rigorous aseptic techniques.

At the end of the breeding season larvae passed through a successful metamorphosis on 14 October. As of the end of October we have approximately 10,000 juveniles between 1 and 3.5 mm in length, averaging 3 mm (Fig. 3).

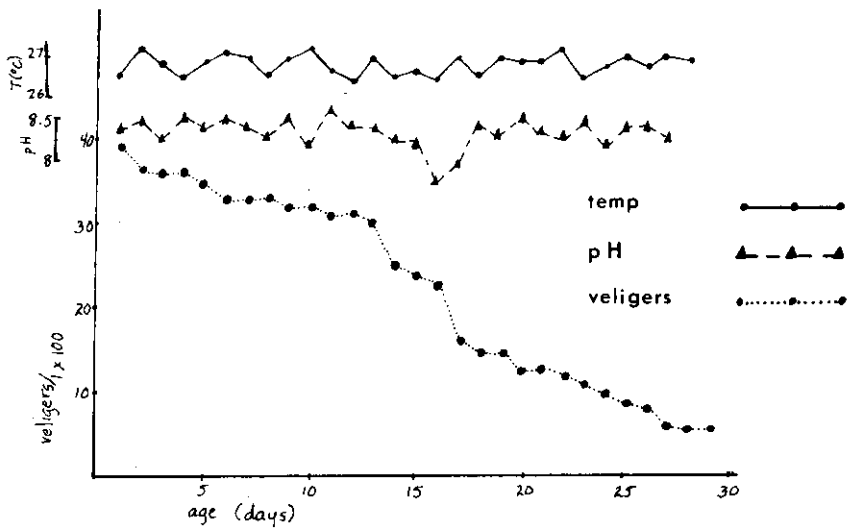

Figure 1 Plot of the number of veligers per liter, pH and temperature.

DISCUSSION

Our results indicate that it is quite possible to cultivate large numbers of juvenile queen conch in Bonaire. This year there have not been any insurmountable problems with water quality, infections nor the cultivation of phytoplankton. The two largest problems were the failure of the power system and the availability of materials to run and equip the laboratory. In February 1983, experiments will take place to seed conch in depleted environments in Aruba, Bonaire and Curacao to obtain data which could lead to the development of the most adequate reseeding techniques.

In preparation for reseeding, a set of regulations has been introduced for management of stocks of queen conch in Bonaire. These regulations have been set up after many discussions with the fishermen directly involved. They have also been discussed with the managers of the National Park, with members of the government and many others, to insure support on a broad basis.

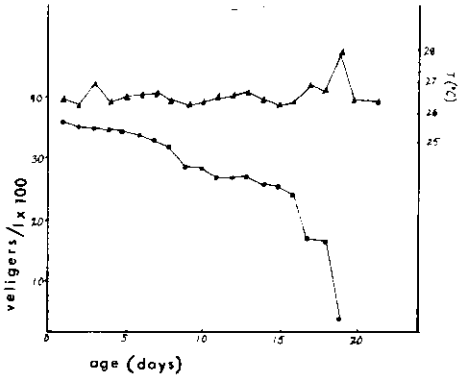

Figure 2 Plot of the number of veligers per liter and temperature. Note that a drastic increase in temperature has disastrous results on the viability of the veligers.

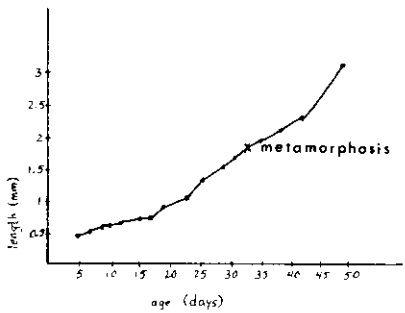

Figure 3 Plot showing the length/age relationship (N = 367).

The regulations include: (1) Protection of the major habitat of conch in Bonaire. (2) Prohibited fishing of conch for 3 years, to insure undisturbed growth of the seeded conch. (3) If after 3 years there are sufficient conch as determined by the Department of Fisheries, fishing may resume on a limited basis. (4) No conch without a well developed flaring lip may be fished, these are presumed to be adults. (5) Only fishermen with a conch fishing permit are allowed to fish for conch. (6) Fishermen have to report the number of conch caught.

The fishermen will take care of their own resource to insure that little or no poaching will take place. This program can be successful as the major conch habitat in Bonaire is restricted to an enclosed bay, Lac Bay, of 8 km^2 with a limited number of fishermen. How these regulations together with seeding techniques that still need to be developed will work in practice will determine how long the conch project will continue to deliver juvenile conch to the Netherlands Antilles.

ACKNOWLEDGMENTS

This research was supported by grants from the Departments of Agriculture and Fisheries (Dienst LVV) of Aruba, Bonaire and Curacao and with additional support of the Ministry of Economic Affairs of the Netherlands Antilles.

Special thanks go to the Commissioners Angela, Leo and Lourens and to the Misters Fowler, Vrolijk, Winkel and Stewart, without whose enthusiastic support the project would not exist today.

LITERATURE CITED

Adams, J.E.
1970. Conch fishing industry of Union Island. Grenadines, West Indies. Trop. Sci. 12:279-287.

Berg, C.J. and Haines, K.C.
1977. Fisheries and aquaculture of the conch, Strombus gigas, in the Caribbean. FAO Fish. Rep. 200 pp. 59-69.

Brownell, W.N.
1978. Report on the status of conch fisheries and related research in Belize, Turks and Caicos, Dominican Republic, Antigua, Dominica, St. Lucia, Barbados, Grenada, Trinidad & Tobago, and Venezuela, with notes on three countries not visited (Cuba, Bahamas, and St. Vincent). Report to the Interregional Project for the Development of Fisheries in the Western Central Atlantic (WECAF), September, 1978. 5 pp.

_____ and Stevely, J.M.
1981. The biology, fisheries and management of the queen conch, *strombus gigas*. Mar. Fish. Rev. 43(7): 1-12.

Guillard, R.R.L. and Ryther, J.H.
1962. Studies of marine planktonic diatoms. 1. *Cyclotella nana* Hustedt and *Detonula confervacea* (Cleve) Gran. Can. J. Microbiol. 8: 229-239.

Hesse, R.C.
1975. The conch industry of the Turks and Caicos Islands. Rep. Turks and Caicos Govt. and Fish Dept. 18 pp.

Stevely, J.M. and Warner, R.E.
1978. The biology and utilization of the queen conch, *Strombus gigas* L., in the Florida Keys and throughout its geographic range. Rept., Marine Resource Inventory, Florida Cooperative Extension Service.