

Reproductive Cycle of the Queen Conch *Strombus gigas* L. 1758 in Guadeloupe FWI

LILIANE FRENKIEL¹, LAURENT PRUVOST², ADRIANA ZETINA ZARATE³,
MARTHA ENRIQUEZ³, and DALILA ALDANA ARANDA³

¹Archipel des Sciences, Lamentin, Guadeloupe FWI

²Bois de Bragelone Saint François Guadeloupe FWI

³CINVESTAV IPN Unidad Merida, Yucatan, Mexico

ABSTRACT

The cycle of reproduction of *Strombus gigas* was established on the basis of samplings limited to 20 adults each month on the period of June 2006 to May 2007. After some preliminary essays conducted from November 2005 to January 2006, with fishermen practicing 40 m deep net fishing or fishing in apnea between 18 and 24 m, all the samplings were carried out by skin diving beyond 20 m in Guadeloupe. The harvested individuals had all a lip thickness of at least 6mm. The samplings during the fishing ban were carried out with a special authorization of the administration of fisheries of Guadeloupe. This study shows a reproduction cycle including a long period of rest that begins in October followed by a proliferation without differentiation in February. From March, gametogenesis is more precocious for males than for female conchs. Maturity begins for both sexes in May; it develops to a maximum from June to August and finishes in September by synchronous spawning. Partial spawns may occur only in August and September according to the presence of post spawn gonads at that time. It demonstrates that the fishing ban from February to September included is an absolute necessity to maintain a sustainable population of queen conch in Guadeloupe.

KEY WORDS: Queen conch, reproduction, Lesser Antilles

Ciclo de Reproducción del Caracol Rosa, *Strombus gigas* L. 1758 en Guadalupe, FWI

El ciclo de la reproducción de *Strombus gigas* fue establecido por muestreos limitados a 20 adultos por mes en el periodo de junio 2006 a mayo 2007. Después de que algunos ensayos preliminares realizados de noviembre 2005 a enero 2006 con pescadores que practican la pesca en aguas profundas con red o pescan en la apnea entre 18 y 24 m, todos los muestreos fueron llevados a cabo con buceo libre a profundidades superiores a 20 m en la región al oeste de Guadalupe. Los individuos capturados tuvieron un espesor de labio superior a 6 mm. Los muestreos durante el periodo de veda se llevaron a cabo con autorización especial de la administración de la pesquería de Guadalupe. Este estudio muestra un ciclo de la reproducción con un periodo largo de descanso que empieza en octubre, seguido por una proliferación sin diferenciación en febrero. En marzo, la gametogenesis inicia, siendo más precoz para machos que para hembras. La madurez empieza para ambos sexos en mayo; con un pico de junio a agosto, finalizando en septiembre por un desove sincrónico. Desoves parciales puedan sucederse solamente durante los meses de agosto y septiembre. El estudio demuestra que la veda de pesca de febrero a septiembre incluidos es absolutamente imprescindible para mantener a una población sostenible de caracol rosado en Guadalupe.

PALABRAS CLAVES: Reproducción, *Strombus gigas*, caracol rosa

Cycle de Reproduction du Lambi *Strombus gigas* L. 1758 en Guadeloupe, FWI

Le cycle de reproduction de *Strombus gigas* a été établi sur la base de prélèvements limités à 20 adultes par mois sur la période de juin 2006 à mai 2007. Après quelques essais préliminaires menés de novembre 2005 à janvier 2006, avec des marins pêcheurs pratiquant les uns la pêche au filet à 40 m et les autres la pêche en apnée entre 18 et 24 m, tous les prélèvements ont été effectués en apnée au-delà de 20 m dans la région est de la Grande Terre. Les individus récoltés avaient tous un pavillon épais d'au moins 6mm. Les prélèvements durant la période d'interdiction de pêche ont été effectués avec une autorisation spéciale de l'administration des pêches de Guadeloupe.

Cette étude montre un cycle de reproduction qui comporte une longue période de repos qui commence en octobre suivie d'une prolifération sans différenciation à partir de février. A partir de mars on observe une gamétogenèse active plus précoce chez les mâles que chez les femelles. La maturité débute pour les deux sexes en Mai; elle est maximale de Juin à Août et se termine en Septembre par des pontes synchrones. Des pontes partielles ont lieu seulement en Août et Septembre compte tenu de l'existence de gonades résiduelles limitée à ces deux mois. Elle montre également que la saison d'interdiction de pêche de février à septembre inclus est une nécessité absolue pour le maintien de la ressource.

MOTS CLÉS: Reproduction, *Strombus gigas*, lambi

INTRODUCTION

Queen conch is a very popular staple food in the French Caribbean islands, Guadeloupe and Martinique. In Guadeloupe, the shallow water populations of *Strombus gigas* have been severely depleted and juveniles have been collected during years even with a regulation forbidding this practice. Several restrictions have been implemented to protect this endangered species.

The queen conch fishery is now submitted to an eight month fishing ban from February to September included and during four months, fishing is reserved to professional fishermen. Fishing by diving with air tanks is strictly forbidden, as well as collecting and selling juveniles. However poaching is a permanent plague.

Skin diving has to be performed down to 20m deep to collect adult conchs. Nowadays, most adult conchs are

fished by a specific net called “folle à lambis” down to more than 40 m, exploiting populations which constituted a reproductive stock protected by depth a few years ago in most queen conch fishing areas.

Given the regional importance of *Strombus gigas* in the Caribbean, and the critical state of some of its populations, the dynamics and reproductive biology of this species have been studied in various countries (McCarthy et al. 2002, Aldana Aranda et al. 2003, Delgado et al. 2004, Castro et al. 2005, Aldana and Frenkiel 2006). However, nothing has been published about the dynamics and reproductive biology of queen conch in the French Caribbean Islands.

The goal of this study was to analyze the gonadic cycle of *S. gigas* in Guadeloupe to adjust better the fishing ban to protect the reproducing population which practices spawning aggregations and to compare this cycle with those observed in other sites of the Caribbean.

MATERIAL AND METHODS

Queen conchs were collected by skin diving around 20 m deep off the small island “Désirade” located at the most eastern point of Guadeloupe. All specimens were adults with a shell lip thicker than 6 mm. The gonad is located at the surface of visceral hump, surrounding the digestive gland. It has a red to orange color for males and white for females. A sample of 20 individuals was analyzed monthly, first during the fishing season from October to February, and thereafter, for a whole year from June to May with a special permit issued by the fisheries authorities of Guadeloupe.

A transverse slice was cut from the visceral hump and fixed in 10% formalin in seawater. Tissue slices with the digestive gland and the connective tissue containing the gonad, were then processed for histology. Sections, 5µm thick, were stained with a trichrome method (Gabe 1968).

RESULTS

Four gonad development stages similar to those used for other ranking for *Strombus gigas* populations of various sites in the Caribbean were defined:

- i) *Undifferentiated* — encompasses rest stage with very small patches of gonad interspersed with connective tissue, and proliferation stage without differentiation.
- ii) *Gametogenesis* — includes all the stages from the first differentiation of gonads that may be identified as male or female. For males, this stage is considered to go on from the first stages of spermatogenesis up to the production of atypical spermatozoa. For females this stage includes previtellogenesis and vitellogenesis up to large oocytes.

- iii) *Maturity and spawning* — characterized by the presence of typical spermatozoa for males and large oocytes full of vitelline platelets for females. For males, the presence of a large deferent canal full of typical and atypical spermatozoa is even a better marker of maturity. For females it is more difficult to be sure of the spawning process. Mature oocytes may be spawned altogether at the end of period of maturity or several times during the reproduction period.

- iv) *Post-spawn* — corresponds to empty gonads with sex still identified. A significant proportion of this stage is a proof of recent spawning. In male, empty gonad and empty deferent duct constitute a good characterization.

All these stages cumulated give the population status as regard to the reproduction pattern.

From October to January, all the gonads are undifferentiated and occupy a very small part of the connective tissue. In February gonadic tubules increase in volume but without differentiation.

From March, it is possible to identify male and female gonads and some males are even mature.

The real conditions for spawning develop in May with almost 90% of the male sample being in gametogenesis or ripe. This situation goes on in July. Twenty percent of the sample being in postspawn stage in August and much more in September demonstrate that spawning is significative only in August and September. September is the last month of spawning.

For females, the reproductive pattern is quite similar but oogenesis begins a little later, in April. Maturation is synchronous from May to August. In September there are more mature females than males which encompasses properly the opportunity of mating and fertilization.

DISCUSSION

In Guadeloupe, the gonadic cycle is designed in two main phases, with a long rest and a progressive maturation up to late spawning. During six months, there is really no opportunity of spawning, but from May to September the opportunity of spawning is really high with a maximum from May to August with the total of gametogenesis and maturity averaging 90% of the sample.

Post-spawn gonads are really important only in August and September, demonstrating a short period of spawning, but for the whole population.

We may compare this situation with those observed in three distant populations: Alacranes reef, Gulf of Mexico, South of the Yucatan peninsula at Boca Chica Belize, and the San Andrés Archipelago (Colombia). Those three populations are characterized by a continuous gametogenesis throughout the year. In Alacranes, frequent spawnings are possible, even with a low proportion of mature gonads.

In Belize, the opportunity of spawning was observed all the year round. In San Andrés, the situation is more worrying as the proportion of undifferentiated gonads is much higher, and the proportion of mature gonads very low (less than 10%) all the year round.

CONCLUSION

The reason of such various conditions is still unclear. Therefore, it is important to monitor reproductive cycle over several years and localities, making emphasis on environmental factors that may influence the gonad development and spawning periods. Such information is useful for an efficient management of the *S. gigas* populations based on reproductive activity around the Caribbean sea.

Meanwhile, the seasonal ban applied in Guadeloupe from February to September inclusive appears well adapted to protect the reproduction period of queen conch. However, some information about population density is mandatory to have a sound knowledge of the opportunity of mating related to the density of populations.

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