Reproductive Cycle of Queen Conch, *Strombus gigas* (L. 1758) in Belize

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ABSTRACT

The cycle of reproduction of *Strombus gigas* of San Pedro, Belize was established from January to December 2008 at San Pedro, Belize. All the samplings were carried out by at 10 - 15 m of depth. Not all the conchs sampled had a lip thickness of ≥6 mm. The samplings during the fishing ban were carried out with a special authorization of the administration of fisheries of Belize. This study showed a long period of undifferentiated stage. Two gametogenesis periods were observed (January-April and September-December). Mature stage was not observed. Three peaks of spawn and postspawn were observed (February, June and August). Reproductive cycle was compared with occurrence of Apicomplexa parasite and variation of temperature.

KEY WORDS: Reproduction, Queen conch, *Strombus*, Apicomplexa

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

El ciclo de la reproducción de *Strombus gigas* en San Pedro Belice fue establecido de noviembre 2007 a diciembre 2008. Los ejemplares se obtuvieron a una profundidad de 10 - 15 m en buceo libre. El ciclo de reproducción presentó un periodo largo de reposo. La gametogenesis presentó dos picos: Enero-Abril y de Setiembre a Diciembre. Los datos obtenidos del ciclo reproductivo se analizaron con los datos de abundancia del parásito Apicomplexa y con datos de temperatura. Los resultados de este trabajo permitirán ajustar el periodo de veda que tiene el recurso en Belice.

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

Cycle Reproductif du *Strombus gigas* L. 1758 au Belize

Le cycle de la reproduction des *Strombus gigas* a été établi sur la base des prélèvements limités à 30 adultes chaque mois de novembre 207 à décembre 2008 à San Pedro, Belize. Tous les prélèvements ont été effectués par plongée en deça de 10 - 15m. Tous les lambis prélevés n'avaient pas une épaisseur de lèvre d'au moins 6mm. Les prélèvements pendant l'interdiction de pêche ont été effectués avec une autorisation spéciale de l'administration des pêches du Belize. Cette étude montre un cycle de reproduction comprenant une longue période de repos. À partir d'avril, la gametogenese est plus precoce pour les mâles que pour les femelles. La maturité commence pour les deux sexes en juin ; elle se développe au maximum de juillet à août et finit en octobre. Les données ont été comparées avec d'autres emplacements dans les Caraïbes, avec la variation de température et par rapport à l'occurrence d'Apicomplexa. Enfin, a été analysée l'incidence de l'interdiction de pêche à Belize sur le cycle reproducteur observé dans cette étude pour proposer un ajustement d'interdiction afin de maintenir une population durable de lambis au Belize.

MOTS CLÉS: Lambis, *S. gigas*, cycle reproducteur, Belize, règlement

INTRODUCTION

The queen conch is a large gastropod mollusk and an important living marine resource with a commercial significance. Interest in queen conch (*Strombus gigas*) efficient management of wild or fishable stocks has increased due to declining catches (Brownell and Stevely 1981). These species has been studied in Virgin Islands, Cuba, Turks and Caicos Islands, Venezuela, Puerto Rico and Mexico (Randall 1964, Alcolado 1976, Hesse 1979, Appeldoorn 1987, Aldana Aranda *et al*. 2003 a, b, c, d).

One aspect of conch biology critical to success of sustainability of wild stocks is information on reproductive cycle. At last time an Apicomplexa parasite has been observed in the digestive gland of *S. gigas* (Gros *et al*., 2009). Aldana Aranda *et al*. 2009 have been related this Apicomplexa with atypical reproduction of *S. gigas*. Others Apicomplexa parasites like *Perkinsus marinus* was reported in *Crassostrea virginica*, Margolisella (*Pseudoklossia haliotis*) in *Haliotis rufescens* (Cáceres Martínez and Vasquez Yeomans 2001). The objective in the present work was determined the effect of Apicomplexa parasite on reproductive cycle of conchs from San Pedro Belize.

MATERIALS AND METHODS

Gonadal and visceral tissues were sampled of *Strombus gigas* collected at San Pedro, Belize. Thirty conchs were sampled monthly during 2008. Not all conchs sampled had a lip thickness of ≤ 6 mm average (characteristic for adults). Slices with the visceral mass (including digestive gland and gonad) were fixed in Bouin, embedded in paraffin, sectioned at 6 µm and stained with Poinceau Trichrome method (Gabe 1968) modified by including Alcian blue for distinguish proteoglycans from digestive gland.

Each slide was examined under light microscope, the reproductive stage were established on the basis of Lucas (1965) whith follows stages:

i) Undifferentiated,
ii) Gametogenesis,
iii) Mature,
iv) Spawn, and
v) Postspawn.

The quantification to establish the occurrence of Apicomplexa parasite was done counting the total of every parasitic stage:

i) Trophozoites,
ii) Gametocyst, and
iii) Gamonts.

A quantification to establish an incidence of the parasite was done counting the total of every stage observed in 15 fields per slide at objective 40x magnification.

RESULTS

Histological analysis of reproductive cycle showed that undifferentiated was the dominant stage ant it was present throughout the year. A very low activity of gametogenesis was observed in February (5%) and October (5%). Spawn was present February to August, with three peak: June (25%), February (10%) and August (11%). Mature stage was not observed (Figure 1). Apicomplexa occurrence, showed twos peaks: June and October. The average occurrence of Apicomplexa was observed thought the year with a value of 28 - 28 parasites per field, with aour significant difference between the months. The occurrence of gamonts was the most abundant through the year (Figure 2).

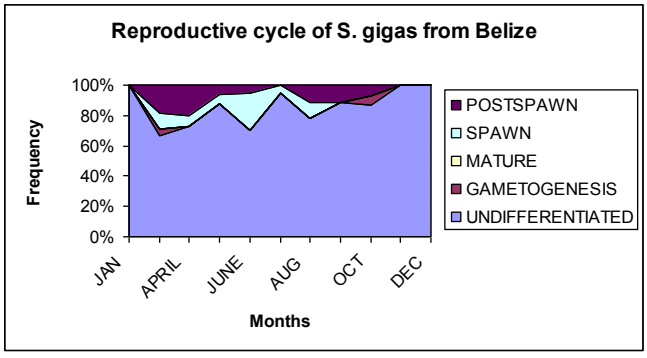

Figure 1. Reproductive cycle of *Strombus gigas* in San Pedro Belize

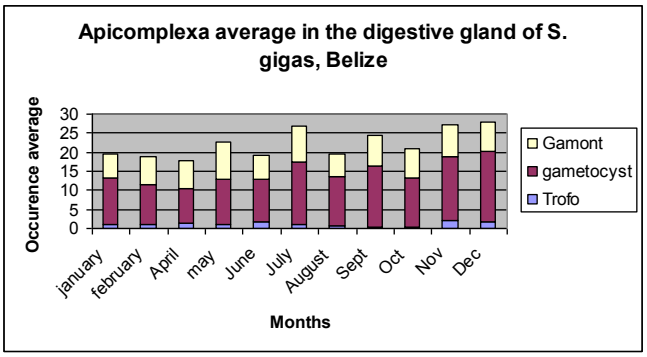

Figure 2. Occurrence of Apicomplexa (Trophozoites, gamonts and gametocyts stages) presents in the digestive gland tissue of *Strombus gigas* from San Pedro Belize.

DISCUSSION

The reproductive cycle of *Strombus gigas* from San Pedro, Belize, was not similar to these reported by Aldana Aranda *et al*. (2008) for queen conch Caribbean populations (Belize, Colombia, Guadeloupe, Martinique). The reproductive cycle not showed the five distinctive stages proposed. The lack of mature stage and a low value of spawn stage could be related to occurrence of Apicomplexa parasite. When digestive gland tissue decreases, the conch is unable to allocate energy towards to growth and reproduction and consequently, conchs have not reserves to defend themselves against pathogenic or environmental disturbances.

Our hypothesis, there would be a decline in reproductive output as a result of high levels of Apicomplexa infection, which supported that queen conch of San Pedro Belize. Aldana Aranda, *et al.* (2008) reported also an atypical reproduction of conchs from San Andres, Colombia.

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