

**POPULATION FLUCTUATIONS OF BIVALVE MOLLUSKS *DONAX STRIATUS* LINNÉ, 1767 AND *TIVELA MACTROIDES* (BORN, 1778) IN TWO SANDY BEACHES FROM VENEZUELA**

**FLUCTUACIONES POBLACIONALES DE LOS MOLUSCOS BIVALVOS *DONAX STRIATUS* LINNÉ, 1767 Y *TIVELA MACTROIDES* (BORN, 1778) EN DOS PLAYAS ARENOSAS DE VENEZUELA**

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ABSTRACT

We studied the population fluctuations from December 1995 to August 1996 of *Donax striatus* Linné, 1767 and *Tivela mactroides* (Born, 1778) in Caimare Chico and Caño Sagua beaches located on the southwestern coast of the Gulf of Venezuela, Zulia State, Venezuela. *D. striatus* (Caimare Chico: 295.84 ind/m<sup>2</sup>; Caño Sagua: 92.63 ind/m<sup>2</sup>) presented a higher abundance in comparison with *T. mactroides* (Caimare Chico: 14.34 ind/m<sup>2</sup>; Caño Sagua: 12.88 ind/m<sup>2</sup>). Both species followed similar fluctuation patterns during the sampling period, having higher abundance mostly during dry season (December - April) and lower abundance during rainy season (May - November). A significant positive correlation was observed in monthly abundance of *D. striatus* ( $r = 0.821$ );  $df = 51.98$ ;  $p < 0.000$ ) and *T. mactroides* ( $r = 0.834$ );  $df = 57.17$ ;  $p < 0.000$ ) between beaches. The significant positive correlation between population fluctuations of *D. striatus* and *T. mactroides* could suggest none or low degree of interspecific competition.

RESUMEN

Se evaluaron las fluctuaciones poblacionales, desde diciembre de 1995 hasta agosto de 1996, de los bivalvos *Donax striatus* Linné, 1767 and *Tivela mactroides* (Born, 1778) en dos playas arenosas (Caimare Chico y Caño Sagua), localizadas en la costa suroccidental del Golfo de Venezuela, estado Zulia, Venezuela. *D. striatus* presentó en promedio una alta abundancia (Caimare Chico: 295.84 ind/m<sup>2</sup>; Caño Sagua: 92.63 ind/m<sup>2</sup>) en comparación con *T. mactroides* (Caimare Chico: 14.34 ind/m<sup>2</sup>; Caño Sagua: 12.88 ind/m<sup>2</sup>). Ambas especies exhibieron un patrón similar en lo que respecta a la fluctuación mensual de la abundancia, alta abundancia en el período de sequía (Diciembre - Abril) y baja abundancia en el período de lluvia (Mayo - Noviembre). El análisis de varianza simple arrojó una correlación altamente significativa de la abundancia mensual de *D. striatus* ( $r = 0.821$ );  $df = 51.98$ ;  $p < 0.000$ ) y *T. mactroides* ( $r = 0.834$ );  $df = 57.17$ ;  $p < 0.000$ ) entre las playas. Esta correlación sugiere bajos niveles de competencia interespecífica entre las especies y que probablemente ambas especies responden a estímulos ambientales similares.

**Key Words:** sandy beach, bivalves, population fluctuations, *Donax striatus*, *Tivela mactroides*, Gulf of Venezuela, Zulia, Venezuela.

**Palabras claves:** playa arenosa, bivalvos, fluctuaciones poblacionales, *Donax striatus*, *Tivela mactroides*, Golfo de Venezuela, Zulia, Venezuela.

## INTRODUCTION

Sandy beaches with high energy waves provide an environment of high stress and continual changes for Intertidal marine infauna. As a result, relatively few macroinvertebrate species inhabit the Intertidal zone as compared with more stable subtidal areas. Among the invertebrates that inhabit this zones are the bivalve mollusks. However, studies on macrobenthic bivalves of sandy beaches are relatively limited (Souza and Gianuca 1995, Mikkelsen *et al.* 1995, Leber 1982, Shelton and Robertson 1981, Delgado 1997).

Intertidal bivalves of the genera *Donax* and *Tivela* have worldwide distribution extending into tropical and temperate latitudes (Wade 1967, Shelton and Robertson 1981; Leber 1982, Sastre 1984, Jimenez and Liñero 1993, Godoy *et al.* 1996, Delgado 1997, Reverol 1997, Reverol *et al.* 1998, García de Severeyn *et al.* 2000). They are filter feeding organisms feeding on organic matter suspended in the water column. The objective of this paper is to describe population fluctuations of *Donax striatus* Linné, 1767 and *Tivela mactroides* (Born, 1778) in Caimare Chico and Caño Sagua beaches, Venezuela.

## MATERIALS AND METHODS

Caimare Chico (11° 10' 33,3" N, 71°50' 4,39" W) and Caño Sagua (11° 21' 8.5" N, 71° 56' 21.15" W) are two beaches located on the southwestern coast of the Venezuela Gulf. Caimare Chico beach is characterized by high energy waves and deposits consisting of principally of well sorted, fine to very fine sand grains and shell remains of the clam *D. striatus*. Caño Sagua beach is similar to Caimare Chico, however, shell remains are mainly of *T. mactroides*. The beaches are 24 km apart.

The collections were made monthly from December 1995 to August 1996, including the dry and rainy seasons, a systematic sampling design similar to that of Leber (1982) was used. Collections were made during the lowest tide (50 cm depth). Three, 50 m replicate transects were made perpendicular to the coast line. Each transect was divided into 10

sampling quadrates of 0.022 m<sup>2</sup>. Quadrates within transects were separated by 5 m, and the transects themselves were separated by 2 m.

The benthic samples were taken with an Ekman grab, for avail the capture area acquaintance (capture area 0.022 m<sup>2</sup>). In the laboratory, samples were sieved through a 850 µm mesh. The samples were then preserved in 10% formalin. A day later organisms were separated, preserved in 70% ethanol, identified and counted. The densities of *D. striatus* and *T. mactroides* were transformed with  $\ln(X+1)$  to perform statistical analyses (Sokal and Rohlf, 1995). Densities (number of mollusks per 0.022 m<sup>2</sup>) was used as an index of abundance.

## RESULTS AND DUSCUSSION

A significant positive correlation was observed in monthly abundance of *D. striatus* ( $r = 0.821$ );  $df = 51.98$ ;  $p < 0.000$ ) and *T. mactroides* ( $r = 0.834$ );  $df = 57.17$ ;  $p < 0.000$ ) between beaches. The fluctuation of abundance patterns of *D. striatus* and *T. mactroides* are shown in Figure 1. The mean abundance of *D. striatus* (Caimare Chico: 295.84 ind/m<sup>2</sup>; Caño Sagua: 92,63 ind/m<sup>2</sup>) was higher than *T. mactroides* (Caimare Chico: 14.34 ind/m<sup>2</sup>; Caño Sagua: 12.88 ind/m<sup>2</sup>). Both species followed similar fluctuation patterns during the sampling period, having higher abundance mostly during the dry season (December - April) and lower abundance during the rainy season (May - November).

The significant positive correlation between population fluctuations of *D. striatus* and *T. mactroides* could suggest none or low degree of interspecific competition. Both species could respond to similar environmental stimuli (such as salinity, water temperature, dissolved oxygen, tide, etc.) which influence seasonal reproductive patterns (Delgado 1997). The population fluctuations of *D. striatus* and *T. mactroides* are likely influenced by recruitment and fisheries pressure. These two clams are heavily used as a resource, they are harvested fisherman on Caimare Chico and Caño Sagua beaches for human food and sale (Severeyn *et al.*1996, Delgado 1997, Godoy 1997, García de Severeyn *et al.*2000).

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