HIGH RECRUITMENT OF HARD CORALS AT ARCHIPIÉLAGO LOS ROQUES NATIONAL PARK, VENEZUELA

Adriana Humanes (adrihumanes@gmail.com), Carolina Bastidas (cbastidas@usb.ve).
Laboratorio de Comunidades Marinas y Ecotoxicología, Departamento de Biología de Organismos, Universidad Simón Bolívar, Caracas, Venezuela.

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Introduction

The replenishment of individuals in populations through recruitment is an essential process for the recovery and long term viability of coral species and their associated communities, particularly under increments of stress that compromises their vitality (Gittings et al. 1988). Additionally, marine populations are interconnected, exchanging individuals mainly through larval dispersal and thereby influencing the dynamics of each population. Today many important characteristics of coral recruitment like spatial and temporal settlement rates, early-survivorship rates, their effects on the spatial variation of juvenile and adult populations, among others, are unknown, especially for the Caribbean region (Szmant 1986).

Objective

The aim of this study is to evaluate temporal and spatial variation of recruitment and early-survivorship rates of hard corals at various spatial and temporal scales in the most important coral reef area of Venezuela, and probably of the Southern Caribbean.

Study area

Los Roques Archipielago National Park (LRNP) was created in 1972 to protect a marine ecosystem of exceptional ecological value dominated by coral reefs, mangroves, and seagrass beds. In this archipelago more than 50 species of hard corals represent most of the coral diversity in the country (Ramirez 2001) and in the Caribbean. Here, Acropora palmata and A. cervicornis for example, have shown some recovery in their populations (Zubillaga *et al*. 2008), whereas this is uncommon for many other Caribbean reefs.

Materials and methods

Settlement and post-settlement survivorship rates of coral recruits were quantified at two regions of the park (NE and SW), each with two reefs (Fig. 1), and during a period of mass spawning (MS, Aug-Dec 2007) and a period lacking this event (NS, March-June 2008). For this, 30 unglazed terracotta tiles of 25x25 cm were fixed horizontally at each reef, between 3 and 5 m deep. Plates were collected and analyzed in the laboratory monthly and of each tile, a visual survey of the lower side was made to quantify hard coral settlers. A settlement rate was estimated by dividing the number of new recruits by the area of the plates. A lineal general model was used to compare the settlement rates within and between regions (NE and SW), time periods (during massive events of reproduction and in absence of them). Additionally, in each survey survivorship rates were estimated as the percentage of those recruits that were present in last survey.

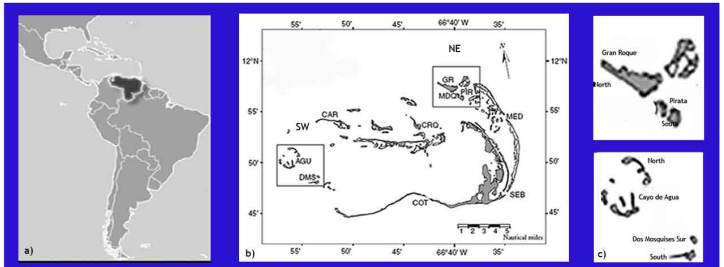
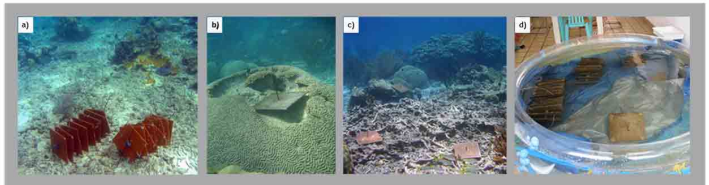


Figure 1: Maps of: a) Venezuela; b) Los Roques National Park showing the NE and SW regions sampled; c) Sites at each region.



	SS	Degr. of Freedom	MS	F	p
Intercept	1,92214	1	1,922136	8,18188	**0,004663**
Region	9,06894	1	9,068935	38,60336	**0,000000**
Site	6,12341	1	6,123405	26,06525	**0,000001**
Region*Site	0,16003	1	0,160026	0,68118	0,410128
Period(Site)	2,42604	2	1,213019	5,16341	**0,006478**
Region*Period(Site)	0,62337	2	0,311684	1,32673	0,267579
Month(Site*Period)	5,19724	4	1,299310	5,53072	**0,000299**
1*4(2*3)	0,58252	4	0,145630	0,61990	0,648805
Error	48,86462	208	0,234926		

Table 1: lineal general model comparing settlement rates within and between regions (NE and SW), time periods (during massive events of reproduction and in absence of them), sites (Gran Roque, Cayo Pirata, Cayo de Agua and Dos Mosquises) and the interactions between them.

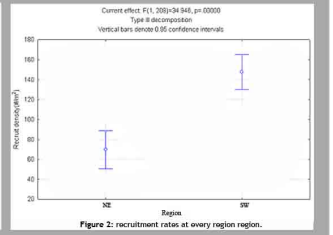


Figure 2: recruitment rates at every region region.

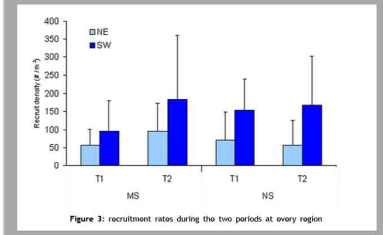


Figure 3: recruitment rates during the two periods at every region

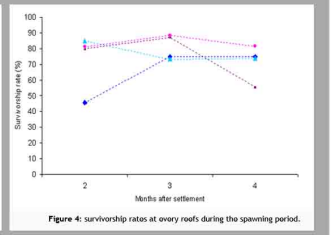


Figure 4: survivorship rates at every roofs during the spawning period.

Figure 5: Examples of the recruits morphos found on the plates. Average size 1 mm.

Results and discussion

A total of 1777 recruits were observed on 221 plates. Across sites recruitment rates varied between 50.28 ± 25.17 and 216 ± 133.99 for the spawning period and between 12 ± 9.94 and 234.14 ± 141.89 for the non spawning period. These rates are considerably high in comparison to other Caribbean reefs (Smith 1992), emphasizing the importance of this protected area at a regional level.

Recruitment rates were lower at the NE (Table 1, Fig. 2), where most of the tourist and fishing activities takes place, suggesting an impact of the human activities over the first life stages of hard corals. However, reef sites in the NE have lower coral cover than the two reef sites in the SW. This could also explain these differences in recruitment rates between NE and SW areas, as a positive correlation between the abundance of recruits and of adult colonies has been found in other reefs (Harriott 1985).

At temporal scales, recruitment rates did not varied between the periods when sampling took place (Fig. 3). This suggest that the recruits could belong to brooding species which spawn larvae throughout the year.

Survivorship rates were high (45-84% at the NE area and 55-84% at the SW area) and tended to increase after 2 months and then decrease (Fig. 4). This rates are considerably high in comparison to survivorship rates obtained under laboratory conditions (Szmant & Miller 2005). Apparently there are no differences on survivorship rates associated to the regions, suggesting an absence of human impacts on recruitment survival.

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