

Jennifer K. Chapman

Status of marine resources in Bacalar Chico Marine Reserve 2013



Omnibus Business Centre, 39-41 North Road, London N7 9DP research@blueventures.org

Tel: +44 (0)20 7697 8598 Fax: +44 (0)800 066 4032



© Blue Ventures 2014. Copyright in this publication and in all text, data and images contained herein, except as otherwise indicated, rests with Blue Ventures.

Keywords: Belize, Bacalar Chico Marine Reserve

Acknowledgements: The author would like to thank Charlotte Gough, Fran Humber and Jo Hudson for undertaking thorough reviews of this report. An enormous thank you to Klavdija Jenko, Pippa Swannell, Sam Hope and Sarah Beach, who led the data collection in the field, and to all Blue Ventures' staff and volunteers who support and assist with the reef monitoring programme. Finally, thank you to the Belize Fisheries Department for your support and advice.

Recommended citation: Chapman, J.K. 2014. Status of marine resources in Bacalar Chico Marine Reserve 2013. Blue Ventures Conservation Report, Blue Ventures, London.

Contents

Acro	onyms	1
Sum	nmary	2
1.	Manatees	3
2.	Birds	5
3.	Coral Reefs	6
4.	Lionfish	10

Acronyms

BBRS	Belize Barrier Reef System
BCMR	Bacalar Chico Marine Reserve and National Park
CZ	Conservation Zone
GUZ	General Use Zone
НСС	Hard Coral Cover
IUCN	International Union for the Conservation of Nature
MBRS	Mesoamerican Barrier Reef System
MPA	Marine Protected Area
NTZ	No Take Zone
PIT	Point Intercept Transect
PZ	Preservation Zone

Summary

With a heavy focus on programme development, refining of monitoring and research objectives, and active leadership in lionfish market development nationally, 2013 has been a defining year for Blue Ventures' conservation programmes in Belize.

The year began with the lease of a new office space in Sarteneja, providing a suitable location for the growing number of volunteers to conduct science training and prepare for community-based activities. January also saw the first volunteer expedition to not have a coral reef and diving focus: instead volunteers learnt about and participated in the monitoring and conservation of bird and manatee populations in Corozal Bay Wildlife Sanctuary (CBWS) and Bacalar Chico Marine Reserve and National Park (BCMRNP). This expedition served as a pilot, and provided the basis for the development of a comprehensive manatee monitoring programme, for implementation in 2014.

Partnership with the Placencia Producer's Cooperative Society Limited in February led to the establishment of a facility certified to export invasive lionfish to the USA. The first export was sent to the USA in July, however prohibitive costs using FedEx put the project on hold. The Northern Fishermen Cooperative (NorFiCo) similarly began stockpiling lionfish in July 2013 initially offering BZ\$8 per pound, but dropping their price to BZ\$5 per pound in December 2013, dis-incentivising fishers from delivering lionfish fillets to NorFiCo. Meanwhile, domestic trade for lionfish increased, with fishers able to sell lionfish fillets for up to BZ\$15 per pound in popular tourist locations. Further opportunities for export will be explored throughout 2014, as demand for export exists year round, and is more dependable than the fluctuating, seasonal demand that currently exists through tourism. Building the domestic demand for lionfish also forms part of the strategy to build a fishery for lionfish in Belize.

Blue Ventures also provided technical support and assistance to the Sarteneja Alliance for Conservation and Development (SACD) to complete monitoring and research objectives, primarily within SACD's manatee, bird and water quality monitoring programmes.

1. Manatees

During the *Norte* season (November-February), the weather is characterised by strong northerly winds, making sea conditions rough. Fortunately, poor weather on the reef afforded the opportunity to study the endangered Antillean manatee, *Trichechus manatus manatus*.

Frequently sighted opportunistically in-water, Blue Ventures has also been able to build a catalogue of photographs, and has thus far identified seven individuals. Furthermore, an opportunistic sightings log has been kept since March 2010.



Figure 1 Volunteers survey within the mangroves

Key findings from the opportunistic sightings, record are that manatees have been confirmed as being present year-round in BCMRNP. Given five sightings of mother-calf pairs in the mangroves during the *Norte* season, the mangroves of BCMRNP may provide an important breeding or nursery ground. A total of 205 individuals were observed over 106 sighting events in three years (March 2010 and March 2013). Comparison between seasons shows a higher frequency of sightings in *Norte* months (November to February), but this was not significant. Manatee sightings were significantly more frequent in mangroves than on reefs during *Norte* (U = 19.000, 22 df, P = 0.026) and dry (U = 35.500, 22 df, P = 0.026) seasons, but there was no significant difference in habitat preference during the rainy season.



Figure 2 Manatee sighting frequency by season and habitat

Timed surface-scans of potential manatee habitat provided the basis for development of a comprehensive manatee monitoring programme by field scientist Klavdija Jenko, and with the generous assistance of Nataly Castelblanco.

Blue Ventures assisted with the data collection and management of SACD's manatee resting hole scans and opportunistic sightings in CBWS, as well as the benthic characterisation of one resting hole.

2. Birds

The 2011 monitoring report showed a peak in bird numbers during the Norte season, a time when birds are known to nest in small mangrove stands scattered within Cantena Lagoon.

With such rich bird biodiversity, BCMRNP has been flagged as a suitable site to promote birdwatching and nature-based tourism. Blue Ventures' bird monitoring programmes aims to develop best-practice guidelines specific to BCMRNP in order to maintain healthy bird nesting colonies and foraging ground for migrant visitors travelling along the North American Flyway.

In late 2012, Blue Ventures engaged with a consultant to review and improve bird monitoring methods, providing strong scientific grounding to accompany anecdotal reports of site value.

Beginning in January 2013, four permanent transect routes, each with three or four timed (15-minute) point observations, are conducted at Figure 3: Bird monitoring in Bacalar Chico dusk and dawn at least once per season (Norte,



Marine Reserve and National Park

dry and rainy). Roving surveys are conducted once every year (during the *Norte* season) by kayak, exploring the network of narrow mangrove channels and lagoons and recording the presence of any potential bird roosting or nesting locations. Such data not only provides the necessary baseline to monitor for changes as tourism development occurs, but provides a basis for development of a management strategy and feedback mechanisms that ensure the maintained integrity of important nesting and/or migratory stopover areas.

A major barrier to the development of recommendations is the current lack of staff availability to analyse and interpret findings. An independent researcher project title "The value and vulnerability of avifauna in Bacalar Chico National Park and Marine Reserve: forming recommendations to ensure planned tourism development is environmentallysound" was developed and advertised through the year in an attempt to address this, and will continue to be advertised through 2014.

3. Coral Reefs

At a National Coral Reef Monitoring Network meeting in February, it was decided to change national protocol to measuring fleshy macroalgal heights on two point intercept transects per site and to increase fish belts to 10 per site where possible.

Mesoamerican Barrier Reef System Synoptic Monitoring Plan (MBRS-SMP) surveys, with these two changes in place, were conducted at a total of twelve reef sites, providing a full complement of BCMRNP's management zonation schemes, backreef and forereef sites, and control sites located outside of the reserve (**Error! Reference source not found.**).

Figure 4: Map of Blue Ventures' coral reef monitoring sites in Bacalar Chico Marine Reserve

Overall reef health was 'poor' both in (SIRHI = 2.18 ± 0.21 , n=10) and out (SIRHI = 2.13 ± 0.13 , n=2) of BCMRNP (Figure 5). Average hard coral cover ($9.15\% \pm 1.60$, n=10) and fleshy macroalgal cover ($21.60\% \pm 2.44$, n=10) within BCMRNP both scored 'poor' when interpreted using the SIRHI. Commercial fish biomass was also found to be 'poor' within BCMRNP ($677.05 \pm 135.07 \text{ g}.100\text{m}^{-2}$, n=10), with herbivorous fish biomass was the only reef health indicator to score 'fair' ($1975.50 \pm 348.15 \text{ g}.100\text{m}^{-2}$). One site, PF1, scored 'good' overall, with 'good' commercial fish biomass and 'very good' herbivorous fish biomass (Figure 6). This is inconsistent with findings for fish biomass from previous years; in 2010-2012, commercial fish biomass at this site was 'critical', whilst herbivorous fish biomass 'fair' in 2010 and 'poor' in 2011 and 2012.



Figure 5: Average SIRHI score for coral reef monitoring sites within and outside of BCMRNP. Background colour is coded to indicate interpretation: red = critical, orange = poor, yellow = fair, light green = good, dark green = very good.



Figure 6: SIRHI scores for coral reef monitoring sites within BCMRNP in 2013 (n=10)

Three of these sites – PF4, GF1 and C2F1 – were identified as key monitoring sites at the end of 2012 due to the range of reef locations, type and characteristics they represent:

• **PF4** is located in the Preservation Zone, and is located on the outer ridge of the double-reef system. There is evidence of hurricane damage at the site, though critically low hard coral and high fleshy macroalgal cover, combined with low herbivorous and commercial fish biomass, suggests poor recovery potential.

- Given that McClanahan *et al.* (2011)¹ found that herbivore populations do not affect macroalgal or hard coral cover on post-disturbance coral reefs, concluding that protecting areas that currently retain high hard coral cover may be more important in retaining functional and healthy reef systems. The healthiest site in BCMRNP in 2011 was **GF1**, being the only site where none of the reef indices scored 'critical' according to the Simplified Integrated Reef Health Index (SIRHI)². Additionally, there was one sighting of the critically endangered goliath grouper (*E. itajara*) and 'good' coral cover. Macroalgal cover at this site was 'fair', and parrotfish biomass was the highest recorded throughout the reserve. However, 2012 reef surveys at this site found it to be in 'critical' condition, with apparent increase in macroalgal cover and decrease in hard coral cover as well as herbivorous and commercial fish biomass.
- Herbivorous fish biomass at C2F1 was 'poor' in 2010, 'very good' in 2011, and 'fair' in 2012, demonstrating the high degree of variability and need for greater replication per site and per year of fish belts. Fleshy macroalgal cover was 'critical' in 2010 and 2011, and 'poor' in 2012. It is possible that this section of reef has undergone a macroalgal phase shift. However, further monitoring is required given the fluctuations in fish biomass data and possibility for recovery to a hard-coral dominated reef following the herbivorous fish ban of 2009. Furthermore, the reef at C2F1 is unique in being the only place along the Belize Barrier Reef where the reef meets the land and becomes temporarily fringing, before separating again into barrier reef to the south of the Rocky Point promontory.

These three sites were surveyed in both April and October 2013, whereas the remaining nine sites were surveyed using MBRS-SMP once. At five sites (PB1, GB1, GF1, C1B1 and C1F1) within BCMRPN, additional fish belts, invertebrate belts, and fish recruit belts were conducted at least three months after or before the complete surveys in order to determine whether site-specific fish abundance and biomass fluctuations are seasonal or random. These additional surveys were named "MBRS-extra" (Table 1).

Diadema antillarum research surveys investigating sea urchin density, fleshy macroalgal cover to genus level, and population structure of known sea urchin predators were conducted at seven sites between January and June 2013. Given that densities of *D. antiallrum* have been found to be significantly higher in April³, no surveys were conducted during that month. Analysis and interpretation of results is planned to take place over the next year to identify hotspots and limits to population recovery for these key reef grazers, currently at a critically low population density.

¹ McClanahan, T.R., Muthiga, N.A. and Coleman, R.A. 2011. Testing for top-down control: can post-disturbance fisheries closures reverse algal dominance? Aquatic Conservation: Marine and Freshwater Ecosystems 21: 658–675

² Healthy Reefs Initiative. 2010. Report Card for the Mesoamerican Reef, 20pp

³ Williams, S.M., Garcia-Sais, J.R., Capella, J. 2009. Temporal Variation of Early Larval Stages of the Long-Spined Sea Urchin *Diadema antillarum* in La Parguera, Puerto Rico. Caribb J Sci 45:110-117

Table 1: MBRS-SMP Coral Reef Monitoring in Bacalar Chico Marine Reserve.* denotes discontinued monitoring sites.

Month	2010	2011	2012	2013	2013 (MARDS, surfree)
_				(MBRS-SMP)	(MBRS-extra)
January			PF1		
			PB1		
February		PF1			
		PB1			
March	C1F1			PF1	
	PF4			PB1	
	GB1	GB1	GB1	GB1	
April				PF4	
-				GF1	
				C2F1	
Mav	C1B1	PF3*			
	PB1	_			
June	C1F1	C1F2*	GB2	GB2	C1B1
	PF1		•••	OF1	C1F1
lulv	PF3*	C2F2*	GF2		
50.1y		0212	0F1		
			OB1		
Διισμετ	C1F2*	PF2*	001	GF2	GB1
August	C2F2*	112		OB1	DB1
	DF2*			ODI	DE1
Sontombor	112	GE1			
Octobor	CP1			DE4	
October			PF4 CF1	PF4	
	PF4	PF4	GFI	GF1	
	0151	CIRI			
November	C1F1	C1F1	C1F1		
	C1B1		C1B1		
	C2F1	C2F1			
December				C1F1	
				C1B1	

4. Lionfish

Blue Ventures work on lionfish continued to progress throughout 2013. Blue Ventures successfully facilitated a market intervention for invasive lionfish in Belize, with the first export occurring in July 2013. Prohibitive export costs have required the export market chain to be temporarily stalled, and through working with the Northern Fishermen Cooperative, Placencia Producers Cooperative Society Limited and the Sarteneja Fishing Association, it is planned that the export market will be developed further through 2014.

Despite seemingly insatiable demand for export, high shipping costs reinforce the need for domestic market growth. To try and develop this, Blue Ventures have been working towards raising the profile of lionfish as an alternative seafood source for use in a variety of traditional Belizean dishes. This has been achieved through conducting regular lionfish information and taster events throughout Sarteneja, and once each in San Pedro and Placencia. A slow-growing domestic market for lionfish now exists, with lionfish available year-round at a Pablito's Estrellas del Mar, a popular restaurant in Sarteneja, and during peak tourist seasons, as a special, at various restaurants in San Pedro and Placencia.



Figure 7 Weighing a team's lionfish catch during Lobsterfest 2013

During the annual Lobsterfest event in Placencia, Blue Ventures assisted the Southern Environmental Association (SEA) to successfully carry out the third annual Placencia lionfish tournament. During the event, dive teams compete for cash prizes⁴ to catch the most, biggest and smallest lionfish. Blue Ventures supported the event through assisting with logistics, leading associated scientific monitoring, and organising and manning a lionfish information booth with tasters. Volunteers and staff of the Toledo Institute for Development and Environment (TIDE) also assisted with all science and outreach activities. Lionfish

⁴ Prizes sponsored by Oceana Belize

tournaments provide a potential opportunity to control lionfish populations in areas where fishing is prohibited, as well as provide a platform for outreach activities.

In addition to this Blue Ventures also took part in the Gulf and Caribbean Fisheries Institute's 66th annual general meeting, where Jennifer Chapman participated in a workshop organised by NOAA and REEF, "Invasive lionfish in the market place; challenges and opportunities". She also presented our work to date on lionfish monitoring and market development.



Figure 8 Snapshot of the poster presented at the Gulf and Caribbean Fisheries Institute's 66th annual general meeting

A national campaign to encourage growth in the domestic market for lionfish will be implemented in 2014, coupled with the development and implementation of lionfish surveys in Bacalar Chico Marine Reserve to answer key research questions identified by the Gulf and Caribbean Fisheries Institute lionfish working group.