



# BBP in Brief

A NEWSLETTER OF THE BAHAMAS BIOCOMPLEXITY PROJECT

Produced by the American Museum of Natural History's Center for Biodiversity and Conservation (AMNH-CBC)

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## Welcome...

This is the newsletter of the Bahamas Biocomplexity Project, or "BBP," also available at <http://bbp.amnh.org/bbpinbrief/>. Here you can learn about the activities and progress of the BBP team and its partners. We welcome your submissions about research progress, upcoming field plans, meetings, or any other information you feel would be of interest to project partners. Submissions for consideration in future newsletters may be made to Kate Holmes or Christine Engels ([bbp.in.brief@amnh.org](mailto:bbp.in.brief@amnh.org)).

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## Marine Reserves and Coral Recovery: BBP Publications Demonstrate How Reserves Can Facilitate Reef Recovery

Kate Holmes, Dan Brumbaugh (AMNH-CBC), and Steve Vollmer (Northeastern University)

Two recent research articles by BBP researchers have revealed important information about how marine protected areas (MPAs) can contribute to the recovery of Caribbean corals.

The first paper, published in the *Journal of Heredity* in January 2007, addresses the maximum spacing among reefs that would allow for reef recovery via an adequate supply of coral recruits (coral larvae that disperse, settle, and grow to become small new coral colonies). That is, how close should damaged reefs be to healthy reefs for them to be able to benefit from a supply of new corals? This information is particularly needed in the Caribbean where the two once-dominant shallow water corals, staghorn coral (*Acropora cervicornis*) and elkhorn coral (*A. palmata*), have suffered unprecedented declines due to white-band disease and other factors. In many locations, losses of these corals have been greater than 95 percent, and both species have been listed as threatened under the U.S. Endangered Species Act.

The researchers, Steve Vollmer and Steve Palumbi, show that larval dispersal in staghorn corals is generally quite limited over moderate to long distances (greater than 500 km). In addition, dispersal can sometimes be limited at local scales, to the point where even adjacent reefs can be genetically different. Their review of coral population genetic studies also found that limited gene flow over 500-km distances is common in a variety of Caribbean and Pacific reef corals. The study's results imply that damaged Caribbean staghorn corals require local source populations for their recovery, and need targeted conservation efforts over spatial scales much smaller than the hundreds to thousands of kilometers often proposed for marine reserves.



A small staghorn coral colony has established itself on a reef in San Salvador. This species can form large, dense thickets and was once abundant throughout the Caribbean. K. Holmes © AMNH-CBC

The second paper, published in the *Proceedings of the National Academy of Sciences* in May 2007, demonstrates how The Bahamas' Exuma Cays Land and Sea Park (ECLSP) facilitates coral recruitment through the protection of grazing parrotfishes. The results build on an earlier paper published in *Science* in January 2006 (discussed in *BBP in Brief*, Issue 6, May 2006) that showed how the ECLSP, in addition to protecting large numbers of Nassau grouper, also enhanced some parrotfish populations, and the grazing function that these fish have on reefs. In turn, this grazing reduced the amount of seaweed growing in the park, thereby freeing up space for corals to settle and grow. The new paper, led by Peter Mumby, shows how grazing pressure correlates with coral recruitment: sites within the park, with twice as much grazing, also had twice as many coral recruits as sites outside the park. After comparing a suite of alternative hypotheses, Mumby and collaborators concluded that the grazing itself, rather than other potentially confounding factors,

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The beak-like teeth of queen parrotfish (*Scarus vetula*) allow them to scrape algae from the substrate. K. Holmes © AMNH-CBC

best explain the enhanced coral recruitment. “This is the first evidence we have that marine reserves benefit coral,” said Mumby. “Coral reefs are unique ecosystems that have supported thousands of fish and other marine species for millions of years. We estimate that humans have already destroyed around 30 percent of the world’s coral reefs and climate change is now causing further damage to coral. These findings illustrate the need to maintain high levels of parrotfish on reefs in order to give corals a fighting chance of recovering.”

Taken as a whole, this research from the ECLSP shows that in addition to protecting an economically important but threatened fish species (the Nassau grouper), the reserve also nurtures the growth of corals, which are the long-term foundation of many other ecosystem processes and services in The Bahamas. The studies also demonstrate how reserves, as outposts of less disturbed, more natural marine ecosystems, can serve as important scientific “controls” for understanding human impacts in surrounding waters. By teasing apart the ecological effects of protected

places such as the ECLSP, one of the largest and best enforced marine reserves in the Caribbean, researchers are also able to address what ecological functions are missing from surrounding, less protected waters.

These articles, and others produced by the BBP, are available via the BBP website: <http://bbp.amnh.org/website/publications.html>.

## A Swimming Cash Crop

David Blinken, A Fishing Guide based in New York City

Every spring for the past ten years, I have made a journey to The Bahamas to kick off my fishing season with a group of other anglers. Two things stand out about the islands when I first enter them. The first thing I notice as I am flying in and crossing Bimini towards Andros Island is the extensive shallow waters of the Bahamas banks. As the plane begins its descent over Andros on its approach to Nassau, one can’t help but see what appear to be white clouds in the water, a few miles off Andros Island’s western shoreline. These clouds are “mudding” bonefish protecting themselves from the midday heat. As the plane flies over the Northern Bight, I can see extensive habitat for bonefish: creeks, flats, and mangrove-lined basins. The Bahamas are a bonefish paradise, and Andros is just one of the hundreds of its islands that stretch out over the Atlantic for over 500 miles in a line going roughly north to south. I feel that when nature decided to create this area it was with the bonefish in mind.

The second thing that strikes me whenever I arrive in The Bahamas is just how important economically the bonefish business is to the country – even the Bahamas’ print advertising campaigns now highlight fishing over gambling and boating. As we enter customs carrying our fly rods packed in long tubes, we look around and recognize others in the brother- and sisterhood of anglers. This is a unique group of people who support the outer islands of The Bahamas through tourism dollars spent in the pursuit of the “Grey Ghost” of the flats. There is no doubt that, to The Bahamas, bonefishing matters. While millions of dollars go into the casinos and clubs of the major islands like New Providence and Grand Bahama – and support many people there – it is ecotourism and fishing that does it for the rest of the outer islands.

The island my group has gone to for the last five years is Acklins Island, which is about 275 miles south-southeast of Nassau. The population of the island, 500, is posted on a faded sign just outside the airport at Springs Point. For many years, the only industry in Acklins was harvesting the bark of the Cascarilla tree, which has a bitter taste and is used by Italian companies to make the aperitif Campari. But now it is the bonefish that drives this little island’s economy. Acklins is approximately 125 miles long, and at its widest, five miles across. To the experienced eye, just to glance at the island, it smacks of bonefish.

We drive about a half-hour north to where we will be staying at Grey’s Point Bonefish Inn; here, the head guide, Garon Williamson, greets us. We catch up and discuss storms and hurricanes that lashed the island but did no damage to the fishing grounds that we will explore over the next week. Garon tells me how good the fishing has been of late and smiles break out all around. That is pretty much how the week goes.

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David and Stevie, a fishing guide from Acklins, take a small clip from a bonefish to be used for genetic analyses. © D. Blinken

Before dinner Garon suggests that I may want to wade behind camp, so I grab my friend Richard Epstein and my seven-weight fly rod and we are off. As we begin our wade across the flat that runs east-west behind camp, I notice piles of garbage washed in from the sea after last year's hurricanes. Soap bottles, tires, nets of all kinds, soda cans, glass bottles, and other refuse line the shoreline that used to be pristine. Now the mangroves are a host to more than just birds, fish, and crustaceans. This saddens me and gives me added insight into the condition of our oceans. If a little outpost like Acklins Island can collect this much garbage from two storms that only brushed the island, what else is out there polluting the waters? I start thinking about ocean dumping, pleasure boaters who may throw their garbage over the side, and commercial fisherman who leave old nets out in the water threatening turtles, dolphins, birds, and a host of other ocean fauna. As my mind continues on this path, I notice a faint glint about 100 feet away, close to the mangroves. It's the tell-tale shine of a tailing bonefish and my thoughts quickly shift.

With Richard on my left, I quietly stalk the fish, going very slowly so as not to disturb the water or the fish. When I am about 60 feet away from the fish, I cast and my fly drops about six feet in front of the bonefish. As the fish rushes the fly, everything is momentarily forgotten. The bonefish eats the fly and speeds off, peeling about 50 yards of line and backing off the reel before I can control it. I reel the "bone" in. Richard takes some photos while I quickly collect a small clip from its dorsal fin for analyses by researchers with the Bahamas Biocomplexity Project. Sample in hand, I release the fish and we turn around and head for dinner.



An Acklins fishing guide, Stevie, prepares to release a bonefish shortly after it was caught. © D. Blinken



Bonefish can be tough to see, even when they're swimming above bare sand. © D. Blinken

Over the next couple of days Garon and I discuss whether people are still eating bonefish on the island and conclude that, for the most part they aren't except in a couple of isolated places. People are mostly eating grouper, conch, barracuda (if caught away from the reef), tuna, and lobster. I ask Garon what he would do if he found people eating bones in the bay that surrounds the lodge, and he says with a smile, "I would have to have a talk with them." Garon goes on to explain the importance of the bonefish to his livelihood and the importance and impact they have on the overall economic health of the island. The guides and their families have a great appreciation of the ocean environment and know what it can do for them, if kept healthy. Without the bonefish, it would be a tough life – there aren't enough Cascarilla trees to harvest and not enough people drink Campari to support the families here.

## BBP General Meeting 2007

Dan Brumbaugh (AMNH-CBC)

In January 2007, BBP collaborators and partners met at the University of California–Davis for a four-day BBP General Meeting. With a series of presentations, opportunities for collaborative data analysis, and break-out discussions devoted to topics that cut across BBP Working Groups, the meeting gave collaborators an opportunity to update their colleagues on the remarkable research progress made by the project's working groups, and to continue the development of research initiatives that integrate findings across working groups and disciplines. For example, new analyses of how small-scale Bahamian fisheries are distributed across habitats is providing new insights into the spatial relationship between catches, seascape structure (that is, the pattern of different habitats across the marine environment), and distance from settlements. This information will be incorporated into statistical models of fish biodiversity and community structure, and will allow for the inclusion of fishing activities in site-selection analyses. In addition to the research discussions, participants also reviewed educational outputs such as the CBC's *Treasures in the Sea* project and the *Marine Reserves and Local Fisheries* simulation, and continued planning for wider public outreach about forthcoming research results and their significance for education and decision-making in The Bahamas.



Tom Oliver and Genia Naro-Maciel meet to discuss genetic data in the U.C. Davis Student Union. K. Holmes © AMNH-CBC

## Bahamian Voices at the 15th UN Commission on Sustainable Development

Kate Holmes (AMNH-CBC)

The United Nations Commission on Sustainable Development met this May at the UN Headquarters in New York City. This Commission is a UN forum that brings countries together to consider ways to integrate key facets of sustainable development including economic growth, social development, and environmental protection. In attendance for part of the 12-day meeting were representatives and supporters of the Save Guana Cay Reef Association (SGCRA), a non-governmental organization (NGO) from Abaco, and Mangrove Action Project (MAP), an international NGO that has been active in Bimini. Participants spoke at one of the Commission's side events, the "Non-Governmental Organizations' Special Event: Mangrove Destruction, Restoration, and Conservation" session. According to a SGCRA press release, this marked the first time a Bahamian delegation has attended the UN to speak on environmental issues.

SGCRA has been drawing attention to the Discovery Land Company's development of Baker's Bay Club at the north end of Guana Cay in Abacos. The cay is just over six miles long and less than one mile wide. The proposed Baker's Bay Club includes the construction of an 18-hole golf course, a 180-slip marina and sites for 400+ homes. Members of SGCRA are concerned that a shoreline golf course will create severe siltation that could kill corals and nearby mangroves. Many also fear that the development has too large a footprint for the small island and will severely damage Guana's marine environment and quiet, tourism-based economy. Similarly, many residents and researchers in Bimini have been concerned about how large-scale development for the Bimini Bay Resort and Casino will affect marine resources there.

Discussion at the mangrove session ranged from global threats to this habitat to specific threats from coastal development in The Bahamas. Delegation presenters included Alfredo Quarto, Executive Director of MAP; Troy Albury and Fred Smith, President and Chief Counsel, respectively, of SGCRA; Bill Parks, representing MAP in Bimini; and several supporting scientists. Quarto highlighted the importance of mangrove forests for conservation of marine biodiversity as well as for protection against future climatic events, such as hurricanes and wave surges. Albury, Smith, and Parks focused on The Bahamas where, they explained, large areas of mangroves are being destroyed on many family islands by foreign developers as part of the government's promotion of "Anchor Projects," which frequently take the form of all-inclusive tourist resorts and exclusive real estate, golf, and marina developments. Particular references were made to the developments at Guana Cay and Bimini.

"We are absolutely not opposed to development," Albury has said. "We just want the developments to be better planned, the impacts monitored, and most importantly, we want them to be environmentally safe for the surrounding reefs."



A small stand of Bahamian red mangrove trees. K. Holmes © AMNH-CBC



## The IUCN Marine Protected Area Summit Calls for Dramatic Increase in Ocean Protection

Jennifer Stenzel (AMNH-CBC), excerpted from an IUCN News Release, Washington, D.C., April 13, 2007

The Earth's oceans are being destroyed at a much faster rate than they are being protected, concluded the world's leading marine experts at the end of the World Conservation Union (IUCN) Marine Protected Area Summit. Organized by IUCN's World Commission on Protected Areas, the Summit spanned April 10-12 in Washington, D.C. and focused on developing a strategy for protecting oceans from increasing pressures such as climate change, ocean acidification, and overfishing.

To save the oceans, participants urged governments, along with business and civil society, to rapidly increase the area under protection and to step up measures to help make marine environments more resilient in the face of climate change. The high seas – oceans beyond national jurisdiction – are particularly threatened. "Entire ecosystems in the high seas are being damaged and lost before we have even acted to protect them," reads the summit's closing statement.

"Summit participants urge governments to establish marine protected area networks by 2012, and to protect at least 10 percent of oceans under national jurisdiction as decided under several legally binding agreements," said Dan Laffoley, Marine Vice Chair of IUCN's World Commission on Protected Areas. "With the current pace of action, the targets will not be met." Currently, only one percent of the oceans are protected, compared to over 12 percent of the Earth's land surface.

Marine protected areas have been proven to allow threatened fish stocks to recover – and to increase the fishing yield in adjacent areas. For example, in the Egyptian Red Sea, five years after the establishment of marine reserves, fishing increased by 66 percent in neighboring areas.

To ease the impacts of climate change on oceans, other stress factors, including pollution and overfishing – which are more immediately in our power to control – need to be reduced in marine ecosystems such as coral reefs. "Climate change makes oceans warmer and more acidic, which causes corals to bleach and erodes their ability to build reef skeletons. But corals can adapt and survive if they are healthy and don't suffer from sedimentation or disruptive fishing practices," said Carl Gustaf Lundin, Head of IUCN's Marine Programme.

Better management of marine environments will also serve to buffer humans from the impacts of accelerated climate change. Today, oceans are the world's largest carbon "sink," absorbing around 50 percent of atmospheric carbon dioxide yearly. However, continued discharges of carbon dioxide and poor marine management may turn oceans from a carbon sink into a major carbon source, releasing vast stores of carbon into the atmosphere, thus exacerbating climate change.

The IUCN Marine Protected Area Summit statement is available at: <http://www.iucn.org/themes/wcpa/biome/marine/callforaction.pdf>.

### 11th International Coral Reef Symposium "Reefs for the Future" Ft. Lauderdale, Florida, USA July 7-11, 2008 Abstract deadline: December 1, 2007



Every four years, many coral-reef biologists, geologists, oceanographers, social scientists, resource managers, educators, and conservationists working on coral reefs worldwide meet together at the International Coral Reef Symposium (ICRS) to share the latest knowledge and advance the understanding of these ecosystems on a global scale. The 11th International Coral Reef Symposium, hosted by the United States and Florida, will be held July 7-11, 2008 in Ft. Lauderdale, Florida. Participation by more than 2,500 attendees from the scientific, marine management, and conservation communities is anticipated.

The scientific theme of the Symposium will be "Reefs for the Future." Degradation of coral reefs due to factors such as pollution, overfishing, and climate change threaten the destruction of these ecosystems and their biodiversity on an unprecedented, global scale. Scientists, policymakers, conservationists, local users, and managers are exercising leadership in developing knowledge and implementing science-based strategies to address the crisis. Plenary speakers will summarize current scientific knowledge about reefs. Mini-Symposia and field workshops will be thematic, question-driven, and define specific science-based outcomes as well as management strategies. Field trips to diverse reefs will help illustrate specific reef types, environmental problems, and management successes. The results of the 11th ICRS will be made accessible in a variety of web-based, CD, and traditional formats.

The abstract deadline for the meeting is December 1, 2007 and the early registration deadline is April 30, 2008. For more information, visit the website of the 11th International Coral Reef Symposium: <http://www.nova.edu/ncri/11icrs/>.

## BBP Collaborators and Partners



### What is BBP?

The Bahamas Biocomplexity Project (BBP) is a five-year initiative funded primarily by the National Science Foundation to investigate the complex environmental and social factors that affect the design, management, and effectiveness of networks of marine protected areas (MPAs). Researchers involved in the project include oceanographers, biologists, and social scientists from nine institutions working in collaboration with various governmental and non-governmental groups in The Bahamas.

Ultimately, the primary goal of the project is to integrate studies of natural and human processes, leading to a more sophisticated understanding of how individual MPAs work, and how they could work as part of a network throughout The Bahamas and in other coral reef ecosystems. Other important goals include the integration of this research with education and decision-making.

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