



Tourism-related drivers of support for protection of fisheries resources on Andros Island, The Bahamas



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ABSTRACT

Fisheries resources in the Caribbean suffer intense pressure from overharvesting. Some of the most valuable fisheries in The Bahamas, such as queen conch (*Strombus gigas*), spiny lobster (*Panulirus argus*), and Nassau grouper (*Epinephelus striatus*), are overexploited and require additional protection. Despite these pressures, we currently know very little about the factors that underlie local residents' support for such protection. We interviewed residents of Andros Island, The Bahamas to evaluate how perception of environmental impacts of tourism, perception of benefits of tourism for their quality of life, income generation from tourism, and education level influenced their willingness to support additional protection of marine resources in the face of a growing tourism industry. We found that respondents supporting additional marine resource protection tended to perceive tourism as having negative impacts on marine resources and neutral to positive effects on their family's quality of life. Attending at least some college also positively influenced support for marine resource protection, although whether residents sold natural products to tourists did not appear to influence their stance on marine resource protection. Our results suggest education in a broad sense, and particularly education highlighting how tourism can both positively affect human well-being and harm marine resources, will promote public support for marine resource protection.

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1. Introduction

Overharvesting of marine resources threatens social and ecological sustainability in the Caribbean Basin. Significant commercial and artisanal fisheries (e.g. shellfish, large pelagic species, and shallow reef fishes), which are considered high value for export or for domestic and tourist consumption, are fully to overexploited (CEO, 2005). Reliance on marine resources is especially prevalent in developing island nations of the Caribbean. Resource extraction ranging from forest products to fisheries provides a form of natural insurance for residents with low incomes, unreliable employment, or during times of economic uncertainty (Pattanayak and Sills, 2001). Over-reliance on natural resources has the potential to create a poverty trap by providing a minimum income thereby removing incentive to invest in education or take risks necessary to escape poverty (Delacote, 2009). Protecting fisheries resources can

ensure reliable long-term availability of the safety net associated with these resources while reducing the poverty trap effect caused by overreliance on extraction.

Fisheries protection measures (e.g., protected areas, closed seasons, catch quotas and size restrictions) have proven successful in counteracting the decline of specific fisheries and other marine species (Sluka et al., 1997; Bohnsack, 2000; Bene and Tewfik, 2003). Although protection can promote more sustainable fisheries and communities, such protection requires public and regulatory support, which can be influenced by factors such as residents' beliefs and education (Chen et al., 2011; Gelcich et al., 2005). The absence of public support, combined with minimal enforcement in protected areas, has often resulted in 'paper parks' where marine resources receive little actual protection. The 'paper park' phenomenon is particularly acute when protected areas lack social support from adjacent residents (Hamu et al., 2004; Abecasis et al., 2013) or when exclusionary practices do not address the impacts to residents' livelihood and culture (Meyer and Helfman, 1993).

Factors previously shown to correlate with support for environmental protection include perceived impacts of environmental

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policy on local culture and environment, community involvement in environmental-decision making, and level of education. In The Bahamas, residents of the Exumas who stood to lose access to resources opposed a marine protected area and indicated a willingness to violate a no-take rule (Stoffle and Minnis, 2007). Residents who participate in the process of defining environmental protection strategies are more likely to support resulting restrictions (Sandersen and Koester, 2000; Pollnac et al., 2001; Kideghesho et al., 2007). Belief that the marine environment is in poor condition represented a positive indicator of support for marine reserves on several 'family islands' (i.e., islands not frequently visited by tourists) in The Bahamas (Broad and Sanchirico, 2008). Greater education is often associated with higher levels of acceptance of environmental protection (Fiallo and Jacobson 1995; Infield, 1988; Mehta and Heinen, 2001) although not necessarily with increased environmental-friendly behavior (Olli et al., 2001; Moorman, 2006).

Tourism in the Caribbean has grown substantially in the past few decades, introducing new opportunities to residents of marine resource-dependent island nations, for instance by potentially offering alternative forms of income. Over the same few decades, there has been a growing awareness of the potentially negative impacts of tourism growth. Hall (2001) provides an extensive review of tourism impacts on coastal and marine environments. Tourism also presents additional demand for resources which are already fully or overexploited. The role of residents' perceptions of tourism in influencing their support for marine resource protection has received little attention. The few studies conducted point toward an overall positive view of tourism, a perception of net financial benefits from tourism, and a strong community reliance on tourism as factors influencing support for conservation initiatives (Lindberg et al., 1996; Walpole and Goodwin, 2001; Broad and Sanchirico, 2008). Greater local participation in tourism initiatives and employment in tourism generates pro-conservation behaviors and perspectives (Stem et al., 2003). However, income generation alone does not necessarily encourage pro-conservation behavior (Stem et al., 2003). For instance, residents dependent on tourism for part of their income were less likely to support conservation in Komodo National Park, perhaps due to negative experiences with park authorities (Walpole and Goodwin, 2001).

Many valuable fisheries in The Bahamas, such as queen conch (*Strombus gigas*), spiny lobster (*Panulirus argus*), and Nassau grouper (*Epinephelus striatus*), are overharvested. In The Bahamas, where conch comprises the second largest fishery, extremely low adult population densities have resulted in very low reproductive potential in most populations around Andros Island (Stoner et al., 2009; Stoner and Davis, 2010). The International Union for Conservation of Nature (IUCN) lists Nassau grouper (Ehrhardt and Deleveaux, 2007; FAO, 2009), as endangered IUCN, 2012. Almost all Bahamian fishers (95%) harvest spiny lobster which are either fully or overexploited throughout the Caribbean (Buchan, 2000),

and despite steady or increasing fishing efforts in recent years, lobster landings began decreasing in 2007 (FAO, 2009). Thus, multiple fisheries in The Bahamas should benefit from additional protection efforts, but few previous studies have investigated tourism-related factors influencing resident support for such protection.

Here we investigate potential drivers of support for fisheries resource protection on Andros Island, The Bahamas, focusing on residents' perceptions of tourism. We developed and tested four hypotheses (Table 1). Three hypotheses centered on the relatively unexplored role of tourism on support for fisheries resource protection, whereas our fourth hypothesis allowed us to account for potential educational effects identified in previous research.

2. Study area

Andros Island is the largest island in The Bahamas (5957 km²) and has one of the least dense human populations (7490 people in 2010; Department of Statistics of The Bahamas), with the third longest barrier reef system in the world. Andros comprises several islands treated politically as one unit, and most people live along The Queen's Highway, which primarily runs along the eastern coast (Fig. 1).

Approximately 9000 visitors arrive on Andros annually (Delancy, 2011), mainly for activities such as bonefishing, diving, bird-watching, deep-sea fishing, sailing, and kayaking. Nature-based tourism activities generate \$43.6 million in revenue each year (Hargreaves-Allen, 2010). Andros provides a good case study because approximately 85% of residents derive primary or secondary income from fishing, crabbing and sponging (Hargreaves-Allen, 2010), while some residents also sell straw products and wood carvings to tourists. Environmental protection is salient to residents because the government established five national parks on Andros Island in 2002 to protect the barrier reef, freshwater blue holes, mangrove nursery habitat, and land crab (*Cardisoma guanhumi*, *Gecarcinus lateralis*) habitat. Moreover, the national government has declared Andros as The Bahamas' premier ecotourism destination (Macleod, 2010) with an obvious desire to grow tourism on the island (P. Douglas, personal communication 2011, Broad and Sanchirico, 2008; Christie, 2014). At the same time, The GEO Bahamas, 2005 State of the Environment Report articulated the need for environmental stewardship and protection to grow and maintain tourism on Andros:

"It is clear that the socio-economic environment of The Bahamas is dependent on tourism. In turn, tourism is dependent on the state of the environment. Consequently maintaining a balance between the environment and economic development is essential for Bahamians, both present and future generations" (GEO Bahamas, 2005).

Table 1
Hypotheses of drivers for support of fisheries resource protection examined in this study.

Driver of support for fisheries protection	General hypothesis	Survey prediction
1. Environmental Impacts of Tourism	Individuals that perceive negative impacts of tourism on critical fisheries resources are more likely to support protection	Perception of negative impacts on conch from tourism will positively predict support for additional protection
2. Quality-of-Life Impacts of Tourism	Individuals that perceive positive impacts of tourism on their quality of life are more likely to support protection	Perception of positive impacts on family quality of life from tourism will positively predict support for additional protection
3. Economic Dependence on Tourism	Individuals that depend in part on tourism for financial support are more likely to support protection	Selling natural products to tourists will positively predict support for additional protection
4. Education	Individuals with more formal educational background are more likely to support protection	Higher levels of formal education will positively predict support for additional protection

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