



Social alienation and environmental decline in a coral reef: Challenges to coastal management in the Mexican Caribbean

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A B S T R A C T

Tourism is the primary economic activity on the Riviera Maya in Quintana Roo, Mexico. The area's main attractions are the fringing coral reefs along the coast and the myriad white sand beaches produced by them. Rapid growth of tourism and supporting industries generates jobs and a steady flow of immigrants, increasing demand for housing and services. It also increases pressure on coastal and marine resources through impacts such as pollution, overfishing, coastal zone modification, etc. In this context, Akumal a small tourism-support town associated to the coastal tourism center Akumal Beach, was selected to assess its level of dependence and appropriation of marine resources. A two-pronged approach included a characterization of the town's population socio-economic indicators, as well as their use and perception of easily identifiable marine resources (coral reef, fish and water quality), applying surveys with close-ended questions. And the second approach was the interview of key local business owners and tours operators to establish their vulnerability to coral reef degradation, and their disposition towards conservation efforts. The relationships between community involvement and resource appropriation, as well as, socioeconomic indicators and local perceptions about the past, present and future condition of marine resources were explored using redundancy analysis (RDA), and additionally important variables identified were tested for significance with a Chi-squared test. Surveys highlighted two socio-economic factors: its high employment rate (90%) with 80% working directly in tourism (but earning average wages 25% lower than the regional average), and the heavy out-of-state immigration. Surveys also brought up two phenomena among newcomers: deterritorialization (or social alienation), consisting in lack of involvement by the local community in decision-making processes, scarce participation in natural resources use, and shifting-baselines associated to ignorance of current resource condition. Interviews with local stakeholders found that they felt only partially vulnerable in a hypothetical situation of total reef loss, and were open to support conservation efforts as long as transparency and full cooperation from all stakeholders was ensured. The measures recommended to coastal managers, broadly applicable to the Mexican Caribbean, focus on development of local strategies addressing the root causes of social mistrust and misperceptions, leading to environmental degradation.

1. Introduction

Coral reefs, when present, are crucial ecosystems for coastal communities. They provide protection against hurricane damage and beach erosion, support both subsistence and commercial fisheries, generate beach sand, and are the focus of income-generating recreational opportunities such as snorkeling and scuba diving (Moberg and Folke, 1999; Wilkinson, 2004; Barbier et al., 2011). Anthropogenic impacts on

these ecosystems during centuries of exploitation are diverse and profound (Jackson, 1997; Cramer et al., 2012): Degradation of the environmental services humans depend on; threats to reef community ecological condition; changes in reef species spatial distribution; increases in the gap between rich and poor nations; and reduction in the capacity of coral reef systems to absorb, transform and adapt to external disturbances (Fox et al., 2006; Levin and Lubchenco, 2008; Srinivasan et al., 2008). Supporting and rebuilding the functionality of a coral reef

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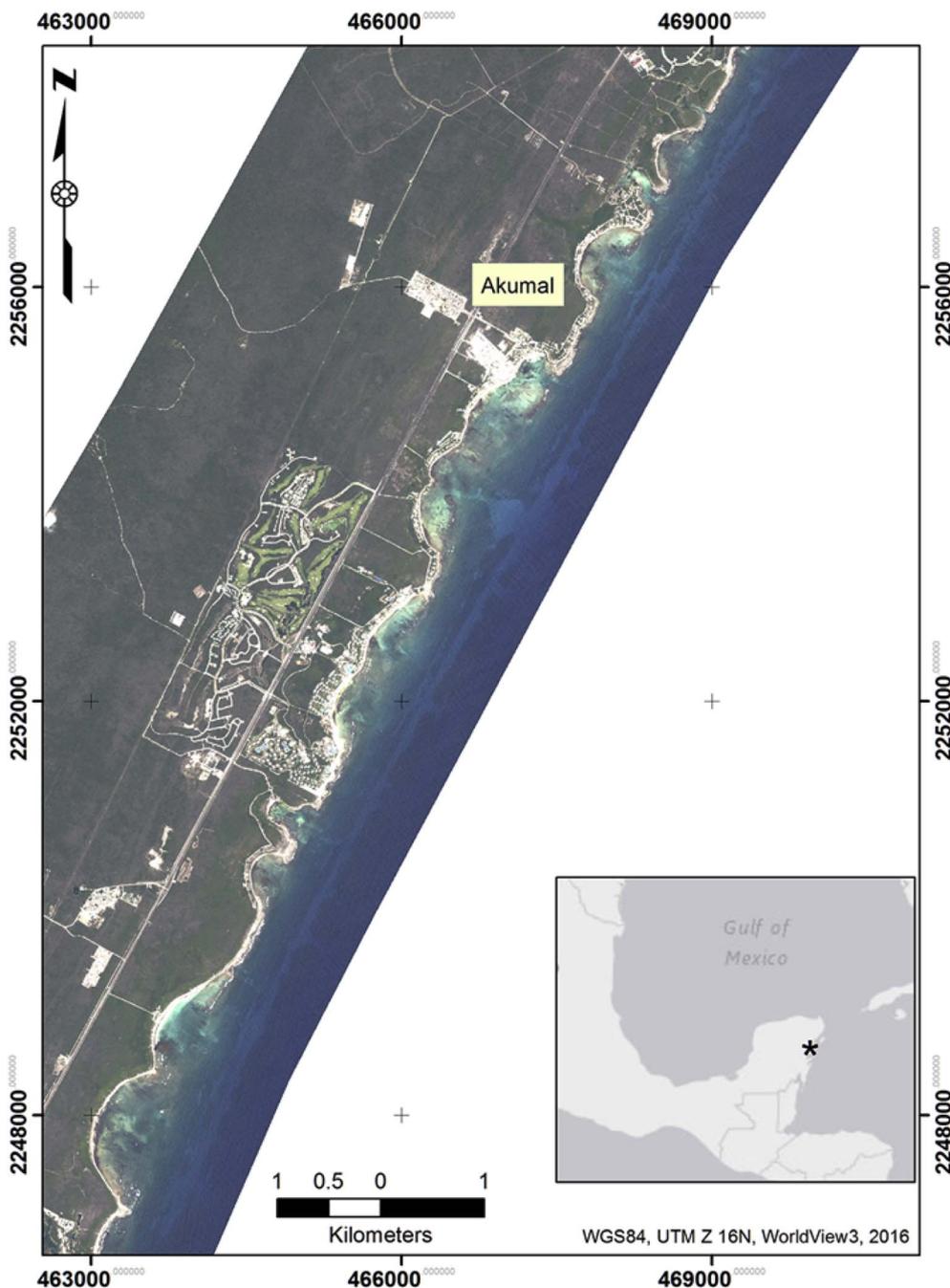


Fig. 1. Study Area, Akumal, Quintana Roo, México.

system and its ability to cope with external stresses requires complete understanding of existing social and ecological systems since system stability depends on their interaction (Walker et al., 2012). Since local stress agents impacts on coastal ecosystems are easier to identify and manage than global agents such as climate change, improving ecosystem resilience is often approached through local or regional management actions, which are more easily measured and improved (Knowlton and Jackson, 2008; Côté and Darling, 2010; Ostrom, 2010; Jackson et al., 2014).

Significant coral reef degradation, coral cover decline and dominant coral species shifts have been documented in Mexico (and the greater Caribbean region) over the last four decades; indeed, coral cover loss has been as high as 79% (Almada-Villela et al., 2002; Gardner et al., 2003; Alvarez-Filip et al., 2009; Carriquiry et al., 2013). Particularly notable impacts have been a steadily growing dominance of macroalgae and loss of the refuge ecological function with a consequent decline in

fish biomass (Knowlton and Jackson, 2008; Alvarez-Filip et al., 2009; Cinner et al., 2009; Jackson et al., 2014). Direct anthropogenic threats to reef fish populations include overfishing, marine habitat transformation and loss, sedimentation, pollution from wastewater discharge, recreational uses and introduction of alien species. Ecosystems and their associated fisheries in the Mexican Caribbean are clearly in a critical situation (Bryant et al., 1999; Bellwood et al., 2004; Brown et al., 2006; Pollock et al., 2011; Jackson et al., 2012, 2014).

Caribbean fisheries are experiencing ecological impacts, but no reports have been forthcoming on the significant social implications of this decline since the region's economy no longer depends directly on fishing. However, the primary economic activity in the region is tourism- and trade-related services, both directly or indirectly dependent on the continued existence of healthy coral reefs (INEGI, 2015a). It is unlikely that the regional economy will be able to avoid the effects of coral reef ecosystem decline much longer.

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