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Development of a collaborative science plan to evaluate the conservation efficacy of a no-fishing, no-anchor marine reserve in Dry Tortugas National Park, Florida, USA

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ABSTRACT

The Dry Tortugas Research Natural Area (RNA), a 158-km^2 no-fishing, no-anchor marine reserve, was implemented in 2007 in Dry Tortugas National Park (DRTO), Florida to minimize the effects of human activities on marine resources and to enhance the productivity and sustainability of fish populations. The process of establishing the RNA resulted in the development of a Memorandum of Understanding (MOU) between the State of Florida and the National Park Service (NPS). The MOU constitutes a roadmap for the roles and responsibilities for a state and federal partnership, collaborative preparation of a research and monitoring plan, and reporting on the progress implementing the plan and preliminary findings. A science plan was developed in conjunction with marine and fisheries scientists from multiple agencies and non-government organizations to: (1) quantify changes in the abundance and size-structure of exploited fish species within the RNA relative to adjacent areas; (2) monitor the immigration and emigration of targeted species; (3) monitor changes in species composition and catch rates of exploited fish species throughout the surrounding region; (4) evaluate the effects on marine benthic biological communities; (5) assess reproductive potential of exploited fish species by evaluating egg production and larval dispersal; and (6) implement social science studies to evaluate visitor experiences. For each topic, performance measures, essential and supplemental activities, and general study recommendations were developed. The plan supported interagency marine resource managers in the structured implementation of a science program by communicating to the public a suite of performance measures and essential and supplementary studies designed to document changes in fisheries resources. Development of collaborative marine science programs are useful for leveraging resources, engaging the public and agency decision-makers, and long-term planning to ensure that research and monitoring data are available for sustainable adaptive management of marine reserves.

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1. Introduction

Renowned for its coral reefs and wide diversity and abundance of fish, Dry Tortugas National Park (DRTO) lies at the western end of the Florida Keys along the Straits of Florida (Fig. 1). First established as Fort Jefferson National Monument in 1935, the site was reauthorized in 1992 as Dry Tortugas National Park. Congress established the park to "preserve and protect for the education, inspiration, and enjoyment of present and future generations nationally significant natural, historic, scenic, marine, and scientific values in south Florida." The enabling legislation stipulates that the park must be managed in a manner to protect, among other values, "a pristine subtropical marine ecosystem, including an intact coral reef community" and also incorporated the prohibition of commercial fishing in 1935. In 1974, following research demonstrating a reduction in spiny lobster abundance and fecundity caused by recreational harvest within DRTO (Bertelsen and Cox, 2001; Davis, 1974), spear fishing and the harvest of all spiny lobster species were prohibited.

Observations of increased visitation and use of all DRTO marine resources made during the 1990s and documented during an interagency, marine spatial planning effort called the Tortugas 2000 Working Group process, contributed to the decision to establish

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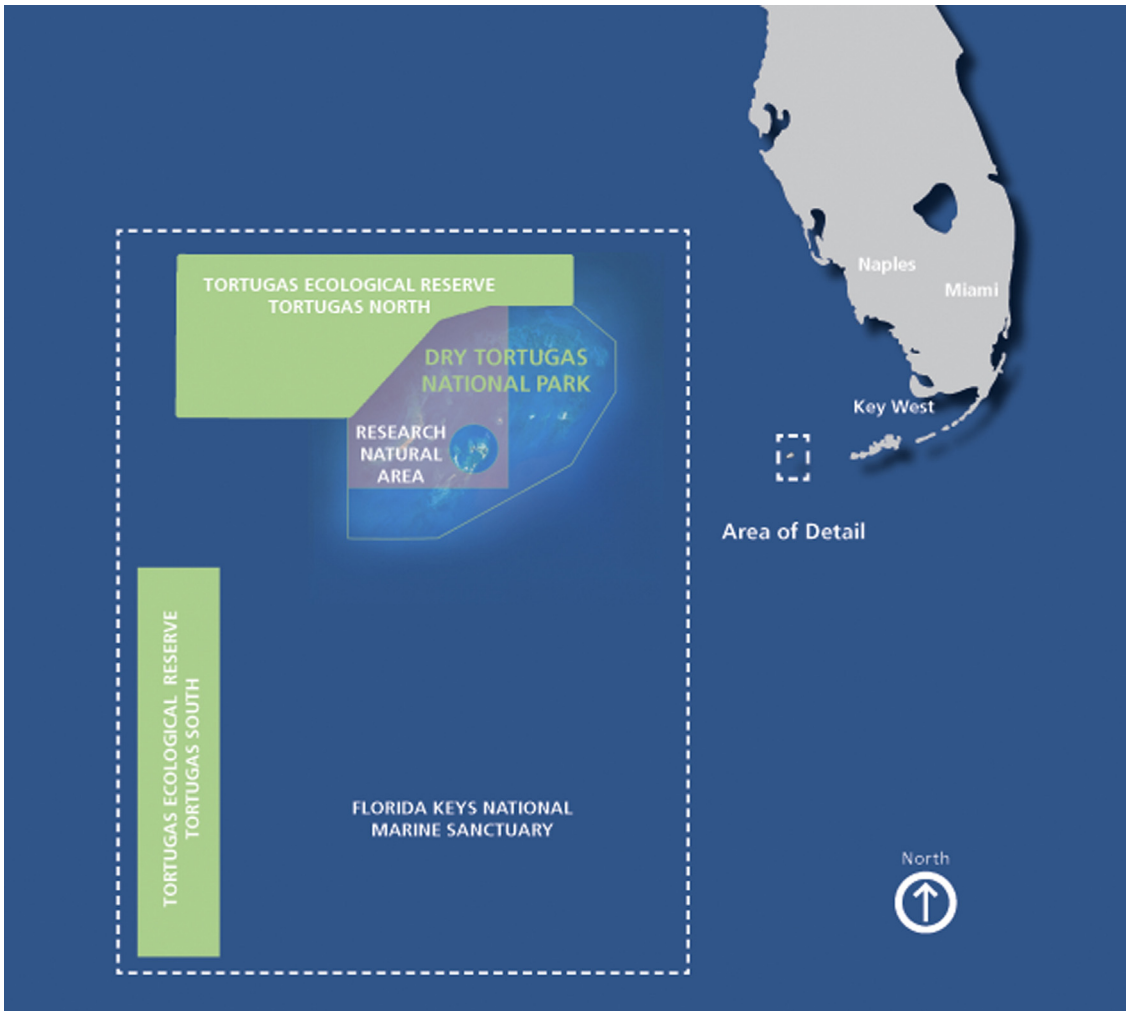

Fig. 1. Dry Tortugas National Park, including the Research Natural Area and the Florida Keys National Marine Sanctuary's Tortugas Ecological Reserves North and South.

a no-fishing, no-anchor marine reserve called the Research Natural Area (RNA) in 2001 (Brock and Culhane, 2004; U.S. Department of Commerce, 2000). The RNA was planned as a 158-km^2 marine reserve – comprising approximately 50% of the park – and was designed to restore ecological integrity and capacity for self-renewal by minimizing the effects of human activities (Fig. 1). It complements protection afforded by the adjacent Tortugas North and South Ecological Reserves (TNER and TSER) of the Florida Keys National Marine Sanctuary established by the National Oceanic and Atmospheric Administration and the State of Florida; consequently, it contributes to a region-wide effort to conserve marine resources. However, the implementation of the RNA was delayed until issues between the federal government and the State of Florida related to the ownership of the submerged lands within DRTO were resolved. In 2005, the Governor of the State of Florida and the Secretary of the U.S. Department of the Interior signed a management agreement for the submerged lands within DRTO (Dry Tortugas National Park, 2006), thereby resolving the submerged lands dispute. The resolution of this issue was key to the success of RNA implementation because it paved the way for establishing the appropriate regulatory partnership between the NPS and the Florida Fish and Wildlife Conservation Commission (FWC). In 2006, the FWC concurred with the NPS plan to establish the RNA with the stipulation that the NPS and the FWC establish a Memorandum of Understanding (MOU) to facilitate collaboration between the two agencies to evaluate the performance of the RNA (South Florida Natural Resources Center and Florida Fish and Wildlife Conservation Commission, 2007). The MOU stipulated that a detailed monitoring and research plan be developed based on several RNA performance areas and include a review and summary of past and existing work in DRTO relevant to the RNA, as well as a schedule of deliverables for reporting. In accordance with the direction provided by the MOU, the NPS and FWC developed a science plan designed to guide a program to evaluate the conservation efficacy of the RNA through the implementation of performance measures, essential and supplementary activities, and proposed studies.

Herein, we detail the joint process that developed the science plan, summarize the various elements of the plan, and discuss the advantages of building strong inter-agency partnerships to leverage resources, engage the public and agency decision-makers, and enable long-term planning to ensure that research and monitoring data are available for sustainable adaptive management of the marine reserve.

2. Materials and methods

2.1. Initial science planning activities

As a joint effort between a state and federal agency, lead scientists from each agency were appointed to build a collaborative relationship, promote understanding among agencies, provide a consistent effort to develop and implement research and