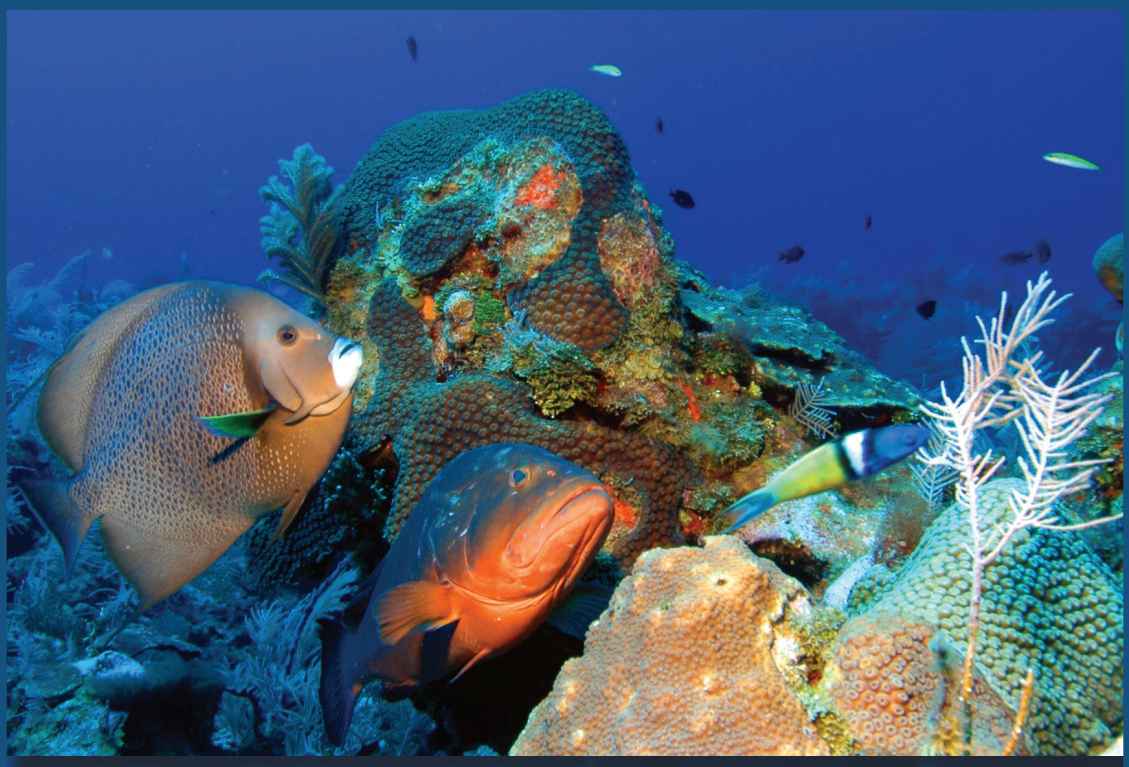
Florida Fish and Wildlife
Conservation Commission

National Park Service
U.S. Department of the Interior

South Florida Natural Resources Center
Everglades and Dry Tortugas National Parks

Assessing the Conservation Efficacy of the Dry Tortugas National Park Research Natural Area



A Science Plan Prepared by the

National Park Service and the

Florida Fish and Wildlife Conservation Commission

2015


TORTUGAS NORTH
ECOLOGICAL RESERVE
PARK BOUNDARY
RESEARCH NATURAL AREA BOUNDARY
Pulaski Shoal
NATURAL CULTURAL ZONE
DRY TORTUGAS
NATIONAL PARK
REASEARCH NATURAL AREA
Hospital Key
Middle Key
East Key
Loggerhead Key
HISTORIC
ADAPTIVE
USE ZONE
RESEARCH NATURAL AREA BOUNDARY
RESEARCH NATURAL AREA BOUNDARY
PARK BOUNDARY
FLORIDA KEYS
NATIONAL MARINE
SANCTUARY
North
Middle Ground
HISTORIC ADAPTIVE USE ZONE DETAIL
Inset scale
0 0.25 Kilometer
0 0.25 Statute Mile
0 0.25 Nautical Mile
Iowa Rock
Fl G 4s 16ft 4M
Fort Jefferson
on Garden Key
Shoal
Bush Key
Light
24°37'41"N
82°52'19"W
Long Key
(closed to public)
Tortugas
anchorage
Nurse Shark Special
Marine Protection Zone
(closed to public)
Brick wreck
GOOD
SNORKELING
Bird Key
anchorage
Bird Key
Bank
Coral Special Marine
Protection Zone
(closed to public)

Assessing the Conservation Efficacy of the Dry Tortugas National Park Research Natural Area

A Science Plan Prepared by the

National Park Service

and the

Florida Fish and Wildlife Conservation Commission

2015

South Florida Natural Resources Center
Everglades and Dry Tortugas National Parks
Homestead, Florida

National Park Service
U.S. Department of the Interior

Florida Fish and Wildlife Conservation Commission
Tallahassee, Florida

Cover photograph by Jerry Ault, Univ. of Miami/RSMAS

TABLE OF CONTENTS

CONTRIBUTING AUTHORS

Tracy A. Ziegler[1] and John Hunt[2]

[1]National Park Service, Dry Tortugas National Park, Key West FL 33040
[2]Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission, Marathon, FL 33050

Comments and Questions: Tracy_Ziegler@nps.gov and John.Hunt@MyFWC.com

LIST OF ABBREVIATIONS

CPUE	Catch per unit effort
CUE	Commercial Use Authorization
DRTO	Dry Tortugas National Park
ENP	Everglades National Park
ESA	Endangered Species Act
FKNMS	Florida Keys National Marine Sanctuary
FWC	Florida Fish and Wildlife Conservation Commission
GMP	General Management Plan
MOU	Memorandum of Understanding
NCZ	Natural/Cultural Zone
NEPA	National Environmental Policy Act
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
RNA	Research Natural Area
RVC	Reef Visual Census
SOW	Statement of Work
SRS	Stratified Random Sampling
TER	Tortugas Ecological Reserve
TNER	Tortugas Northern Ecological Reserve
TSER	Tortugas Southern Ecological Reserve

Please reference the report as follows:

Ziegler, T. A. and Hunt, J., editors. 2015. Assessing the Conservation Efficacy of the Dry Tortugas National Park Research Natural Area. South Florida Natural Resources Center, Everglades and Dry Tortugas National Parks, Homestead, FL, and the Florida Fish and Wildlife Conservation Commission, Tallahassee, FL. 11 pp.

Refer to our website, http://www.nps.gov/ever/naturescience/technicalreports.htm,
for a copy of the original 2007 science plan and the 2012 5-year report.

INTRODUCTION

Renowned for its cultural and natural resources, Dry Tortugas National Park (DRTO) lies at the western end of the Florida Keys along the Straits of Florida. 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 so as to protect, among other values, "a pristine subtropical marine ecosystem, including an intact coral reef community." The seven islands of the Dry Tortugas are composed of sand, limestone, and coral reef fragments and are surrounded by shoals and water to depths of 25 m (82 ft.). A significant characteristic of the park is its ratio of land to water; 99.8% of the park consists of marine ecosystems.

This document presents a modified science plan developed by the National Park Service (NPS) and the Florida Fish and Wildlife Conservation Commission (FWC) that will be used to assess the effectiveness of the Research Natural Area (RNA) of DRTO Park over the next 5 years. Established in January 2007, the RNA is a 46-square mile marine reserve designed to restore ecological integrity and capacity for self-renewal by minimizing the effects of human activities. The RNA complements protection afforded by the adjacent Tortugas Ecological Reserve (TER) of the Florida Keys National Marine Sanctuary (FKNMS) established by the National Oceanic and Atmospheric Administration (NOAA) and the state of Florida, and thereby contributes to a region-wide effort to strengthen resource protection. Together, the RNA and the larger TER will help to ensure the success of both marine and terrestrial ecosystems while offering outstanding opportunities for scientific research and public education.

The goal of establishing the DRTO RNA is to protect shallow water marine habitat, ensure species diversity, and enhance the productivity and sustainability of fish populations throughout the region. Appropriate activities within the reserve include boating, swimming, snorkeling, scuba diving, hiking, research, and education. Anchoring and fishing are prohibited; however, mooring buoys are available for day use by snorkelers and scuba divers. No manipulation of resources is allowed, except as needed to accomplish restoration. The RNA provides a unique unexploited area that can be used to help assess the effects of fishing on exploited areas. Long-term studies and monitoring will serve to document existing baseline conditions and analyze how park natural resources respond to the protection provided.

The NPS and the FWC remain committed to working together to conduct research, education, enforcement, and adaptive management of the Dry Tortugas ecosystem. The agencies produced a report in 2012 that assessed the conservation efficacy of the RNA 5 years following implementation (Ziegler and Hunt 2012). At the June 2012 meeting of the FWC, the results of the 5-year assessment were presented. The Commission approved continued support of the special regulations of the RNA, and requested a new Memorandum of Understanding (MOU) for another 5-year term. On April 4, 2013, the NPS and the FWC established a second MOU to facilitate cooperation in the evaluation of the performance of the RNA. The new MOU retains the six areas of RNA performance to be evaluated:

1. Quantification of changes in abundance and size-structure of exploited species within the RNA relative to adjacent areas;
2. Monitoring of the immigration and emigration of targeted species in the RNA;
3. Monitoring of changes in species composition and catch rates of exploited species throughout the surrounding region;
4. Monitoring of species composition and abundance of the benthic community;
5. Assessment of reproductive potential of exploited species by evaluating egg production and larval dispersal, as necessary; and
6. Incorporation of social sciences into the research and monitoring program.

Porkfish and gray snapper, Dry Tortugas National Park. Photo by Naomi Blinick, Pacific Historic Parks.

The MOU stipulates that we continue with the monitoring and research plan developed that incorporates the RNA performance areas described above. The MOU requires that a review and summary of past and existing work in DRTO relevant to the RNA be undertaken and that a schedule of deliverables for reporting be provided. The partnering agencies have been working to find additional funding for new research projects that they have identified as priorities. As such, the next assessment report will be published in 2020.

In response to the direction provided by the MOU, this science plan identifies monitoring and research activities for each of the performance areas. Appropriate performance measures are listed for each performance area, along with essential and supplemental categories of monitoring and research activities. Each performance area described in the Monitoring and Research Activities section of this report includes a summary of relevant past and existing work in DRTO. A schedule for delivery of an evaluation report is provided. For reference, the MOU is included as Appendix I of this report.

The implementing agencies believe that the RNA provides substantial benefits to the Tortugas region; however, the authors of this report also recognize that ecosystems take time to respond to management actions. We have recommended a variety of indicators that will help evaluate benefits both in short and long timeframes. Natural variability in sea temperature, weather events such as hurricanes, and other factors can affect many of the indicators described in this document and thereby have the potential to complicate RNA assessment. The 2012 5-year assessment report (Ziegler and Hunt 2012) documents the initial ecosystem response resulting from the implementation of the RNA. The full benefit of the RNA to the Tortugas region will likely only be measurable in the long-term.

The science plan is specifically designed to address issues related to the RNA and identified in the associated MOU. However, because important resource issues that are not directly addressed by the establishment of the RNA remain, additional resource stewardship strategies are being developed to help accomplish effective conservation of DRTO resources. For instance, although reef fish and coral declines are important DRTO natural resource stewardship issues, RNA establishment does not directly address the root causes of coral decline. A substantial decrease in stony corals has occurred during the last 30 years, especially among the major reef forming *Acropora* species, now formally listed under the Endangered Species Act (ESA). The loss of stony corals has been due mostly to disease, bleaching, hypothermic events (strong cold fronts), and hurricanes. Other resource protection strategies will be considered to address coral loss.

Resource managers will continue to assess the conservation efficacy of the Special Protection Zones in DRTO. Special Protection Zones have been established in areas requiring protection from human impact, including areas of shallow and sensitive corals. The purpose of these zones is to protect and restore ESA-listed species and other rare, at-risk species, assemblages, and habitats by providing maximum protection within the park. Science needs and activities for these and other natural resource stewardship issues not covered by the RNA MOU will be discussed in a more comprehensive DRTO science plan developed by the NPS.

MONITORING AND RESEARCH ACTIVITIES

This section of the 2015 DRTO RNA science plan provides a detailed description of the monitoring and research activities associated with the six RNA performance areas identified in the MOU. For each topic, relevant performance measures are stipulated, a summary of past and existing work in DRTO and the region is provided, and newly anticipated essential and supplemental activities are identified.

This document retains the structure of the 2007 DRTO RNA science plan with some slight modifications. In addition to introducing the performance topic, we summarize the information learned from the first 5 years of science work. A recommendation regarding the need to continue core monitoring studies is also provided. New priorities for future research are identified.

RNA Performance Topic 1: Quantify changes in the abundance and size-structure of exploited species within the RNA relative to adjacent areas.

MOU Statement of Work (SOW) A.2.a: "Continue ongoing research and monitoring that assesses important reef fish populations within the Dry Tortugas region and the RNA. The research and monitoring program could incorporate multi-gear sampling to monitor changes in abundance and size of targeted species inside and outside RNA boundaries and in seagrass beds of the region. Increases in the abundance and size-structure of these species in the absence of fishing mortality serve as an indicator that the RNA is protecting spawning biomass, age-structure, and genetic diversity that potentially enhance the productivity and sustainability of these species in the region."

The primary goal of no-fishing marine reserves is to produce long-lasting increases in the abundance, size-structure, and productivity of target fishery species within the reserve. Numerous scientific studies have demonstrated that marine reserves can and do achieve this goal (National Academy of Sciences 2001, Roberts et al. 2001, Halpern 2003, Lubchenco et al. 2003). The activities described below are designed to test the hypothesis that implementation of the RNA will enhance reef fish populations within the protected area.

Performance Measures

Abundances, sizes, occurrence frequency, and estimates of fisheries stock assessment parameters for groupers, snappers, and grunts inside and outside the RNA. Abundance of reference (non-fishery) reef fishes (e.g., parrotfishes).

Essential Activities

1. ***Continue to implement a coral reef fish visual census (RVC) in DRTO using a stratified random sampling (SRS) design inside and outside the RNA.***

Summary of 2012 5-Year Report. From 1999 to 2011, fishery independent visual surveys were conducted to assess the status of the coral reef fish community and evaluate spatial and temporal trends in species abundance metrics in the Tortugas region with particular emphasis on the RNA post-implementation. In both the Tortugas North Ecological Reserve (TNER) and DRTO, abundance, as measured by occupancy rates and density at survey sites, and sizes of red grouper, mutton snapper, yellowtail snapper, and hogfish at or above the legal size of capture have increased since the implementation of the RNA. In contrast, abundance and size of these species either remained the same or decreased in nearby areas of the Tortugas region that are open to fishing. Abundance of adult spawning-sized fish has increased within the RNA relative to other areas, as well. The protection afforded to these reef fish species by the RNA is likely an important component for the recovery of their populations (Ault et al. 2013).

Need for Continuation. The RVC surveys should continue at a minimum frequency of every other year. These surveys remain a high priority because they are the only long-term data source for abundance and size structure of exploited and non-exploited fish species in the Tortugas area. The RVC is the only extant sampling program that can detect change in fish populations over time. The RVC is an essential monitoring tool and must continue.

2. ***Evaluate the role of seagrass communities and other shallow water habitats inside and outside of the RNA as a nursery and juvenile habitat for fish in the Tortugas region***

Summary of 2012 5-Year Report. Fishery independent trapping surveys designed to assess fish assemblages associated with seagrass, including juveniles, were conducted within DRTO, inside and outside the RNA, for the first 5 years of RNA implementation. In general, white grunts and red grouper collected in seagrass beds were smaller than those observed at nearby reefs. Juveniles of red and black groupers were most frequently collected in the shallow seagrass beds of the RNA. That study tentatively concluded that seagrasses within the RNA may function as the primary nursery habitat for juveniles of exploited reef fish species of the Tortugas region.

Visual reef census, Dry Tortugas National Park. Photo by Evan D'Alessandro, Univ. of Miami/RSMAS.

Soft-bottom habitat, Dry Tortugas National Park. Photo by Brett Seymour, NPS.

Need for Continuation. Given the tentative conclusions of the initial surveys, examining the role that the shallow seagrass beds of DRTO play in supporting reef fish populations of the Tortugas region is a priority for the next 5-year period (2015-2019). Key information needs include developing a better understanding of fish populations in the seagrass community, identifying the location of settlement habitats, and studying the spatial dynamics of fish recruitment at the local scale and the ontogenetic movements of reef fish within the shallow platform of the Tortugas region. These are high priority research areas that, if completed, will lead to a strong understanding of the role that the shallow waters of DRTO play in supporting the fish populations of the entire Tortugas region.

Reef fish species abundance and size-structure, especially of juveniles, would be measured at depth-stratified randomly selected seagrass sites within the RNA and fished areas outside the RNA — similar to the sampling design for coral reefs that is described in Performance Topic 4. Seagrass plant community rapid assessments should be conducted at the fish survey sites (e.g., percent cover using the Braun-Blanquet methods). These seagrass plant community assessments would also contribute to Performance Topic 4, Supplemental Activity 1.

3. *Estimate the effect of the invasive lionfish on reef fish populations inside and outside of the RNA.*

At the time that the 2007 DRTO RNA science plan was developed, lionfish were not known to exist in Florida to any considerable extent. Consequently, they were not part of the first plan. This is a new issue that we are facing. The current invasion of lionfish is a threat to the ecosystem, and includes impacts that range from possible envenomations of anglers, snorkelers, divers, and swimmers to the alteration of the structure of the reef fish community and thus the biotic integrity of the parks. The widespread establishment of the lionfish in an open marine system represents a unique case of a successful marine invasion (Ruiz-Carus et al. 2006). DRTO provides habitat for a wide diversity of native marine life and coral reef biota, including many species commonly targeted by recreational and commercial fishermen (e.g., snappers, groupers, grunts, lobsters and hogfish). Due to the well-documented voracious appetite of the lionfish and lack of natural predators in the Atlantic region, native reef fishes, recreationally important fishes, and invertebrates could potentially be displaced by lionfish that out-compete native species for the same prey resources and/or by becoming prey for lionfish. Thus, with increased lionfish densities, we can expect a reduction in forage fish biomass. Another potential impact could be an increase in algal growth due to herbivore removal by lionfish. Lionfish may cause cascading trophic impacts on economically important species resulting in niche takeover by lionfish (Cure et al. 2012; Green et al. 2012). Understanding their impacts and the ability to manage their populations offshore will be essential to the management of the RNA and the ecosystem.

Previous and Existing Studies. The first study to assess the presence and distribution of lionfish in park waters occurred in 2013. We removed 78 lionfish during 141 timed surveys (1493 min searching) at different sites within DRTO waters. Our goal was to minimize ecological impacts of a detrimental invasive species to natural resources while simultaneously improving visitor experience and reducing safety threats to park visitors and employees who utilize and/or work in the marine resources of the park.

Proposed Studies. The RNA and the Tortugas Region can act as a natural laboratory to study the potential for natural control mechanisms to limit the lionfish invasion because of the past successes of the no-fishing areas. Comparing the abundance and size of lionfish found inside vs. outside of the RNA with the number of potential lionfish preda-

Invasive lionfish. Photo by Albert Kok.

tors (e.g., large groupers, sharks that are capable of eating lionfish) would be helpful to understanding the mechanisms of lionfish control in a remote area.

Supplemental Activities

1. ***Conduct spiny lobster population surveys inside and outside the RNA as well as in the adjacent management areas (i.e., Tortugas Bank, TNER, Tortugas South Ecological Reserve (TSER), etc.).***

Previous and Existing Studies. During the past 5 years, NPS staff has perceived a possible decline in spiny lobster numbers. Park staff is concerned that lobster poaching may be increasing within DRTO. No formal studies have been conducted on spiny lobster populations within the park since 1999.

Proposed Studies. Spiny lobster population structure and reproductive dynamics were monitored in the fished (Florida Keys tract) and unfished (Dry Tortugas) regions during the peak breeding season in south Florida from 1996 through 1999. A study of spiny lobster population structure could be undertaken with new data being compared to the pre-implementation data from the 1990s. Such a study would estimate the size of the population and also provide data to help estimate if there is a poaching presence inside the park. For comparison, the study could be repeated following a dedicated increase in law enforcement presence in the park.

Florida spiny lobster. Photo by Jerry Ault, Univ. of Miami/RSMAS.

RNA Performance Topic 2: Monitor the immigration and emigration of targeted species in the RNA.

MOU SOW A.2.b: "Continue tagging studies (e.g., using acoustic tags as well as conventional dart-tags) to examine broad- and fine-scale movement patterns of targeted species in and out of the RNA, as needed. Such studies will help evaluate if adjacent fishing areas are enhanced through emigration of target species from the RNA."

Performance Measures

Net emigration of select species from the snapper-grouper complex from the RNA to adjacent fished areas inside and outside DRTO.

Essential Activities

1. ***Implement a sonic tagging study to monitor broad scale net emigration patterns of selected species from the RNA to fished areas in the DRTO region. The study area will encompass the Florida Shelf of the DRTO region and consist of open fished areas (Natural/Cultural Zone (NCZ), DRTO and FKNMS waters south of DRTO to Rebecca Shoals (15 km east of DRTO), and regulated marine protected areas (RNA, TSER, and TNER).***

Summary of 2012 5-Year Report. A migratory corridor for adult mutton snapper between the RNA and offshore spawning habitat at Riley's Hump was identified using acoustic telemetry. Mutton snapper were observed to make that migration up to four times during each summer spawning season. A large mutton snapper aggregation and repeated spawning events were documented for the first time in Florida, 5 days after the full moon, along the south slope of Riley's Hump. The RNA, complemented by the TNER and the TSER, provides critical protection of essential reef fish habitat and important fish spawning habitat. The results suggest that the RNA may provide important support to the mutton snapper spawning aggregation at Riley's Hump. FWC is continuing this tagging work on black grouper.

Home range estimates of acoustically tagged snappers and groupers were utilized to evaluate spillover across the boundaries of the RNA. Spillover was detected for all the species that were acoustically tagged. Many home ranges of individual fish straddled the RNA boundary. Low rates of return of conventionally tagged fish limited the ability to evaluate spillover from this method. However, long-range movements were detected for one red grouper and two yellowtail snappers. The RNA is likely providing benefits to the surrounding region through spillover. However, study of the ontogenetic movements of fish within the region was not addressed.

Need for Continuation. The agencies do not have further recommendations for future efforts for adult reef fish tagging studies during the next 5-year time period

(2015-2019). We support a tagging effort for juvenile fish to study recruitment and ontogenetic migration patterns in reef fish. We propose a study to examine the finer scale movements of fish between shallow water habitats (e.g., seagrass, hard bottom) within the confines of the park in order to understand how these habitats work together during the ontogenetic habitat shifts (see study outlined above in Performance Topic 1).

RNA Performance Topic 3: Monitor changes in species composition and catch rates of exploited species throughout the surrounding region.

MOU SOW A.2.c: "Continue to develop a fisheries-dependent monitoring program to evaluate potential changes in catch rates, species composition, and size composition of commercial and recreational fisheries in areas surrounding the RNA. This program could use a variety of data collection methods including on-board observers, logbooks, aerial surveys, and recreational fisheries interviews."

NPS will continue to develop and implement a fisheries-dependent monitoring program to assess the effects of RNA implementation on recreational and commercial fisheries in fishing areas surrounding the RNA. Recreational fishing activity in DRTO is currently being monitored using private angler creel surveys. Commercial fishing has been prohibited in DRTO since 1935. This information will contribute to targeted fishery species stock assessments. Existing Tortugas recreational and commercial fisheries dependent monitoring programs will be used to evaluate the effects of RNA implementation on fisheries outside DRTO.

Performance Measures

Catch per unit effort (CPUE), including released fish, harvest per unit effort, estimated total catch and harvest, and population size-structure of targeted reef fishery species, especially grouper and snapper species, throughout the Tortugas region.

Essential Activities

1. ***Continue to implement the angler creel survey in fished areas within DRTO (survey conducted by fixed intercept at Garden Key, roving patrol, and via the visitor use permit system). This survey should record CPUE and sizes of reef fish caught within general regions in the park.***

Summary of 2012 5-Year Report. NPS staff has been working with University of Miami fisheries scientists to develop an improved creel census for DRTO. Creel survey data are currently being collected and will be used to calculate CPUE for exploited fisheries species, which can help provide an estimate of species abundance. The vessel permit system that is in place will be used in concert with the creel surveys to help assess the effects of RNA implementation on recreational fishing areas surrounding the RNA. The DRTO visitor use permit system requires all private boat anglers to obtain a permit.

2. ***Collect DRTO permitted charter boat recreational fishing data via a logbook system.***

Proposed Studies. All professional charter boats operating in DRTO are required to obtain annual CUA (commercial use authorization) permits. These operators are required to provide monthly reports of the catch and effort for each fishing trip using logbooks supplied with their permits. However, there are very few charter boat operators for this region, and there are currently no permitted charter boats for DRTO.

3. ***Review and utilize data from existing Tortugas recreational and commercial fisheries dependent monitoring progras to evaluate the effects of RNA implementation on fisheries outside DRTO.***

Proposed Studies. Several recreational and commercial fisheries dependent monitoring programs collect data from the Tortugas region. Recreational charter boat data in the Florida Keys/Gulf Coast areas are gathered through the Cooperative Gulf Charter Boat Survey Research Program administered in the southeast Gulf Region by the state of Florida and Gulf States Marine Fishery Commission in cooperation with the National Marine Fisheries Service (NMFS). There is also a pilot logbook/telephone survey underway to determine which is the best method to estimate total effort (number of trips/anglers/hours fished) and angler catches. These are side-by-side survey comparisons with the current method used by the NMFS Marine Recreational Fishery Statistics Survey. The method deemed the best of the above alternatives will be implemented to assess charter boat fishing activity in the Tortugas. Tortugas commercial fisheries data will be compiled from federal and state commercial landings and logbook data collection programs that include the Tortugas Region.

Need for Continuation. The agencies agree that the creel surveys must continue during the next 5-year period (2015-2019) as a high priority project.

Supplemental Activities

1. ***Estimate overall fishing activity in DRTO using the park visitor use permit system and/or aerial surveys.***

Previous and Existing Studies. No studies have estimated overall fishing activity in DRTO.

Proposed Studies. The DRTO visitor use permit system requires all private boat anglers to obtain a permit. Anglers could be required to provide fishing activity data through this permit system. Anglers would be provided with survey forms when obtaining their permits and would be required to return completed surveys either at Garden and Loggerhead Keys, by US mail, or via the internet. This method should be developed, initiated, and evaluated.

If the proposed permit system data collection technique is not feasible, then an aerial survey method should be designed and implemented. Aerial survey design should be similar to that of surveys conducted elsewhere (e.g., the Everglades National Park (ENP) marine fishing boat surveys). The aerial survey technique provides less comprehensive data and is more costly than fishing activity surveys via the permit system. Visual surveys from Fort Jefferson could be conducted but these would likely be effective only for the Adaptive Use Zone, the one nautical mile radius around the fort.

2. *Conduct aerial surveys of fishing activities in the Tortugas region.*

Previous and Existing Studies. We have no knowledge of previous aerial surveys of fishing activities in the Tortugas region.

Proposed Studies. Aerial survey design should be similar to that of aerial surveys conducted elsewhere (e.g., similar to the ENP marine fishing boat surveys from 2006).

RNA Performance Topic 4: Evaluate the effects of RNA implementation on marine benthic biological communities.

MOU SOW A.2.d: "Continue sampling benthic monitoring stations to evaluate the impacts of RNA mooring buoy visitor activities and fishing and the effect of changing fishing and boating activities within the RNA on benthic community structure. Measures of benthic community change and condition will be used to assess the impacts of diving and snorkeling activities in the RNA and can incorporate an evaluation of cultural resources."

RNA implementation could have a variety of effects on coral reef benthic and seagrass communities. Because the RNA is a no anchor zone, diving is now concentrated at designated dive sites with mooring buoys. Frequent diving activity at these sites could cause damage to corals, as has been documented elsewhere. Anchor damage to corals could increase at prime fishing and diving sites adjacent to the RNA (e.g., Bird Key Reef) as a result of increased fishing and diving activity at these sites.

The recovery of reef fishes in the RNA after eliminating fishing could have cascading effects on coral reef benthic communities and ecological processes. Prohibiting anchoring in the RNA should greatly reduce or eliminate anchor damage to coral reef, other hard bottom, and seagrass communities.

Performance Measures

The resource stewardship objective is to have no long-term effects on corals from diving or boat anchoring activities. The primary performance measures are damage and loss of branching, foliose, and plating stony coral species, especially ESA-listed Acropora species. Stony coral species with branching morphology (e.g., Acropora and Porites species) are most susceptible to damage by diving activities (Hawkins and Roberts 1992, Harriott et al. 1997, Rouphael and Inglis 2002). Acropora species are now rare in DRTO and thus are at highest risk. Foliose and plating stony corals (e.g., Agaricia species) are more susceptible than branching soft corals and head type stony corals (e.g., Montastrea species). Damage can be measured as the percentage and/or number/area of coral branches and/or colonies broken and abraded. Loss can be assessed by measuring changes in live coral percent cover.

Changes in the following key ecological attributes: Comprehensive coral reef benthic community structure; abundances of key species and functional groups, including stony and soft corals, sea urchins, especially Diadema, algal functional groups, and sponges. Herbivore grazing intensity; direct measures of fish grazing (e.g., bites/area/time); indirect measures of sea urchin grazing, especially Diadema (abundance/density). Coral recruitment and mass spawning. Coral disease and bleaching incidence; needed to differentiate effects of no-fishing from these important coral stressors. Benthic primary productivity. Duration and timing of coral spawning. Target and non-target fish species and assemblage performance measures from Performance Topic 1 (abundances and individual size of key fish species and functional groups).

Essential Activities

1. ***Assess the effects on corals of SCUBA and snorkeling use at RNA designated (mooring buoy) dive sites. At least four dive sites and four reference sites should be sampled once per year.***

Summary of 2012 5-Year Report. Because boat anchoring is not permitted in the RNA, SCUBA diving and snorkeling activities in the RNA are concentrated at designated

Mooring buoy, Dry Tortugas National Park. Photo by Naomi Blinck, Pacific Historic Parks.

dive sites with mooring buoys and the designated Loggerhead Key swim areas. The goal of this project is to determine if diver-related impacts will occur at RNA dives sites designated with mooring buoys. In 2009, permanent monitoring stations were established at four RNA dive sites and three equivalent reference sites with no mooring buoys and which have little or no diving activity. Surveys conducted in 2009 and 2010 established excellent baseline information prior to the installation of the mooring buoys. Installation of the mooring buoys was completed in 2011. Post-installation surveys will be conducted to evaluate the extent of diver impacts.

Many submerged cultural resources exist inside and outside the RNA. A survey in 2009 was conducted at 40 of 50 submerged cultural resources and condition assessments were performed at each site. Baseline condition data have been collected and will be used for monitoring change in the condition of cultural resources within the RNA and other areas of DRTO. Because submerged cultural resources serve as substrate for benthic natural resources and associated fish and invertebrate communities, opportunities exist for collaborative studies between NPS Natural and Cultural Resource divisions to determine benefits of RNA implementation.

2. ***Investigate trophic cascade effects on RNA coral reef community structure and ecological processes resulting from the removal of fishing activities.***

Summary of 2012 5-Year Report. A study was initiated to examine the potential impacts of reduced abundance of exploited reef fish species on herbivores, macroalgae, and corals. Surveys were performed inside and outside of the RNA to characterize relationships between different trophic level organisms inhabiting the coral reef ecosystem. No significant differences in the abundance of herbivorous fish and urchins or in the abundance of exploited fish species in the shallow, low-relief hard bottom communities were observed inside vs. outside the RNA. Evaluating and understanding trophic changes that may occur related to the RNA will require a long-term research and monitoring effort. Future surveys will be necessary to determine if changes have occurred in the proportions of major coral reef ecosystem components and to help determine if the

Schoolmaster and grunts swim around elkhorn coral, Dry Tortugas National Park. Photo by Evan D'Alessandro, Univ. of Miami/ RSMAS.

implementation of the RNA results in balanced benthic communities at DRTO.

DRTO has not experienced the intensity and breadth of fishing pressure (e.g., fish trap use and spear fishing) as have other places in the tropical western Atlantic. Thus, we would not expect as rapid or perhaps extensive trophic cascade response to RNA implementation as in these other locales. It is unlikely that trophic cascade effects in the RNA could be detected in the first 5 years after establishment. However, monitoring and research are needed in the next 3 years to establish baseline conditions to ascertain any future trophic cascade effects on DRTO coral reefs. DRTO could serve as an important information source for assessing the effects of no-take marine reserves on reef food webs and community structure over a broader fishing pressure gradient and geographic scale.

Need for Continuation. The agencies agree that the trophic cascade response study must be repeated during the next 5-year time period (2015-2019).

RNA Performance Topic 5: Assess reproductive potential of exploited species by evaluating egg production and larval dispersal.

MOU SOW A.2.e: "Continue efforts to track and model larval movement patterns within the Tortugas and Florida Keys region from important reef fish and other aquatic species to evaluate larval recruitment of several finfish species in the south Florida region, as needed."

A hypothesized spillover effect of no-fishing marine reserves refers to a broad-scale, regional replenishment of target fishery species via larval transport from the reserve. There is scientific evidence that reserves enhance populations regionally through greater larval production and export due to increased fecundity of organisms within reserves (Lubchenco et al. 2003). Drifter studies simulating larval transport have found that reef fish larvae spawned in the Tortugas could be viably dispersed as far as Cape Canaveral on the Atlantic coast and Tampa Bay on the Gulf coast (Burke et al. 2003). The activities proposed below will test this broad-scale spillover-effect hypothesis with the RNA.

Performance Measures

Fecundity and larval production of reef sportfish and movement of reef sportfish from the RNA to spawning aggregation sites. RNA export of targeted reef fishery species, primarily larval groupers and snappers, throughout the Tortugas and Florida Keys.

Essential Activities

1. ***Collect and develop population data on reef sportfish fecundity. Use a variety of methods inside and outside the RNA to develop a robust fecundity dataset for one or two species, representative of the snapper-grouper complex.***

Summary of 2012 5-Year Report. A south Florida marine ecosystems model was developed to simulate the larval drift of marine organisms. This model was used to assess the reproductive potential of exploited reef fish species by evaluating the expected physical transport and fate of fish eggs and larvae spawned in the Dry Tortugas region to the adjacent waters of the south Florida coral reef ecosystem. Simulation results indicate that spawning in the Dry Tortugas region is likely supplying newborn recruits to reef fish populations throughout southern Florida, including the Dry Tortugas and Florida Keys reef tract, coastal bays along the West Florida Shelf, and along the east coast of Florida north of Miami.

Need for Continuation. We have no knowledge of studies currently collecting population data on reef fishery species fecundity in the Tortugas region. However, work completed in Performance Topic 1 showed that the abundances and size of reef fish have increased over time. Using a combination of the data collected from other performances measures and from our knowledge of the life history stages of selected species, the agencies agree that

Mutton snapper spawning. Photo by Christopher Parson, Photography by Chris Parsons.

we should be able to estimate fecundity. The modeling suggests that fish larvae are moving away from the Tortugas region, however, it does not detect whether or not there is a change in the regional fecundity. Using the existing knowledge of life history of the exploited species (such as snappers and groupers) and the observed changes in abundance and size in the species, a model could be created to detect the effectiveness of the regional management zones, or to model whether or not there is an increase or decrease in fecundity (e.g., the number of fertilized eggs over time).

RNA Performance Topic 6: Incorporate social sciences into the research and monitoring program.

MOU SOW A.2.f: "Continue to incorporate social sciences into the research and monitoring program for evaluating the RNA performance measures. The social science component shall include collection of compliance rates and enforcement activity and surveys of visitor experiences."

Performance Measures

Fishing activity, SCUBA and snorkeling activity (total number of SCUBA divers and snorkelers and duration in water for each designated dive site and reference site), number of boats anchoring by location, visitor satisfaction, and law enforcement activity and regulatory compliance rates (number and percentage of violations by user permit type). Creel survey performance measures and required fishing activity data are discussed under Performance Topic 3.

Essential Activities

1. ***Collect and analyze fishing, diving, and boat-use data needed to assess the effects of RNA implementation on visitor use.***

Summary of 2012 5-Year Report. A visitor use and experience survey was designed and implemented in the summer of 2013. This project surveyed park visitors who participated in recreational boating, fishing, SCUBA diving, snorkeling, and other activities within DRTO, with an emphasis on understanding the use of the RNA. When the analysis is complete, this survey will help managers understand the behaviors and actions of park visitors that have significant impacts on resources and the success of the RNA. The survey results will provide basic demographic information on the respondents, the frequency and extent to which they engage in different types of recreational activities, and their perceptions of the RNA.

2. ***Implement an appraisal system to characterize visitor use experience and views regarding RNA implementation.***

Previous and Existing Studies. The primary information on public views of RNA implementation is derived from the public comments on the DRTO General Management Plan (GMP) alternatives through the National Environmental Policy Act (NEPA) process (DRTO 2002). The most recent study on park visitor use was in 2002 (Le and Littlejohn 2003). This study asked visitors about the importance of protecting natural resources; however, there were no specific questions about RNA implementation.

Proposed Studies. Understanding visitor use experiences and perceptions regarding the RNA and similar new stewardship regulations, such as the Special Protection Zones, is critical to effective park adaptive management. Since the behaviors and actions of recreational users can have significant impacts on resources, a study designed to identify attitudinal and cognitive factors contributing to these behaviors could assist park managers in developing education, outreach, and interpretation programs, promoting compliance with regulations, and helping visitors to protect the resources they enjoy. NPS and FWC seek to understand attitudes and perceptions toward park resources and new regulations and how these factors affect visitor use patterns and visitor satisfaction over time.

The following activities are recommended; however this list may need to be prioritized and scaled back to fit available resources.

- Measure visitor and broader public knowledge and perceptions about the RNA and other marine ecosystem stewardship issues, including marine ecological resource conditions, coral decline, over-fishing, anchoring, and regulations designed to protect and restore coral reefs, seagrass, and fishery resources. How do these views and experiences change over time?
- Evaluate visitor RNA use experience and satisfaction. How has RNA implementation affected visitor use throughout the park? How do these views and experiences change over time?
- Obtain a general socio-demographic profile of boaters, anglers, divers, and snorkelers the vist the park on private vessels.
- Measure visitor contact with environmental education or interpretation programs via brochures, site bulletins, public service announcements, marine radio, visitor contact, and visitor centers.
- Coordinate socio-economic studies and human dimension assessments with NOAA Biogeographic Assessment already completed or underway.

- Integrate information obtained from social science surveys, visitor use patterns, and recreational fishing activity surveys (creel and charter boat).

3. ***Monitor RNA law enforcement activity and regulation compliance rates by visitors, commercial operators, and scientific researchers on an annual basis.***

Previous and Existing Studies. We have no knowledge of studies that have monitored law enforcement activity and regulation compliance rates by visitors and businesses.

Need for Continuation. The agencies recommend that the social science study be repeated during the next 5-year period (2012-2019), and a comparison of the two data sets be made to evaluate visitor perception and experience of the RNA. Law enforcement activity related to fisheries violations and obedience of the RNA regulations could be tracked over time to measure compliance.

SCHEDULE OF DELIVERABLES

The MOU established between FWC and the NPS stipulates that a jointly prepared report on the evaluation of the performance of the RNA will be provided to FWC Commissioners, NPS managers, and the public at 5-year intervals.

The next report will be completed in 2020 and will provide a detailed description of the results of all the ongoing studies and discuss the results in relation to the stated goals of the RNA 13 years following implementation.

LITERATURE CITED

Ault, J.S., S. G. Smith, J. A. Bohnsack, J. Luo, N. Zurcher, D.B. McClellan, T.A. Ziegler, D.E. Hallac, M. Patterson, M.W. Feeley, B.I. Ruttenberg, J. Hunt, D. Kimball and B. Causey. 2013. Assessing coral reef fish changes and marine reserve dynamics in the Dry Tortugas, Florida USA. Fisheries Research. 144: 28-37.

Burke, J. S., C. A. Currin, D. W. Field, M. S. Fonseca, J. A. Hare, W. J. Kenworthy and A. V. Uhrin. 2003. Biogeographic analysis of the Tortugas Ecological Reserve: examining the refuge effect following reserve establishment. Marine Conservation Series MSD-04-1. U. S. Department of Commerce, National Oceanic and Atmospheric Administration, Marine Sanctuaries Division, Silver Spring, MD. 28pp.

Cure, K., E. Cassandra, T. Benkwitt, L. Kindinger, E. Pickering, T. Pusack, J. McIlwain and M. Hixon. 2012. Comparative behavior of red lionfish (*Pterois volitans*) on native Pacific versus invaded Atlantic coral reefs. Mar Ecol Prog Ser 467: 181–192.

DRTO. 2002. Dry Tortugas National Park Final General Management Plan and Environmental Impact Statement. National Park Service, U.S. Department of the Interior.

Green S.J., J.L. Akins, A. Maljkovic´ and I.M. Cote´. 2012. Invasive Lionfish Drive Atlantic Coral Reef Fish Declines. PLoS ONE 7(3): e32596.

Halpern, B. S. 2003. The Impact of Marine Reserves: Do Reserves Work and Does Reserve Size Matter? Ecological Applications 13(1) Supplement: S117-S137.

Harriott, V. J., D. Davis and S. A. Banks. 1997. Recreational diving and its impact in marine protected areas in eastern Australia. Ambio 26: 173–179.

Hawkins, J. P. and C. M. Roberts. 1992. Effects of recreational SCUBA diving on fore-reef slope communities of coral reefs. Biological Conservation 62: 171–178.

Le, Y. and M. Littlejohn. 2003. Dry Tortugas National Park Visitor Study: Spring 2002. National Park Service, Visitor Services Project, Report 132. 113pp.

Lubchenco, J., S. R. Palumbi, S.D. Gaines and S. Andelman. 2003. Plugging a hole in the ocean: The emerging science of marine reserves. Ecological Applications 13(1) Supplement: S3-S7.

National Academy of Sciences. 2001. Marine Protected Areas: Tools for Sustaining Ocean Ecosystems. National Academy Press, Washington, D.C.

Roberts, C. M., J. A. Bohnsack, F. Gell, J. P. Hawkins and R. Goodridge. 2001. Effects of marine reserves on adjacent fisheries. Science 294: 1920-1923.

Rouphael, A. B. and G. J. Inglis. 2002. Increased Spatial and Temporal Variability in Coral Damage Caused by Recreational Scuba Diving. Ecological Applications 12(2): 427-440.

Ruiz-Carus R., R.E. Matheson Jr., D.E. Roberts Jr. and P.E. Whitfield. 2006. The western Pacific red lionfish, *Pterois volitans* (Scorpaenidae), in Florida: Evidence for reproduction and parasitism in the first exotic marine fish established in state waters. Biol Conserv 128, 384-390.

Ziegler, T.A. and J. Hunt. 2012. Implementing the Dry Tortugas National Park Research Natural Area Science Plan: The 5-Year Report. South Florida Natural Resources Center, Everglades and Dry Tortugas National Parks, Homestead, FL, and the Florida Fish and Wildlife Commission, Tallahassee, FL 63pp.

APPENDIX 1: MEMORANDUM OF UNDERSTANDING

Memorandum of Understanding

between

the State of Florida, Fish and Wildlife Conservation Commission

and

the National Park Service, Dry Tortugas National Park

NPS Agreement Number G5299-13-0002

ARTICLE I – BACKGROUND AND OBJECTIVES

WHEREAS, The State of Florida and the National Park Service (the Service) have entered into a Management Agreement with respect to the submerged lands within Dry Tortugas National Park (DTNP); and

WHEREAS, Consistent with the provisions of the Management Agreement, the Service has promulgated special regulations pertaining to DTNP and which have been concurred in by the Florida Fish and Wildlife Conservation Commission (the FWC) and the Board of Trustees of the Internal Improvement Trust Fund for the State of Florida; and

WHEREAS, In furtherance of the objectives of the Management Agreement, this Memorandum of Understanding is intended to facilitate the management, protection, and scientific study of fish and aquatic resources of DTNP between the FWC and the Service based on the jointly developed science plan, "Assessing the Conservation Efficacy of the Dry Tortugas National Park Research Natural Area" (hereinafter referred to as the Science Plan) developed during 2007 whose objective is to evaluate the effect and efficacy of the 46-square-mile Research Natural Area (hereinafter referred to as the RNA) encompassing a portion of DTNP; and

WHEREAS, The FWC is an agency created by Article IV, Section 9, of the Florida Constitution and is vested with the state's executive and regulatory authority with respect to freshwater aquatic life, wild animal life, and marine life. This authority, directly derived from the Constitution, provides the FWC with authority to regulate and manage wild animal life, freshwater aquatic life, and marine life within the State of Florida, including the areas encompassed by DTNP; and

WHEREAS, The Management Agreement specifically provides that nothing in its terms shall be construed to affect, expand, or diminish the authority of the FWC in the exercising of its jurisdiction under the Florida Constitution with respect to marine fish; and

WHEREAS, Congress in the Organic Act of 1916, 16 U.S.C. Section 1, created the Service to promote and regulate the National Park System for "the purpose of conserving the scenery and the natural and historic objects and wildlife therein and to provide for the enjoyment of the same in such manner and by such means as would leave them unimpaired for the enjoyment of future generations"; and

WHEREAS, In 1992, Congress enacted Public Law 102-525 (16 U.S.C. Section 410xx et seq.) abolishing Fort Jefferson National Monument and establishing DTNP in its place. Congress established DTNP "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"; and

WHEREAS, the regulations provide for the RNA which encompasses a 46-square-mile area protecting a representative range of terrestrial and marine resources in DTNP. The RNA is closed to fishing and is otherwise designed to protect near-pristine habitats and ecological processes that will afford high quality research opportunities; and

WHEREAS, both FWC and the Service (the Parties or, as appropriate, a Party) have responsibilities under Federal and State laws and regulations that affect fish and other aquatic resources within the RNA; and

WHEREAS, the Service is to provide a report to the State at least every five years concerning the status, activities, and condition of the sovereignty submerged lands that are subject to the Management Agreement; and

WHEREAS, both parties have carried out a collaborative research and monitoring program and have successfully provided a jointly-developed comprehensive report to each agency as required in a previous Memorandum of Understanding; and

WHEREAS, both parties wish this Memorandum of Understanding to reflect common goals and intended cooperation and coordination to achieve these goals; and

WHEREAS, both parties recognize there may be times when the missions of the FWC and the Service may differ, and that while every effort will be made to cooperate fully and jointly manage fish stocks within the RNA, there may be occasions when the two agencies choose to disagree. Such occasions will not be construed as impasses and every attempt will be made to avoid communication barriers and not jeopardize future working relationships; and

WHEREAS, nothing in this Memorandum of Understanding shall be construed as a contract or obligating any Party hereto to the expenditure of funds or the future payment of money; and

WHEREAS, nothing contained herein shall be construed as limiting in any way the responsibility and authority, as defined by law, of the Director, National Park Service, or the Executive Director and Commissioners, Florida Fish and Wildlife Conservation Commission, in connection with the administration and protection of lands and resources under their respective administrations.

ARTICLE II – AUTHORITY

As a unit of the National Park System, DTNP is authorized *under 16 U.S.C. § 1 and 16 U.S.C. § 1 (a) – 2 (l)* to enter into agreements with governmental bodies and other appropriate organizations to further the objectives and purposes of DTNP and to promote research and protection of park resources.

The FWC is authorized under Chapter 370.103 Florida Statute, to enter into cooperative agreements with the Federal Government or agencies thereof for the purpose of preserving saltwater fisheries within and without state waters and for the purpose of protecting against overfishing, waste, depletion, or any abuse whatsoever.

NOW, THEREFORE, both parties agree as follows:

ARTICLE III – STATEMENT OF WORK

A. The parties generally agree as follows:

1. To jointly continue the program for natural resources research, inventory, and monitoring within the RNA with the goal of continuing to evaluate the performance topics established in the Science Plan. The goals of the RNA are to protect near pristine shallow water marine habitat, ensure species diversity, enhance the productivity and sustainability of exploited fish populations throughout the region, and provide a unique unexploited area that will be used to help assess the effects of fishing on exploited areas. The Science Plan performance topics are: 1) quantifying changes in abundance and size-structure of exploited species within the RNA relative to adjacent areas; 2) monitoring the immigration and emigration of targeted species in the RNA; 3) monitoring changes in species composition and catch rates of exploited species throughout the surrounding region; 4) monitoring species composition and abundance of the benthic community; 5) assessing reproductive potential of exploited species by evaluating egg production and

larval dispersal; and 6) incorporating social sciences into the research and monitoring program. This program will include: 1) draft proposals to develop new research or expand upon ongoing research as deemed necessary; 2) identification of funding sources for expanded and additional research deemed necessary; and 3) a schedule of deliverables.

2. Subject to adequate funding, proposed research and monitoring activities will include, but not necessarily be limited to:

    a. Continue ongoing research and monitoring that assesses important reef fish populations within the Dry Tortugas region and the RNA. The research and monitoring program could incorporate multi-gear sampling to monitor changes in abundance and size of targeted species inside and outside RNA boundaries and in the seagrass beds of the region. Increases in the abundance and size-structure of these species in the absence of fishing mortality serve as an indicator that the RNA is protecting spawning biomass, age-structure, and genetic diversity that potentially enhance the productivity and sustainability of these species in the region.

    b. Continue tagging studies (*e.g.,* using acoustic tags as well as conventional dart-tags) to examine broad- and fine-scale movement patterns of targeted species in and out of the RNA, as needed. Such studies will help evaluate if adjacent fishing areas are enhanced through emigration of target species from the RNA.

    c. Continue to develop a fisheries-dependent monitoring program to evaluate potential changes in catch rates, species composition, and size composition of commercial and recreational fisheries in areas surrounding the RNA. This program could use a variety of data collection methods including on-board observers, logbooks, aerial surveys, and recreational fisheries interviews.

    d. Continue sampling benthic monitoring stations to evaluate the impacts of RNA mooring buoy visitor activities and the effect of changing fishing and boating activities within RNA on benthic community structure. Measures of benthic community change and condition will be used to assess the impacts of diving and snorkeling activities in the RNA and can incorporate an evaluation of cultural resources.

    e. Continue efforts to track and model larval movement patterns within the Tortugas and Florida Keys region from important reef fish and other aquatic species to evaluate larval recruitment of several finfish species in the south Florida region, as needed.

f. Continue to incorporate the social sciences into the research and monitoring program for evaluating the RNA performance measures. The social science component shall include collection of compliance rates and enforcement activity, surveys of visitor experiences.

3. To seek concurrence in meeting the management goals of both agencies and strive to identify means, measures, and other interagency actions for the mutual benefit of the natural resources within the RNA, including the above referenced activities of research, inventory and monitoring within the RNA, and any future agreements for shared law enforcement or other responsibilities.

4. To manage fisheries within the RNA in accordance with applicable laws, and in a manner that promotes healthy, self-sustaining fish populations and recognizes the biological characteristics and reproductive potential of individual species.

5. To share scientific information, field data, and observations pertaining to the aquatic resources of DTNP and activities affecting those resources, consistent with the requirements of applicable laws for non-disclosure of certain specific information, such as law enforcement matters and confidential landings statistics. The parties will provide each other with copies of reports that include results of work conducted within the RNA and surrounding areas.

6. The science coordinators for each agency (FWC Florida Keys Program Administrator and DTNP Fisheries Biologist) will continue to work collaboratively to coordinate research activities and exchange information on fish and aquatic resources within the RNA, and to develop a five-year review schedule for examining relevant research information and assessing the effectiveness of the RNA in terms of the agreed upon performance measures. This examination and assessment shall include a jointly prepared comprehensive (5-year) report. This report shall provide conclusions and recommendations addressing whether the RNA is achieving stated goals, through the application of the agreed upon performance measures.

7. Nothing in this Memorandum of Understanding shall be construed as obligating either Party to expend funds in any one fiscal year in excess of the monies appropriated by Congress and allocated by DTNP for the performance of this agreement.

8. Specifically, with respect to continuing a research and monitoring program and performance measures to assess the effectiveness of the RNA in achieving its stated goals, the two agencies agree as follows:

B. The FWC agrees to:

1. Assign staff, as deemed appropriate, to collaborate with the DTNP and its cooperators in continuing the ongoing research and monitoring program during this second five-year implementation period, and to coordinate this work with similar efforts by the FKNMS.

2. Seek funding to support Service-sponsored RNA monitoring and research which is in furtherance of the purposes of this Memorandum of Understanding. .

3. Provide a five-year report to FWC Commissioners and Service managers that summarize RNA-related research and evaluate the performance of the RNA regarding its stated goals, and otherwise provide briefings to Commissioners and Service managers as appropriate.

4. Provide access to and support for requests by the Service to existing data and information as may be applicable to DTNP fisheries and aquatic resources. .

C. Dry Tortugas National Park agrees to:

1. Assign staff, as deemed appropriate, to collaborate with the FWC and its cooperators in continuing the ongoing research and monitoring program during this second five-year implementation period, and to coordinate this work with similar efforts by the FKNMS.

2. At least every five years, submit to the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida (Board of Trustees) a report on the status, activities, and conditions of the sovereignty submerged lands within the park, in accordance with the terms of the established management agreement between the National Park Service and the Board of Trustees approved on August 9, 2005. Further, the National Park Service acknowledges that on November 14, 2006 the Board of Trustees concurred with the implementing regulations for the Dry Tortugas National Park for a period of five years at which time the National Park Service will bring the regulations back for review and approval under the terms of the Management Agreement. .

3. Seek continuing project funding to apply to appropriate financial assistance agreements to support ongoing Service-sponsored RNA monitoring and research which is in furtherance of the purposes of this Memorandum of Understanding. .

4. Provide a five-year report to FWC Commissioners and Service managers that summarizes RNA-related research and evaluates the performance of the RNA regarding its stated goals, and otherwise provide briefings to Commissioners and Service managers as appropriate. .

5. Provide access to and support for requests by the FWC to existing data and information as may be applicable to DTNP fisheries and aquatic resources. .

6. Secure contractors and cooperators with appropriate subject matter expertise in order to develop research and monitoring projects designed to evaluate the performance of the RNA.

7. Participate as appropriate in briefings, presentations, or other forums for which the FWC may request assistance in conducting, or otherwise attending, concerning fisheries/wildlife management within the RNA.

8. Facilitate and encourage the joint publication of press releases and the interchange between the Parties of all pertinent agency policies and objectives, statutes, rules and regulations, and other information required for the wise use and perpetuation of the fisheries resources of DTNP. .

9. Facilitate research permitting to state entities for activities needed to accomplish goals identified in the research and monitoring plan. .

10. Provide logistical support to the maximum extent practicable in the form of living space at DTNP and vessel support for visiting researchers conducting research consistent with this Memorandum of Understanding. .

ARTICLE IV – TERM OF AGREEMENT

This Memorandum of Understanding is effective as of the date the last Party signs this agreement, and it shall remain in effect for a term of five (5) years. It may be extended for such additional terms as the parties determine to be appropriate.

This Memorandum of Understanding in no way restricts the FWC or the Park from participating in similar activities with other public or private agencies, organizations, and individuals.

This Memorandum of Understanding is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the Park and the FWC will be handled under separate written agreements in accordance with applicable laws, regulations, and procedures.

ARTICLE V – KEY OFFICIALS

A. For Dry Tortugas National Park:

Superintendent
Dry Tortugas National Park
40001 SR 9336
Homestead, FL 33034

B. For the Florida Fish and Wildlife Conservation Commission:

Executive Director
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
Tallahassee, FL 32399

ARTICLE VI – PRIOR APPROVAL

Not applicable

ARTICLE VII – REPORTS AND/OR OTHER DELIVERABLES

Upon request and to the full extent permitted by applicable law, the parties shall share with each other final reports of incidents involving both parties.

ARTICLE VII – PROPERTY UTILIZATION

Unless otherwise agreed to in writing by the parties, any property furnished by one party to the other shall remain the property of the furnishing party. Any property furnished by the Park to the FWC during the performance of this agreement shall be used and disposed of as set forth in the federal property management regulations.

ARTICLE VIII – MODIFICATION AND TERMINATION

Either Party may terminate this Memorandum of Understanding by providing 60 days advance written notice to the other Party. If one Party provides the other with written notice of its intentions to terminate this Memorandum of Understanding, the Parties will first meet and attempt to address and resolve their differences.

This Memorandum of Understanding may be modified at any time upon written agreement of the FWC and the Service.

ARTICLE IX – STANDARD CLAUSES

A. **Civil Rights**

During the performance of this Memorandum of Understanding, the participants agree to abide by the terms of the U.S. Department of the Interior (hereinafter referred to as the Department) – Civil Rights Assurance Certification, non-discrimination and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, sexual orientation, national origin disabilities, religion, age or sex.

B. **Public Information Release**

The FWC will obtain prior approval from the Superintendent for any public information releases, which refers to the Department of the Interior, any bureau, park unit, or employee (by name or title), or to this agreement. The specific text, layout, photographs, etc. of the proposed release must be submitted with the request for approval.

C. **Liability Provision**

To the extent allowed by applicable state and federal law, each Party will be responsible for the actions of its employees, representatives and agents in carrying out this Memorandum of Understanding.

THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK

ARTICLE X – SIGNATURES

IN WITNESS HEREOF, the parties hereto have executed this agreement on the dates set forth below.

FOR DRY TORTUGAS NATIONAL PARK:

Signature: Dan B. Kimball

Dan B. Kimball
Superintendent
Dry Tortugas National Park

Date: 3/4/2013.

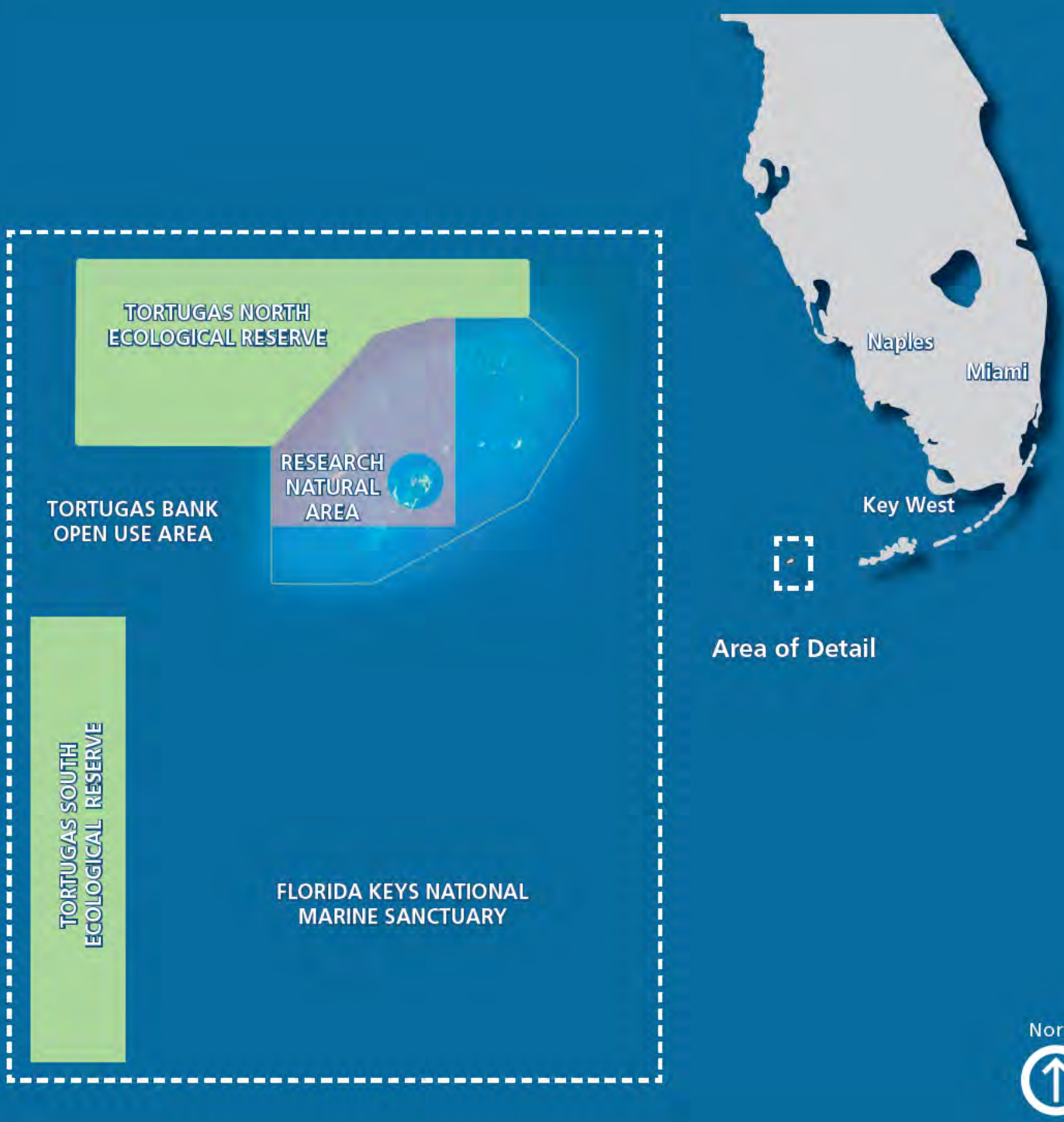
FOR THE FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION:

Signature: Nick Wiley

Nick Wiley
Executive Director
Florida Fish and Wildlife Conservation Commission

Date: 4.4.13

APPROVED AS TO FORM
AND LEGAL SUFFICIENCY
Commission Attorney


TORTUGAS NORTH ECOLOGICAL RESERVE
RESEARCH NATURAL AREA
TORTUGAS BANK OPEN USE AREA
TORTUGAS SOUTH ECOLOGICAL RESERVE
FLORIDA KEYS NATIONAL MARINE SANCTUARY
Naples
Miami
Key West
Area of Detail
North

South Florida Natural Resources Center
Everglades and Dry Tortugas National Parks

950 N. Krome Ave, 3rd Floor
Homestead, FL 33030-4443

www.nps.gov/ever/naturescience/sfnrc.htm
www.MyFWC.com