# Translating Scientific Data to Knowledge: Educating Stakeholders on Trap Impacts

# Traduciendo Datos Científicos al Saber: Educando partes Interesadas sobre los Impactos de Trampas

# Traduire les Données Scientifiques en Connaissances: L'éducation des Parties Concernées sur les Effets du Piège

GABRIELLE F. RENCHEN* and THOMAS R. MATTHEWS
*Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 2796 Overseas Hwy, Ste. 119, Marathon, Florida 33050 USA. *gabby.renchen@myfwc.com.*

## ABSTRACT

Trap fishing is part of the cultural history of the Florida Keys and supports a lucrative commercial fishery for the Caribbean spiny lobster. However, the use of traps in the fishery inadvertently increased lobster mortality, marine debris, entanglement of cetaceans and sea turtles, and loss of coral. The Florida Fish and Wildlife Conservation Commission (FWC) has attempted to address these environmental impacts through three management efforts: the Lobster Trap Certificate program, gear modifications, and derelict trap removal. Throughout the management processes, state researchers have conducted extensive cooperative research with commercial fishermen to understand the nature of trap interactions with the environment. As our next step, we will conduct an educational outreach program to translate our data to knowledge, making information on trap impacts more accessible to the stakeholder community. The stakeholder community is comprised of a broad audience including commercial and recreational fishermen, dive operators, and the general public. We will conduct a series of workshops for commercial fishermen, seminars for the general public, and utilize social media to reach a broader cross-section of the stakeholder community. It is anticipated that the primary challenges to the education campaign will be effectively engaging diverse stakeholder groups and overcoming a culture that is resistant to change. The program goal is to expand knowledge of trap-induced environmental damage and encourage managers and stakeholders to develop solutions that will reduce trap impacts, thus promoting sustainable fishing practices and resource protection.

KEY WORDS: Lobster traps, environmental impacts, outreach, education

## INTRODUCTION

Trap fishing is part of the cultural history of the Florida Keys and supports a lucrative commercial fishery for the Caribbean spiny lobster. The first commercial harvest of spiny lobster in the Florida Keys began during the early 1800s (Labisky et al. 1980), however the use of wooden lobster traps didn't begin until the 1940s (Little 1993). The fishery was considered viable by the 1940s, and proceeded to grow in size and value in the following decades (Labisky et al. 1980). Between 1974 and 1978, the number of traps used in the fishery more than doubled to over 500,000. This increase was due to the closure of the Bahamian fishing grounds to US fishermen, shifting fishing effort to Florida and subsequently increasing the number of traps to 939,000 by 1991 (Hunt 1994). Rapid increases in the number of traps and declines in the catch per trap raised concerns about the economic sustainability of the fishery (Milon et al. 1999) and increased potential for environmental impacts, thus research was needed to evaluate these concerns.

Lobster fishery research in the 1970s and 1980s directed at measuring the catch rate in traps identified mortality of lobsters in traps as an issue. Two sources of lobster mortality associated with traps were identified. The practice of holding undersized lobsters in boxes on fishing boats for subsequent placement in traps as live bait caused many lobster to die from exposure (Lyons and Kennedy 1981, Hunt and Lyons 1986, Hunt et al. 1986, Matthews 2001). Secondly, experiments indicated some lobsters died associated with confinement in traps (Hunt and Lyons 1986, Lyons and Hunt 1991, Matthews 2001). This research was published in several scientific journals and research reports which were readily available to fishery managers and accepted by other scientists. However, perception of the research and enmity towards the subsequent proposed fishing regulations by the fishing industry heralded a period of animosity and distrust of research.

In the 1990s, there was an increased interest in the sustainability of habitat in marine ecosystems. The detrimental effects of mobile fishing gear, such as trawls, dredges, and drift nets on habitat were well known and dramatic (Dayton et al. 1995, Hamilton 2000), but the impact of traps fished on habitat, traps moving during storms, or lost traps was largely unknown. As lobster trap fishing is virtually ubiquitous throughout the Florida Keys, it affects ecologically important habitats such as seagrass, hard-bottom and coral reefs. The presence of lost traps and trap debris has become a typical feature throughout the Keys underwater seascape (Chiappone et al. 2002, Chiappone et al. 2004, Chiappone et al. 2005, Uhrin et al. in press). Once again, research was needed to identify the causes, impact, and potential amelioration of trap and trap debris issues.

There was a great deal of trepidation by fishermen, researchers and fishery managers that the methods needed to protect habitat would be another source of conflict. An approach was needed to avoid the regulatory process culminating in an adversarial encounter. While fishermen have continually been involved in the public input process during the development

of regulations, they were generally not participants in the science used to support the development of regulations. Fishermen needed to participate in not just the rule making process, but in the science that identified underlying issues. Fishermen needed to have the same opportunity as the scientific and management community to recognize and acknowledge problems existed before they could be expected to accept regulatory change. A cooperative research effort was envisioned to involve fishermen in the scientific process that identified the effects traps have on habitat. Research projects were developed in partnership with with a Board of commercial fishermen and fishermen were hired to build and deploy traps used in experiments. Photographs and data were presented to the board and project methods were revised where needed to address fishermen's concerns. A series of projects provided a comprehensive assessment of the types, amount, distribution, and effects of traps and trap debris in the Florida Keys.

The prevalence and impact of trap fishing and lost fishing gear has been well documented by the scientific community in the Florida Keys, but these findings have not garnered public or fishing industry attention. Traditional scientific publications and government reports are for practical purposes, inaccessible to the public. Public awareness and concern is often the momentum that drives public policy (Bjorkland and Pringle 2001) thus there is a compelling need to effectively communicate the available scientific data related to the environmental impact of traps to the public. We will provide a summary of the environmental impacts documented by the cooperative research efforts related to the spiny lobster trap fishery and discuss plans for an education and outreach program to translate data to knowledge, making information on trap impacts more accessible to the stakeholder community.

## ENVIRONMENTAL IMPACTS

Identifying where lobster trap fishing occurs was critical for determining the fishery's impact to the benthic habitats of the Florida Keys. Distribution surveys of actively fished traps revealed that ~15% of observed traps were deployed in sessile fauna habitats that included coral, gorgonians and sponges. The majority of traps were deployed in bare substrate (~37%) or seagrass habitats (~35%), while 13% were deployed in algae beds (FWC 2006, Matthews and Uhrin 2009). Although the majority of trap fishing did not occur in sessile fauna habitats, because of the high number of traps and presence of protected coral species, the impact to this habitat was a concern. Observations of commercial fishermen's actively fished traps indicated that each time a trap was deployed and retrieved on coral reef, an average of 3.3 injuries to coral, gorgonians or sponges affecting a total area of approximately 198 $cm^2$ were observed (Lewis et al. 2009). However, the majority of trap effects on habitat occurred when traps moved due to several days of high wind. Traps fished on coral reefs that moved during winter storms affected an area of approximately 2.9 $m^2$ causing a 20% loss of living coral, gorgonians and sponges (Lewis et al. 2009). Trap movement from tropical cyclones and winter storms has been identified as the primary cause of coral loss from traps in the Florida Keys.

Trap loss has been identified as a chronic issue in the Florida Keys. Trap loss is both an economic issue for fishermen and a source of damage to the environment. Harvest losses due to lobster mortality in ghost fishing traps and the cost of the gear itself are substantial sources of lost income for the fishermen. Lost traps and trap rope were one of the most abundant types of submerged marine debris documented during debris surveys in the Florida Keys (Chiappone et al. 2002, Uhrin et al., In press). Estimates suggest that there were approximately 85,000 intact lost traps throughout the fishery (Uhrin et al. In press). Mail surveys completed by commercial lobster fishermen indicated that approximately 100,000 or 20% of traps are lost annually (Matthews and Uhrin 2009). When tropical cyclones occurred, trap losses often doubled or tripled (FWC, Unpublished data). A study investigating the decay rate of lost lobster traps indicated that wooden and wire traps continued to catch lobster and by-catch species, for over a year. Debris from lost traps including ropes and buoys has also been observed entangled with protected species. Statewide entanglement data indicated that 15% of dolphin, manatee and sea turtle entanglements occurred with trap gear (Hudak et al. 2012). The Florida Keys were identified as predominant area for trap gear entanglement, accounting for 48% of the statewide sea turtle entanglements (FWC unpublished data).

## MANAGEMENT HISTORY

The FWC has attempted to address the environmental impacts associated with trap fishing through three management efforts: the Lobster Trap Certificate program, gear modifications, and derelict trap removal.

### The Lobster Trap Certificate Program

The Lobster Trap Certificate (LTC) program was developed to stabilize fishing effort in the lobster fishery by reducing the total number of traps allowed with the expectation that total lobster landings would be maintained or increase due to the reduction in confinement mortality of sub-legal sized lobsters (Hunt 1994, Rule 68B-24, F.A.C). Reducing the number of traps would also have the broad effect of reducing trap impacts on habitat and marine debris stemming from lost traps. The program was established by the Florida Legislature (Florida Statute 370.142) in 1992. The LTC program involved a series of reductions in the number of traps until 400,000 traps were in the fishery. The LTC program reduced the number of traps from over 939,000 in 1991 to approximately 485,000 as of 2013. The recent trap reduction rate was approximately 0.5% which removed approximately 2,500 traps from the fishery annually achieving the goal of the trap reduc-

tion program in 2064. Bioeconomic analyses by Milon et al. (1999) suggested that between 160,000 and 260,000 traps would further improve the economic efficiency of the fishery. Controversy remains among stakeholders over the appropriate number of traps that would be best for the fishery and the environment.

**Gear Modifications**

Fishermen's preferred alternative to reduce effects of traps on habitat was to modify traps. This method was a direct outcome of the cooperative research on trap movement. The FWC partnered with commercial lobster trap fishermen to determine if gear modifications could reduce trap movement while still maintaining lobster catch. Fishermen proposed 26 alternative trap designs which were tested for the potential to move less distance during storms. The trap types that moved less were tested for the ability to catch lobsters and by-catch. In the more geographically extensive hardbottom habitat, alternative trap designs utilizing wire moved considerably less than the standard wooden lobster traps used in the fishery. The tradeoffs associated with this type of trap, including reduced lobster catch, increased fish by-catch, increased ghost fishing potential and debris accumulation raised questions about the net environmental benefits of alternative trap types. Therefore, no management decisions have been made concerning the potential use of alternative traps.

**Trap Retrieval**

Lost or abandoned lobster traps have long been recognized as a problem for Florida's marine environment by various stakeholders, including the commercial fishing industry (Miller 2010). In response, the FWC developed two trap retrieval programs. First, each of the three major trap fisheries, spiny lobster, stone crab and blue crab have trap retrieval contracts with commercial fishermen to remove buoyed traps during the closed seasons. Secondly, the derelict trap and trap debris removal program authorizes volunteer groups to collect derelict traps and trap debris during the open or closed seasons (Rule 68B-55, F.A.C). These trap retrieval programs remove less than 2% of the estimated 100,000 lobster traps lost annually (Matthews and Uhrin 2009, FWC, Unpublished data). These trap retrieval programs have high participant satisfaction and good public recognition, but remove relatively little of the trap debris accumulated annually.

**Education and Outreach**

We will conduct an educational outreach program to translate data to knowledge, making information on trap impacts and fishing gear debris more accessible to the stakeholder community. The stakeholder community in the Florida Keys is comprised of a broad audience including commercial and recreational fishermen, dive tour operators, and the conservation-minded public. The conversion of scientific information for use by both the fishing community and the public is a critical step to manage our public resources. The information will be translated so that the public may understand the key concepts related to fishing gear debris, how it affects them and opportunities for affecting change. We will conduct a series of workshops for commercial fishermen, seminars for the general public, and utilize social media to reach a broader cross-section of the stakeholder community.

Workshops with commercial fishermen will disseminate our research on the type, cause, and amount of marine debris related to trap fishing. As some fishermen have been highly involved in the research pertaining to the environmental effects of trap fishing, our focus will be primarily related to engaging additional fishermen about trap loss and trap debris issues. Besides providing information about the effects of trap debris on the environment, the workshops are intended to produce industry recommendations to encourage behavioral changes that reduce trap debris and promote participation in the development of regulatory action as needed to protect habitat.

Presentations for public seminars, university guest lectures, local schools, and community events will encompass a broad spectrum of information related to research completed by the FWC on traps and marine debris. Topics include types and sources of marine debris, impacts of marine debris, impacts of lost traps, commercial fishing industry efforts to reduce trap loss, prevention of fishing gear loss (including traps and monofilament), and opportunities for tackling the issue of fishing gear debris in the Florida Keys.

In an effort to reach a broader cross-section of our targeted audiences, we plan to utilize social media outlets. Modern digital media provides for practically unlimited creativity to develop visual and print media to relay complex research results. We plan to use a traditional website, FWC's Fish and Wildlife Research Institute website and FWC social media accounts including Facebook, Twitter, YouTube, and Flickr to relay new content and encourage the public to become more involved in fishing gear debris reduction. Examples of content that may be developed include opportunities to participate in debris cleanups, webinars, video demonstrations of safe boating to avoid trap line cut-offs, photographs, project updates, and descriptions of the spiny lobster research program related to marine debris and its environmental impact.

## CONCLUSION

The education campaign is a work in progress that will be carried out over the next two years. The campaign is needed to increase public participation and engage the fishing industry to be part of the solution to the issue of habitat protection and lost fishing gear. We anticipate that the primary challenges to the education campaign will be effectively engaging diverse stakeholder groups and overcoming a culture that is resistant to change. The goal is

to determine if expanding knowledge of trap induced environmental damage will allow managers and stakeholders to develop solutions that will reduce trap impacts and loss, thus promoting sustainable fishing practices and resource protection.

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