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The Effects of Trap Fishing in Coral reefs and reef-associated habitats

R. HILL[1], P. SHERIDAN[1],, G. MATTHEWS[1], AND R. APPELDOORN[2]
[1]*U. S. Department of Commerce, NOAA*
National Marine Fisheries Service, Southeast Fisheries Science Center
4700 Avenue U, Galveston TX 77551 USA
[2]*Department of Marine Sciences, University of Puerto Rico*
Mayagüez PR 00681-9013 USA

ABSTRACT

Trap fishing in United States waters occurs in coral habitats in the Florida Keys, Puerto Rico, and the Virgin Islands. Although the numbers of traps fished and the general placement areas of traps are known, there is little information on the exact placement of traps by habitat type, seasonal movement of traps among habitats, and potential for gear impacts to various habitats such as seagrasses, macroalgae, sponges, and hard and soft corals. We are examining the placement of traps in relation to habitat types and conducting underwater surveys of traps and fishing techniques in all three locales to quantify habitat damage and investigate the necessity for gear or method modifications.

INTRODUCTION

The effects of trap fishing on essential fish habitats, particularly coral reefs and reef-associated habitats, are largely unstudied. The U. S. National Marine Fisheries Service (NMFS) has identified traps as one of five types of fishing gear with the highest potential for impacting essential fish habitat (Hamilton 2000). Trap fishing occurs in coralline habitats under the jurisdiction of all three federal fishery management councils in the southeast U.S. and in state, territory, and commonwealth waters. Traps are used to capture spiny lobster *Panulirus argus* in Florida (Matthews and Williams 2000) and spiny lobster plus various reef fishes in Puerto Rico (Matos-Caraballo 2000a,b) and the U. S. Virgin Islands (Garrison et al. 1998).

We are building on preliminary investigations conducted in Puerto Rico (Appeldoorn et al. 2000) to compare and contrast the distribution and potential habitat effects of trap fishing in the Florida Keys, Puerto Rico, and the U.S. Virgin Islands. Our objectives are 1) to review the known distributions of fishing effort and habitats and to suggest refinements, 2) to develop methods for rapid, large scale surveys of the distribution of traps and potential for habitat damage in both shallow and deep waters, and 3) to document gear effects on habitat and to suggest less destructive fishing methods, if needed.

DATA COLLECTED

Boat Surveys
Trap location(GPS)
Trap depth
Buoy Identification

Habitat Look
Trap type
Habitat trapped
Adjacent habitat

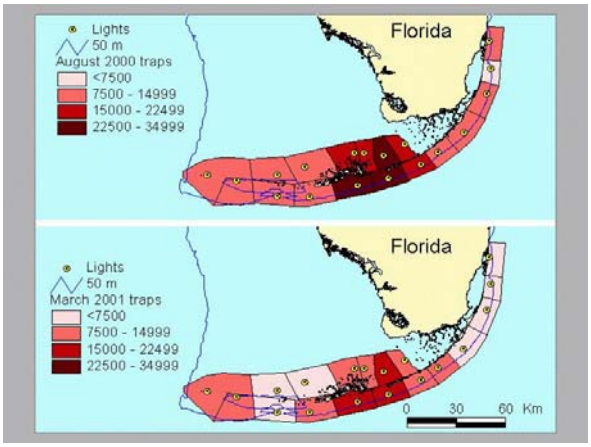
Diver surveys
Trap type/construction
Habitat types
Benthic cover
Habitat damage
Trap catch composition

WHAT WE KNOW

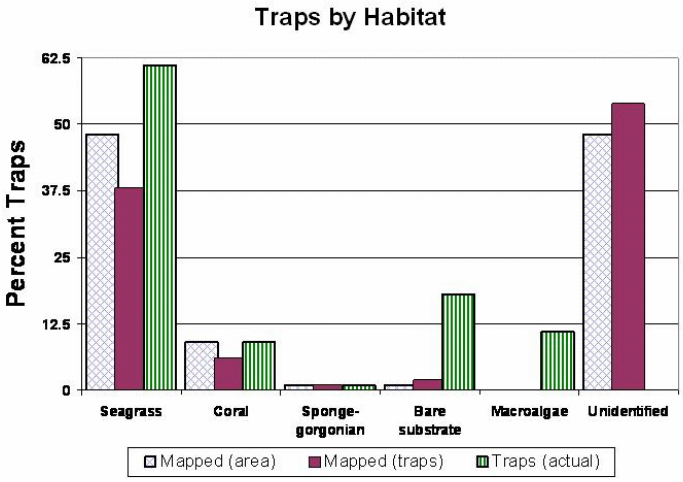
Florida Keys

The Florida Marine Research Institute (FMRI) employs a ticket system wherein fishers record a variety of data

for each trip completed during the spiny lobster fishing season (August - March). Data include biomass landed, number of traps fished, soak times, coastal area, and whether traps were fished inshore / bay, offshore, or in federal waters. Landings generally are highest in August and decline through March. During 2000, most landings were recorded from the vicinities of the Dry Tortugas, Key West, and Marathon (83% of the 1.93 million kg total; NMFS Miami, FL, unpublished data). Approximately 20% of the total landings came from inshore or bay waters (mostly from the Florida Bay region near Marathon), while the remaining 80% came from offshore state and federal waters. Over 500,000 lobster traps were permitted for the 2000-2001 fishing season, approximately 90% of the traps were fished as singles, and traps were fished as deep as 45-60 m (T. Matthews, FMRI, Marathon, FL, pers. comm.).



Commercial fishers are requested to participate in an annual FMRI questionnaire that asks them to indicate on a map where they fished relative to a series of coastal markers (reefs, shallows, and lights differing from the aforementioned coastal areas) and how many traps they deployed each month. We used data collected after the 2000-2001 season to generate a finer-scale picture of the distribution of effort in relation to available habitat maps. Trap effort was expended on both Atlantic and Gulf of Mexico sides of the Florida Keys and the Dry Tortugas and extended along the southeastern mainland north of Biscayne Bay and Fowey Rocks (Figure 1). Effort was highest in the central Keys (particularly Bullard Light in the Gulf and Looe and Sombrero Keys in the Atlantic) and lowest at the extremes (northeast around Fowey Rocks, and southwest around Smith Shoal, Ellis Rock, and Cosgrove Shoal). There appeared to be little difference in proportional allocation of effort among areas between start (August 2000) and end (March 2001) of the fishing season, although the total number of traps in use decreased by 30%.



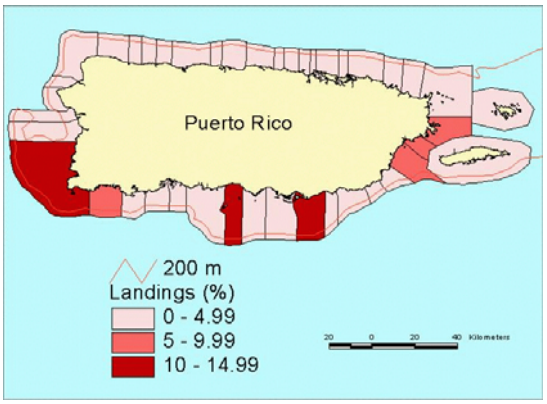
There have been several cooperative characterizations of south Florida benthic habitats (available from FMRI, St. Petersburg, FL, and NOAA, National Ocean Service, Silver Spring, MD). We have assembled these data in a geographical information system (GIS) format in order to overlay apparent fishing effort on habitat characteristics. Habitat categories have been combined to reflect three dominant features: coral reef, seagrass, and unknown or uninterpreted substrates due to poor water clarity (Figure 2). Corals are found primarily on the Atlantic side of the islands and around the Dry Tortugas and Marquesas. Seagrasses are the primary live bottom habitat inshore and are found in shallower waters inshore of reefs. Other live bottom and bare substrates (not pictured) are scattered throughout. Characterizations, however, have been depth-limited (< 30 m).

To date: Completed boat transects covering 9,137 ha. with 3940 traps. Video records of all habitats. Diver surveys of traps show low coral cover and commensurate low damage to corals (~10% of traps); greater damage to other

invertebrates (e.g., sponges, gorgonians, etc). Recovery rates of hard corals seem to be encouraging. Additional experimentation examining wind induced movement of traps and associated damage. Surveys continuing (final year).

Puerto Rico

The Puerto Rico Department of Natural and Environmental Resources (PRDNER) employs a ticket system wherein fishers record a variety of data for each trip completed during the year (Matos-Caraballo 2000a). Data include species biomass landed, number of traps, hours fished, and municipality landing areas. Fish traps are employed in almost every municipality but are most numerous in the southwest (Cabo Rojo, Lajas), south central (Guayama), and east coasts (Culebra and Naguabo; 44% of the 11,213 traps reported), whereas spiny lobster traps are almost all found on the east (Vieques and Culebra) and south (Juana Diaz; 52% of the 4,268 traps reported; Matos-Caraballo 2000b). Trap fishery landings during 2000 included 223,000 kg of fish (primarily snappers, boxfish, grunts and groupers) and 50,700 kg of spiny lobster, and most landings were recorded from the aforementioned municipalities (Figure 3; NMFS unpublished data). Examination of the distribution of traps and landings for 2000 indicates similar areas of concentration (Figure 3), however, there appeared to be under-reporting of traps in the southwest municipalities. Most traps are fished singly, at least in the southwest (Valdéz-Pizzini et al. 1997, Jean-Baptiste 1999, Appeldoorn et al. 2000).



Cooperative habitat characterization of shallow Puerto Rico benthic habitats by the University of Puerto Rico, PRDNER, and NOAA is still in progress (J. Christensen, U. S. Department of Commerce, NOAA, National Ocean Service, Silver Spring, MD, pers. comm.). Preliminary habitat data for the La Parguera (Lajas) area of southwestern Puerto Rico were available to estimate potential for habitat disturbance (Figure 4). Major habitat categories included

coral reef, seagrass, bare sand or mud, and unknown or uninterpreted habitats. Corals dominate the offshore area, while seagrasses are primary in shallow inshore waters and around reefs. Bare substrates are scattered in the eastern section, and a large area of unknown habitat dominates the central section. Again, habitat characterizations have been depth-limited (< 30 m) and fishing may extend beyond these depths over unknown habitat types.

To date: We have completed boat surveys covering 2575 ha. with 488 traps. Most are seasonal surveys in La Parguera, with a small number off the west ans east coasts. Our plans include greater coverage in other areas of PR. As many as 50 % of the traps may be causing damage to hard coral. Monitoring of recovery/mortality rates are underway.

U. S. Virgin Islands

The Virgin Islands Department of Planning and Natural Resources (VIDPNR) employs a monthly log book wherein fishers record a variety of data for each day fished during the year. Data include biomass landed by major family groups (such as groupers, parrotfishes, or lobsters), number and type of traps fished, and area fished around each island. Landings vary by season, location, and species groups. During 1998 (the latest complete data set), fish trap landings were highest during January-March and lowest during May-June, whereas lobster trap landings were highest during January-February and lowest during July-August (NMFS unpublished data). Landings for 1998 included 161,000 kg of fishes (dominated by parrotfishes, triggerfishes, and grunts) and 16,800 kg of spiny lobsters. Approximately 8,500 traps are permitted (1,500 in St. Croix and 7,000 in St. Thomas and St. John), with about half of the fishers using single traps and half using strings that may include hundreds of traps (B. Kojis, VIDPNR, St. Thomas, USVI, pers. comm.). Traps were most often placed off southwestern St. Croix and southern and western St. Thomas and St. John (Figure 5; NMFS unpublished data).

Characterization of shallow benthic habitats has been completed recently (cooperators include University of the Virgin Islands, VIDPNR, U. S. Geological Survey, National Park Service, and NOAA; available from U. S. Department of Commerce, NOAA, National Ocean Service, Silver Spring, MD). Habitat categories have been combined to reflect system dominants such as coral reef, seagrass, macroalgae, and unknown or uninterpreted substrates (Figure 6). Coral and seagrass dominate the fishable area of St. Croix, while extensive algal plains are prominent in the reef systems of St. Thomas and St. John. Again, deeper waters are of unknown habitat type but they may not all be coral reefs. Much of the trap fishing effort is offshore and in waters deeper than those included in the mapping effort (B. Kojis, VIDPNR, St. Thomas, USVI, pers. comm.).

To date: Surveys have covered 3200 ha and 527 traps around St. Thomas and St. Croix. Little effort has been expended around St. John. We know we are missing deeper water traps, which is the bulk of the commercial operations off St. Thomas. These traps are fished without surface buoys. Sampling is continuing.

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