

Assessing the Ecological and Economic Impact of Derelict Fish Traps in the U.S. Virgin Islands

KEY WORDS: Derelict gear, ghostfishing, fish traps, marine debris, fisheries

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Evaluar el Impacto Ecológico y Económico de Capturas de Peces Abandonados en las Islas Vírgenes

PALABRAS CLAVE: Capturas de peces abandonados, impacto ecológico, pesquerías, Islas Vírgenes

Évaluation de L'impact Économique et Écologique de Pièges à Poissons Abandonnées dans les Iles Vierges

MOTS CLÉS: Pièges à poissons abandonnées, l'impact écologique, Iles Vierges

EXTENDED ABSTRACT

Fish traps are a widely used multi-species fishing gear in the Caribbean and around the world. Like most marine industries, the trap fishery can result in marine debris through intentional disposal of unwanted traps at sea, loss of traps through storms and strong surge or currents, lines cut by boats and ships and through abandonment. Derelict fish traps are often considered a threat to the marine environment due to “ghostfishing” and habitat damage. Ghostfishing is a process that occurs when a fisherman has lost all control over the fishing gear and it continues to fish and induce mortality. Impact to marine habitats is thought to occur from the physical disturbance to coral and other biota when traps are mobilized by storms, sea swell and strong currents. Around the world, derelict fishing gear has become a great concern to the fishing industry and other marine stakeholders, as well as management agencies and the broader public sometimes leading to marine debris removal programs. In the Caribbean region, very little is known about the distribution of derelict traps and whether they pose a threat to fisheries livelihoods and to marine species and habitats. Threat assessment is required to determine if modifications to fishing practices are required and to provide reliable information to decision makers in resource management to determine the level of risk to the environment and if actions such as trap removal or trap disposal programs are required. Due to the large gap in knowledge about derelict fish traps in the U.S. Virgin Islands, the objectives of this study were to first determine the scale and distribution of derelict fish traps and then experimentally examine their ecological interactions through the use of experimentally controlled and monitored derelict fish traps. It was estimated that ~4,800 fish and 3,100 lobster traps are fished in the areas surrounding St. Thomas and St. John. To determine the spatial distribution of trap fishing effort and the known locations of lost traps in the USVI, we first developed a participatory mapping approach in partnership with the St. Thomas Fisherman’s Association (STFA). Trap fishermen provided locations of fishing effort on a map of the shelf areas around St. Thomas and St. John that was divided up into 1 km x 1 km grid cells. Fishermen provided geographical coordinates for the locations where they had lost traps in the past. This information was used to:

- i) Guide the sampling design for a controlled field experiment to assess the ecological and economic impacts of derelict traps; and
- ii) To support a pilot study using autonomous underwater vehicles (AUV’s) to detect derelict fish and lobster traps.

The research reported here focuses on the use of controlled experiments to examine derelict fish traps. The overall objective was to provide reliable quantitative scientific information to the fishing community and resource managers on the impact of derelict fish traps in the U.S. Virgin Islands. This experimental evidence is intended to help decision makers evaluate the threat from derelict traps and determine if derelict traps should stay in-situ or be removed. Specific questions investigated in this study included determining the amount of ghostfishing and mortality that occurs in fish species caught in experimental derelict traps, and how they behave including residence time, physical condition, time of capture and

activity in the traps. Possibly affecting residence time for specific species, biodegradable rot cord deterioration rates were monitored to determine the amount of time needed for the escape panels to open. Trap movement was also incorporated as a question so that distance and habitat damage could be quantified if it did occur.

In order to determine the impact of ghostfishing, unbaited fish traps were deployed at inshore and offshore locations in St. Thomas, USVI where derelict fish traps are currently present. Six of the experimental traps were actively fishing and six were left with the escape panels open. The traps were surveyed three days a week for six months for species abundance, size and mortality. General behavioral observations were also recorded such as aggression, avoidance, attempting to escape etc. Biodegradable rot cord deterioration was documented through photographs and the number of days before the rot cord snapped and the escape door opened were recorded. Economic loss was determined by calculating the length-weight relationship for each species mortality and current market prices. To assess fish behavior in the traps, a "TrapCam" was deployed for continuous twenty-four hour periods. Fish entry and exit times were documented and behavior such as species interactions and activity periods were recorded.

Five percent of the fish species caught in the experimental derelict fish traps experienced mortality. Mortality was comprised of eleven species, with porgies (*Calamus calamus*) exhibiting the highest mortality; thirteen percent of all porgies captured perished, comprising 30% of the overall mortality. The economic loss was estimated at approximately \$160. The biodegradable rot cord took an average time of approximately four months to snap and an average of approximately 1.5 months later for the escape panel to open. This estimate was based on previously unused traps and rot cord; with normal trap usage the biodegradable rot cord is likely to snap sooner and therefore the deterioration times are considered a worst case scenario, yet have revealed the potential problems with trap panels opening after cord has snapped. Once in the traps most species exhibited behaviors such as banging into the sides of the traps and swimming frantically, all of which are not typical behaviors of un-trapped fish. Snapper species tended to avoid individuals of other species of fish, while trunkfish spent a higher proportion of time trying to escape through the trap mesh. Angelfish tended to swim frantically and act aggressively towards other species.

Assessing the impacts of experimental derelict traps demonstrated that derelict fish traps can cause mortality, although 95% of fish were able to eventually escape through the trap the way they had entered. Sub-lethal physical damage was observed, but post-escape survival rates are unknown. Although lower than expected mortality was recorded, ghostfishing does occur and can lead to mortality. Modifications to fishing practices and gear

design could minimize both the abundance of derelict traps in the marine environment and the impact of derelict traps.