Managing Fish Traps within a Context of Socio-Economic Sustainability in U.S. Virgin Islands Waters

El Manejo de Nasas de Peces en Aguas de las Islas Vírgenes Americanas dentro de un Contexto de Sostenibilidad Socio-Economica

Gestion des Pièges à Poissons dans un Contexte de Durabilité Socio-Économique dans les Eaux des Îles Vierges Américaines

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ABSTRACT

The fish trap is a widely used gear for harvesting reef fish in U.S. Virgin Islands waters, but the use of this gear continues to be controversial because of non-target species retention and possible physical impacts to the reef. The Caribbean Fishery Management Council has partnered with NOAA's National Marine Fisheries Service, the government of the USVI, and commercial fishers to implement management measures designed to reduce ecosystem impacts of fish traps while minimizing socio-economic costs to fishing communities. As a first step, fully implemented annual catch limits have capped harvest by all gears within U.S. Caribbean exclusive economic zone waters. Additionally, a USVI fishers/government partnership has implemented a trap reduction program that codifies a cap on the number of traps allowed to be deployed by each fisher in territorial waters. This program also limits entry of additional fishers, ensuring a stable if not decreasing trap footprint in USVI waters. To manage trap impacts on ecosystem diversity, the effectiveness of various escape vent configurations is being tested to identify a single configuration that will minimize retention of non-desirable or non-target species with minimal reduction in catch of target species. Together, these measures serve to reduce fish trap impacts on USVI reefs while maintaining employment within the commercial fishing industry and food security within the communities they serve.

KEY WORDS: Traps, management, escape vents

INTRODUCTION

The fish trap is a widely used gear for harvesting reef fish in Caribbean waters, but the use of this gear continues to be controversial for a variety of reasons. Some of the more common issues associated with the use of fish traps include non-target species retention, physical impacts to the reef, and ghost fishing of lost traps. However, fish traps have a long history of use in Caribbean fisheries, including on the islands of the U.S. Virgin Islands (USVI), and harvest by fish traps provides substantial value to the artisanal fishers both in the USVI (Table 1) and throughout the wider Caribbean. Calls for the elimination of fish traps may be valid from a strictly ecological perspective, but fail to consider the economic importance of trap-based harvest, alienate fishers and fishing communities, and may overly simplify a complex socioeconomic issue. In U.S. Caribbean waters, and specifically in territorial and federal waters surrounding St. Thomas and St. John in the USVI, commercial fishers, the USVI Department of Planning and Natural Resources (DPNR), the Caribbean Fishery Management Council, and NOAA's National Marine Fisheries Service (NMFS) have implemented a suite of management measures designed to reduce the negative impacts of fish traps while continuing to sustain the income stream fishers obtain from using traps.

ANNUAL CATCH LIMITS

In response to a Congressional mandate, NMFS instituted annual catch limits (ACLs) in U.S. Caribbean exclusive economic zone (EEZ) waters beginning in 2011, with the first fully impacted calendar year being 2012. Annual catch limits are designed to ensure that harvest rates do not exceed the biological capacity of the resource to maintain itself, i.e., that overfishing does not occur. In most cases, this is accomplished by setting a harvest cap that is at least 10 - 15% below the level at which overfishing is expected to occur.

If a three-year running average of landings for any fishery management unit (FMU) does exceed the established ACL, an accountability measure (AM) is implemented. The AM requires that, for an FMU that exceeded its assigned ACL, the allowable harvest season is shortened in the year following identification of the overage by the length of time necessary to ensure the overage does not again occur. Since the application of ACLs and AMs, AMs have been applied in response to ACL overages for the commercial deep-water snapper fishery off the west coast of Puerto Rico, for commercial harvest of wrasses (primarily hogfish, *Lachnolaimus maximus*) in Puerto Rico EEZ waters, and for the harvest of groupers from St. Thomas EEZ waters. The latter case is of particular pertinence to the present discussion, as groupers including red hind (*Epinephelus guttatus*) are an important target for harvest by fish traps in St. Thomas/St. John territorial and EEZ waters.

In general, the implementation of ACLs has resulted in, or at least been contemporaneous with, a decrease in commercial harvest in St. Thomas/St. John waters, particularly but not exclusively in the trap fishery (Figure 1).

Table 1. Value of fish commercially harvested by traps and landed in St. Thomas/St. John, U.S. Virgin Islands. Also included are the change in dollar value, and the percent change in value, from one year to the next. Value percent indicates the value of trap fishery landings as a percentage of the value of the entire St. Thomas/St. John commercial fishery.

Year	Value in Dollars U.S.	Change in Dollar Value from Previous Year	Percent Change in Value from Previous Year	Value Percent of the Fishery
2000	1,524,097			61.0
2001	1,865,587	+341,490	+22.4	60.3
2002	1,966,492	+100,905	+5.4	62.9
2003	2,370,963	+404,471	+20.6	65.6
2004	2,523,815	+152,852	+6.4	71.8
2005	2,369,269	-154,546	-6.1	71.3
2006	2,484,605	+115,336	-4.9	62.2
2007	2,317,066	-167,539	-6.7	64.7
2008	2,184,465	-132,601	-5.7	71.2
2009	2,435,377	+250,912	+11.5	65.9
2010	2,350,636	-84,741	-3.5	70.7
2011	1,817,525	-533,111	-22.7	70.9
2012	1,690,540	-126,985	-7.0	74.0
2013	1,600,810	-89,730	-5.3	78.2

USVI TRAP REDUCTION PROGRAM

Commercial fishers operating in the waters surrounding the USVI recognize the importance of sustainable fisheries to their livelihood. They also appreciate that without a healthy coral reef ecosystem to provide food and shelter for the species they target, there will be few if any fish to harvest. To ensure fishing opportunities and food security into the future, they have on their own initiative, and in cooperation with the USVI DPNR, undertaken to reduce and redistribute fishing effort. In particular, they have developed and implemented a trap reduction program for territorial waters designed to reduce and cap the number of fish traps deployed around the islands. The program calls for a minimum 20% reduction in the number of traps each fisher deploys relative to recent historical levels, allows no single fisher to deploy more than 250 traps, and limits entry of new fishers into the fishery. Ultimately, this capacity control will evolve into a capacity reduction as attrition reduces the number of active trap fishermen. The program has been approved by the DPNR Commissioner. Following a series of hearings to consider petitions for entry from those who have used traps in the past but are no longer using them and therefore do not qualify for inclusion in the trap fishing sector, the program will be fully implemented. Enforcement of fishing regulations is always problematic, not just in USVI waters but throughout the nation, but compliance is anticipated to be high because the reduction was implemented by the fishers themselves. Even prior to the implementation of the trap reduction program, the number of trap hauls reported from the waters surrounding St. Thomas and St. John has dropped steadily (Figure 1), possibly reflecting an adjustment to the implementation of ACLs.

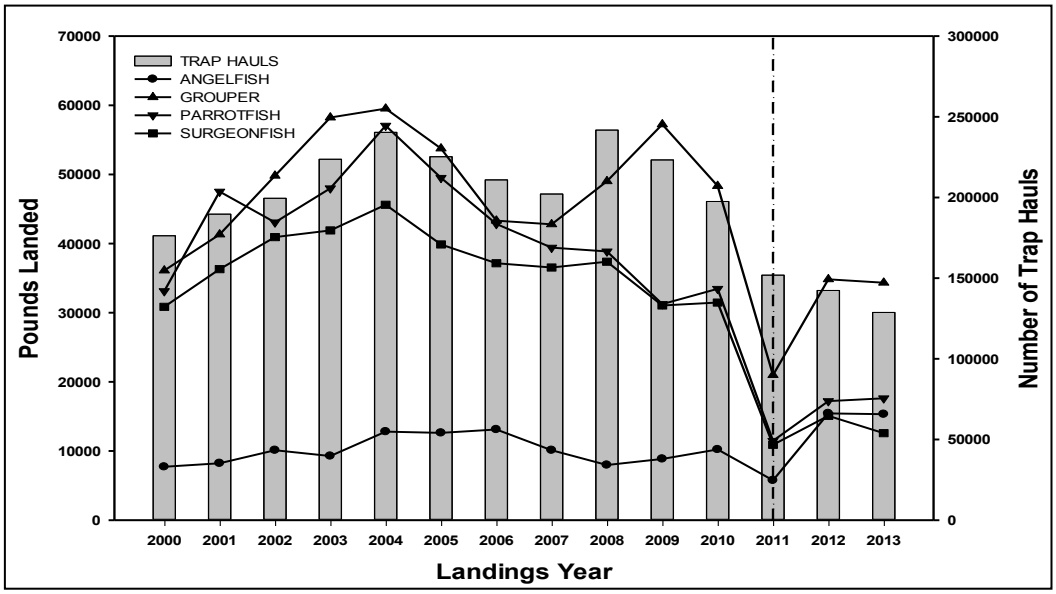

Figure 1. Annual reported landings for the angelfish, grouper, parrotfish, and surgeonfish fishery management units from St. Thomas and St. John, USVI, during 2000-2013. Also depicted is the number of trap hauls each year during that period of time. The dashed vertical line indicates the point at which annual catch limits were implemented.

ESCAPE VENTS

Another important issue with fish traps is bycatch, not only of unwanted species but also of members of the target species that are undersized and unsuitable for the market. Addressing bycatch requires a balance between the release of non-target specimens and the retention of marketable specimens. The St. Thomas Fisherman's Association (STFA) undertook a series of studies to determine which vent or vent combination would provide the best balance between reducing bycatch and minimizing economic impacts due to a reduction in catch. Pilot studies indicated a vent measuring 35 mm width by 146 mm height provided the best combination of release and retention. Using this vent configuration, the STFA fishers conducted a series of pairwise comparisons to quantify the catch of a control trap containing no escape vent with the catch of a test trap accessorized with an escape vent mounted in the side of the trap.

The results of the pairwise comparisons were equivocal for some of the many species captured in the fish trap fishery, but for three ecologically important species including blue tang (*Acanthurus coeruleus*), gray angelfish (*Pomocanthus arcuatus*), and stoplight parrotfish (*Sparisoma viride*), a clear shift in the size at which 50% selectivity was achieved was obtained. Blue tang experienced an approximately 10 mm increase in the size at which 50% selectivity was achieved in the vented trap relative to the control trap (Figure 2). Similarly, gray angelfish experienced an approximately 34 mm increase in the size at which 50% selectivity was achieved when the vent was included (Figure 3), and stoplight parrotfish experienced an approximately 22 mm increase in the size at which 50% selectivity was achieved when the vent was included (Figure 4). In contrast, the vent had minimal impact on the size at which 50% selectivity was achieved for the commercially important red hind (*Epinephelus guttatus*)(Figure 5). The suitability of a 35 x 146 mm vent for reducing bycatch while minimizing economic impacts to the fishers will only be fully revealed upon operational usage. That information will be forthcoming, as many St. Thomas/St. John trap fishers have already installed this vent configuration in their traps.

SUMMARY AND CONCLUSIONS

Commercial fisheries are integral components of the economy and culture of the USVI, and their choice of gear is deeply engrained in their fishing practice. They are willing to modify their fishing gear to ensure the health and sustainability of the resources upon which they depend, but that willingness is conditioned upon evidence supporting that change in gear configuration. In the case of the fish trap fishery of St. Thomas and St. John, the fishers and their fishery have responded positively to externally mandated and internally generated management measures that are supported by quantitative evidence of outcomes. Reductions in overall take via ACLs and AMs, while controversial, ultimately appear to have been accepted. Within the context of ACLs, fisher generated reductions in the number of allowable fish traps has reduced effort, further ensuring that catch levels are not exceeded. Finally, to better focus the trap fishery on species of interest to local markets, escape vents have been tested and implemented, decreasing the catch of non-target and undersized target species. Together, these measures will contribute to lessening the impact of fish trap gear on Caribbean coral reefs while supporting the commercial fisheries and commercial fishing communities of the USVI.

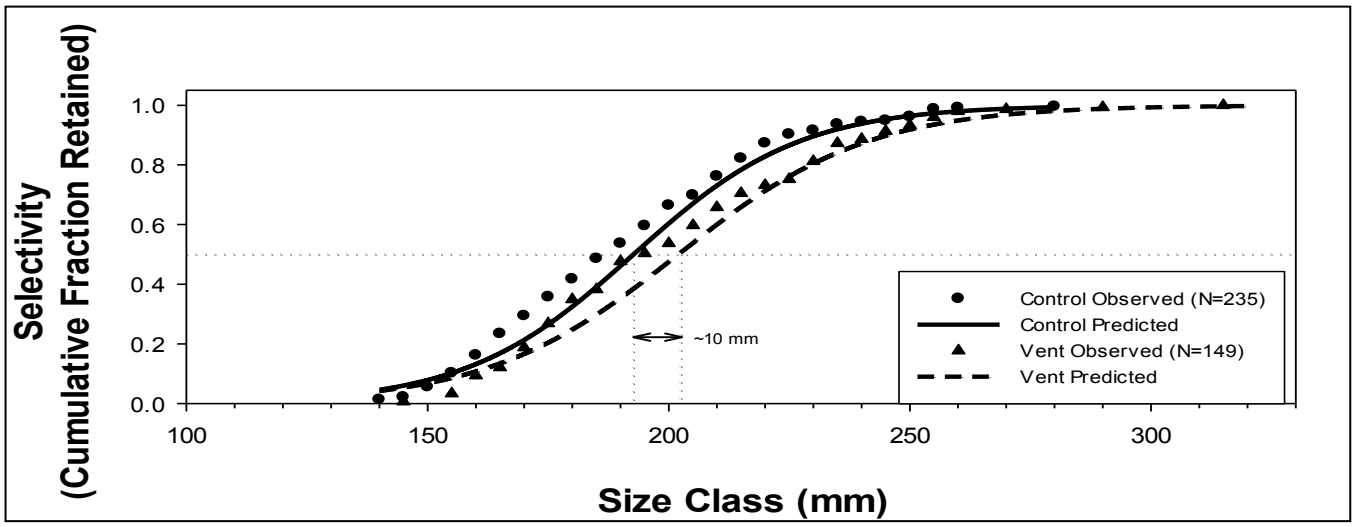

Figure 2. Trap selectivity for blue tang (*Acanthurus coeruleus*) without (solid line) and with (dashed line) a 35 mm wide by 146 mm high escape vent installed in the side of the trap. n = the number of fish measured from each of the without vent and with vent traps. Data points were fitted using the Statistical Analysis System (SAS) non-linear curve fitting procedure, and the complementary curve plotted using the coefficients generated from the fitting procedure. The horizontal dotted line represents 50 percent selectivity, and the dotted drop lines indicate the size at which 50 percent selectivity was achieved. Size classes are binned into 5 mm increments.

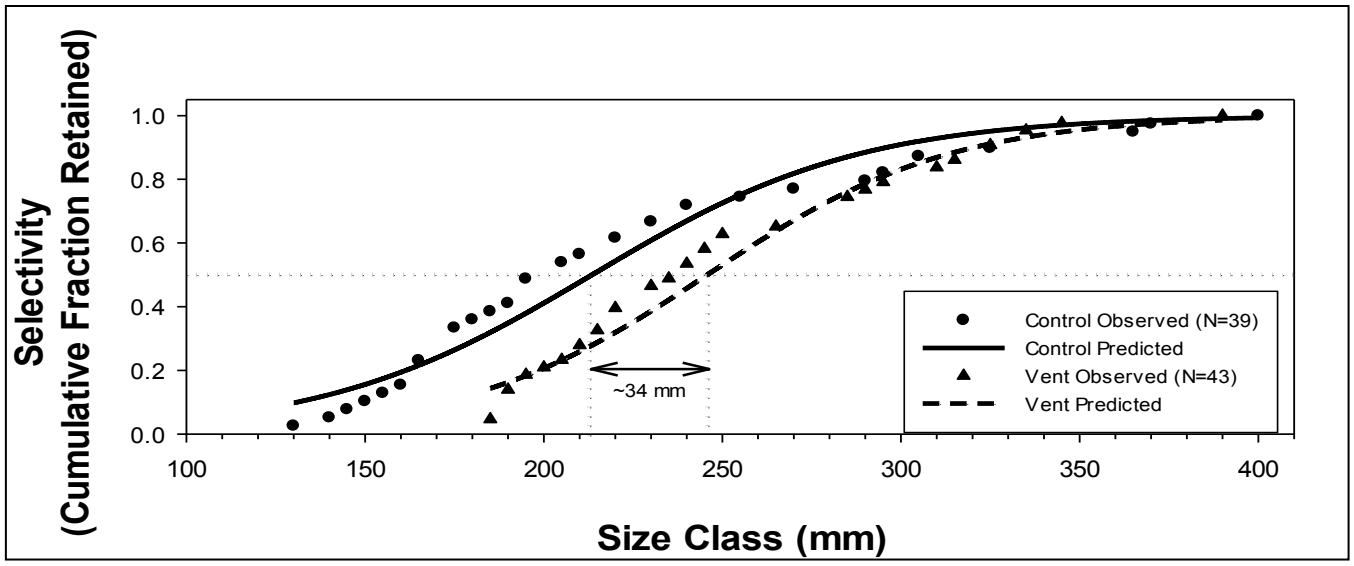

Figure 3. Trap selectivity for gray angelfish (*Pomocanthus arcuatus*) without (solid line) and with (dashed line) a 35 mm wide by 146 mm high escape vent installed in the side of the trap. N = the number of fish measured from each of the without vent and with vent traps. Data points were fitted using the Statistical Analysis System (SAS) non-linear curve fitting procedure, and the complementary curve plotted using the coefficients generated from the fitting procedure. The horizontal dotted line represents 50 percent selectivity, and the dotted drop lines indicate the size at which 50 percent selectivity was achieved. Size classes are binned into 5 mm increments.

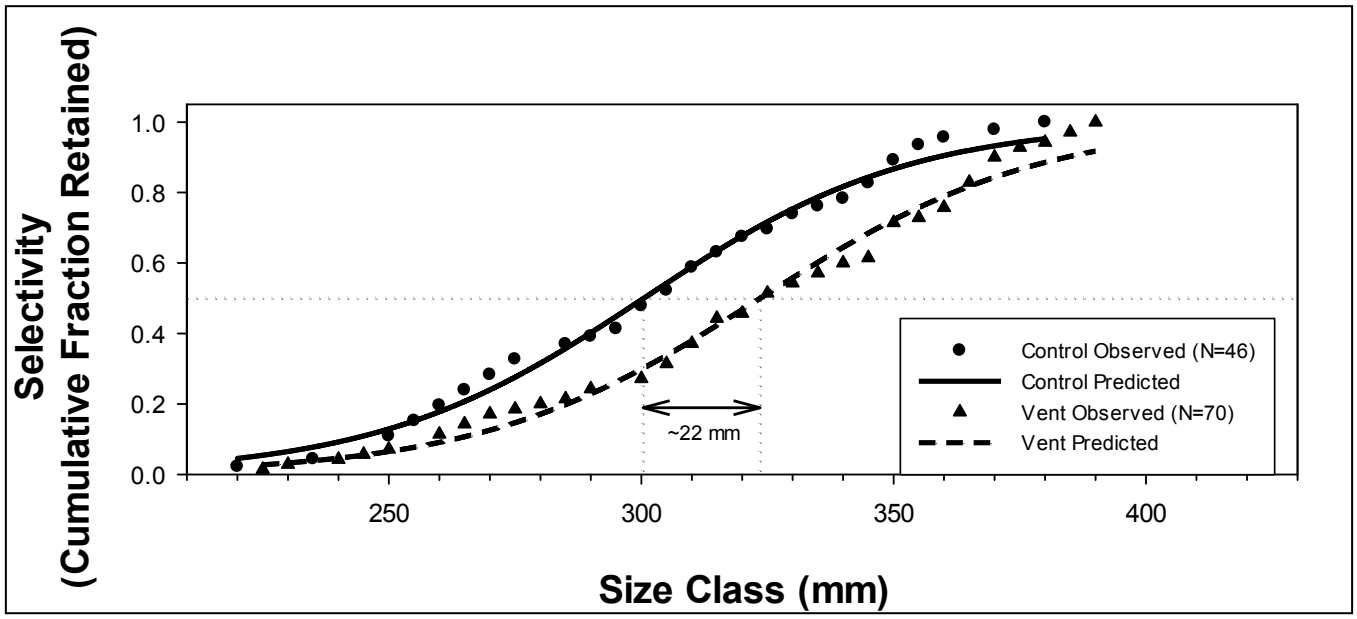

Figure 4. Trap selectivity for stoplight parrotfish (*Sparisoma viride*) without (solid line) and with (dashed line) a 35 mm wide by 146 mm high escape vent installed in the side of the trap. N = the number of fish measured from each of the without vent and with vent traps. Data points were fitted using the Statistical Analysis System (SAS) non-linear curve fitting procedure, and the complementary curve plotted using the coefficients generated from the fitting procedure. The horizontal dotted line represents 50 percent selectivity, and the dotted drop lines indicate the size at which 50 percent selectivity was achieved. Size classes are binned into 5 mm increments.

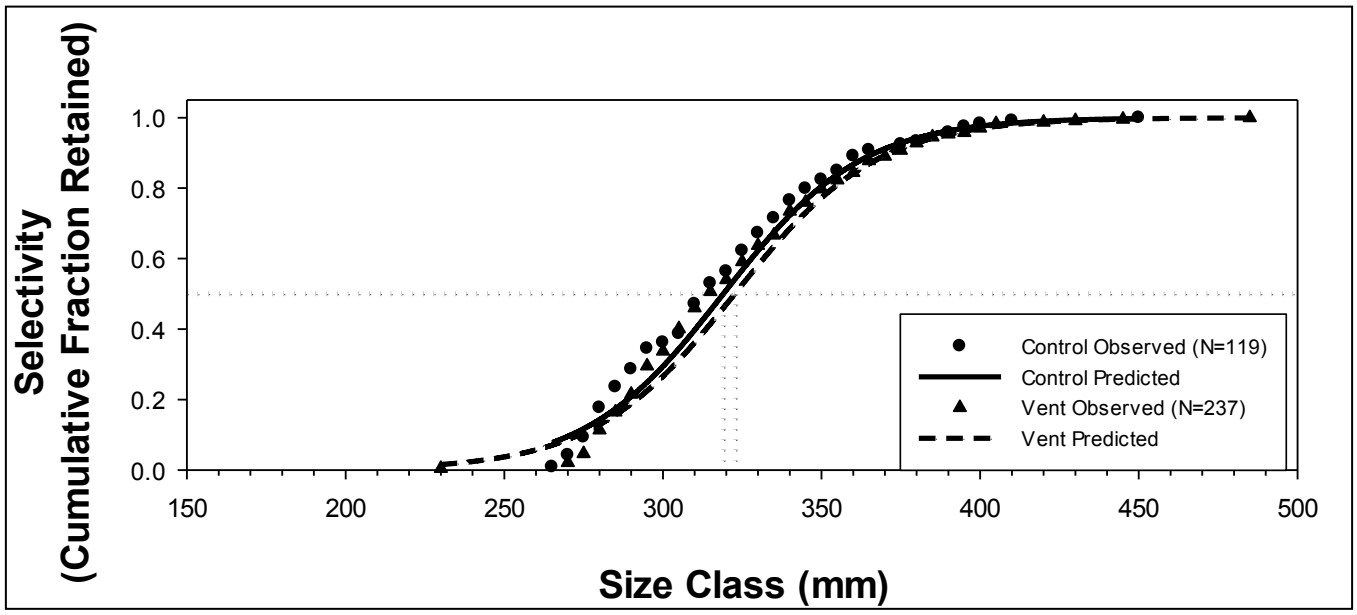

Figure 5. Trap selectivity for red hind (*Epinephelus guttatus*) without (solid line) and with (dashed line) a 35 mm wide by 146 mm high escape vent installed in the side of the trap. N = the number of fish measured from each of the without vent and with vent traps. Data points were fitted using the Statistical Analysis System (SAS) non-linear curve fitting procedure, and the complementary curve plotted using the coefficients generated from the fitting procedure. The horizontal dotted line represents 50 percent selectivity, and the dotted drop lines indicate the size at which 50 percent selectivity was achieved. Size classes are binned into 5 mm increments.