Preliminary Effort and Yield Estimates from the Haitian Fishery at Navassa Island

MARGARET W. MILLER[1], JEAN W. WIENER[2], DAVID B. MCCLELLAN[1], and BRENT STOFFLE[1]
[1]*Southeast Fisheries Science Center, NOAA-Fisheries Service, 75 Virginia Beach Dr., Miami, Florida 33149 USA*
[2]*Fondation pour la Protection de la Biodiversité Marine (FoProBiM)*
6011 Henning St., Bethesda, Maryland 20817 USA

ABSTRACT

Navassa is a small, uninhabited oceanic island 50 km west of Haiti. The USA has designated the island and a 12 mile marine radius as a Caribbean National Wildlife Refuge, but sovereignty is disputed between the USA and Haiti. Observational reports from infrequent scientific expeditions, 2000-2004, have predicted and noted increasing fishing effort. Transient Haitian fishers regularly frequent the island, but since no quantitative fishery data is available, we sought to make educated estimates of fishing effort and landings. Information was derived from semi-directed interviews with participants in the fishery regarding typical fishing practices and direct observation/measurement of landed catch from a small number of Navassa fishing trips.

KEY WORDS: Navassa, Haitian artisanal fishery, effort and yield estimates

Estimados Preliminares de la Captura y el Esfuerzo de la Pesqueria Haitiana en la Isla de Navassa

Navassa es una pequeña isla oceánica desabitada a 50 KM al oeste de Haití. Los Estados Unidos han designado la isla y doce millas náuticas marinas alrededor como Refugio de la Fauna Nacional del Caribe, pero su soberanía esta aún en disputa entre Los Estados Unidos y Haití. Expediciones científicas ocasionales entre el 2000 y el 2006 han observado un esfuerzo de pesca creciente. Pescadores haitianos frecuentan la isla regularmente, pero no existen datos cuantitativos de la pesquería, por lo que se decidió realizar estimados de capturas y desembarcos. La información se obtuvo mediante entrevistas indirectas con pescadores participantes en prácticas pesqueras típicas y observaciones o mediciones directas realizadas a desembarcos de un número pequeño de pescadores.

PALABRAS CLAVES: Navassa, pesqueria Haitiana, estimados de captura y esfuerzo

INTRODUCTION

There is increasing interest in fisheries management at Navassa, a small, uninhabited oceanic island 50 km west of Haiti. Sovereignty is disputed between the USA and Haiti, with transient Haitian fishers frequenting the island and the USA designating the island and a 12-mile marine radius as a National Wildlife Refuge. Observational reports from infrequent scientific expeditions have indicated increasing fishing effort over the period from 2000 - 2004 (Miller and Gerstner 2002, Miller 2003, Miller *et al*. 2003, McClellan and Miller 2005). Over this same short time frame, a trend of reduced reef fish abundance and size has been documented (Miller *et al*. 2007) via visual census (McClellan and Miller 2003). Since no quantitative fishery data is available, we sought to make educated estimates of fishing effort and landings from Navassa derived from semi-directed interviews with participants in the fishery regarding typical fishing practices and direct observation/ measurement of landed catch from a small number of Navassa fishing trips.

METHODS

In 2004 - 2005, we conducted a sociocultural assessment of the Navassa fishery via on-site observations of fishing activities and interviews during a November 2004 cruise to Navassa and site visits to six villages in southwest Haiti during March-August 2005. We undertook semi-directed group and individual interviews of the fishing communities working at Navassa in the Haitian-Creole language to describe fishing practices and perceptions of changes over time. Interviews of fishers at Navassa were conducted during a November 2004 cruise by approaching each fishing vessel observed (30 fishers). Interviews in south-west Haiti were conducted during three site visits (March – August 2005) and included participants from six villages (Figure 1). Semi-directed interviews were held with individuals and small groups of fishers (90 total estimated participants, 53 individual interviews) following community meetings (*c*. 450 participants) to identify key informants with knowledge of the Navassa fishery (ethnographic methods detailed in Wiener 2005). Consensus responses from small group and individual interviews are reported.

We sought to estimate fishing effort from consensus average numbers of individual fishers, person trips and boat trips reported in interviews. We then combined these estimates with the landed catch measured from three independent boat trips landed in two separate villages in May/June 2005 to extrapolate an estimate of total annual landings from the Navassa fishery. Due to the numerous assumptions involved in such extrapolations, we sought to bound each step with high and low estimates related to the qualitative degree of uncertainty at that step.

Finfish catch was salted and gutted with head removed when landed and not identifiable to taxa. Conversion factors for salted/dried, gutted, head-removed finfish were

examined from a compilation of available national authorities' factors reported to FAO (FAO/Fisheries Circular C847 (Rev.1) "Conversion factors from landed to live weight"; accessed April 2007 at:

http://www.fao.org/fi/website/FIRetrieveAction.do?dom=org&xml=FIDI_STAT_org.xml&xp_nav=3,3,3).

Although there were no records for reef fish species in this compilation, reported conversion factors for other species/countries with this processed form ranged from 1.7 to 2.8. We chose to bound our estimates for landed finfish using conversion factors of 2.0 and 2.5.

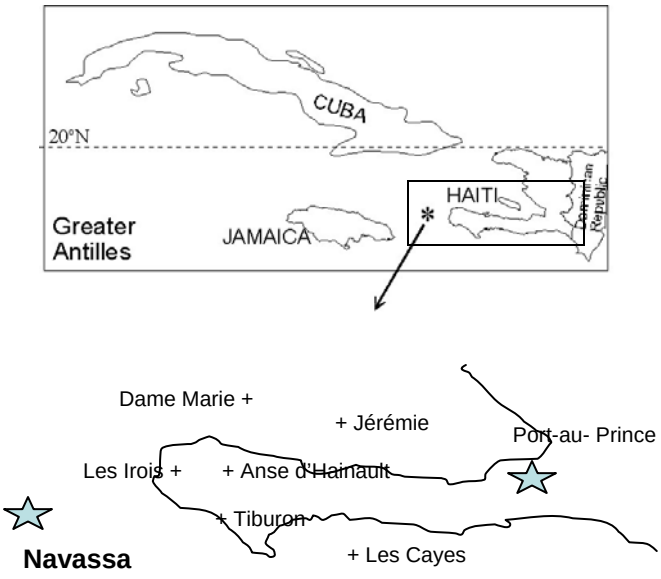

Figure 1. Relative location of Navassa Island and six villages in southwest Haiti where fisher interviews were performed.

Because interviews yielded little consistency in reports of total number of trips per year, and because there is uncertainty as to how much of the year active fishing takes place (e.g., some fishers report a 'resting season' from December through Easter), we used a range of three estimates of total trips per year. The estimates were based on:

i) The consensus number of trips per year reported in fisher interviews,
ii) The average 2004 observed number of boats per day fishing at Navassa (assuming average eight days per trip from interviews and, conservatively, six months of active fishing per year), and
iii) The average 2002 observed number of boats per day fishing at Navassa with similar assumptions. These scenarios gave estimates of 150, 99, and 45 trips per year, respectively.

Area of the first shelf around Navassa (~30 m depth) was determined from GIS analysis of IKONOS satellite imagery. Further from shore, the bathymetry drops to abyssal depths and most fishing activity has been observed in this nearshore area.

RESULTS AND DISCUSSION

The measured landings (finfish, lobster, and conch) from three Navassa fishing trips are given in Table 1. Based on interviews, these trips were typical in terms of number of fishers participating and length of trip. Catch was variable among trips for all three catch types and did not relate directly to effort (i.e. person-days for the trip) as the trip with the highest number of person days (60) had the lowest total catch (though higher lobster catch).

Table 1. Catch quantified from three independent boat trips landed in southwest Haiti. Fish were gutted, salted, and not identifiable to taxa. The first two boats were sampled in the village of *Anse d'Hainault,* the third in the village of *Dame Marie.*

	Fish (kg salted, gutted)	Lobster (kg whole)	Conch (kg fresh meat)	# of fishers	# of days
Boat 1	187	16	10	5	5
Boat 2	90	25	15	6	10
Boat 3	151	6	21	3	6
mean catch per trip	143	16	15		

Estimates extrapolating these observed landings to annual catch and yield (catch per shelf area) are given in Table 2. Based on uncertainties related to conversion factor (salted gutted to fresh weight for fin fish) and actual number of fishing trips per year, annual catch estimates range from 14 to 58 tons total, or 1.6 to 6.7 tons/km^2 shelf area.

We hope to utilize yield estimates, in comparison to estimates from other, comparable regions to infer the status of the Navassa fishery. For example, if the areal yield is notably higher than comparable fisheries, this may indicate overexploitation that is bound to be short-lived. Alternatively, high yields may indicate a particularly high productivity due to unique habitat or oceanographic features, though the oceanic isolation and high physical disturbance regime of Navassa suggests this is unlikely (Sandin 2003). Conversely, if the yield is low, this might indicate relative under-exploitation of the fishery, abnormally low productivity of the area, or an existing condition of overexploitation and depletion..

Unfortunately, little reliable comparable data (i.e. annual catch per fished area) seems to be available for comparable areas of the Caribbean. We accessed reported recent (2000 - 2004) annual 'capture production' for marine fishes plus mollusks plus crustaceans reported to FAO by various Caribbean nations (http://www.fao.org/

fishery/topic/16140) and an estimate of continental shelf area (reported by World Resources Institute, http://earthtrends.wri.org/text/coastal-marine/variable-62.html) to provide some context for our Navassa estimates (Table 3). Our mid range estimate of ~ 4 tons/km^2 shelf area appears to be relatively high while our low-range estimates are comparable to other, nearby nations (Dominican Republic, Jamaica, Table 3). It is unclear, however, on what data the FAO-reported catch is based.

If a useful fishery management plan is to be devised for Navassa, it will be necessary to interpret the estimates provided here in an appropriate regional context, in order to infer the degree of exploitation or over-exploitation in the Navassa fishery. It would also no doubt be appropriate to invest in obtaining more reliable effort and yield estimates for Navassa and most other Caribbean jurisdictions.

Table 3. Comparison of FAO-reported 'capture production' (marine fish plus crustaceans plus mollusks) for other Caribbean islands.

Area	Total Annual Capture* (mt)	Shelf Area$^+$ (km^2)	kg/km^2
Antigua/Barbuda	2213	2145	1031
Cuba	45279	51040	887
Dominican Republic	13378	5863	2281
Haiti	6900	5856	1178
Jamaica	9160	5608	1633
Puerto Rico	3164	5538	571
US Virgin Islands	1322	1967	672

* Mean total annual 'capture production' (marine fishes plus crustaceans plus mollusks) reported to FAO for the years 2000-2004 obtained via query from Global Capture Production database of the Fisheries and Aquaculture Department of FAO (http://www.fao.org/fishery/topic/16140, accessed January 2008)

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Table 2. Extrapolated yield estimates. Range of estimated annual landings from Navassa based on A) estimated 150 boat trips to Navassa per year from fisher interviews, B) mean daily boats observed in November 2004 (4.4) extrapolated at 8 days/trip for 6 months active fishing per yr, C) mean daily boats observed in 2002 (2.0) extrapolated similarly. Annual fish landings converted to fresh whole weight via *conversion factor of 2.5 and ^conversion factor of 2.0 (range derived from conversion factors reported in FAO/Fisheries Circular C847 (Rev.1); see text). $^+$Yield based on estimated 8.7 km^2 shelf area.

	Fish (est. fresh kg high)*	Fish (est. fresh kg low)^	Lobster (kg whole)	Conch (kg fresh meat)	TOTAL (kg fresh)	YIELD$^+$ (kg/km^2)
A) Estimated annual landings (max: 150 trips)	53625	42900	2400	2250	58275-47550	6698-5465
B) Estimated annual landings (mid-range: 99 trips)	35393	28314	1584	1485	38462-31383	4421-3607
C) Estimated annual landings (min: 45 trips	16088	12870	720	675	17483-14265	2009-1639