

# Ghost Fishing by Lost and Derelict Fish Pots in the Commonwealth of Dominica

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## ABSTRACT

Over 4500 fish pots were lost in the Dominican pot fishery during the passage of Hurricanes Lenny in 1999, Dean in 2007 and Omar in 2008. Additionally, it is estimated that fishers lose on average five percent of the pots deployed annually through theft, relocation due to changes in tides and currents, encounters with marine traffic and conflict with other fishing operations.

These pots which retain full capture function will continue to fish well in excess of twelve months. During continuous observation of seven months fin fish were entrapped an average of 189 fish per pot.

The experiment was conducted on the West Coast of Dominica using ten (10) Antillean Z-type pots, straight funnel entrance to demonstrate the Ghost Fishing function of lost traps by observing them using SCUBA, and other underwater observation of fish behavior and condition. It was also observed that even after one year, the capture function was still present in some of the pots.

The research revealed micro and macro estimation of mortality in the ten pots as well as affected organisms in those pots.

KEY WORDS: Ghost fishing, Antillean Z-type pots, Straight funnel entrance

## La Pesca Fantasma por Trampas Perdidas y Abandonadas en Commonwealth de Dominica

Más de 4,500 trampas para peces se perdieron en Dominica debido al paso de los huracanes Lenny en 1999, Dean en 2007 y Omar en 2008. Además, se estima que los pescadores pierden en promedio cinco por ciento de las trampas desplegadas anualmente a causa de los robos, la reubicación, los cambios en las mareas y corrientes, los encuentros con el tráfico marino y la pesca en conflicto con otras operaciones. Estas trampas, que conservan plena función de captura de pescado, continúan así por más de doce meses. Durante la observación continua de 7 meses, los peces fueron atrapados en un promedio de 189 peces por cada trampa.

El experimento se llevó a cabo en la costa oeste de Dominica utilizando diez (10) trampas Antilleana tipo Z-, entrada de embudo recta, para demostrar la pesca fantasma por la pérdida de las trampas mediante la observación de éstas usando buceo, y otras formas de observación del comportamiento de los peces y su estado. También se observó que incluso después de un año, la función de captura sigue presente en algunas trampas. La investigación reveló micro y macro de la estimación de la mortalidad en las diez trampas, así como los organismos afectados en las mismas.

PALABRAS CLAVE: Pesca fantasma, trampa Antilleana tipo Z-, entrada de embudo recta

## La Pêche de Fantôme en les Casiers Perdus et Abandonnés dans le Commonwealth de la Dominique

Le département de la pêche au casier de la Dominique avait perdu plus que 4 500 casiers de pêche pendant la passage de cyclone Lenny en 1999, le cyclone Dean en 2007, et Cyclone Omar en 2008. En plus, il est estimé que les pêcheurs ont perdu en moyenne 5% des filets de pêche chaque année à cause de vol ; les déplacements selon la marée haute/basse ; des rencontres avec le trafic marin ; et le conflit avec des autres opérations de pêche.

Ces casiers de pêche, dont la fonction de la capture est en tact, continueront la pêche au moins de 12 mois de plus. L'observation continuait pendant 7 mois et monte qu'un moyen de 189 poisson fins ont été attrapés par chaque casier.

L'expérience était faite à la côte de l'ouest de la Dominique en utilisant dix (10) casiers du type Antillean Z, l'entrée d'entonnoir droite pour démontrer la fonction de la pêche fantôme des casiers perdu, les observait en utilisant SCUBA et des autres observations sous-marins de les conditions et le comportement des poissons. Il était observé que, même après un an, la fonction de la capture était encore présente dans certains casiers.

La recherche a révélé la micro et macro estimation de la mortalité et des organismes affectés dans les dix casiers.

MOTS CLÉS: La pêche fantôme, casiers de type Antillean Z, l'entrée entonnoir droite

## INTRODUCTION

After hurricane Lenny in 1999, 275 Dominican fishers lost over 1800 fish pots (conservative estimates), 498 or 27% of those pots came from one small fishing village on the West Coast. The Fisheries Division was very much concerned about this large volume of pots on our reefs continuously harvesting marine organisms with no control by humans. The same situation occurred in 2007 post hurricane Dean, with a loss of 1450 fish pots to more than 120 fishers affecting mostly our inshore demersal fishery.

In this regard, the Fisheries Division in collaboration with the Japan International Cooperation Agency (JICA) through the Regional Technical Expert based in Antigua, agreed as part of its agenda of activities for 2008 to conduct a "Fish Pot and Ghost Fishing Survey" in Dominica as a component of its Community Based Fisheries Resource Management (CB-FRM) Programme.

Ghost fishing is defined as "derelict fishing gear either lost or abandoned which retains its capture function in water and continues inducing mortality of aquatic organ-

isms without human control” (Matsuoka 2005).

A problem analysis on Ghost Fishing by derelict fish pots in Dominica was done during the second visit of the JICA Expert. A study team and matrix was developed.

This survey was expected to continue until the pots had been deteriorated and could no longer perform their capture function.

**PURPOSE**

The purpose of the survey was to be able to:

- i) Estimate the pot life of some fish species,
- ii) Observe behavior of trapped fish in a pot,
- iii) Determine the underwater life span of a fish pot,
- iv) Average the # of fish lost/dead and calculate loss of income to fisher in a given period using a given formula or model, and
- v) Introduce alternative approaches to reduce pot loss and in so doing, ghost fishing.

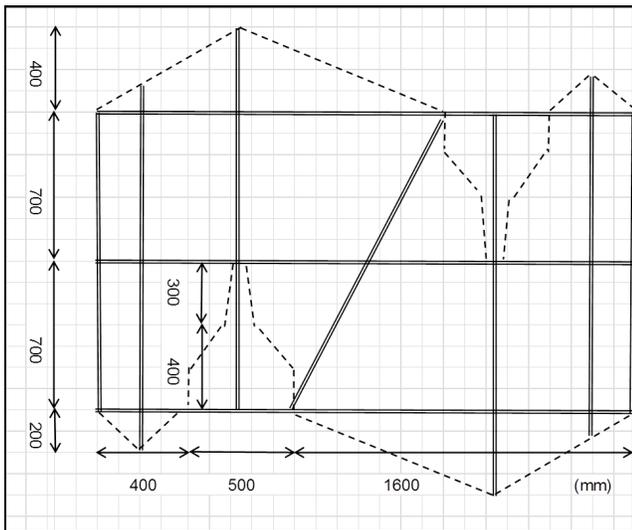
**METHODS**

**Fish Pots/Traps**

Ten Antillean Z-type pots of 0.9144m H x 1.288m W x 3.3528 m L were constructed from 18 gauge 3.81 cm (1.5 inch) (Figures 1 and 2), chicken wire mesh and the frame from a local wood named “tibom” were set at the depth (Table 1). The mesh and wood were tied together using binding wire. Entrance type was chosen Strait funnel entrance (Figures 3 and 4.) as most commonly utilized around Dominica. Other well utilized entrance was the gooseneck-type.

**Bait**

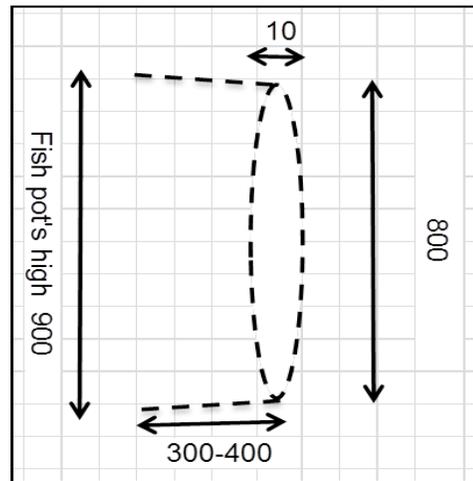
Composition of the bait included 3 types, Papaw (papaya), Baylot (local name), and Coconut, they were used in all ten pots.



**Figure 1.** The design of the fishpots “Z type” at Dominica H = 900 mm



**Figure 2.** Z-type fish pots

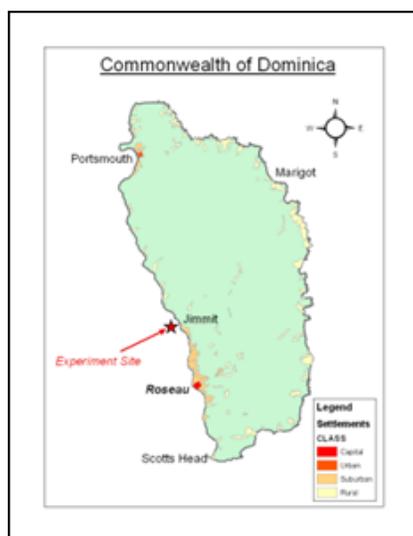


**Figure 3.** Straight funnel entrance of the pot (mm)



**Figure 4.** Straight funnel entrance of Z-type pot

Site Location: The south western coast of Dominica in an area called Rodney's Rock was chosen as the site for deployment of the pots. Average depth is 20 meters and GPS location is N 15° 22.672', W 061° 24.655' or 200 meters from shore across a cave (Figure 5).



**Figure 5.** Map of Dominica showing experimental site

**Table 1.** Pots number and depth

Pots #	Depth (m)	Pots #	Depth (m)
1	17.8	6	22.3
2	18.2	7	24.3
3	19.0	8	23.5
4	21.1	9	22.8
5	21.4	10	19.9

### Survey Methodology

Using SCUBA, still and video cameras were used in order to observe and obtain fish behavior, condition and activities in pots. Data was collected from each fish pot two times a week for 7 month commencing from 15<sup>th</sup> February 2008 to 19<sup>th</sup> September 2008 as No. 54 dives without problem on fish species and abundance, size and state of health as in good, poor, injured or dead. During the No. 54 to No. 55 dives the No. 9 and 10 pots were pulled out by human, so we continued other 8 pots observation until No. 58 dives for 242 days 13<sup>th</sup> October 2008. After this our research boat was destroyed by Hurricane Omar and the observation continued irregularly until 16th July 2009.

The number of live and dead organisms was counted on every diving observation. The number of new entrapped and escaped organisms was calculated by the

differences of the observation of the day and previous dive data. Newly entrapped and dead organisms were counted only if the species was identified. Usually the fish disappeared during 3 to 7 days after death. Therefore number of escaped “fish” could be included as unidentified dead organisms.

### RESULTS

During 218 day, cumulative total entrapped organisms were 2110, escaped 1891, dead fish 81 in 10 pots. 41 fin fish and 8 other organizes were observed. Grunts, snapper, and jacks were sometimes difficult to do head count so these are used as group names (Graph 1).

Most common fish observed were goatfish (*Mullidae*), flying gurnard (*Dactylopterus volitans*), doctor fish (*Acanthuridae*), jacks (*Carangidae*) and snappers (*Lutjanidae*).

The first dead fish was observed after six days. After 22 days there was evidence of weak, injured, and dead fish in some pots, for example, injured are blackbar soldier fish (*Myripristis jacobus*), bar jack (*Caranx ruber*) and southern sting ray (*Dasyatis Americana*). Dead fish included greater soap fish (*Rypticus maculatus*), flying gurnard (*Dactylopterus volitans*), and Atlantic guitarfish (*Rhinobatidae*) (Table 2).

After half a year, the wood frame started to deteriorate, but chicken gages were intact, keeping its capture function. After 218 elapsed days, total observed entrapped fin fish per 10 pots were 1827, total observed dead fin fish per 10 pots were 79. After 242 days, as Hurricane Omar (Oct 2008) approached, all remaining eight fish pots were still capturing fish until mid-February 2009. Some fisherman informed the research team that he pulled out the pots. The team confirmed that all fish pots were stretched. The team concluded that this type of pots keep the capture function more than one year. The chicken gage material was still intact, based on diving observations, on 24<sup>th</sup> June 2009.

### DISCUSSION

Micro-estimation of finfish mortality of one pot per 365 (one year) estimate durability of the pots is 13.2, and 547 (one year half) 19.8.

Macro-estimation of finfish mortality of 1,565 derelict pots as effect of the Hurricane Omar (2008) could be in case of 200 days 13,046 or 300 days 19,569 or 400 days 26,092. If all the finfish prices applied as 4 fish/lb., at \$7 XCD (Eastern Carb Dollar) as Dominica street price, XCD22.830-, XCD34, 245-, XCD45, 661- respectively.

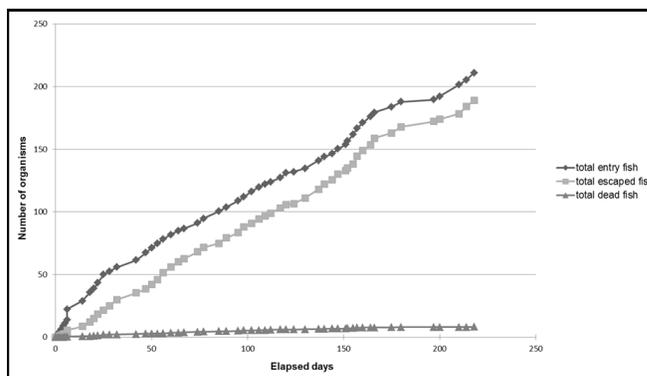
Macro-estimation of affected finfish (entrapped fin fish) of 1,565 derelict pots as effect of the Hurricane Omar (2008) is in case of 200 days 5,093,070- or 300 days 7,639,605 or 400 days 10,186.140-.

The experimental fish pots were located around 20 m depth, therefore fin fish habitat in deep slope such as snappers could be affected more in case the fish pots are set on that depth.

Hurricane Omar of October 2008 destroyed over 125 pirogue type fishing boats on the West Coast of Dominica, but the experimental pots did not suffer any damage

Table 2. Mortality of each species (total pots number n=10)

English name	Scientific name	Size	Cumulative data by day or dive since first day.			
			Total entrapped fish	Total escaped fish	Total dead fish	mortality
fin fish						
1 Atlantic Guitarfish	<i>Rhinobatos lentiginosus</i>	medium	2	0	2	100.00
2 Balloonfish	<i>Diodon holocanthus</i>	small	66	66	0	0.00
3 Blackbar Soldierfish	<i>Myripristis jacobus</i>	small	46	43	3	6.52
4 Blackfin Snapper	<i>Lutjanus buccanella</i>	small	130	119	2	1.54
5 Doctorfish	<i>Acanthurus chirurgus</i>	small	109	98	7	6.42
6 Peacock Flounder	<i>Bothus lunatus</i>	small	75	71	1	1.33
7 Flying Gurnard	<i>Dactylopterus volitans</i>	small	113	94	18	15.93
8 French Angelfish	<i>Pomacanthus paru</i>		10	10	0	0.00
9 Glasseye Snapper	<i>Heteropriacanthus cruentatus</i>	medium	9	9	0	0.00
10 Gray Snapper	<i>Lutjanus griseus</i>	medium	9	9	0	0.00
11 Greater soapfish	<i>Rypticus saponaceus</i>	medium	35	28	6	17.14
12 Green Moray	<i>Gymnothorax funebris</i>	medium	36	35	0	0.00
13 Grunts	<i>Haemulidae</i>		179	158	3	1.68
14 Jacks	<i>Carangidae</i>		230	208	4	1.74
15 Juvenile Snappers	<i>Lutjanidae</i>	small	5	5	0	0.00
16 Lane Snapper	<i>Lutjanus synagris</i>		2	2	0	0.00
17 Sand Diver	<i>Synodus intermedius</i>		9	5	1	11.11
18 Mahogany Snapper	<i>Lutjanus mahogoni</i>	small	69	66	2	2.90
19 Mutton Snapper	<i>Lutjanus analis</i>		47	44	0	0.00
20 Parrot Fish	<i>Scaridae</i>	small	119	113	6	5.04
21 Porgy	<i>Sparidae</i>	medium	34	31	3	8.82
22 Queen Triggerfish	<i>Balistes vetula</i>		3	2	1	33.33
23 Sailors Choice	<i>Haemulon parra</i>	medium	1	1	0	0.00
24 Sand Tilefish	<i>Malacanthus plumieri</i>	medium	2	2	0	0.00
25 Saucereye Porgy	<i>Calamus calamus</i>		1	1	0	0.00
26 Silver Jenny	<i>Eucinostomus gula</i>	small	2	2	0	0.00
27 Smooth Trunkfish	<i>Lactophrys triqueter</i>	small	175	168	4	2.29
28 Snapper	<i>Lutjanidae</i>		2	2	0	0.00
29 Southern Stingray	<i>Dasyatis americana</i>	small	3	0	2	66.67
30 Spotted Goatfish	<i>Pseudupeneus maculatus</i>	small	142	110	4	2.82
31 Spotted Moray Eel	<i>Gymnothorax moringa</i>	medium	11	11	0	0.00
32 Spotted Trunkfish	<i>Lactophrys bicaudalis</i>		14	13	0	0.00
33 Stone / Scorpion fish	<i>Scorpaenidae</i>	small	6	2	0	0.00
34 Stripped Mullet	<i>Mugil cephalus</i>	small	9	7	1	11.11
35 Trumpetfish	<i>Aulostomus maculatus</i>		32	27	0	0.00
36 Vermillion Snapper	<i>Rhomboplites aurubens</i>		1	1	0	0.00
37 Yellow Goatfish	<i>Mulloidichthys martinicus</i>	small	231	210	9	3.90
38 Yellowtail Snapper	<i>Ocyurus chrysurus</i>		16	16	0	0.00
39 Dog Snapper	<i>Lutjanus jocu</i>		2	0	0	0.00
40 Coney	<i>Cephalopholis fulvus</i>		3	1	0	0.00
41 Blue Runner	<i>Caranx crysos</i>		37	37	0	0.00
Sub total			2027	1827	79	3.90
Other organisms						
42 True Crab	<i>Brachyura</i>	medium	6	5	0	0.00
43 Cushion Sea Star	<i>Oreaster reticulatus</i>		20	16	0	0.00
44 Slipper Lobster	<i>Scyllaridae</i>		1	1	0	0.00
45 Octopus	<i>Octopus vulgaris</i>		6	5	1	16.67
46 Sea Cucumber	<i>Holothuroidea</i>		8	3	0	0.00
47 Spiny Lobster	<i>Panulirus argus</i>		9	2	1	11.11
48 Caribbean Reef Squid	<i>Sepioteuthis sepioidea</i>		29	29	0	0.00
49 True Tulip	<i>Fasciolaria tulipa</i>		4	3	0	0.00
Sub total			83	64	2	2.41
TOTAL			2110	1891	81	3.84



Graph 1. Observed number of live organisms and dead bodies in one pot (average of 10 pots, all species)

**RECOMMENDATION**

Some fish were observed to enter and exit pots easily. Strait funnel type fish pots seemed more environmentally friendly, however we observed a total 109 dead organisms during 242 days by 10 pots, and we don't know what happened to the injured fish after escaping. We should continue research using another common entrance, called gooseneck type, which does not allow fish to easily exit pots.

Biodegradable material as escape panels should be introduced in all fish pots. Each fisheries sector should do research on which local material is adequate and put it in place to better manage their fisheries.

To get more accurate estimates, the ground survey as fish pots census should be conducted to know the best type of fish pot and the design of its entrance.