

Characterization of the Jamaican Spearfishing Sector

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ABSTRACT

A questionnaire-based study conducted in the first quarter of 2009 showed that greater numbers of spearfishers presently exist than were previously estimated. Some 2% of fishers are spearfishers whereas previously the estimate was 1%. However, on the third largest landing site, spearfishers comprised nearly 50% of all fishers. Some fishers use boats, but many north coast fishers do not, instead simply swimming to the nearby reefs. Fishing effort is very high, with 4 hour trips done 5 days per week. Mean catches using mostly home-made and commercial spearguns, are estimated at a surprisingly high 3,500 kg/spearfisher/yr. Dominant species landed were parrotfishes, jacks, groupers, snappers, barracuda, spiny lobsters and octopus. Spearfishers report increasing numbers of the Pacific-invasive species, the lionfish *Pterois volitans*, which was first reported in 2008. Best fishing season was the summer months. Most fishers reported they would have no alternative income if spearfishing was to be banned. The spearfishing sector thus annually harvests a far greater quantity of fishable resources than was previously imagined.

KEY WORDS: Spearfishing, reef fishes, Jamaica, management

Primera Caracterización del Sector de la Pesca de Arpon de Jamaica

Un estudio de cuestionario-basó realizó en el primer trimestre de 2009 mostró que los números más grande de spearfishers actualmente existen que fueron estimados anteriormente. Unos 2% de pescadores son spearfishers mientras que anteriormente la estimación fue 1%. Sin embargo, en el tercer spearfishers más grande de sitio de aterrizaje comprendió casi 50% de todos pescadores. Algunos pescadores utilizan los barcos, pero muchos pescadores del norte de costa hacen no, en lugar simplemente swimming a los cerca arrecifes. El esfuerzo pesquero es muy alto, con viajes de 4 horas hechos 5 días a la semana. Las capturas promedio utilizando arpones submarinos en su mayor parte hecho en casa y comercial, son estimadas en un sorprendentemente alto 3.500 kg/spearfisher/año. La especie dominante rural fue loros, los gatos, los meros, los pargos, la barracuda, langostas y pulpo con púas. El informe de Spearfishers los números crecientes de la especie del pacífico Invasivo el Lionfish, *Pterois volitans* de que fue informado primero en 2008. Mejor temporada de la pesca fue los meses del verano. La mayoría de los pescadores informaron ellos no tendrían los ingresos alternativos si spearfishing fue de ser prohibido. El sector de spearfishing así cosecha anualmente una cantidad mucho más grande de recursos de fishable que fue imaginado anteriormente.

PALABRAS CLAVES: Spearfishing, peces arrecifes, Jamaica, direccion

La Première Caractérisation du Secteur de Spearfishing de Jamaïque

Une étude de questionnaire basé a dirigé dans le premier trimestre de 2009 a montré que les plus grands nombres de spearfishers existent bientôt qu'ont été auparavant estimé. Quelques 2% de pêcheurs est spearfishers tandis qu'auparavant l'estimation était 1%. Cependant, sur le troisième plus grand spearfishers de site d'atterrissage a compris presque 50% de tous pêcheurs. Quelques pêcheurs utilisent des bateaux, mais beaucoup de côte pêcheurs du nord ne font pas, plutôt simplement swimming aux récifs proches. L'effort de pêche est très haut, avec 4 voyages d'heure faits 5 jours par la semaine. Les prises moyennes utilisant fusils à harpon surtout des faits à la maison et commerciaux, sont estimé à un étonnamment haut 3.500 kg/spearfisher/l'an. L'espèce dominante atterrie était parroquettes, les crics, les mérour, les lutjanidés, le barracuda, les homards et la pieuvre épineuses. Le rapport de Spearfishers les nombres croissants de l'espèce Pacifique-Invasif le Lionfish, *Pterois volitans* qui a été premièrement rapporté en 2008. La meilleure saison de pêche était les mois d'été. La plupart des pêcheurs ont rapporté ils neaient auraient pas d'autre choix le revenu si spearfishing était être interdit. Le secteur de spearfishing annuellement moissonne ainsi une plus grande quantité éloignée de ressources de fishable que s'a été auparavant imaginée.

MOTS CLÉS: Spearfishing, poissons arecif, Jamaïque, administration

INTRODUCTION

Jamaica lies to the centre of the southwest Caribbean Sea, and is the third largest of the Greater Antilles with a total area of 10,940 km² a population of approximately 2.8 million (Aiken 2008) and a coastline of 885 km. The fishing industry is primarily artisanal and small scale, but is surprisingly diverse and complex (Halcrow 1998). In Jamaica, there are at least 15,000 active (but as many as 20,000) fishers and at least 3,500 registered fishing vessels operating from 168 landing sites island-wide. The artisanal fishery operates over inshore and offshore areas has been considered by many to be the 'employer of last re-

sort' (Figure 1). The inshore fishery takes place in the coastal waters of the island shelf and its nine proximal banks. Historically, this area has supported the bulk of the fishery activities in terms of manpower and vessel. Larger decked vessels seasonally target lobster and conch on the offshore banks, primarily the Pedro and Morant banks to the south and southeast respectively, but also the smaller offshore oceanic banks such as Formigas, Henry Holmes and Grappler Banks to the northeast.

Annual catches of marine fishes from 1986 to 1995 showed a downward trend ranging from 9,100 to 4,200 t. Since 1991 a commercial offshore conch fishery has

greatly expanded. Industrial conch vessels in the offshore conch fishery operate by diving in deeper waters using Scuba and hookah. The principal item of fishing equipment used in Jamaica's artisanal fisheries in the Z-type Antillean fishpot, a fish trap using skeleton of mangrove, wild coffee, sweetwood or lancewood sticks covered with meshwire of 4.13cm (1.25 in) maximum aperture. The average trap size is 180 × 120 × 60 cm, and 64% of all fishing boats use fish traps. Other common gears are gill and seine nets (18%), hook-and-line (16%) and spear guns (1%). The use of dynamite is not uncommon.

Fishing has provided the means of livelihood for thousands of Jamaicans for many years, and contributes significantly to economic growth. In 2003 the Fishing industry in Jamaica contributed \$1,113.9 million to the Gross Domestic Product (GDP). Total exports amounted to 1,363,693 kg, valued at US\$ 11.4 million in 2001 and accounted for eight percent (8%) of all agricultural exports.

The main fishing gears everywhere are fish traps (pots) and beach seine, tangle and gill nets, followed by handlines, spearfishing and some use of illegal explosives. Over the period since 1980 especially, there has been steady increase in the number of fishers employing nets of various kinds, in an apparent attempt to avoid widespread pot theft. By 1996 net fishing gears contributed 40% of all gears employed, equaling the use of pots (Fisheries Division, 1997). Many fishers employ more than one type of gear (Espeut and Grant 1990). North coast fishers are mainly part-time as opposed to the largely full time ones on the south coast. Marketing is by a large diffuse higgler (small-scale vendor) system (Aiken 2008).

A spear gun is a gun-like device designed to fire a spear, usually underwater, in order to impale an edible fishable aquatic resource which includes fishes. Spear guns come in a wide variety of designs. Some use rubber bands, while some use compressed carbon dioxide gas or air to provide the propulsive force that drives out the spear, usually metallic in construction and thus into the animal target. All spear guns have a trigger mechanism that holds a spear in place along the barrel. The spear is connected to the gun by line of some resilient material strong enough to resist the effort of the catch which may be initially violently struggling away.

The Problem

Spearfishing is one of the few techniques where each target is individually selected so fishermen usually only catch what they want to catch.

(www.jamaicagleaner.com/20070119).

Unfortunately, local populations of adult fish can be removed completely where reef species are heavily targeted in spearfishing, and this could cause regional extinction of the species. Improperly practiced spearfishing kills the adult as well as the immature reef fishes after a period of time. Spearfishing is not normally a destructive fishing practice as it removes very large fishes that might not be able to enter for example, fish traps due to their size. However, in an overfished fishery such as Jamaica, small fishes are all that remain. This situation would have an impact on the target resources and may also affect non-target species, as they would have less prey to feed on. Additionally, excessive removal of fishes like grunts



Figure 1. Study Area included several coastal sites all around Jamaica (image from Magellan).

(Haemulidae) which feed on invertebrates, surgeonfishes (Acanthuridae), which graze heavily on low algae, cause reef corals to become overgrown and shaded out and to eventually die. The reef quickly crumbles away, and all life forms on it are lost. When spearfishing is done repeatedly in areas which are already overfished and not extensive but relatively narrow, as found on the north Jamaican coast, intense spear fishing will very likely create problems of severe overfishing and eventually collapse of the entire coral reef fishery itself in all its components, such as trap, line, and net fishing. Spearfishing is supposedly highly selective, but within education and proper regulations, spearfishing can be one of the most ecologically sustainable forms of fishing.

OBJECTIVES

The Fisheries Advisory Board of the Ministry of Agriculture and Fisheries indicated to the second author (KA) that there was need for a study of the spearfishing sector. It was discovered that there was no previous detailed study and thus a survey was organized. An undergraduate from the Department of Life Sciences of the University of the West Indies was assigned to undertake this work under his supervision. A suitable questionnaire was designed and tested. Fisheries Division personnel advised on the landing sites (fishing beaches) to survey islandwide and staff members accompanied the interviewer into the field on all occasions.

The principal objective was therefore to produce an accurate first description of the sector and to determine its overall extent and relative importance. Another objective for this study was also to investigate reports of widespread abuse by spearfishers (landing large numbers of immature fishes, lobsters and other resources) and possibly form the basis of a ban on spearfishing in Jamaica.

METHODOLOGY

An islandwide spearfishing data based on the application of a suitable questionnaire designed with 30 questions for fishers and interviews on at least one beach per parish for ten parishes out of Jamaica’s 14 parishes. A preliminary version was tested in the field and modifications made. Close consultation with the Fisheries Division provided personnel to guide and location key informants at each site visited. A total of 19 landing sites (fishing beaches) in 10 out of a total of 14 parishes (administrative districts), were visited. This provided face-to-face interviews with 101 fishers who generally all cooperated, despite the high question number (30) on the sheets that were administered. The regions visited were as follows:

- i) Port Henderson, St.Catherine,
- ii) Hellshire, St.Catherine,
- iii) Old Harbor, St.Catherine,
- iv) Rocky Point, Clarendon,
- v) Rocky Point, St. Thomas,
- vi) Alligator Pond, Manchester,

- vii) Black River and Long Acre, St. Elizabeth,
- viii) Smithfield and St.Mary’s Beach, Westmoreland,
- ix) Salem, Sailor’s Hole and White River, St. Ann,
- x) Annotto Bay Beach, Robin’s Bay and Pagee, St.Mary,
- xi) Falmouth, Trelawney, and
- xii) Harvey’s Beach and River Bay Beach, St.James

Over the period of three months starting from January 8, 2009 and ending on March 28, 2009, eleven trips were made to nineteen different beaches or sites in different parishes to collect data from 101 spearfishers. The age analysis of the interviews with 101 fishermen on the nineteen different beaches in various parishes shows a mean age of 36 years (s.d ± 5.4). The data shows that on average 17 yrs (s.d ± 4.8) of the fisherfolk’s life is spent fishing (Figure 2 and 3, Table 1).

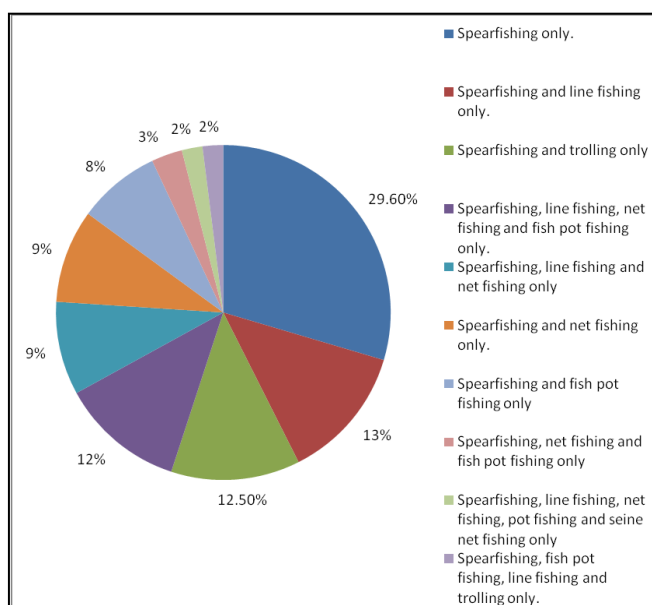


Figure 2. Fishing gears used by spearfishers from North coast beaches.

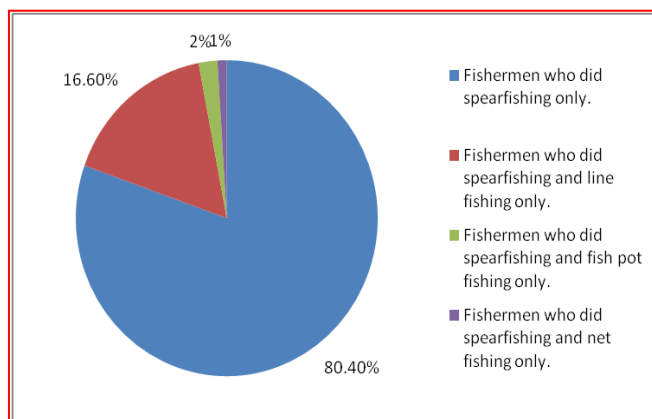


Figure 3. Fishing gear used by spearfishers from South coast beaches.

Table 1. Fishing gear used by spearfishers (ranked) for north coast and south coast beaches surveyed in the present study. Note multiple gear use by spearfishers.

Fishing gear used (ranked) for North Coast Beaches	Fishing gear used (ranked) for South Coast Beaches
Spearguns	1. Spearguns
Hand-lines	2. Hand-lines
Trolling	3. Fish Pots
Fish Pots	4. Nets
Gill Nets	
Seine Nets	

Fishing Effort and Best Season

Mean number of days spearfishers went fishing was 5 days per week (s.d ± 1.24) for all sites sampled. This is very high effort and is much higher than expected. A total of 80% of the spearfishers said that “summer” (July, August, September) was the best season followed by spring, autumn, then winter, while the remaining 20% said there no best season for spearfishing.

Mean Amount of Time Spent Spearfishing

Mean time spent in water spearfishing on the north coast and south coast beaches was four hours. This time was longer than previously imagined. Group effort was apparent from this study as most spearfishers were accompanied by at least three other persons on each trip.

DISCUSSION

Cost- benefit Analysis of Spearfishing

A basic assessment showed that quality fish taken by spearing are the most valuable of the three categories of mixed reef fish. Common fish are intermediate in value and this is in keeping with trap caught fishes. Trash fish are the lowest priced species of mixed reef fish (Fisheries Division/CFRAMP 1997). One section of the island quality fish (e.g. Snapper) was priced for J\$218 - \$258 per lb (US\$2.42-\$2.78). Prices for common fish was J \$135-\$205 per lb (US\$1.50 - \$ 2.28) and for trash fish J\$136 (US\$1.51).

Spearfishers' catches average a surprising 15 kg per trip. Spearfishers are able to target larger, reproductively valuable fish including species such as parrotfish (Scaridae), snapper (Lutjanidae), grunt (Haemulidae), doctorfish (*Acanthurus chirurgus*), jack (Carangidae) and barracuda (Sphyraenidae), (see Table 2).

Table 2. List of the fish species caught by spearfishing

Fish species landed by spearfishers in ranked order (all beaches visited)

Parrotfish (Scaridae)
Snapper (Lutjanidae)
Grunt (Haemulidae)
Doctorfish (<i>Acanthurus chirurgus</i>)
Jack (Carangidae)
Barracuda (Sphyraenidae)
Butterfish (Serranidae)
Wenchman (Holocentridae)
Grouper (Serranidae)
Goat Mullet (Mullidae)
Turbit/triggerfish (Balistidae)
Angel fish (Pomocathidae)
Snook (Centropomidae)
Kingfish (Carangidae)
Others;
Shad (Gerreidae)
Atlantic spade fish (Ephippidae)
Panga (Sparidae),
Marlin (Istiophoridae),
Bonito (Scombridae)
Squirrelfish (Holocentridae)
Coney (Serranidae)

Spearfishing Catches

Mean catches average a surprising 16.45 lbs (s.d ± 1.58), with the frequency of trips of five out of seven days per week. If five percent of all fishers (20,000 known fishers) are spearfishers, then there may be approximately 1000 spearfishers islandwide.

Sector Production

Based on the daily catches figures from the present study, each spearfisher lands 3,600 kg/ fisher/yr. Even if we correct downwards, total annual spearfishing yield could thus be as high as 3,000 t/yr. This is approximately a third of all other known annual fisheries production (approximately 10,000 t) from a sector which was assumed to be producing far less than 1000t/yr. This first estimate is so high as to be in need of a further later study (Figure 4).

Perception on Spearfish Banning

Approximately 43% of spearfishers have said that they would have a problem if spearfishing is banned and if it was controlled. However, 55% of the spearfishers would not have a problem if it was banned but not controlled. Another 2% would not have a problem if it was banned or controlled.

According to the findings, the majority of spearfishers would have a problem if spearfishing is banned as spearfishing is their only source of income (Figures 5 and 6).

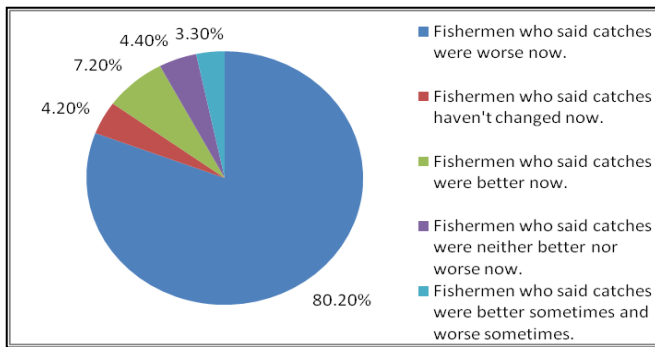


Figure 4. Opinion of spearfishers on catches

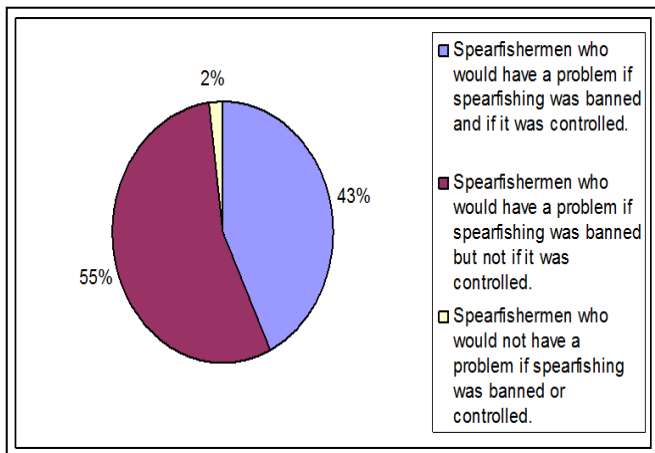


Figure 5. Percentage of spearfishers who would or would not have a problem if spearfishing is banned or controlled

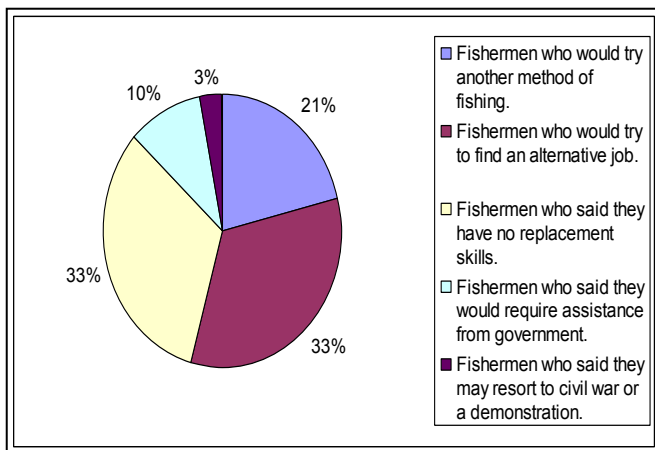


Figure 6. Opinion of spearfishers at all sites visited on alternative jobs if spearfishing was banned.

CONCLUSIONS

It is very important to remember that the present study was a preliminary one which attempted to provide a first description of this unknown sector and thus our conclusions are first estimates which could be modified, following later studies. The average Jamaican spearfisher fishes five days per week a surprisingly high figure. With approximately 1,000 spearfishers islandwide, this is a very high level of fishing effort and is much greater than was previously assumed. Most spearfishers also carry out other types of fishing. The mean catch per spearfisher for one year was more than 3,000 kg or 3 tons/fisher/year. The annual production could be in the order of approximately 3,000 t/year. If this estimate is accurate then spearfishing thus removes a much larger quantity of marine resources each year than was known previously. Most common catch species are parrotfishes, grunts, groupers, snappers and lobsters. Most of these were smaller specimens and some were caught at night. Night spearfishing is strongly condemned by this paper as it takes sleeping reef fishes which have little or no chance to escape. This specific activity must be eradicated completely. Spearfisher numbers have increased between 1999 and 2004. There appears to be a new gear shift from traps and nets to spearfishing, possibly as a result of declining trap catches, high gear costs and trap piracy. The apparent very high levels of spearfishing landings which comprised of mainly fishes and lobsters but of small immature sizes, was a genuine surprise to researchers and a ban on spearfishing is recommended. This ban is in order to protect the under-sized fishable reef resources.

FURTHER RESEARCH

Another study that specifically re-investigates fishing effort, catch composition and value from spearfishing over a longer period than the first study, is strongly recommended along with a socio-economic study which examines :

- i) The economics of spearfishing, and
- ii) The sociological aspects of persons involved in harvesting, distribution and selling of the resources harvested.

These additional data would greatly assist the government agency involved in management of fisheries, to obtain a more complete understanding of spearfishing in relation to other fisheries activities.

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