A General Overview of Sportfishing and a Summary of Billfish Data from Jamaican Recreational Fishery Sources, 1976 — 1986

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ABSTRACT

Desde 1959, Jamaica ha sido una de las mejores áreas para la pesca del marlin azul que se pueda encontrar en el mundo. Los torneos de pesca iniciados en 1959 (Puerto Antonio) y 1960 (Bahía Montego) han continuado en forma exitosa cada año, durante la mejor época de pesca de marlin la cual ha sido reconocida como aquella durante los meses de septiembre y octubre: aunque los pescadores comerciales que corren silga para la pesca del marlin azul, usando líneas de mano, capturan esta especie durante todo el año, fuera de la costa norte de Jamaica. Concurrentemente, Jamaica tiene cuatro torneos internacionales para la pesca del marlin azul por año. En el caso del torneo de Ocho Ríos, éste se lleva a cabo en mayo y en octubre de cada año. Los autores han estado coleccionando datos biológicos y han mantenido récords de captura durante los torneos anuales del marlin azul desde 1976. El torneo de Puerto Antonio, no fue llevado a cabo durante los años de 1978 a 1981 debido a problemas domésticos. por lo tanto no estan incluidos en dichos records. El marlin azul es el foco de pesca recreacional debido a la baja incidencia de otros peces de pico. Un total de 355 marlin azul han sido capturados en torneos, con una distribución desde 25 kilos hasta 268 kilos por animal desde 1982. Todos han sido pesados. medidos, determinados el sexo y el contenido estomacal también ha sido anotado. Menos del 10% de los marlin azul muestreados eran hembras, éstas usualmente pesan sobre los 90 Kg., mientras que el peso de los machos fluctúa entre los 36 Kg. hasta 80 Kg. La industria de botes de pesca de alquiler esta pobremente desarrollada y se continúa mayormente en dos centros de turismo; estos son: Bahía Montego y Ocho Ríos. Las capturas estan compuestas de una variedad de escómbridos, peces de pico y pez dorado, pero no se llevan a cabo récords de estas capturas. En Kingston hay una flota grande de botes privados que se dedican a la pesca deportiva para alquiler. Hay varios bancos fuera de las costas, adyacentes a la costa sur, que son usualmente pescados por pescadores comerciales y recreacionales. Hay una falta de bancos de pesca mar afuera en el caso de la costa norte. El desplegamiento de aparatos para atraer peces (FADs) podria aumentar la pesca recreacional en el futuro.

INTRODUCTION

Since the initiation of international billfish tournaments during the late 1950s, Jamaica has continued to offer some of the finest recreational blue marlin fishing to be found in the world. While blue marlin are caught by the small charterboat fleet all year round, fishing tournaments have been successfully held each year during the prime blue marlin season of availability, which is in September and October. In addition to the annual tournaments and charterboat operations, blue marlin are caught commercially by artisanal fishermen who troll (or drift) for marlin in small dugout or fiberglass canoes.

DISTRIBUTION

Blue marlin are found all around the island, especially near offshore oceanic banks and along the continental shelf edge. Blue marlin are chiefly caught along the island's north coast where deep water (> 200 m) is found within 0.5 km of the shore (Figure 1). The four annual international blue marlin tournaments are held out of Montego Bay, Ocho Rios (2), and Port Antonio (Figure 1). Anglers seldom need to travel more than 5 km offshore in the hunt for marlin and prefer to run east and west along the drop-off, less than 1 km from shore.

Other species normally sought by sports fishermen are the same as those in Florida, the Bahamas, the Virgin Islands, and Puerto Rico. A list of these species and their season(s) of availability is shown in Table 1.

Table 1. Availability of species in the recreational fishery.

Scientific Name	Common Name	Season	Peak
Makaira nigricans	Blue marlin	year round	Sept-Oct
Tetrapturus albidus	White marlin	· —	Jan-Mar
Istiophorus platypterus	Sailfish	_	Scarce
Coryphaena hippurus	Dolphin	year round	Feb-Mar
Acanthocybium solanderi	Wahoo	year round	Feb-Ma
Scomberomorus cavalla	King mackerel	year round	Feb-Aug
Scomberomorus regalis	Cero mackerel	year round	Mar-Sep
Thunnus albacares	Yellowfin tuna	year round	
Thunnus atlanticus	Blackfin tuna	year round	
Euthynnus alletteratus	Little tuna (Bonito)	year round	Sept-Jan
Katsuwonus pelamis	Skipjack tuna	year round	oop. ou.
Elagatis bipinnulatus	Rainbow runner	year round	Apr-July
Caranx hippos	Crevalle jack	year round	ripi-outy
Caranx latus	Horse-eye jack	year round	
Caranx fusus	Bar jack	year round	
Trachinotus falcatus	Permit	year round	
Sphyraena barracuda	Barracuda	year round	
Megalops atlanticus	Tarpon	year round	
Centropomus undecimalis	Snook	•	
Xiphias gladius	Swordfish	year round year round	

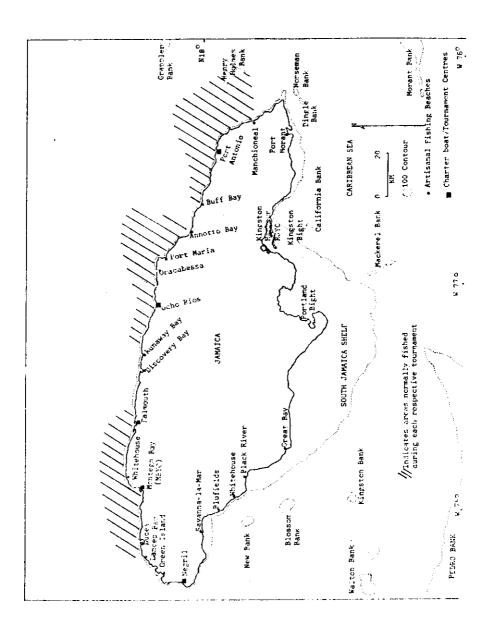


Figure 1. Jamaica - Indicating offshore pelagic fishery (recreational and artisanal)

CHARTERBOAT INDUSTRY

The charterboat industry is poorly developed and is confined largely to the two centers of tourism on the north coast, namely Montego Bay and Ocho Rios. Currently there are only 20 charterboats available as follows: Negril, 1; Montego Bay, 8; Falmouth, 2; Ocho Rios, 8; Port Antonio, 1 (Figure 1). Kingston's Royal Jamaica Yacht Club has a large fleet of privately-owned sportsfishing vessels but none are available for charter. Blue marlin are the focus of the charter and recreational fishery as there is a low incidence of other billfish; generally; however, no catch or effort records are kept. The only data of any significance is being collected during tournaments by the authors. In Jamaica tourism is now one of the pivotal sectors in view of the decline of the bauxite industry.

Watersports generally, and deep sea sportsfishing in particular, have considerable potential as earners of foreign exchange, especially if one considers that it has been estimated between U.S. \$4,000 to \$5,000 is spent in Florida or Puerto Rico (Thornton, pers. comm.) to catch a single billfish. In addition, Jamaica has yet to capitalize on its potential as a yachting destination. With the latent abundance of billfish (blue marlin), the island's economy stands to benefit greatly from upgrading the island's few marinas and the increased promotion of

the sport fishery by the Jamaica Tourist Board.

COMMERCIAL FISHERY

Artisanal fishermen operating out of fishing beaches along the north and west coast, indicated in Figure 1, troll primarily for scombrids, dolphin fish, and billfish in the deep ocean. The narrow shelf along this part of the coast is considered overfished, and the trap and benthic fishery is exhausted, which has resulted in the redirection of effort to the exploitation of offshore stocks (Aiken, 1984). Again no records are kept, but fishermen consistently report that blue marlin are available all year, with a marked increase in abundance in September to November and in January to March. Seasons of availability of other species are shown in Table 1. The best time of month for blue marlin is reported as being during the first quarter and full moon phase of the lunar cycle. Artisanal fishermen use heavy hand lines (150 kg breaking strain) and fish bait is preferred to artificial lures. Prime baits are whole bonito, black fin tuna, houndfish, and moray eels, as well as ballyhoo and strip baits. Drifting with whole dead and live baits has resulted in fights that last up to 36 hours with fish that weigh up to 400 kg. The marlin caught are sold to hotels or for smoking, and the dressed fish may fetch up to J\$7.00 per lb. or U.S. \$1.25 per pound (0.9) kg). At present there is no locally-based longline fishery for billfish, nor do fishermen attempt to fish for swordfish (Xiphias gladius) at night. One reason for the lack of a longline fishery is that there is no locally established market for shark meat and traditionally sharks compose the greatest percentage of the catch in most longline operations (Berkeley, personal communication; Aiken, 1985),

Blue marlin are caught incidentally along the south coast when fishermen, trolling for skipjack tuna, blackfin tuna, and wahoo, have hooked fish overtaken

by a feeding marlin.

Due to the scattered geographical distribution of fishing beaches, and the absence of any central landing places, data collection concerning any aspect of the Jamaican fishing industry is generally difficult (Harvey, 1982; 1986), but due to the increase in co-operation, both from charterboat captains and

commercial marlin fishermen, it is hoped that more billfish catch rate data will be obtained.

A recent addition to the annual tournament calendar has been the inclusion of one-day local canoe tournaments (usually held on the rest day during each tournament). These occasions have been popular since their initiation in 1984 and are well attended by artisanal marlin fishermen in each location, attracting 25 to 45 entries.

Biological data and catch records have been kept during the international blue marlin tournaments, particularly in Port Antonio, since 1959, largely by visiting scientists from the University of Miami or from National Marine Fisheries Service (NMFS), Southeast Fisheries Center, Miami. The Montego Bay Yacht Club Annual Marlin Tournament has continued unbroken for the last 26 years. The Port Antonio International Marlin Tournament, initiated by the Eastern Jamaican Angling Association in 1959 had a gap between 1978 and 1981, but was successfully rejuvenated in 1982 by the Kingston-based group of sports fishermen, the Sir Henry Morgan Angling Association Ltd, assisted by the Jamaica Tourist Board (J.T.B.). In 1984, the Ocho Rios Angling Association was formed and an annual tournament has been held there in May each year. Also in 1984, the Jamaica Big Game Fishing Club was formed though, in spite of its name, membership is thus far limited largely to the Ocho Rios area. This Club holds an annual tournament in the fall. Thus a visiting angler may fish a series of three separate international blue marlin tournaments during September and October of each year in Jamaica.

BIOLOGICAL DATA

Jamaican fishing competitions provide a special opportunity for fishery biologists to work on many fish samples at the same time under fairly controlled conditions. The continued high catch rates at all tournaments have enabled the sampling of 573 blue marlin since 1976 and up to the end of the 1986 season. Table 2 shows overall catch figures since 1976. Overall catch rates have greatly improved in both Montego Bay and Port Antonio tournaments since the introduction of the use of artificial lures during 1982-83 as against the use of fish bait prior to that time. Increased catches have helped promote tournaments both locally and abroad, and the increase in number of sportsfishing boats owned by Jamaicans has helped boost participation. Local record overall catches were recorded for Montego Bay in 1982, 1985, and 1986; and for Ocho Rios in 1986. Local record catches for Port Antonio occurred in 1983, 1985, and 1986.

All fish were sampled for total (overall) length, fork length, weight, sex, stage of gonadal development (1 - 4) and stomach contents. Other parameters such as use of lures versus bait, time of "hook-up" and body deformities were also recorded. One of the most basic patterns of a fish population are demonstrated by its size frequency distribution which is a record of the sizes and sex of fish in the population. As mentioned previously, the blue marlin examined have mostly been caught at one time of year (September-October), when small males far outnumber larger females. However, the distinct difference in size between males and females (sexual dimorphism) is recorded in the blue marlin worldwide. Most of the small fish are males (Figure 2) with 95% of the males weighing between 75 pounds and 175 pounds (32.9 - 79.4 kg). Females dominate the larger size classes and reach weights much greater than males. Most females (80%) weighed between 175 pounds and 590 pounds (79.4

Table 2. Blue Martin Catches in Jamaican Tournaments 1976-1986.

Year	Location	Dates	Anglers	Boats		Hours Fished	No.Hooks Reported	Martin Raised Per Hr
1976	MBYC	Sept 8-11	21	6	3.5	288	12	0.042
	PA	Oct 4-8	_	16	5.0	752	50	0.066
1977	MBYC	Sept	42	8	3.5	322	9	0.028
	PA	Oct		14	5.0	658	53	0.080
1978	MBYC		47	11	3.5	423	13	0.031
1979	MBYC	Sept 25-28	37	9	3.5	346	15	0.043
1980	MBYC	Sept	29	8	3.5	308	17	0.055
1981	MBYC	Sept	45	12	3.5	462	14	0.030
1982	MBYC	Oct 16-19	36	10	3.5	385	35	0.091
	PA	Sept 27-						0.047
		Oct 1	203	42	5.0	2058	96	0.069
1983	MBYC	Sept 15-19	66	15	3.5	577	40	0.084
	PA	Oct 10-14	292	58	5.0	2842	240	0.066
1984	OR	May 14-16	80	20	3.0	635	42	0.034
	MYBC	Sept 20-24	95	16	4.5	784	30	0.094
	PA	Oct 1-5	229	51	4.0	2244	211	0.060
	OR	Oct 11-13	88	22	3.0	693	42	
1985	OR	Apr 30-May 3	90	15	4.0	630	23	0.036
	MBYC	Sept 9-14	98	17	4.5	1156	112	0.096
	PA	Sept 23-27	225	50	4.0	2195	270	0.123
	OR	Oct 11-13	80	20	4.0	802	32	0.040
1986	OR	May 20-24	45	10	4.0	420	39	0.093
	MBYC	Sept 8-13	115	24	4.5	816	67	0.082
	OR	Sept 22-27	85	18	4.5	789	98	0.124
	PA	Oct 6-10	245	63	4.0	2421	265	0.109

- 310 kg) but they may attain weights of over 1,000 pounds (454 kg). Previous age and growth studies indicate that the size difference between sexes in blue marlin is the result of different growth rates. Small females have also been found, indicating that this species does not undergo a sex change from male to female as they grow.

The majority of males (79%) are in a ripe or running ripe (gonad developmental stage 3 or 4; gonad index > 1%) in September-October. The few females sampled have had spent (stage 1) or ripe ovaries (stage 3), but none have been sampled with running ripe ovaries (stage 4). Previous studies have indicated that blue marlin are batch spawners, with Pacific blue marlin spawning several times in one season which is estimated as occurring in June-August by Hopper(1986). In Jamaica and elsewhere, anglers and boat captains report that they frequently see a single large (female) marlin accompanied by two or more smaller marlin (presumably male), and that multiple hook-ups (two or more fish

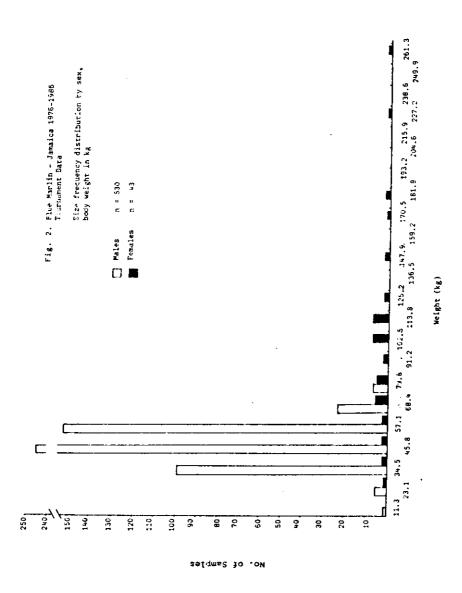
Table 2 (continued).

Year	Location	Dates	Mariin Landed Per Hr Troiling	Marlin Per Boat	Landed	Mariin Caught	Blue	Billfish
1976	MBYC	Sept 8-11	0.017	0.83	5	0	145	1 SF
	PA	Oct 4-8	0.019	0.87	14	0	232	
1977	MBYC	Sept	0.012	0.50	4	0	160	
	PA	Oct	0.012	0.57	8	0	147	1 SF
1978	MBYC		0.012	0.45	5	0	147	
197 9	MBYC	Sept 25-28	0.009	0.33	3	0	134	
1980	MBYC	Sept	0.006	0.25	2	0	142	
1981	MBYC	Sept	0.013	0.50	6	0	145	
1982	MBYC	Oct 16-19	0.057	2.20	22	0	242	
	PA	Sept 27-						
		Oct 1	0.014	0.66	28	15	519	
1983	MBYC	Sept 15-19	0.021	0.80	12	50	298	
	PA	Oct 10-14	0.025	1.24	72	61	270	
1984	OR	May 14-16	0.028	0.90	18	95	590	
	MYBC	Sept 20-24	0.009	0.43	7	65	335	1 SF
	PA	Oct 1-5	0.022	0.98	50	96	334	1 WM
	OR	Oct11-13	0.024	0.77	17	100	169	1 SF
1985	OR	Apr 30-May 3	0.005	0.20	3	100	185	3 WM
	MBYC	Sept 9-14	0.026	1.76	30	85	189	
	PA	Sept 23-27	0.031	1.36	68	97	248	
	OR	Oct 11-13	0.017	0.70	14	100	268	
1986	OR	May 20-24	0.031	1.30	13	100	395	1SF,1WM
	MBYC	Sept 8-13	0.042	1.41	34	90	268	
	OR	Sept 22-27	0.042	1.83	33	100	170	1 SPF
	PA	Oct 6-10	0.043	1.67	105	100	262	1WM,1SF
	BM = Blu	e Marlin WM	= White N	Aarlin S	SPF = Spea	urfish S	F = Sailfish	1

striking simultaneously) are fairly common. This suggests that the presence of several males may be needed to ensure successful fertilization during the breeding season. A male blue marlin of 72 pounds (32.6 kg) was shown to be sexually active, whereas a 70 pound (31.8 kg) female was shown to be inactive; an active 173 pound (78.5 kg) female having a gonad index of 3.54% was found in September 1986, and an active female of 140 pounds (63.5 kg) had a gonad index 2.96% in September 1984.

STOMACH CONTENTS

Since the introduction of artificial lures to Jamaica in 1982-83, there has been a marked increase in the number of blue marlin boated with their stomachs not everted, thus providing information on food. When using natural bait, the billfish tend to be hooked in their belly, and evert their stomach outside the mouth, ejecting all stomach contents, in an effort to get rid of the hook. The blue



marlin is known to feed in and near surface waters, but sometimes takes food in relatively deep waters as has been suggested by the finding of a number of deep water species during this study. They are also known to kill or stun their prey by spearing or hitting it with their bill, but many food items have been found whole, apparently unscathed, in which case the marlins have probably outrun and overtaken the prey. Some of the largest food items found since 1982 include a 19 pound (8.6 kg) yellowfin tuna in a 248 pound (112.5 kg) marlin, an 18 inch (45.7 cm) swordfish in a 159 pound (70.5 kg) marlin, a 34 inch (86 cm) lancet fish (Alepisaurus ferox) in a 114 pound (51.7 kg) blue marlin. Some specimens had up to nine 14 inch (35.5 cm) skipjack tuna (Katsuwonus pelamis) in their stomachs. Small food items such as juvenile surgeonfish, triggerfish, filefish,

pufferfish, and jacks of 2 to 3 cm are readily consumed.

In contrast to other reports (Nakamura, 1985) not one flying fish (Exocoetidae) has been collected from marlin stomachs in Jamaica since 1982. Flying fish abound in Jamaican coastal and offshore waters, especially in the areas that are frequented by blue marlin, and they are one of the most important food items for dolphin and wahoo. There appears to be no simple explanation for the absence of flying fish from blue marlin stomachs. Table 3 gives a breakdown of stomach contents composition since 1982, from a total of 16 fishing tournaments (526 fish). It can be seen that blue marlin caught along Jamaica's north coast heavily depend on tuna-like fishes, deep water snake mackerel(Gempylus serpens), and cephalopods. The high incidence of the Goggle-eye Jack (Selar crumenophthalmus) in 1982 from Montego Bay Yacht Club stomach contents was due to the presence of a very large shoal of this bait fish along the continental shelf just east of Montego Bay, at the time of the tournament. As marlin are seldom sampled at any other time of year, it is not known, if feeding patterns and composition changes. It is reported, that blue marlin visiting the offshore banks to the south of the island (Figure 1) in November-February each year take advantage of the huge schools of small blackfin tuna (Thunnus atlanticus). With no banks off Jamaica's central north coast, it is probable that the blue marlin are migrating as there is little bait to hold billfish in the area.

Harvey (1986) has suggested the use of Fish Aggregation Devices (FADS), which are now commercially manufactured in Florida (Greg McIntosh, personal communication), along the north coast shelf edge. FADs will probably attract and hold schools of small scombrids, carangids, clupeids, and engraulids and attract a corresponding number of billfish and large scombrids. It is considered that FADs are likely to improve catch rates in the charterboat, tournament, and artisanal fishery. When placed close to shore, FADs are easily monitored and may become accessible to all users in the near future.

CONCLUSION

Jamaica is fortunate in having a year-round recreational fishery for blue marlin which is currently exploited by charterboats, artisanal canoes and by a number of tournaments. Three of the four international tournaments are held during the annual period of peak abundance (September-October) and this is reflected by the high total catches seen in 1984 (72 blue marlin), 1985 (112 blue marlin), and 1986 (172 blue marlin). Catch rates have improved since 1982 due to more promotion by the Jamaica Tourist Board, more participants, and the use of state of the art fishing tackle. Since 1983, each of the three locations have

Table 3. Results of blue martin stomach analyses. Mean percentage of food items in stomach contents of specimens from Montego Bay Yacht Club (MBYC), Ocho Rios (OR) and Port Antonio (PA).

Month /Year	Location	No. Boated	No. with Contents	50% Dominant	10%-50% Common	10% Present	Largest Measured (cm)
Sept'82	A	58	17	K. pelamis T. atlanticus 12-25 cm	Cephalopods	C. hippurus Alepisauridae Balistidae Carangidae	28 cm
Oct'82	MBYC	22	6	S. crumenophthalmus 15-19 cm	Scombridae Cephalopods	Belonidae Tetraodontidae Balistidae Istiophoridae	32 cm 19 cm
Sepr'83	MBYC	2	01	K. pelamis T. atlanticus	Cephalopods Gempylidae	Acanthuridae Alepisauridae Balistidae Tetraodontidae	32 cm 37 cm
Ocr83	ď	87	20	Cephalopods 12-23 cm T. atlanticus	Scombridae Carangidae	Carangidae Belonidae Balisbdae Acanthuridae Alepisauridae Monacanthidae	15 cm 40 cm 41 cm
May'84	8	82	41	K. pelamis	C. hippurus 22-27 cm Cephalopods	Diodontidae Emmelichthyidae Belonidae Balistidae Monacanthidae	36 cm 14 cm

9 Table 3 (continued).

Month / Tear	Location	No. Boated	No. with Contents	50% Dominant	10%-50% Common	10% Present	Largest Messured (cm)
Sept'84	MBYC	7	အ	K. pelamis T. atlanticus	Cephalopods Gempylidae	Carangidae Belonidae	36 cm
						Alepisauridae	29 cm
						Scombridae	32 cm
						Istiophoridae	22 cm
Oct'84	Αď	20	4	T. atlanticus	C. hippurus	T. albacares	42 cm
				Cephalopods	Gemylidae	Balistidae	24 cm
					T. attanticus	Belonidae	56 cm
						Monacanthidae	
						Carangidae	
						Xiphiidae	46 cm
						Tetraodontidae	
Oct'84	ဗ	17	12	Gempylidae	T. atlanticus	Hemiramphidae	
				K. pelamis	Cephalopods	Belonidae	26 cm
				14-40 cm		Carangidae	
						Alepisauridae	38 cm
						Istiophoridae	42 cm
Apr/May'85	6	ო	7	T. atlanticus	'Gempylidae	Carangidae	
						Monacanthidae	
						Belonidae	22 cm
Sept'85	MBYC	ස	ន	T. atlanticus	Cephalopods	Gempylidae	
				K. pelamis	22 cm	Belonidae	29 cm
				16-38 cm		Istiophoridae	39 cm
						Acanthuridae	2 cm
						Monacanthidae	
						Tetrandontidae	22 cm

Table 3 (continued).

Month /Year Location No. Bosted	Location	No. Boated	No. with Contents	50% Dominant	10%-50% Common	10% Present	Largest Measured (cm)
Sept'85	&	89	8	Gempylidae T. atlanticus	Cephalopods K. pelamis C. hippurus	Carangidae Belonidae Acanthuridae Alepisauridae Istiophoridae T. albacares Ostraciochonidae	32 cm 76 cm
Oct'85	e E	4	01	Scombridae	Belonidae	Balistidae Cephalopods	
May'86	e e	55	=	Data not collected by author Gempylidae T. atlanticus Belonida	ted by author K. pelamis Belonidae	Cephalopods C. hippurus	29 cm
						Tetraccontidae Acanthuridae Alepisauridae	16 cm
Sept'86	MBYC	34	g	K. pelamis 6-43 cm	Belonidae T. atlanticus	Sargassum Gempylidae Alepisauridae	% c⊪
					5-18 cm Cephalopods Small fish	Hemiramphidae Carangidae Balistidae Monacantridae	18 cm
						Tetraodontidae	26 cm

attracted the maximum number of participating boats that each facility can comfortably accommodate. If an increase is further desired by the respective angling associations, then the facilities must be upgraded, with assistance from

the government, in terms of docking space, power supply, and water.

At present the number of blue marlin boated is quickly absorbed by the hotel trade. However there is a school of thought that contends that Jamaicans should begin to release blue marlin, in order to conserve this excellent sportfishery. Meanwhile there has been a positive change in attitude in terms of sportsmanship, whereby more anglers are using lighter tackle during tournaments. In addition Jamaica has recently had two new IGFA representatives appointed, one of whom is the senior author of this paper.

The swordfish fishery remains completely unutilized in Jamaican waters, partly as the result of the excellent blue marlin fishing and partly due to lack of

expertise in drift fishing at night.

The Government Agency responsible for the development and management of the fishing industry in Jamaica, the Fisheries Division, has historically maintained a low level of involvement in sportfishing due mainly to staffing constraints. The Fisheries Division administers the Fishing Industry Act of 1975 which requires that all anglers and fishing vessels involved in sportfishing in Jamaica be licensed and registered. In 1976, 1977, and 1986 officers from the Fisheries Division attended the International Marlin Tournaments in Port Antonio and collected biological data on the catch. During 1976 an attempt was made to have Kingston based sportsfishermen voluntarily assist in the collection of catch and effort data by completing a log book while at sea and returning it to the Fisheries Division when they return to Port. This project had very limited success. The Fisheries Division intends to play a more active role in sportfishing in Jamaica by closely monitoring the catch and effort at each fishing tournament.

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