RECENT BILLFISH CATCH DATA FOR BARBADOS (1987-1992)

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ABSTRACT

Annual recorded landings of billfish in Barbados over the last 5 years have fluctuated between 33 and 77 mt, and actual landings may be 3 times greater. Billfish landings account for between 2.2 and 4.5 % of the total annual fish catch. The proportion of billfish in the catches of pelagic boats varies with fishing method. The catches of traditional boats fishing surface handlines comprise approximately 1.3% billfish, those of longline boats fishing deep-set lines over night comprise approximately 15% billfish, whilst those of longline boats fishing shallower lines during the day comprise approximately 46% billfish. The overall billfish catch for Barbados is estimated to comprise 69% sailfish, 18% blue marlin, 9% white marlin and 4% spearfish.

RESUME

Les débarquements annuels d'istiophoridés enregistrés aux Barbades depuis cinq ans ont fluctué entre 33 TM et 77 TM, et il se peut que les débarquements réels soient trois fois plus importants. Les débarquements d'istiophoridés constituent de 2,2 % à 4,5 % de la prise annuelle totale de poisson. Le pourcentage d'istiophoridés dans les prises des bateaux pélagiques varie selon la méthode de pêche. Les prises des bateaux traditionnels qui pêchent à la ligne à main de surface comportent environ 1,3 % d'istiophoridés, celles des palangriers qui mouillent des lignes de profondeur la nuit comprennent à peu près 15 % d'istiophoridés, alors que celles des palangriers qui pêchent de jour dans des eaux plus superficielles comportent environ 46 % d'istiophoridés. La prise globale d'istiophoridés aux Barbades est estimée comporter 69 % de voilier, 18 % de makaire bleu, 9 % de makaire blanc et 4 % de Tetrapturus pfluegeri.

RESUMEN

Los desembarques anuales de marlines registrados en Barbados durante los últimos 5 años, han fluctuado entre 33 y 77 t, pero la cifra real podría ser tres veces superior. Los desembarques de marlines representan entre el 2.2 y el 4.5 por ciento del total de la captura anual. La proporción de marlines en las capturas de los barcos pelágicos varía con el método de pesca. Las capturas de los barcos tradicionales que pescan con liñas de superficie incluyen aproximadamente 1.3% de marlín; las correspondientes a los palangreros que pescan por la noche con palangre profundo, incluyen aproximadamente un 15% de marlín, y las de los palangreros que pescan de día con palangre mas superficial, incluyen aproximadamente 46% de marlín. Se estima que la captura global de marlín en Barbados se compone de 69% de pez vela, 18% de aguja azul, 9% de aguja blanca y 4% de Tetrapturus pfluegeri.

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1. INTRODUCTION

1.1 Characteristics of the Pelagic Fishery

The pelagic fishery accounts for 85-95% by weight of all fishing landings in Barbados. The traditional pelagic fishery is highly seasonal (November-June) and primarily targets flyingfish (*Hirundichthys affinis*) and large pelagics, especially dolphinfish (*Corypheana hippurus*), although other large pelagics including billfish, are taken whenever available. The billfish catch, comprising blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), sailfish (*Istiophorus albicans*) and spearfish (*Tetrapturus pfleugeri*) accounts for approximately 3-6% of the annual total fish landings in Barbados (Oxenford, 1990).

The traditional pelagic fishing fleet which comprises approximately 275 commercial day-boats, 75 commercial ice-boats (introduced into the fleet in the early 1980s) and 20 sport-fishing boats, captures large pelagics on single-hook handlines (commercial boats) or rod and reel (sport-fishing boats). Fishing techniques for large pelagics include trolling in open water, working short lines around floating objects, or drifting with live bait on tethered lines. With all techniques, lines are fished at the surface and the most commonly used bait is flyingfish.

Over the last 4 years, the pelagic fleet has undergone rapid change with the introduction in 1988 of longline fishing, by two Barbados-based US longline boats and two local boats specially equipped for longlining. By the end of the following year (1989) the local longline fleet had expanded to 11 boats, comprising mainly converted ice-boats. The longline fleet has since stabalised at around this number, although there appears to have been a high turnover, with several of the earlier boats leaving the fishery, and new purpose-built boats or refitted ice-boats joining the longline fleet. Unlike the traditional pelagic fleet, these longline boats use mechanically operated, multihook, longlines set below the surface, and primarily target billfish, swordfish (*Xiphias gladius*) and yellowfin tuna (*Thunnus albacares*). Two basically different longlining techniques are being employed by these boats. Some boats are setting shallow longlines (40-65 m below the surface) during daylight hours, baited with flyingfish. Others are setting deep longlines (75-120 m below the surface) overnight, baited with squid and light sticks.

1.2 Catch Data Collection

Barbados has a well established catch and effort data recording system which dates back to 1961 at all major landing sites (Oistins, Speightstown, Baystreet and Cheapside) (Mahon *et al.* 1981). Government personnel record the catch weight by species or species groups for each boat, 6 days a week. Since 1980, a sub-sample of minor landing sites (sheds) have also been monitored. At the end of the 1989 fishing season, a new major landing site was opened, the Bridgetown Fisheries Complex (BFC). This site now handles the catch from two former major landing sites in Bridgetown (Bay Street and Cheapside), and from an additional unmonitored illegal landing site. Despite a comprehensive Government catch data collection system, blue marlin, white marlin, sailfish and spearfish have always been grouped together and recorded as "billfish". The first swordfish landings in 1988 and 1989 were also recorded with this group, although since 1990 they have been recorded separately.

1.3 Billfish Sampling Program

A small-scale billfish sampling program was established in Barbados in late 1988 to examine the species composition and size of individuals in the billfish catch, and to examine the changing nature of the pelagic fishery with regard to billfish catches.

2. METHODS

During the first year (1988/89), all sport-fishing tournaments were monitored, and commercial port sampling was conducted 2-3 days a month, at the then main pelagic fish landing site (Oistins). During the second year (1989/90) all sport fishing tournaments were again covered and commercial port sampling was conducted mainly at the newly opened major landing site (BFC), which had quickly become the most important landing site for the longline fleet, as well as for a large number of the traditional

pelagic boats. In the third and four year (1990/91-1991/92), sampling was moreorless restricted to the sport-fishing tournaments.

At sport-fishing tournaments all billfish were identified to species, measured for the full range of standardised lengths (LJFK, EOFL, PFL, DFL and PAL) to the nearest cm with a flexible tape, and the whole weight of each fish was recorded to the nearest 0.1 kg. At commercial ports, billfish catches were identified to species, measured for a limited set of standardised lengths (PFL, PDL and PAL), and individual dressed weights were recorded to the nearest 0.5 kg whenever possible. Only length measurements comparable between the 2 data sets (i.e. PFL and PAL) are presented here.

To examine the proportion of billfish in overall catches of traditional pelagic boats, 1990 catch records from day-boats and ice-boats landing at Oistins and at Speightstown were used as representative of the traditional fleet. To examine the proportion of billfish in overall catches of longline boats, catch data from the log book of a typical local longline boat were used. These data comprised 12 months (19 trips) of deep-set longlining in 1988/89 and 12 months (29 trips) of shallow-set longlining in 1989/90.

Since billfish are not recorded separately by species in Government catch records, nor in the personal log books of longline boats, the species composition of billfish catches landed by traditional pelagic boats and longline boats landings, was examined by visual observation 2-3 days a month (1988-1992).

3. RESULTS

3.1 Total Catch

Historical billfish catch data at the major landing sites were examined by Oxenford (1990). Recent catch data (1987-1992) for all recorded sites are given in Table 1. The total recorded billfish catch over the last 5 years has fluctuated annually between 33 and 77 mt (Table 1). Recorded landings have for many years been assumed to represent approximately one third of actual total landings. However, since the opening of the BFC in late 1989, which now records all boats previously landing at a major unmonitored illegal site, this official Government correction factor is now under review (Willoughby, per. comm.).

The relative importance of the landing sites for billfish in recent years is shown in Figure 1. The two landing sites in Bridgetown (Bay Street and Cheapside) accounted for over 50% of the annual billfish landings in Barbados prior to 1990. Since the opening of the Bridgetown Fisheries Complex to replace these two former landing sites at the end of 1989, Bridgetown now accounts for 70-80% of all recorded billfish landings in Barbados (Figure 1). Oistins was the most important single landing site up until 1990, accounting for 29-39% of all billfish landings. However, it has declined in importance as a billfish site since 1990. Speightstown has remained of minor importance for billfish (< 3% of all billfish landings) and the combined sheds account for approximately 6% of all recorded billfish landings (Figure 1).

An examination of monthly variation in total recorded billfish landings shows that there is no clear seasonal pattern (Table 2, Figure 2). Billfish landings have been relatively constant over the year, except for 1990 when particularly large billfish landings were recorded in March and April (Figure 2).

3.2 Proportion of Billfish in the Total Catch

The billfish catch has accounted for between 2.2-4.5% of the total fish catch recorded in Barbados over the last 5 years (Table 1). The contribution of billfish to the total fish catch has a marked seasonal pattern, with billfish contributing significantly (13-21% of total landings) during the migratory pelagic "offseason" (July - November), and considerably less (< 3% of total landings) in all other months (Table 3, Figure 3).

The proportion of billfish in the catch also varies with the fishing method (Chi squared 3x2 contingency test: $X^2 = 19599$, df = 2, $P < 0.001$, Figure 4). The total annual catch of traditional pelagic boats fishing surface handlines during daylight hours, comprises around 1.3% billfish. Longline boats

fishing deep-set lines overnight catch around 15% billfish, whilst those fishing shallow-set lines during daylight, catch as much as 46% billfish (Figure 4).

Although the number of longliners operating has remained at around 11 boats for the last four years, the proportion of boats setting deep longlines compared with shallow longlines has changed. The number of boats setting shallow lines has steadily increased over this period to the present (1992) longline fleet which comprises 9 boats using shallow lines and only one boat still engaged in deep set longlining. However, some boats are now contemplating carrying two carts of line, such that they can switch freely between the two types of longline fishing.

3.3 Billfish Species Composition

Sailfish appears to be the most commonly represented species in the billfish catch. Pooled species composition data from 1988-1992 indicate that overall billfish catch composition for Barbados comprises 69% sailfish, 18% blue marlin, 9% white marlin and 4% spearfish by number (Table 4). The data also indicate seasonal differences in species composition of catches, although sample sizes are small. Billfish species composition also appears to vary with fishing method (Chi squared 4x2 contingency test: $X^2 = 42.450$, d.f. = 3, $P < 0.001$; Table 5, Figure 5). Although the species still share the same rank in importance (sailfish, blue marlin, white marlin and spearfish, respectively), the most notable differences are between the proportion of sailfish and white marlin (Figure 5). Traditional pelagic boats catch proportionally less sailfish (47% compared with 75% for longline boats) and proportionally more white marlin (21% compared with 4% for longline boats). No attempt was made to further separate the longline species composition of catches by fishing technique.

3.4 Billfish Size Frequencies

Mean lengths of individual billfish landed by the pelagic fishery in Barbados are given separately by species in Table 6, and mean weights are given in Table 7. Size frequencies based on PAL measurements are given separately for the 3 most important species in Figure 6, and whole weight frequencies are given in Figure 7. Sample sizes are too small to warrant an investigation of different sizes between fishing techniques.

4. DISCUSSION

The relative importance of major landing sites in Barbados for billfish have undergone recent changes. The proportion of the actual total landings which are recorded have also changed with the opening of a major new facility in Bridgetown. The proportion of total landings which is presently recorded by Government personnel is not known, although it is under investigation (Willoughby, per. comm). As such, any time series analysis of billfish landings in Barbados will be complicated.

The overall contribution of billfish (by weight) to the total fish catch is small, but varies with season. This is not surprising given than the target pelagic species (flyingfish and dolphin fish) are highly seasonal and that billfish landings remain relatively steady throughout the year. Furthermore, the proportion of billfish in the catch varies with fishing technique. Annual total landings of billfish in Barbados can therefore be expected to vary, not only in response to variation in abundance of billfish around Barbados and to the number of boats actively fishing (fishing effort), but they can also be expected to vary with the relative proportion of traditional pelagic fishing boats, shallow-set longline boats and deep-set longline boats in the fleet. Although the number of boat trips are recorded in Government records, the type of boat (ice-boat, day-boat or longliner) is only recorded on cash receipts and not entered into official records. Furthermore, the type of longlining (i.e. deep-set or shallow-set) is not recorded at all. As such, interpreting inter-annual variations in billfish catch will require careful examination of fleet structure and fishing techniques.

The billfish group comprises 4 species. However, the species composition appears to change with season, and does vary between fishing techniques. A major constraint of the present Government catch data for billfish is the lack of species separation for this group in official records. This is further compounded by a lack of official records of boat type and no records of fishing technique.

Larger sample sizes are required to examine size composition of billfish catches by different boats in the pelagic fleet.

5. REFERENCE LIST

MAHON, R., W. HUNTE, H. OXENFORD, S. STOREY and R. HASTINGS, 1981. Seasonality in the commercial marine fisheries of Barbados. Proc. Gulf Carib. Fish. Inst. 34: 28-37.

OXENFORD, H., 1990. Historical landings and trends in abundance of billfish at Barbados. ICCAT Col. Vol. Sci. Pap. 32: 398-406.

Table 1. **Billfish landings (kg) recorded at all major landing sites and six minor landing sites (sheds) in Barbados (1987-91).**

Year	Bridgetown	Oistins	Speightstown	Sheds	Total	% Total fish catch
1987	22641	13842	618	2067	39168	3.17
1988	18890	9763	816	3806	33275	3.17
1989	27293	19951	755	3155	51154	4.50
1990	66239	7286	679	2654	76858	3.39
1991	31907	9341	993	2579	44820	2.18

Table 2. **Total recorded billfish landings at Barbados shown separately by month and year (1987-91).**

Month	1987	1988	1989	1990	1991
1	2666	3847	1706	6849	2976
2	2765	2145	2033	2583	2322
3	1379	1379	3171	14901	2826
4	2363	3313	3653	14312	5867
5	2557	2766	3100	6107	4885
6	1988	1974	3804	3773	3309
7	2674	1217	5988	6973	1925
8	5628	1961	4044	8713	2661
9	2581	3024	6188	4123	2959
10	6600	3235	5460	2177	3693
11	5084	5084	5964	2980	7155
12	2883	3330	6043	3367	4242

Table 3. **Monthly billfish landings shown as a percentage of total fish landings in Barbados (1987-91).**

Month	1987	1988	1989	1990	1991
1	1.54	3.07	1.44	5.12	1.90
2	2.01	1.56	2.20	1.28	0.90
3	0.76	0.76	2.48	4.36	0.86
4	1.66	2.55	2.68	4.72	1.71
5	1.76	2.39	1.80	1.21	1.51
6	1.05	1.55	2.93	0.94	1.84
7	4.49	2.79	5.21	14.34	1.90
8	24.48	8.09	11.84	27.04	9.30
9	19.14	15.57	25.44	17.27	12.09
10	38.93	20.96	16.48	15.31	13.97
11	17.19	17.19	13.31	6.96	11.34
12	2.38	3.40	5.63	1.51	1.92

Table 4. **Species composition of billfish catches (by number) for a sub-sample of the Barbados pelagic fishing fleet (1988-92), shown separately by month.**

Month	Blue marlin	White marlin	Sailfish	Spearfish
1	7	4	0	0
2	3	7	3	0
3	9	14	44	3
4	44	16	110	15
5	7	0	30	0
6	4	0	9	0
7	6	0	89	0
8	4	0	34	0
9	0	0	0	0
10	4	0	19	0
11	2	1	5	0
12	1	1	0	0
Total	91	43	343	18
%	18.38	8.69	69.29	3.64

Table 5. **Species composition of billfish catches (by number) shown separately for a sub-sample of traditional pelagic boats using surface handlines, and longline boats using subsurface longlines.**

Species	Surface handlines	Subsurface longlines
Sailfish	58	202
Blue marlin	33	51
White marlin	26	10
Spearfish	7	7

Table 6. **Mean lengths (cm) for a sub-sample of billfish landed by the pelagic fishery in Barbados (1988-92). PAL - pectoral anal length, PFL - pectoral fork length.**

Species	n	PAL	n	PFL
Sailfish	251	58.2	244	97.5
Blue marlin	73	53.4	67	98.7
White marlin	30	40.5	26	80.6
Spearfish	13	40.2	13	85.9

Table 7. **Mean weights (kg) for a sub-sample of billfish landed by the pelagic fishery in Barbados (1988-92).**

Species	n	Whole weight	n	Dressed weight
Sailfish	53	23.2	51	19.4
Blue marlin	27	49.5	23	56.8
White marlin	21	20.5	4	9.0
Spearfish	7	10.9	2	11.0

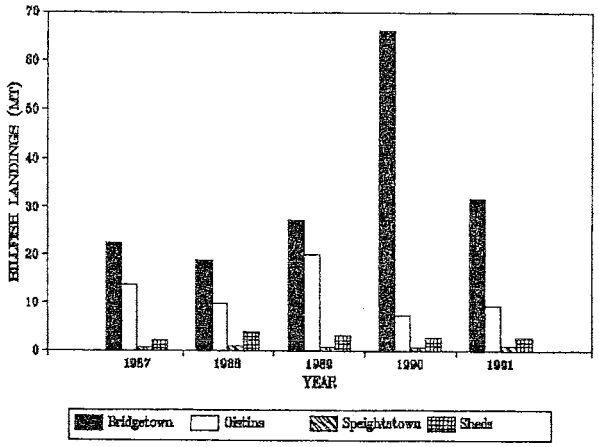


Figure 1. Total recorded billfish landings at Barbados shown separately by landing sites (1987-91).

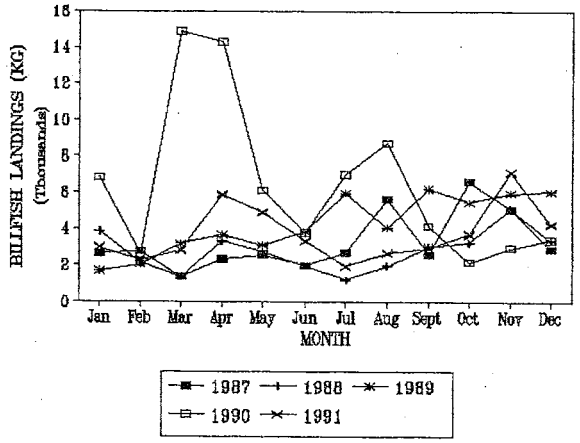


Figure 2. Total recorded billfish landings at Barbados shown separately by month and year (1987-91).

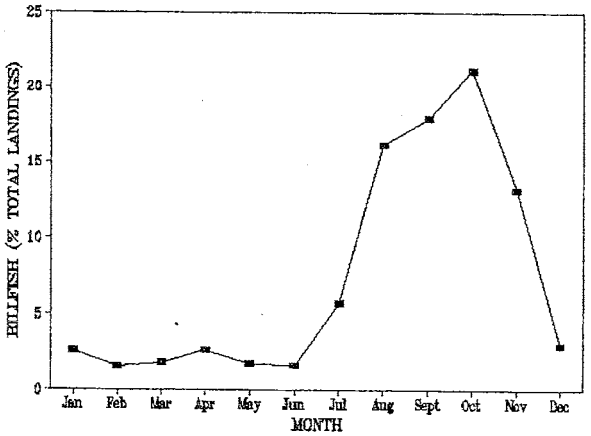


Figure 3. Seasonal contribution of billfish to the total fish landings at Barbados, shown as a 5-year monthly mean percentage of total landings (1987-91).

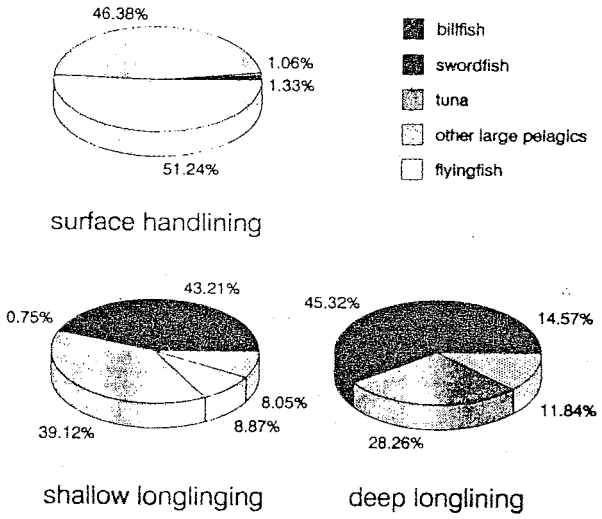


Figure 4. Typical species composition of annual catches landed by the pelagic fishing fleet at Barbados, shown separately by fishing technique.

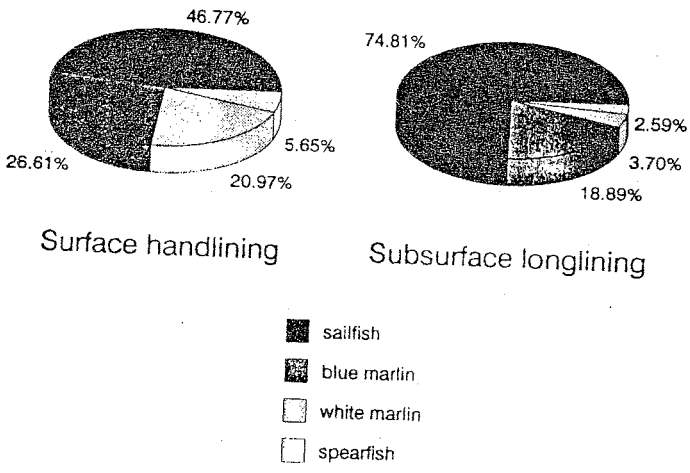
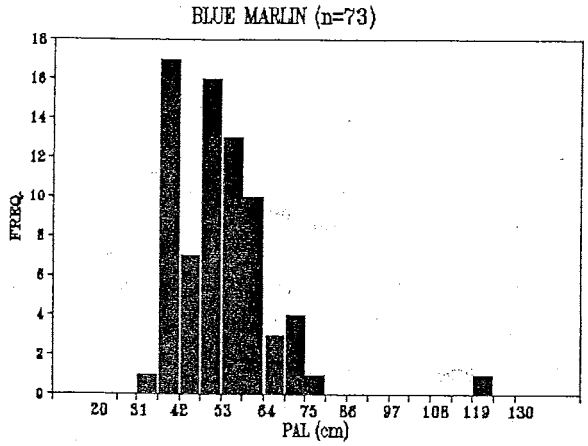
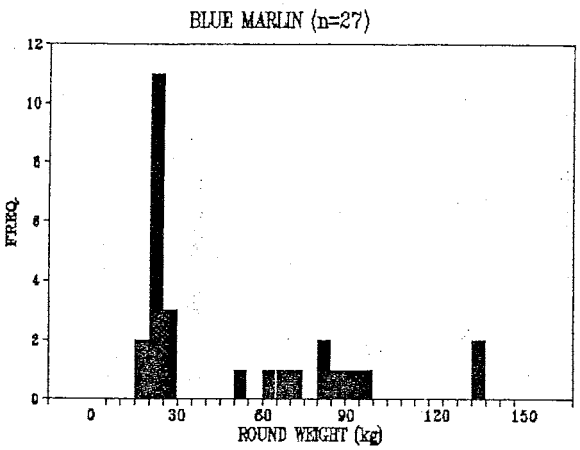
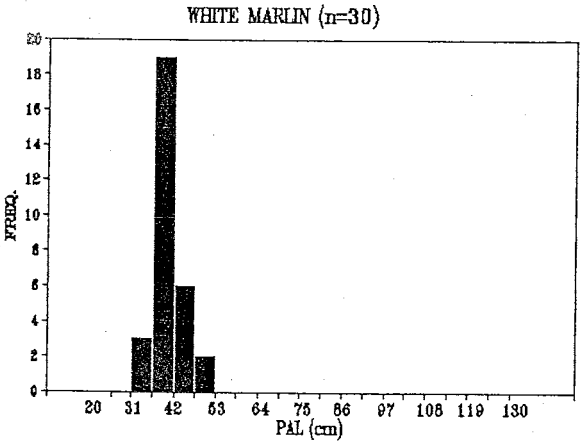
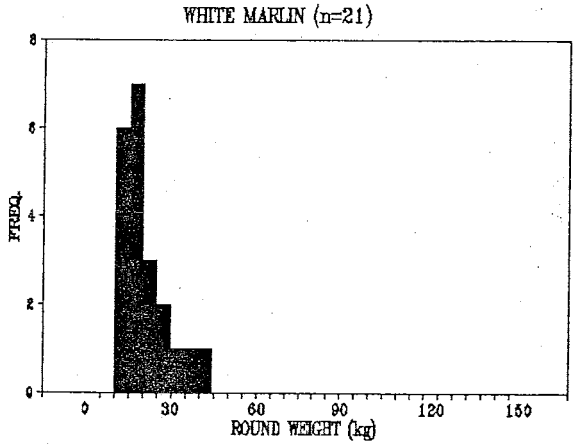


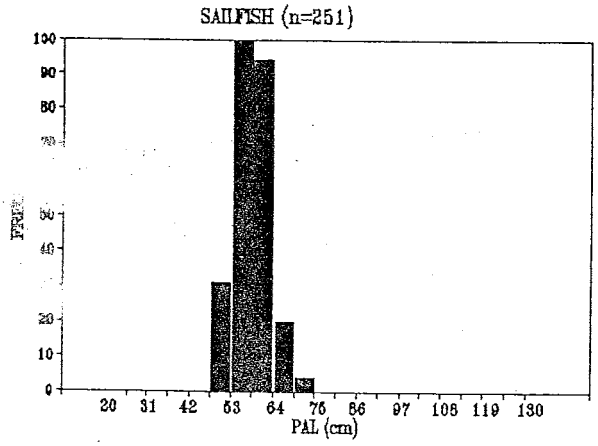
Figure 5. Typical species composition of billfish catches landed by the pelagic fishing fleet at Barbados, shown separately by fishing technique.











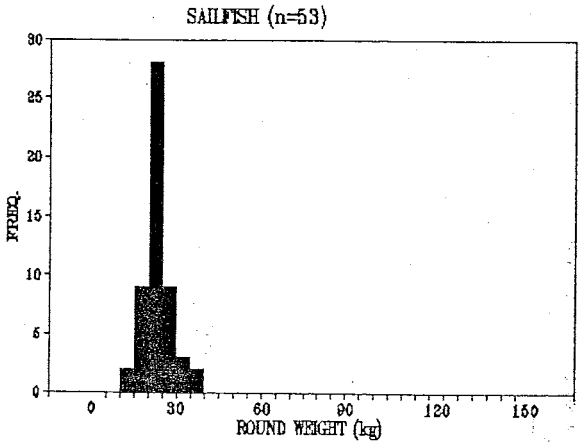


Figure 6. Length (cm) frequencies for a sub-sample of billfish landed by the pelagic fishing fleet at Barbados, shown separately by species. PAL - pectoral anal length.

Figure 7. Whole weight (kg) frequencies for a sub-sample of billfish landed by the pelagic fishing fleet at Barbados, shown separately by species.