

HISTORICAL LANDINGS AND TRENDS IN ABUNDANCE OF BILLFISH AT BARBADOS

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SUMMARY

Barbados has a long history of pelagic fishing. The fishery is highly seasonal (December-June) and the target species are flyingfish and dolphinfish, although wahoo, sharks, billfish and tuna are frequently taken. The billfish group represent about 3-6% of the total pelagic catch. Government records of fish landings indicate that there has been a slight increase in the billfish catch recorded at the major landing sites in Barbados over the last 30 years (1958-1988). The annual catch has increased from around 20-25 MT in the late 1950's to around 30-40 MT in the late 1980's. Catch-per-trip data over this period indicate that billfish abundance has remained relatively stable, although in recent years greater interannual variation is apparent. Billfish landings are highly seasonal, peaking between December and June as a result of the seasonal fishing which is determined by the seasonal availability of target species. However, billfish appear to have two abundance peaks near Barbados, one in April/May and a second in October/November.

A preliminary investigation of the species composition of the billfish group landed by the fishery showed that between December and April approximately equal numbers of blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), and sailfish (*Istiophorus albicans*) were landed, whilst spearfish (*T. pfluegeri*) were only taken occasionally. In terms of weight, it was estimated that blue marlin account for about 54% of the billfish catch, sailfish 21%, white marlin 16% and spearfish 9%. However, sample sizes were small and further study is needed to examine the species composition of the billfish group year round.

RESUME

La pêche pélagique est ancienne aux Barbades. La pêche est nettement saisonnière (décembre-juin), et les espèces visées sont les exocets et les coryphènes, mais il y a de fréquentes captures de thazard bâlard, de requins, d'istiophoridés et de thonidés. Les istiophoridés constituent environ 3-6 % de la prise pélagique totale. Les registres gouvernementaux des débarquements de poisson indiquent qu'il s'est produit au cours des trois dernières décennies (1958-88) un léger accroissement des prises d'istiophoridés enregistrées dans les principaux points de débarquement des Barbades. La prise annuelle est passée d'environ 20-25 TM à la fin des années cinquante à environ 30-40 TM à la fin des années quatre-vingt. Les données de capture par sortie au cours de cette période indiquent que l'abondance en istiophoridés est demeurée relativement stable, bien qu'une variation interannuelle plus forte soit visible ces dernières années. Les débarquements d'istiophoridés sont fortement saisonniers, atteignant leur maximum entre décembre et juin du fait d'une pêche saisonnière déterminée par la disponibilité saisonnière des espèces visées. Les istiophoridés semblent cependant avoir deux pics d'abondance, un en avril-mai et un autre en octobre-novembre.

Une recherche préliminaire sur la composition par espèce des istiophoridés débarqués par la pêcherie montre qu'entre décembre et avril un nombre à peu près identique de makaira bleu (*Makaira nigricans*), de makaira blanc (*Tetrapturus albidus*) et de voilier (*Istiophorus albicans*) a été débarqué, alors que le "spearfish" (*T. pfluegeri*) n'a été pris que de façon occasionnelle. En termes de poids, il a été estimé que le makaira bleu constitue environ 54 % de la prise d'istiophoridés, le voilier 21 %, le makaira blanc 16 % et le "spearfish" 9 %. La taille de l'échantillon est cependant réduite, et il faut des études plus poussées pour étudier pendant toute l'année la composition par espèce des istiophoridés.

RESUMEN

Barbados tiene una larga historia de pesca pelágica. Esta pesquería es de naturaleza estacional (diciembre-junio) y sus especies objetivo son el pez vela y el delfín, si bien con frecuencia captura peto, tiburón, marlines y túnidos. Los marlines constituyen del 3 al 6% del total de la captura pelágica. Los registros oficiales del gobierno respecto a desembarques indican que se ha producido un ligero aumento en la captura de marlín registrada en los principales puntos de desembarque en Barbados a lo largo de los últimos 30 años (1958-1988). La captura anual ha aumentado desde 20-25 t a finales de los años 50 hasta alrededor de 30-40 t a finales de los años 80. Los datos de capturas por viaje a lo largo del periodo indican que la abundancia de marlines ha permanecido relativamente estable, si bien en años recientes se observa una gran variación de un año a otro. Los desembarques de marlines dependen de la estación del año, alcanzando cifras altas entre los meses de diciembre y junio, como resultado de una pesca de temporada determinada por una disponibilidad de las especies que, asimismo, depende de la temporada.

Sin embargo, la abundancia de marlines parece tener dos momentos álgidos en aguas cercanas a Barbados, uno en abril/mayo y el segundo en octubre/noviembre.

Una investigación preliminar sobre la composición por especies de los marlines capturados por la pesquería, mostraba que entre diciembre y abril se obtuvo aproximadamente el mismo número de aguja azul (Makaira nigricans), aguja blanca (Tetrapturus albidus) y pez vela (Istiophorus albicans), en tanto que solo en ocasiones se capturó Tetrapturus pfluegeri. En términos de peso, se estimó que la aguja azul constituye el 54% en la captura de marlines, 21% el pez vela, 16% la aguja blanda y 9% el T. pfluegeri. No obstante, las muestras eran pequeñas y será necesario realizar nuevos estudios para examinar la composición por especies del grupo de marlines durante todo el año.

BACKGROUND

Barbados is situated in the eastern Caribbean at 13° 10'N and 59° 39'W, and has a long tradition of commercial fishing. The commercial fishery may be divided into a trap fishery which targets reef fish near shore, a snapper/groupers fishery which targets demersal species on offshore banks, and a pelagic fishery which targets oceanic pelagic species offshore. Each of these fisheries may be considered multispecies and artisanal, although the pelagic fishery has recently been moving towards higher capital investment and more sophisticated gear.

The traditional pelagic fishery, which accounts for 85-95% by weight of the commercial landings, is highly seasonal (December-June), and targets flyingfish (Hirundichthys affinis) and dolphin (Coryphaena hippurus), although other large oceanics including wahoo, sharks, tunas and billfish are frequently taken. The pelagic fleet has been expanding gradually over the last 30 years and has undergone rapid changes in the last decade with the introduction of ice-boats to the fleet in the early 1980s and longliners in 1988. The present pelagic fishing fleet comprises approximately 400 day-boats (7-11 m wooden launches), 71 ice-boats (9-13 m wooden or fibreglass launches with ice holds and accommodation) and 11 longliners (11.5-14.5 m wooden or fibreglass launches with ice holds and accommodation). The day-boats fish between 8-56 km from shore and return to market each evening. The ice-boats, many of which are converted day-boats, stay at sea from 4-14 days and travel as much as 300 km from Barbados. These vessel types use the same gear and target the same species. Flyingfish are taken by surface gillnets and hand-held dipnets, whilst the large pelagics are taken by trolling and handlines. The longliners, most of which are converted ice-boats, stay at sea from 4-14 days travelling 300-400 km from Barbados. For the last 1 1/2 years, these vessels have been attempting to capture swordfish (Xiphias gladius) and yellowfin tuna (Thunnus albacares) year round, although other billfish and sharks are frequently caught. Multihook longlines are used and set 60-140 m below the surface. Two US longliners have also been fishing out of Barbados since September 1988. These vessels are targeting swordfish (X. gladius), with multihook longlines set at 70-90 m, but are also taking a bycatch comprising tuna, billfish and shark. Barbados also has a small recreational fishery for pelagic species. The recreational fleet comprises less than 20 boats, both private and charter vessels. The charter vessels operate mainly during the tourist season (December to April) and troll near shore targeting barracuda (Sphyraena barracuda), mackerel and small tunas. The private vessels operate mostly at weekends during the peak fishing season (January to April).

and target the large oceanic pelagics.

Fishing effort (number of boat trips) and fish landings (by weight in species groups) have been recorded by Government fisheries personnel six days a week at three major fish landing sites since 1958 and at a fourth major landing site since 1961. Activities at a fifth major landing site have remained unrecorded since this site has no official market facility. The site is therefore considered illegal, but police control has varied over the years and at least 100 boats are known to land fish there regularly. Landings have been recorded at an additional six minor landing sites around the island since 1980. At present therefore, 10 out of 28 landing sites are being monitored on a daily basis. These records provide a long time series of catch and effort data, and are believed to represent approximately one third of the total landed catch. There is no official catch recording system for the recreational fishery, although the Barbados Game Fishing Club (BGFC) keeps records of all fish landed during tournaments.

Blue marlin (*Makaira nigricans*), white marlin (*Tetrapturus albidus*), sailfish (*Istiophorus albicans*), spearfish (*Tetrapturus pfluegeri*) and more recently swordfish (*Xiphias gladius*) are recorded together as "billfish" in the official catch recording system. Blue marlin and sailfish are recorded separately by the BGFC, but white marlin and spearfish are not reliably separated from these when specimens are small. The proportion of each species within the billfish group in both the commercial and recreational pelagic landings in Barbados therefore remains unknown.

The aim of this study was to review historical landing data for the billfish group to determine trends in abundance near Barbados, and to make a preliminary investigation of the seasonal changes in composition of the billfish group and in size structure of each species within the group.

METHODS

Government catch and effort data for the billfish group were supplied by the Ministry of Agriculture, Food and Fisheries, Barbados. Catch data from only the four major landing sites (Oistins, Speightstown, Cheapside and Bay Street) were examined since they have the longest time series (1958-1988). Catch per effort from only the largest of these four sites (Oistins) were examined, since Speightstown is known to primarily target small pelagics (flyingfish), whilst both Bay Street and Cheapside have been affected by the illegal landing site, such that effort records at these sites have been sporadic, particularly in recent years. Catch data from a local longliner were also supplied by the Fishery Division of the Ministry of Agriculture, Food and Fisheries.

On site checks of all billfish landed at Oistins were made two days a month during the peak fishing season (December 1988 to June 1989), for species composition, and size data were collected whenever possible. Ice-boats landing at the illegal site were also checked once a month for billfish species composition, and all billfish landed during game fishing tournaments were measured and recorded by species.

RESULTS

Billfish landings recorded at the major landing sites in Barbados have increased slightly over the last 30 years from around 20-25 MT a year in the

late 1950s to around 30-40 MT a year in the 1980s (Figure 1, Table 1). Catch has varied substantially, with particularly low catches (11-17 MT/year) being recorded from 1967-1969 and again in 1979, and very high catches (35-60.5 MT/year) being recorded from 1972-1976. However, the marked variation in the total catch results mainly from the records at a single landing site, Cheapside (Figure 2). The high landings at Cheapside are the consequence of imported billfish from Korean vessels being landed at this site in the 1970s. The present annual billfish catch recorded at the four major landing sites is around 30-40 MT and the total catch island wide may be as much as 90-120 MT a year.

Billfish are not specifically targeted by the traditional pelagic fisheries, but are taken whenever available and represent about 3-6% of the total fish landed (Figure 3, Table 1). The large increase in the proportion of billfish in the recorded catch (up to 14%) between 1972-1976 was again a result of imported billfish being recorded at Cheapside. Billfish accounted for up to 50% of the recorded catch at Cheapside over this period (Figure 4).

As indicated by catch per trip data, billfish abundance near Barbados has remained relatively stable over the last 30 years, although greater interannual variation is apparent in recent years (Figure 5). The data appear to suggest a slight increase in abundance over this period, the catch per trip increasing by a mean of 0.06 kg/trip/year. This is probably due to an increase in the catching efficiency of the boats which have increased in power and size, particularly since the 1980s. Moreover, several of the longer range ice-boats have been landing fish at Oistins since 1985 and no differentiation is made between these and the short range day-boats in the effort records.

The pelagic fishery is highly seasonal with a peak in fishing effort from December-June (Figure 6a), reflecting seasonal variation in availability of the target species, flyingfish (Mahon *et al.* 1985) and dolphin (Oxenford and Hunte 1986). Hence billfish (non-target species) landings are also highly seasonal, with peak landings occurring from December-June (Figure 6b). However, the abundance of billfish near Barbados, although seasonal, does not appear to share the same seasonality as the target species. Using catch per trip data as an index of billfish abundance, there appear to be two distinct peaks each year, one in April/May and a second in October/November (Figure 6c); although the relative size of the peaks varies annually (Figure 7).

A preliminary investigation of the species composition of the billfish group indicated that during December-April, blue marlin, white marlin and sailfish were taken in equal numbers by the pelagic fishery, whilst spearfish were only taken occasionally; but sample sizes are very small (Table 2). The size frequencies by length and weight are given for each species in Figures 8 and 9. The mean pectoral fork length and whole weight for blue marlin was 138.3 cm and 65.10 kg; for sailfish 134.5 cm and 24.77 kg; and for white marlin 87 cm and 19.41 kg. Thus, in terms of weight landed, blue marlin probably accounts for as much as 54% of the billfish catch, with sailfish accounting for 21%, white marlin 16%, and spearfish 9%. A size frequency histogram for swordfish landed during experimental longlining by a local vessel from October-December 1988 is given in Figure 10. The mean whole weight was 23.7 kg. The majority of swordfish landed by local longliners, and all swordfish landed by foreign longliners, are shipped to the USA and do not appear in the landing records.

DISCUSSION

The long time series of billfish catch and effort data at Barbados is unique for the eastern Caribbean, and indicates that, as a species group, the resource has not shown any signs of decline, although interannual variation in abundance appears to be increasing. Billfish are not specifically targeted by local fleets and landings have only increased slightly over the last 30 years. Local increases in fishing mortality are therefore unlikely to be affecting the stock, but fishing mortality may be increasing due to an increase in the number of foreign longline vessels operating in the eastern Caribbean. These are known to take billfish as bycatch, particularly when targeting tuna (O'Connor, 1987).

Examining catch records of a species group can mask the decline of one or more species within the group. It is therefore desirable to separate the group into species in long-term monitoring programmes. At present, blue marlin, white marlin and sailfish appear to be taken in equal numbers by the Barbados pelagic fishery during the main fishing season. However, the mean individual weight of blue marlin is substantially higher than for the other two species, such that blue marlin account for more than 50% of the landed weight. To accurately separate billfish landings by species, a much greater sample size is required and a comparison of mean dressed weights is needed, since catches are generally recorded after dressing, rather than as whole weights.

Species composition of the billfish group may vary seasonally, especially between the two peaks in abundance. Additional species composition data must therefore be collected during October and November, when billfish catches are relatively low because of low fishing effort, but when billfish abundance is apparently high.

ACKNOWLEDGEMENTS

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Table 1.

Annual billfish landings in Barbados, expressed as metric tonnes and as a percent of total fish landings, at the major landing sites, Oistins, Speightstown, Bay Street and Cheapside.

Year	Landings (MT)	% of total fish landings
1958	22.33	3.31
1959	17.90	2.84
1960	22.78	2.54
1961	26.61	3.85
1962	27.32	3.57
1963	27.16	3.88
1964	26.59	5.62
1965	24.82	5.28
1966	31.25	3.95
1967	17.34	2.49
1968	14.61	2.91
1969	11.29	2.60
1970	25.26	4.98
1971	21.93	4.50
1972	34.31	8.34
1973	50.28	11.67
1974	60.54	14.40
1975	50.80	7.59
1976	40.03	6.09
1977	27.41	5.57
1978	24.22	4.82
1979	17.01	2.85
1980	24.36	3.40
1981	38.78	5.41
1982	29.52	4.14
1983	34.33	2.20
1984	40.94	3.14
1985	29.55	3.47
1986	40.00	4.77
1987	37.10	4.43
1988	31.02	3.80

Table 2.

Monthly species composition of the billfish group taken by the pelagic fishery in Barbados.

Month	blue marlin		white marlin		sailfish		spearfish	
	No.	%	No.	%	No.	%	No.	%
December	1	50	1	50	0	0	0	0
January	1	100	0	0	0	0	0	0
February	3	30	5	50	2	20	0	0
March	2	10.5	6	31.6	10	52.6	1	5.3
April	8	57.2	3	21.4	3	21.4	0	0
Total	15	32.6	15	32.6	15	32.6	1	2.2

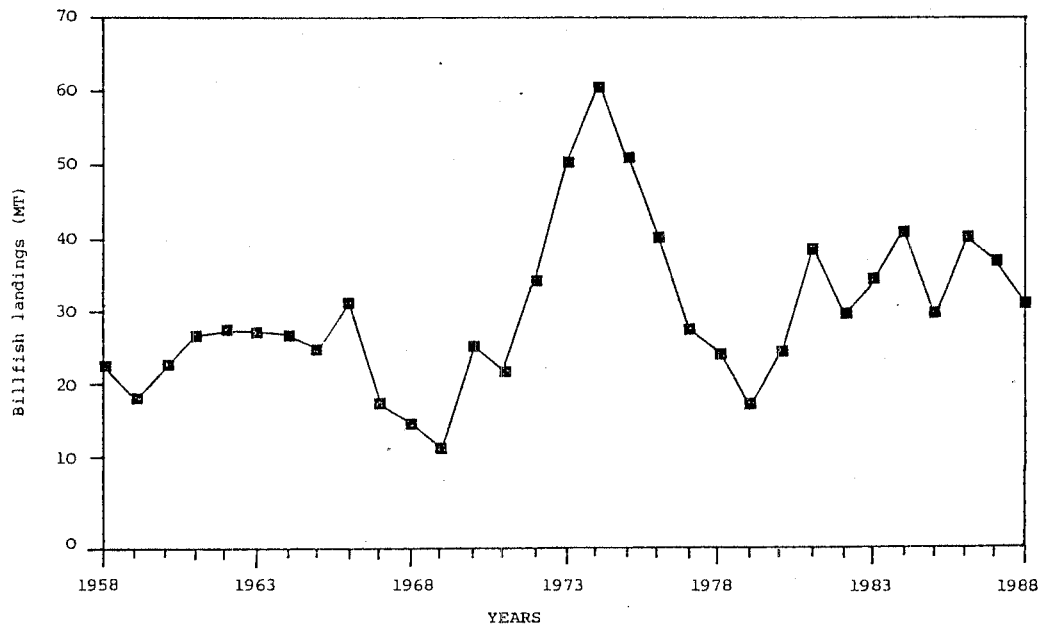


Figure 1. Annual billfish landings in Barbados recorded at the major landing sites, Oistins, Speightstown, Bay Street and Cheapside.

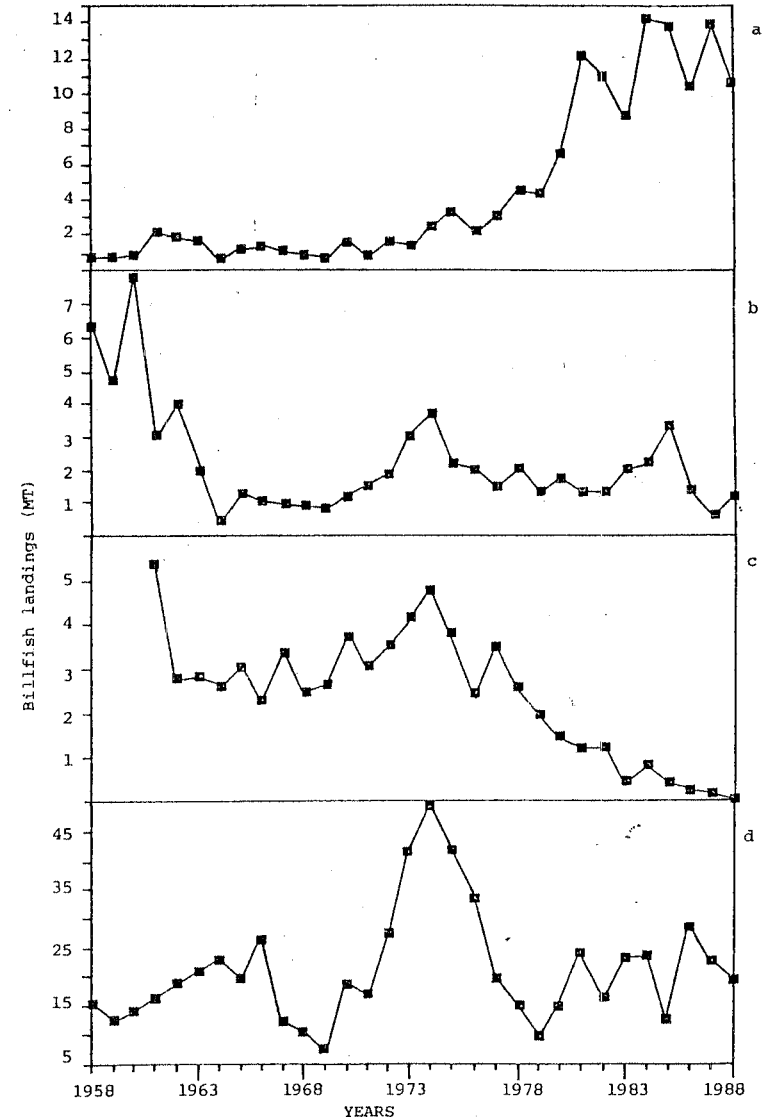


Figure 2. Annual billfish landings recorded by market a) Oistins b) Speightstown c) Bay Street d) Cheapside.

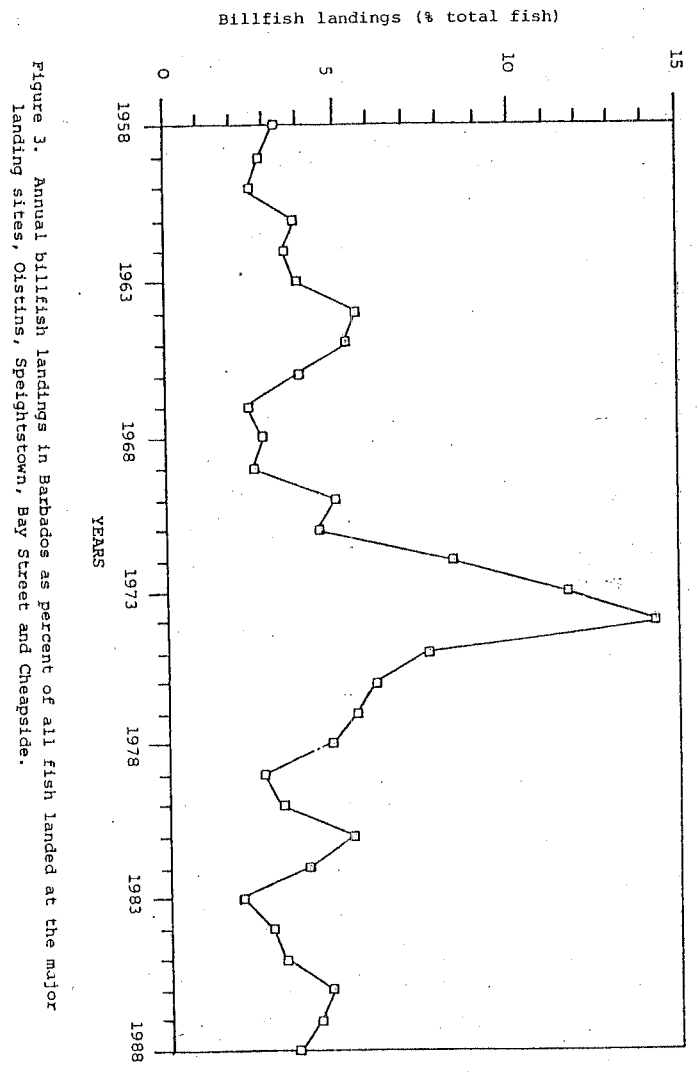


Figure 3. Annual billfish landings in Barbados as percent of all fish landed at the major landing sites, Oistins, Speightstown, Bay Street and Cheapside.

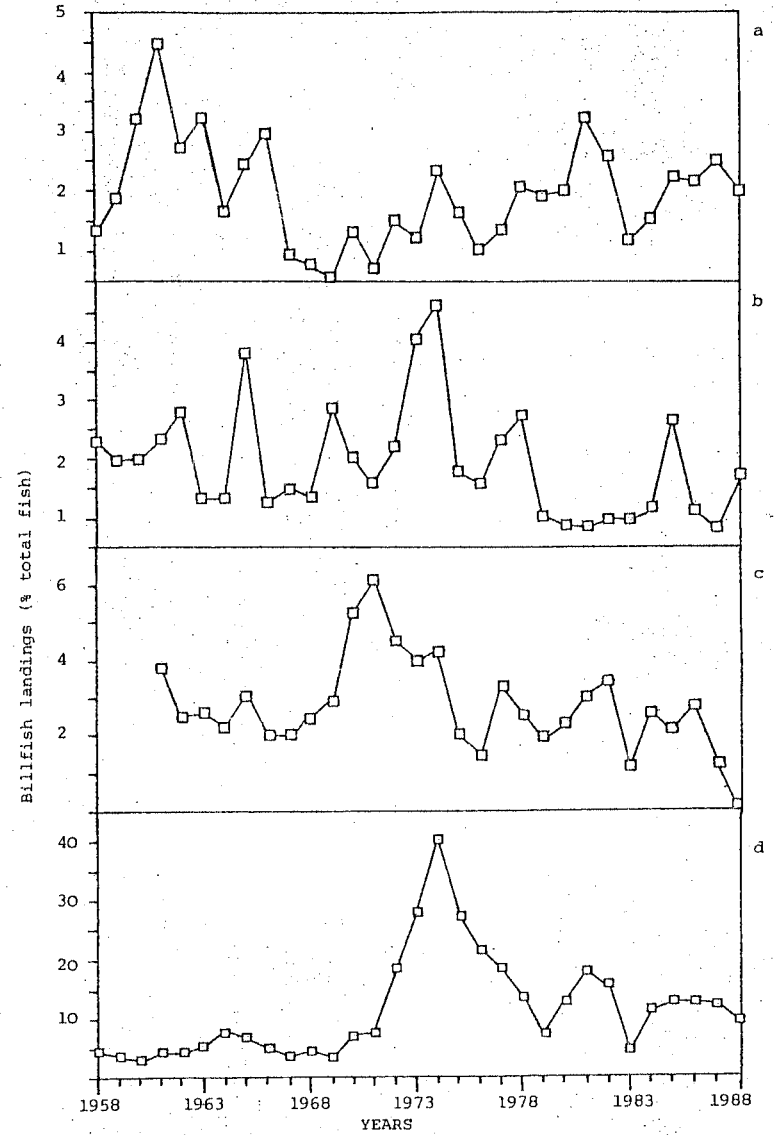


Figure 4. Annual billfish landings as percent of all fish landed by market a) Oistins b) Speightstown c) Bay Street d) Cheapside.

Figure 5. Annual catch per trip of billfish at the main landing site, Oistins, Barbados.

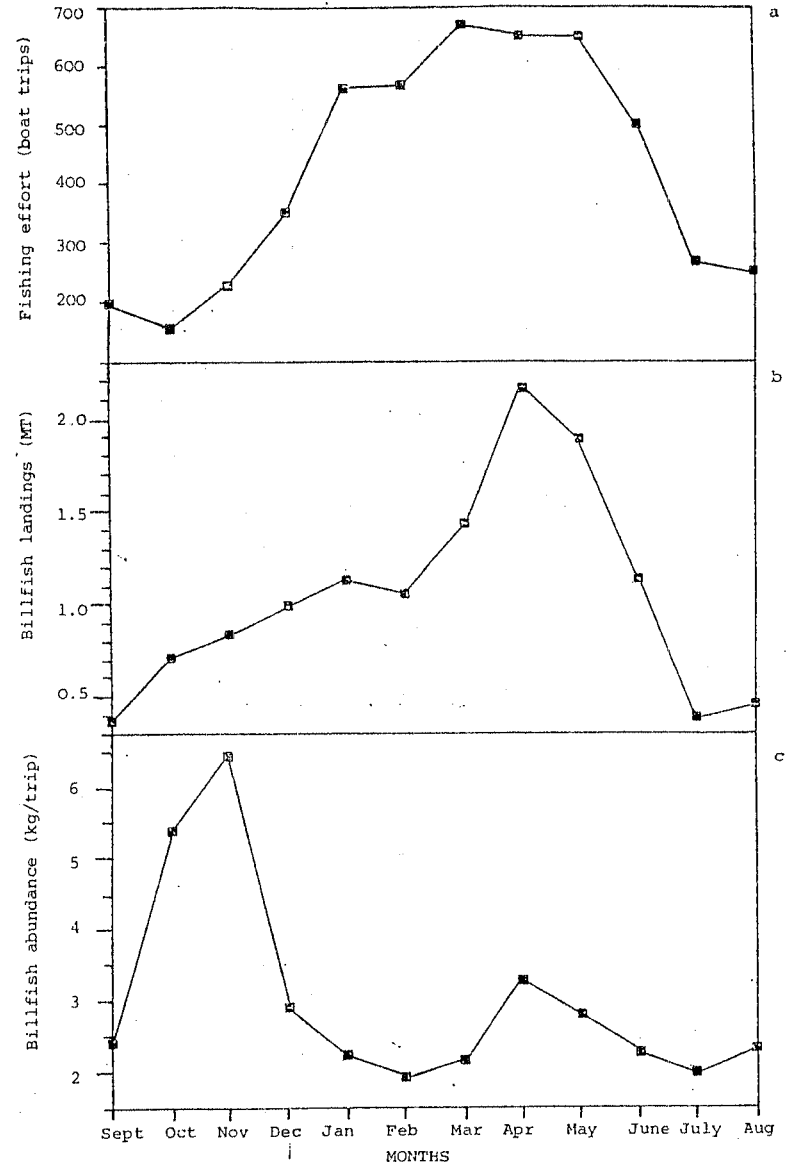
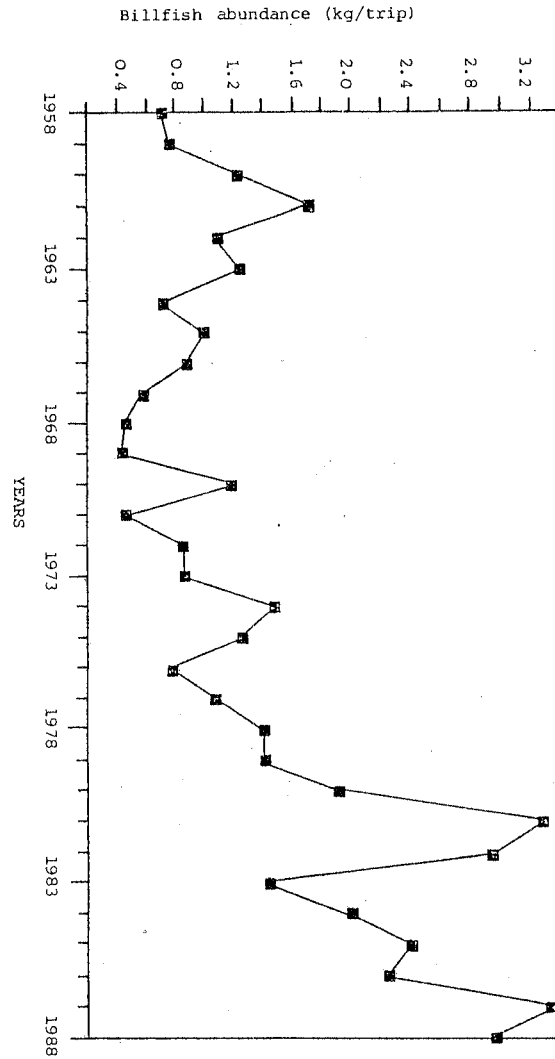


Figure 6. Seasonality of a) fishing effort, b) billfish landings, and c) billfish catch per trip. All values represent 5-year means recorded at the main landing site, Oistins, Barbados.

Figure 7. Monthly catch per trip of billfish recorded at the main landing site, Oistins, Barbados.

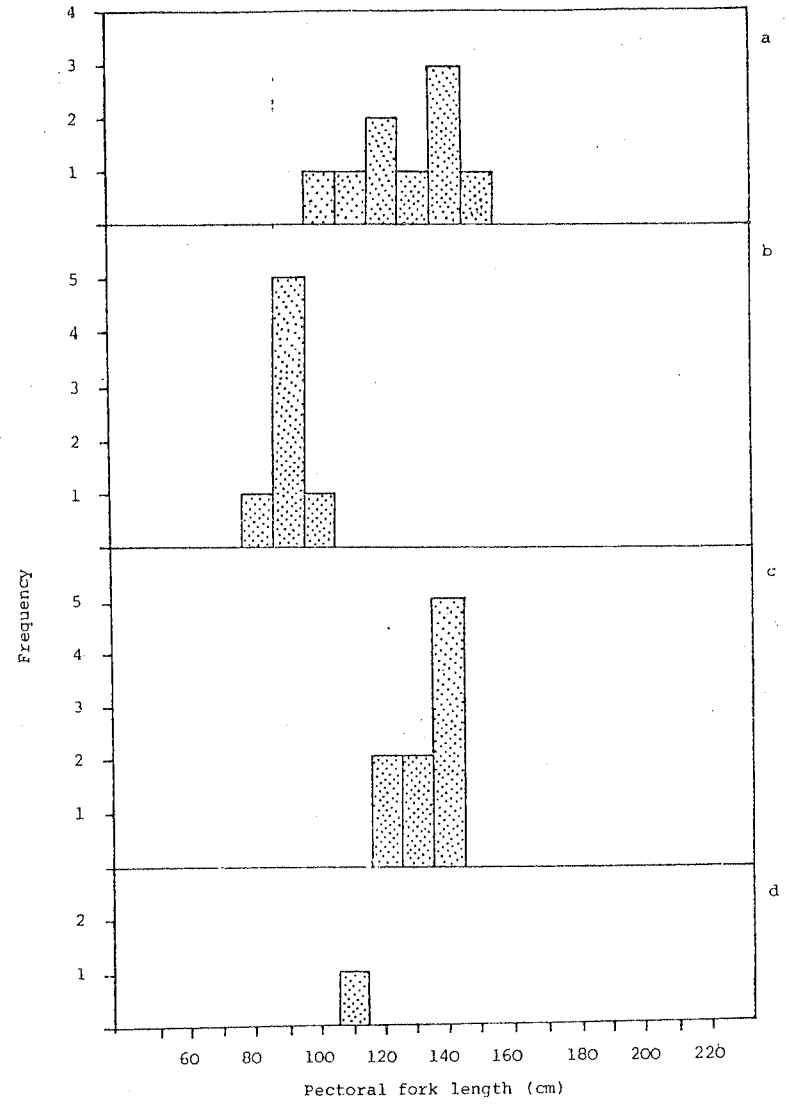
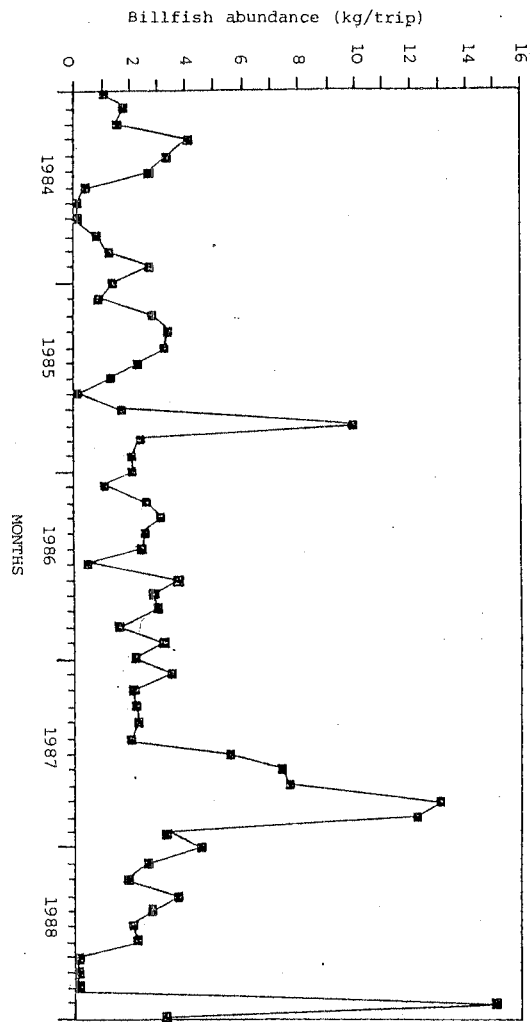


Figure 8. Billfish length frequencies by species a) blue marlin b) white marlin c) sailfish d) spearfish, landed by the pelagic fishery in Barbados.

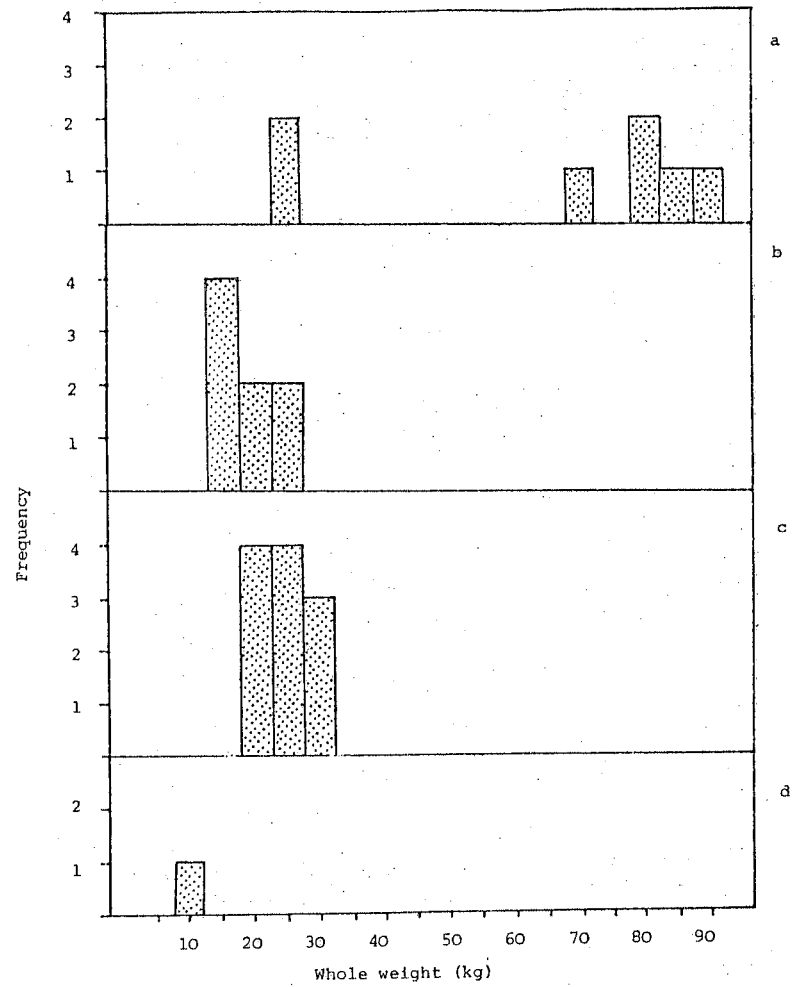


Figure 9. Billfish weight frequencies by species a) blue marlin b) white marlin c) sailfish d) spearfish, landed by the pelagic fishery in Barbados.

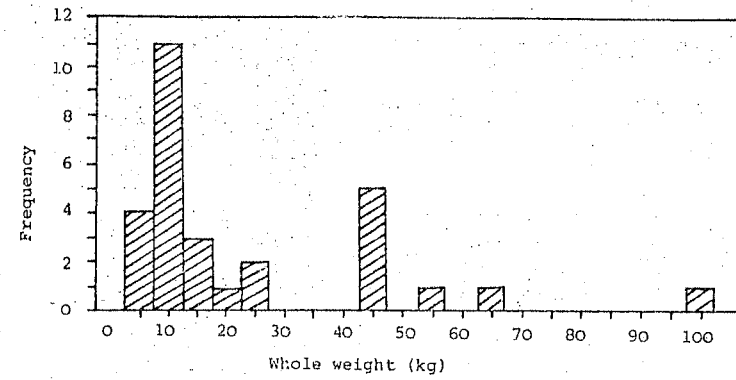


Figure 10. Weight frequency of swordfish landed by Barbados longliner