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The flyingfish fishery of Barbados

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Abstract: The flyingfish fishery of Barbados is a major component of the island's fisheries, landing on average 3,000 mt annually and accounting for approximately 57% of the total fish landings and 64% of the pelagic landings. The fishery employs an estimated 6,000 people and the annual landed value of the flyingfish catch is in excess of BDS$ 9 million (wholesale) and BDS$ 13 million (retail). The fishing fleet has developed over the last 40 years from open sail boats to a fully mechanised fleet comprising partially covered vessels with inboard diesel engines which fish on a daily basis (day-boats) or are fitted with ice holds and stay at sea for a week or more (ice-boats). Traditional fishing techniques (dip net) are still used, but the surface gillnet has superseded these as the main gear used for flyingfish. The flyingfish fishery is highly seasonal, with 94% of the catch landed between December and June. The fishery remains unmanaged at present.

DESCRIPTION OF THE FISHERY

Fishing techniques, past and present

Prior to the 1950s the harvesting of flyingfish was done from small open sailboats, which did not venture more than 4 to 5 miles from shore. On reaching the fishing area the sails were lowered and the boat allowed to drift. Fish were attracted to the boat by a process locally known as "chumming". A wicker bait-basket, filled with rotting fish mixed with vegetable oil, was placed over the side of the boat and adjusted to move in and out of the water as the boat rode the waves. The constant agitation caused small bits of bait and oil to be dispersed over the water. The small pieces of bait attracted the flyingfish, while the oil becalmed the area and enabled the fishermen to see the fish more clearly. As the fish gathered, short hand lines with hooks were used to catch the fish. As larger numbers of fish gathered near the boat, hand lines were abandoned, and the fish were scooped up by a dip net (Bair 1962).

During the 1950s there was a transition from sail to motor powered vessels, which enabled the fishermen to venture further afield. These early motorised vessels (known as launches) were wooden and each carried a cabin house. The launches were powered by inboard diesel engines, placed amidships within the cabin house and were steered by tiller. The 1950s also saw improvement of fishing gear. Firstly (1951-1952) there was the introduction of surface gillnets (stretched mesh 1 5/8" or 4.1 cm), which eventually replaced hand lines as the main method for catching flyingfish. Secondly there was the introduction of fish attracting devices made of floating bundles of sugarcane trash (locally known as "screelers") which were used in addition to the traditional "chumming". The "screeler" was attached to the boat by a line 200-400 m in length. After the flyingfish had gathered, gillnets were set to catch the fish. If fish formed dense spawning schools at the surface around the boat, they were then caught by the traditional dip nets (Willoughby 1989).

The present flyingfish fishing fleet comprises approximately 275 motorised launches (day-boats) and 75 larger motorised ice-boats (Figure 1). The day-boats are still of the same traditional design introduced in the mid 1950s, but a few are now made of fibreglass instead of wood. They vary in length from 6-12 m and the majority have inboard diesel engines of 10-85 hp, while a few have outboard engines of 40-185 hp. A few of these day-boats now have wheel instead of tiller steering and are well equipped with navigation, safety and communication equipment. These day-boats, like the early launches, use the same fishing methods as were introduced in the 1950s and return to port every evening. Ice-boats, a new type of fishing vessel that was introduced into the fleet in the late 1970s, are of the same basic design as the day-boats, but are longer (over 12 m), carry more powerful engines (63-350 hp), hydraulic steering, and are fitted at the stern with an insulated ice hold (4-12 mt capacity) in which fish are stored on ice while at sea. These vessels are out-fitted with modern navigation, safety and communication equipment and like the modern day-boats, they still use the same traditional fishing methods introduced in the

1950s, except that they travel further afield and may stay at sea for up to 14 days.

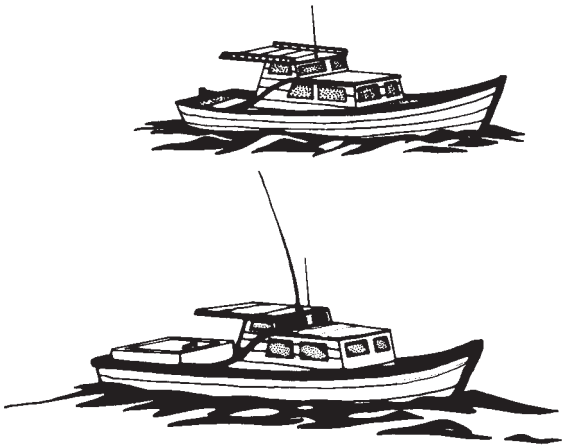

Figure 1. Typical day-boat (above) and ice-boat (below) used in the flyingfish fishery in Barbados (redrawn from Willoughby 1989).

Figure 2. Fish landing sites in Barbados.

Fishing area and landing sites

Day-boats fish for flyingfish mainly off the west and southwest coasts of the island between 8 and 46 km from shore. Ice-boats tend to fish further afield, as far as 300 km from shore.

Fish landing sites around the island, are classified as either Primary, Secondary or Tertiary. The three Primary Sites now in operation are public fish markets, namely Speightstown in the north, Oistins in the south and Bridgetown Fisheries Complex in the south west (Figure 2). The Bridgetown Fisheries Complex, which is the largest and best, equipped of the three sites, opened in late 1989, replacing the two former Primary Sites (Bay Street and Cheapside) in the Bridgetown area. The facilities at the complex include a fishing harbour for 150 boats, a processing hall, vendor stalls for display and sale of fish, a boat yard for service and repair of boats, refrigeration facilities, locker facilities and fuel outlets. There are eight Secondary Sites located as shown in Figure 2. At each of these sites there is a small open structure known as a shed. These sheds contain water, electricity and space for gutting and boning fish (Willoughby 1989). Tertiary Sites number approximately sixteen, and comprise open beaches with no fisheries-related structures. The most important Tertiary Sites for flyingfish landings are shown in Figure 2.

Estimated current flyingfish catch and effort

Fish landings have been recorded 6-7 days a week at the Primary Sites (markets) since the late 1950s and at the Secondary Sites (sheds) since 1972.

These records are believed to represent about 33% of the actual total landings for the island. However, this proportion is presently under review in light of the recent opening of the Bridgetown Fisheries Complex, where recorded. Estimates of actual total flyingfish landings (recorded landings x 3) are given in Table 1 for the 10 year period 1980-1989. Estimated total landings have fluctuated between 1,748 and 5,936 mt of flyingfish per year over this period (Figure 3, Table 1), with an average of 2,917 mt flyingfish per year. Despite inter-annual fluctuations there appears to have been an overall increase in total landings from around 1,700-2,000 mt a year in the early previously unmonitored catches are now being 1980s to around 2,000-6,000 mt a year in recent years (estimated landings for 1990 were 5,982 mt) (Figure 3).

Using flyingfish catch per trip data from one of the major flyingfish landing sites (Oistins) as an index of flyingfish abundance, it is apparent that flyingfish around Barbados are highly seasonal (Table 2, Figure 4). Approximately 94% of the annual flyingfish catch is landed between December and June (Table 2), with abundance peaks occurring in December/January and May/June (Figure 4).

Table 1. Estimated national flyingfish landings for Barbados for the 10-year period 1980-1989.

Year	Flyingfish landings (mt)	% of pelagic landings	% of total landings
1980	1,748	67	46
1981	1,968	69	57
1982	2,040	67	59
1983	4,115	70	63
1984	4,281	80	74
1985	1,914	54	49
1986	2,661	68	63
1987	2,436	37	36
1988	5,936	66	65
1989	2,072	64	57

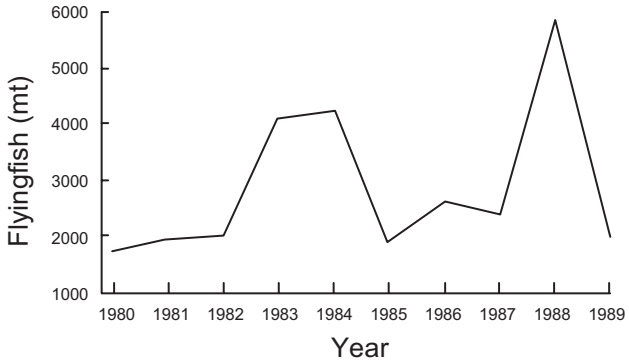

Figure 3. Estimated total flyingfish landings for Barbados (1980-1989).

Table 2. 10-year monthly mean catch and effort data for Oistins.

Month	Landings (kg)	%	Catch/trip (kg)
January	45,892	18.1	93
February	33,755	13.3	67
March	33,534	13.2	52
April	30,023	11.8	48
May	41,887	16.5	66
June	29,829	11.8	62
July	6,719	2.7	23
August	350	0.1	1
September	3	0.0	0
October	343	0.1	2
November	7,041	2.8	31
December	24,448	9.6	83

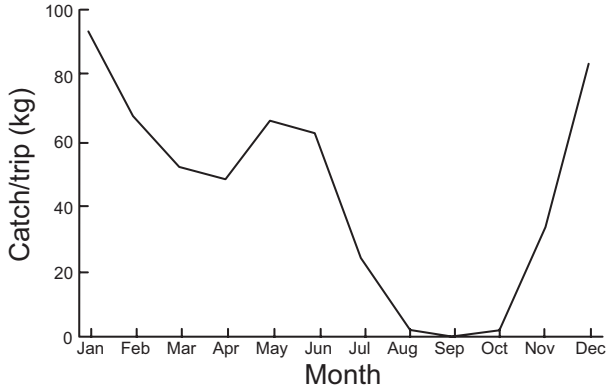

Figure 4. 10-year (1980-1989) monthly mean flyingfish catch per trip recorded at Oistins.

Large inter-annual fluctuations in the average catch per trip indicate differences in the abundance of flyingfish around Barbados from year to year (Table 3, Figure 5). Poor years (low abundance relative to contiguous years) were recorded in 1982 and 1985, and good years (high abundance relative to contiguous years) were recorded in 1984 and 1987. The poor year of 1985 may be attributable to an exceptionally high abundance of their main predator (dolphinfish) recorded in this same year. An overall increase in the mean catch per trip from around 20-30 kg in the early 1980s to around 53-83 kg in the late 1980s may have resulted from the increase in the number of ice-boats in the Oistins fishing fleet and the fact that no differentiation is made between ice-boat and day-boat fish landings in the official records.

Table 3. Annual mean flyingfish catch per trip for commercial boats at Oistins.

Year	Catch/ trip (kg)	Year	Catch/ trip (kg)
1980	23	1985	39
1981	28	1986	54
1982	20	1987	83
1983	59	1988	75
1984	86	1989	59

Proportion of the total fish catch

The relative importance of flyingfish in the pelagic catches and total fish landings are shown in Table 1. Flyingfish continues to be the most important species (by weight) landed by the commercial fisheries. Over the 10-year period 1980-1989 flyingfish have, on average, accounted for 57% of the total fish landings and 64% of the pelagic landings (Table 1).

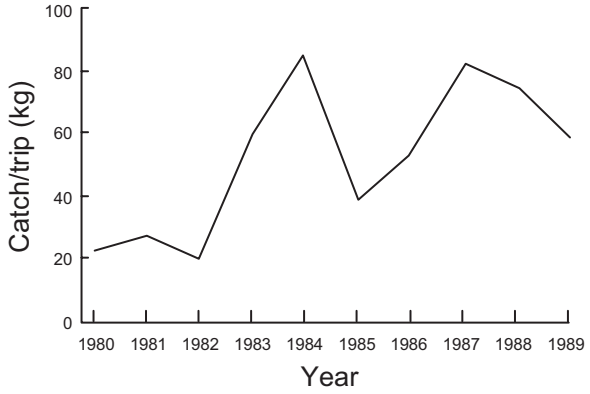

Figure 5. Annual mean flyingfish catch per trip recorded at Oistins (1980-1989).

Economic value of the catch

Records of wholesale (price paid by vendors to fishermen) and retail (price paid by public to vendors) prices paid for whole flyingfish at landing sites have been collected daily by Government fisheries statistics collectors since 1982. The mean wholesale and retail prices paid each month over the 5-year period (1985-1989) at Oistins are summarised in Table 4.

Table 4. Five-year monthly mean wholesale and retail prices of whole flyingfish at Oistins for 1985-1989.

Month	Wholesale (BDS$/100 fish)	Retail (BDS$/100 fish)
January	25	32
February	29	36
March	32	42
April	31	39
May	27	35
June	26	34
July	39	62
August	66	87
September	-	-
October	-	-
November	65	80
December	34	49

Prices of whole flyingfish at the landing site vary considerably throughout the flyingfish season according to supply. The price is highest (up to BDS$ 0.80 per fish wholesale, and BDS$ 1.00 per fish retail) during months of low abundance when flyingfish are scarce, and lowest (down to BDS$ 0.10 per fish wholesale, and BDS$ 0.15 per fish retail) during months of peak abundance when flyingfish are plentiful. The mark-up price for whole flyingfish (wholesale to retail) at the landing site also varies seasonally from BDS$ 7-23 per 100 fish (i.e. a mark-up of between 24-59%).

Prices of filleted flyingfish are less variable over the season. Fresh filleted fish are retailed at the landing sites for BDS$ 0.80-1.20 per fish over the season, while vacuum packed, frozen, filleted flyingfish are sold in supermarkets for BDS$ 1.00-1.20 per fish (BDS$ 4.99-5.99 per packet of 5) over the year.

Mean monthly wholesale and retail prices for whole flyingfish at the Oistins landing site are given in Table 5 for 1989. The weighted average price (based on the average percentage of the total flyingfish catch landed each month; see Table 2) for flyingfish in 1989 was BDS$ 42.63 per 100 fish wholesale and BDS$ 57.88 per 100 fish retail. This translates to BDS$ 3.28 / kg wholesale and BDS$ 4.46 / kg retail, given that there are on average 7.7 fish to a kg (3.5 fish / lb; Storey 1983). The estimated mean total annual landings of flyingfish (2,917 mt), are therefore worth approximately BDS$ 9,567,760 wholesale and BDS$ 13,009,820 retail per year at today's (1989) prices.

Table 5. Monthly mean wholesale and retail prices of whole flyingfish at Oistins for 1989.

Month	Wholesale (BDS$/100 fish)	Retail (BDS$/100 fish)
January	35	43
February	40	46
March	50	81
April	36	42
May	42	56
June	40	56
July	44	49
August	70	100
September	-	-
October	-	-
November	80	100
December	52	86

Employment generated by the fishery

There are between 1,500 and 2,000 full-time and approximately 200 part-time fishermen all of whom are involved in the flyingfish fishery during the season November to July. There are approximately 800 full-time and between 500 and 1000 part-time vendors involved in selling and filleting flyingfish. There are also many small-scale flyingfish processors, scaling and boning fresh flyingfish for resale to the public and small restaurants. There are four large-scale processors jointly employing about 100 people to scale and bone

flyingfish and to freeze and vacuum pack fillets. Therefore, it is estimated that up to 6,000 people (including fishermen's family, processors, boat builders, gear suppliers and mechanics) are involved in some way in the flyingfish industry.

Species composition and size structure of the flyingfish catch

The commercial catch is composed almost entirely of the four-winged flyingfish *Hirundichthys affinis*, with a small number of the "guineaman" or margined flyingfish *Cypselurus cyanopterus*. *Cypselurus melanurus*, the Atlantic flyingfish is occasionally encountered in large schools offshore Barbados, and *Hirundichthys speculiger* the mirror-winged flyingfish occurs infrequently (Jones and Oxenford 1986).

At the end of the season the flyingfish (*H. affinis*) are often thin and heavily parasitised and known locally as "June fish". The smaller flyingfish caught at the end of November are referred to as "iron-sides" although it is not certain whether these are a different species. Some of the flyingfish caught a larger distance from Barbados by the iceboats are referred to as "blue-birds", although they are the same species as the flyingfish caught close to the island (i.e. *H. affinis*).

Size structure of the commercial flyingfish catch in Barbados was examined by Lewis *et al*. (1962) and Storey (1983). A more recent study of flyingfish size structure in Barbados was done by Khokiattiwong (1989) and is summarised in Figure 6. The mean size of females was consistently larger than males, and the largest mean size occurred in March/April (Khokiattiwong 1989).

DEVELOPMENT AND MANAGEMENT OF THE FLYINGFISH INDUSTRY

Catch and effort data collection system

Fish landings are recorded at all the Primary and Secondary landing sites. A detailed description of this process is given by Willoughby *et al*. (1988). There is no recording of fish landings at any of the Tertiary landing sites.

Traditionally the total annual national landings were estimated by multiplying the recorded landings by a factor of three. However, since the opening of the Bridgetown Fisheries Complex it is likely that a greater proportion of the actual total catch is now being recorded and the multiplication factor will need to be reconsidered. This situation is presently under review.

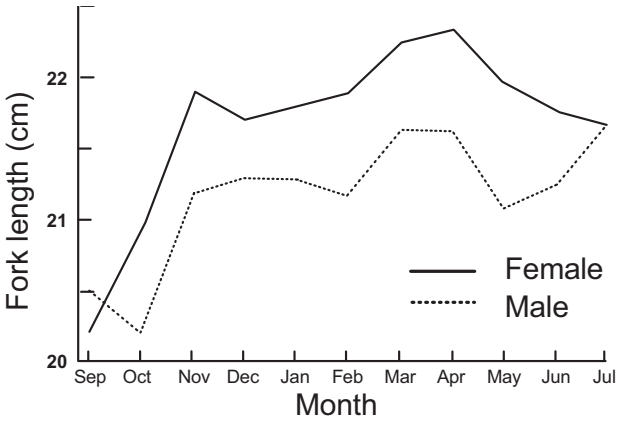

Figure 6. Monthly mean size of flyingfish caught off Barbados (redrawn from Khokiattiwong 1989).

Recent fishing agreements and negotiations

In 1991 Barbados was party to a fishing agreement with Trinidad and Tobago. This agreement allowed Barbadian vessels to fish in the EEZ of Trinidad and Tobago.

Recent legislation pertaining to flyingfish

At present there is no legislation pertaining specifically to flyingfish.

Planned future directions for the industry

The Government of Barbados in its 1988-1993 Development Plan indicated that considerable progress has been made in the improvement of on-shore facilities in the growth of the iceboat (offshore boats) segment of the fishing fleet. However, deficiencies in fish handling, storage, distribution and marketing continue to exist, while effective exploitation of available marine resources is still to be realised.

Consequently the objectives of Government Policy as stated in the 1988-1993 Development Plan are to:

- Enhance the viability of the fishing industry.
- Promote the process of diversification by identifying and developing the harvesting of species not now exploited.
- Promote the further modernization of the fishing industry through improved boat design and equipment and through enhanced fishing technology.

- Improve the livelihood and welfare of all persons in the fishing community.
- Increase the output of high quality fish in order to allow for self-sufficiency.
- Upgrade the standards of fish handling.

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