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National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
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TO ALL BILLFISHERS:

This is a report of the biological and statistical aspects of the Twenty-first Hawaiian International Billfish Tournament (HIBT). For 18 of the 21-year history of HIBT the Honolulu Laboratory, Southwest Fisheries Center, National Marine Fisheries Service (NMFS) has sent observers to the tournaments to collect biological data on billfishes. Besides collecting data, the observers have organized workshops, presented seminars, put up exhibits, and made themselves generally available to answer questions about fishes. In recent years I have added to our activities the instant analysis of your reports at radio round-up time to give you the best-area-of-the-day bulletin immediately after each round-up. And as a wrap-up, I write this report.

This year my assistant was Bob Humphreys. Also participating in making scientific observations were Dr. Richard W. Brill, newly appointed Director of Science of the Pacific Gamefish Foundation, and Peter Saul, Recreational Fisheries Advisory Officer from New Zealand.

A lot of people supported us with their cooperation and assistance. Without that support we would not have been able to complete our work. I wish to acknowledge you, billfishers, for responding so conscientiously to all the round-up calls and for allowing us to examine your catch. Jim Sutherland, Chris Mason, and Petra Layman of headquarters helped us in many ways before, during, and after the tournament. At radio round-ups Phil and Beverly Parker and Carol Zuzak assisted us in keeping our records straight. Colleen Bryant and Shirley Eldridge provided data from the catch reports. At the pier, Jack Fischer's magic unfailingly caused to appear anything we needed. A sincere mahalo to all.

THE CATCH

A new tournament rule this year was that a fish had to be at least 100 lb (45.4 kg) to qualify for points. This rule virtually eliminated all shortbill spearfish, sailfish, and striped marlin from qualifying. In the last 10 years of HIBT, except for one striped marlin of 102 lb (46.3 kg), none of the catch of these species even came close to 100 lb.

This year's catch was 62 blue marlin and 7 ahi (yellowfin tuna). With 70 teams and 5 days of fishing in the tournament, an average of

5.1 boat-days was required to land each fish, the worst rate since 1969 (Table 1). Beginning in 1970 HIBT has been scheduled to coincide with the dark of the moon. Before that no attention was paid to moon phase in the scheduling. Note that since 1970 the catch rate has improved substantially (Table 1). Even though this year's rate is the worst in 10 years, it is better than 7 of the 8 previous years. Although the blue marlin catch this year was lower than usual (84% of the average for 1970-78), the low ahi catch was the major contributor to the low rate. This year's ahi catch was 21% of the 1970-78 average catch of ahi.

Weights of blue marlin caught ranged from 115 lb (52.1 kg) to 616 lb (279.4 kg) and averaged 209.7 lb (95.1 kg). The ahi weighed 113-229 lb (51.3-103.9 kg) and averaged 152.4 lb (69.1 kg).

FISHING AREAS

Within the designated fishing boundaries of HIBT are 26 arbitrarily defined areas (Figure 1). Ten of these areas attracted 97% of the fishing effort. Data analysis was limited to these 10 areas, each of which had over 100 boat-hours of fishing in it (Table 2). Area *Tango* was by far the most popular area with 397 boat-hours. Although *Uniform Bravo* ranked seventh in popularity, its strike rate of 0.19 strike per boat-hour was decidedly the best (Table 2). Areas with the next best strike rates ranked in order were *Lima*, *Mike*, *Victor*, *Tango*, and *Sierra* (Table 2 and Figure 1).

The average strike rate for all the areas was 0.12 strike per boat-hour. This is 60% of last year's overall rate of 0.20 strike per boat-hour. In fact, the strike rate for this year's best area was lower than last year's average rate.

Hawaiian International Billfish Tournament scores are not determined by the number of strikes obtained but by the number of pounds of fish landed. Perhaps the number of pounds of blue marlin per boat-hour is a more meaningful measure of how good an area was. Based on that measure, the best areas were *Victor*, *Mike*, *Uniform Bravo*, *Kilo*, and *Sierra* (Table 2).

Fish were caught from 13 areas. Table 3 lists the number of each species and the average weight caught from each area. The largest blue marlin was caught in *Victor* and the largest ahi in *Kilo*.

SEX

Of the 45 blue marlin examined 38 were males and 7 were females for a male:female ratio of 5.4:1. This is the second highest male:female ratio since 1962 and continues the history of the predominance

of male captures at HIBT (Table 4). Of the fish examined the largest male weighed 259 lb (117.5 kg); the smallest female weighed 305 lb (138.3 kg). This distinctive difference in sizes between sexes prompted a spectator at the pier to ask if blue marlin underwent a sex change. The answer is no. Small female blue marlin do exist. There are fish species which undergo a sex reversal, however. For example, all Hawaiian threadfin or moi, start their lives as males and later become females. Other species which exhibit sex reversal belong, for the most part, in the threadfin family or the sea bass family. One could say that this trait runs in the family.

STOMACH CONTENTS

Table 5 is a summary of our examinations of blue marlin stomachs. Only two specimens were examined the first day because of the breakdown of the forklift that transported fish to the examination table. As usual, tunas, particularly skipjack tuna, squid, opelu, and spiny puffer were the most frequently occurring items in the stomachs. Not so usual was the high frequency of goatfish. An interesting item in three of the stomachs was young swordfish. At a foot (30 cm) in length, they were the smallest I have seen in marlin stomachs. In fact, except for a 14-lb (6.4-kg) skipjack tuna, all of the items in the stomach were small.

In addition to food items seven fish had parasites in their stomachs. Five of them had flukes which are common in stomachs of pelagic fish. The other two had a threadworm and a tapeworm, which are parasites seldom seen in marlin stomachs.

TIME, TACKLE, TIDE, AND TAGGING

The best hour for catching blue marlin was 10-11 a.m. (Figure 2). Four of the 10 large blue marlin (greater than 300 lb or 136 kg), however, were caught between noon and 1 p.m.

Of the 62 blue marlin landed, 39 were caught on 24-kg test line and 23 on 36-kg test line. The average weight of fish caught on 24-kg test was 185.2 lb (84.0 kg); on 36-kg test the average weight was 251.4 lb (114.0 kg). Thirty percent of the fish caught on 36-kg test weighed greater than 300 lb (136 kg) while only 8% of the fish caught on 24-kg test weighed greater than 300 lb. For the benefit of those of you who think in terms of tournament points, the 24-kg line accounted for 10,931 points including one "largest fish of the day" bonus whereas the 36-kg line accounted for 6,282 points including bonuses for four "largest fish of the day" and the largest fish of the tournament.

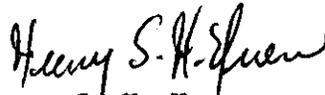
Forty-six of the blue marlin were caught on plastic lures, 10 on metal lures, 4 on live bait, and 2 on dead bait. Because we don't have data on how many plastic lures were trolled compared to metal lures or baits, I can't say whether plastic lures are preferred by blue marlin or by blue marlin fishermen.

The highest strike rates (strikes per boat-hour) for each day occurred on the rising tide (Figure 3). On Monday, Tuesday, Thursday, and Friday, the period just after low tide had the best strike rates. On Wednesday the period of best strike rate occurred just before high tide. On the other hand, the worst rates of the day occurred during periods of ebbing tide. On the one day (Monday) that the period of lowest strike rate was not during the ebbing tide, no part of the fishing day was in the ebb phase.

Except for inferences gleaned from Japanese longline fishery data, virtually nothing is known of the migratory routes of the billfishes which appear seasonally in Hawaiian waters. The tagging and releasing of fish can produce concrete evidence of their movements provided, of course, that the tagged fish are caught again and the tags are noticed and returned. This year with the lower weight limit of 100 lb (45.4 kg) in effect, HIBT promoted the tag and release of undersized billfish. Tagging equipment and supplies--tags, report cards, applicator tips, and pennants from NMFS and tagging poles from HIBT--were made available to every boat in the tournament. Although the actual tagging results during the tournament were meager--one shortbill spearfish tagged and released--I think that the tagging promotion did serve to increase your consciousness about tagging and its importance. Many of you have elected to retain the tagging equipment and supplies. I hope that your choosing to do so is a sign of your intention to tag fish in the very near future.

If you have any questions about this or any observations on game fishes you would like me to know about, please feel free to contact me.

Respectfully submitted,



Heeny S. H. Yuen
Leader, Recreational Fisheries

Attachments

October 22, 1979

Table 1.--Numbers of qualifying game fish landed and teams fishing during Hawaiian International Billfish Tournaments, 1962-79.

Year	Blue marlin	Black marlin	Striped marlin	Shortbill spearfish	Sailfish	Yellowfin tuna >100 lb	Total qualifying fish	Number of teams	Number of boat-days fishing ¹ per fish
1962	30	1	--	--	1	19	51	68	6.7
1963	19	2	1	--	--	26	48	72	7.5
1964	31	--	1	--	--	2	34	69	10.1
1965	47	--	--	--	--	9	56	78	6.9
1966	26	3	2	--	--	7	38	72	9.5
1967	63	--	1	--	--	18	82	68	4.2
1968	36	2	4	--	--	4	46	85	9.2
1969	32	1	--	--	--	4	37	75	10.1
1970	91	--	2	--	2	14	109	73	3.3
1971	41	--	3	1	--	47	92	77	3.4
1972	77	--	--	--	--	11	88	59	3.4
1973	76	--	1	3	1	17	98	61	3.1
1974	66	2	1	6	--	37	110	64	2.9
1975	104	--	2	8	--	79	193	79	2.0
1976	47	1	3	5	--	32	88	74	4.2
1977	71	--	1	1	--	14	87	73	4.2
1978	105	--	2	9	--	43	159	65	2.0
1979 ²	62	--	--	--	--	7	69	70	5.1

¹Nine-hour fishing days, 1962-73; 8-hour days, 1974-79.

²Minimum size of 100 lb put into effect in 1979.

Table 2.—Strike and catch rates by area,
Hawaiian International Billfish Tournament, 1979.

Area	<u>Number of strikes</u> Boat-hour	<u>Number of</u> <u>blue marlin</u> Boat-hour	<u>Pounds of</u> <u>blue marlin</u> Boat-hour
<i>India</i>	0.08	0.027	5.0
<i>Juliett</i>	0.06	0.015	2.1
<i>Kilo</i>	0.09	0.031	6.2
<i>Lima</i>	0.15	0.026	5.4
<i>Mike</i>	0.14	0.029	8.3
<i>Sierra</i>	0.11	0.027	5.5
<i>Tango</i>	0.12	0.028	4.5
<i>Uniform Alpha</i>	0.09	0.015	2.8
<i>Uniform Bravo</i>	0.19	0.026	7.1
<i>Victor</i>	0.12	0.043	11.2

Table 3.--Number of fish caught by species, area, and date; Hawaiian International Billfish Tournament, 1979.

Date	Area													V
	H	I	J	K	L	M	N _B	R	S	T	U _A	U _B		
<u>Blue marlin</u>														
August 20	--	1	--	2	2	2	--	1	2	2	1	1	1	1
21	1	2	--	3	--	--	--	--	2	--	--	2	1	1
22	--	2	1	1	3	--	--	--	--	2	1	--	1	1
23	--	2	1	--	1	1	--	--	2	4	--	2	2	2
24	--	--	--	1	2	--	1	--	2	2	2	--	--	--
Sum	1	7	2	7	8	3	1	1	8	10	4	5	5	5
Average weight (lb)	462.0	188.1	137.5	197.1	206.8	287.7	129.0	165.0	199.8	178.6	178.3	271.8	260.4	
<u>Ahi</u>														
August 21	--	--	--	1	--	--	--	--	--	1	--	--	--	--
23	--	--	--	--	--	1	--	--	--	--	2	--	--	--
24	1	--	--	--	--	1/2	--	--	--	--	--	--	--	--
Sum	1	--	--	1	--	1/2	--	--	--	1	2	--	--	--
Average weight (lb)	154.0			229.0		131.5				113.0	154.0			

Table 4.--Sex ratios for blue marlin examined from
Hawaiian International Billfish Tournaments, 1962-79.

Year	Number of males	Number of females	Ratio of Males to females
1962	16	7	2.3:1
1963	13	6	2.2:1
1964	14	12	1.2:1
1965	35	8	4.4:1
1966	16	8	2.0:1
1967	51	13	3.9:1
1968	24	10	2.4:1
1969	23	8	2.9:1
1970	63	14	4.5:1
1971	21	9	2.3:1
1972	64	8	8.0:1
1973	47	21	2.2:1
1974	46	14	3.3:1
1975	70	16	4.4:1
1976	7	37	0.2:1
1977	41	25	1.6:1
1978	80	22	3.6:1
1979	38	7	5.4:1

Table 5.--Stomach contents of blue marlin,
Hawaiian International Billfish Tournament, 1979.

FOOD ITEMS	Date and number of stomachs containing listed items					Percent occurrence
	August					
	20	21	22	23	24	
<u>Fish</u>						
Tunas, Scombridae	--	4	7	7	6	55.8
Skipjack tuna	--	4	5	5	4	41.9
Frigate tuna	--	--	2	1	2	11.6
Other tunas	--	3	3	5	1	27.9
Jacks, Carangidae						
Opelu	1	5	2	1	2	25.6
Akule	--	1	2	--	--	7.0
Spiny puffer, Diodontidae	--	3	3	--	6	27.9
Goatfish, Mullidae	--	1	3	3	2	20.9
Triggerfish, Balistidae	--	--	3	--	2	11.6
Squirrelfish, Holocentridae	--	1	2	2	--	11.6
Aweoweo, Priacanthidae	--	--	2	1	--	7.0
Snake mackerel, Gempylidae	--	1	1	--	1	7.0
Swordfish, Xiphiidae	--	1	2	--	--	7.0
Needlefish, Belonidae	--	--	2	--	--	4.7
Filefish, Monacanthidae	--	--	1	1	--	4.7
Cowfish, Ostraciidae	--	1	--	1	--	4.7
Puffer, Tetraodontidae	1	1	--	--	--	4.7
Lizardfish, Synodontidae	--	--	--	1	--	2.3
Flyingfish, Exocoetidae	--	--	--	1	--	2.3
Barracuda, Sphyraenidae	--	--	--	--	1	2.3
Mahimahi, Coryphaenidae	--	--	--	1	--	2.3
Bonnetmouth, Emmelichthyidae	--	--	--	1	--	2.3
Butterflyfish, Chaetodontidae	--	--	--	1	--	2.3
Unidentified fish	--	6	4	6	5	48.8
<u>Invertebrates</u>						
Squid, Decapoda	--	3	6	3	3	34.9
Crab, Decapoda	--	1	--	2	--	7.0
Octopus, Octopoda	--	1	--	1	--	4.7
Mantis shrimp, Stomatopoda	--	1	--	1	--	4.7
Unidentified crustacea	--	--	--	--	1	2.3

Table 5.--Continued.

	Date and number of stomachs containing listed items					Percent occurrence
	<u>August</u>					
DISORDERS	20	21	22	23	24	
<u>Parasites</u>						
Fluke, Trematoda	1	--	1	1	2	11.6
Threadworm, Nematoda	--	--	1	--	--	2.3
Tapeworm, Cestoidea	--	1	--	--	--	2.3
<u>Ulcers</u>	--	--	--	2	1	7.0
Empty or everted stomachs	1	1	1	2	--	11.6
Number of stomachs examined	2	10	11	12	8	
Total: 43						

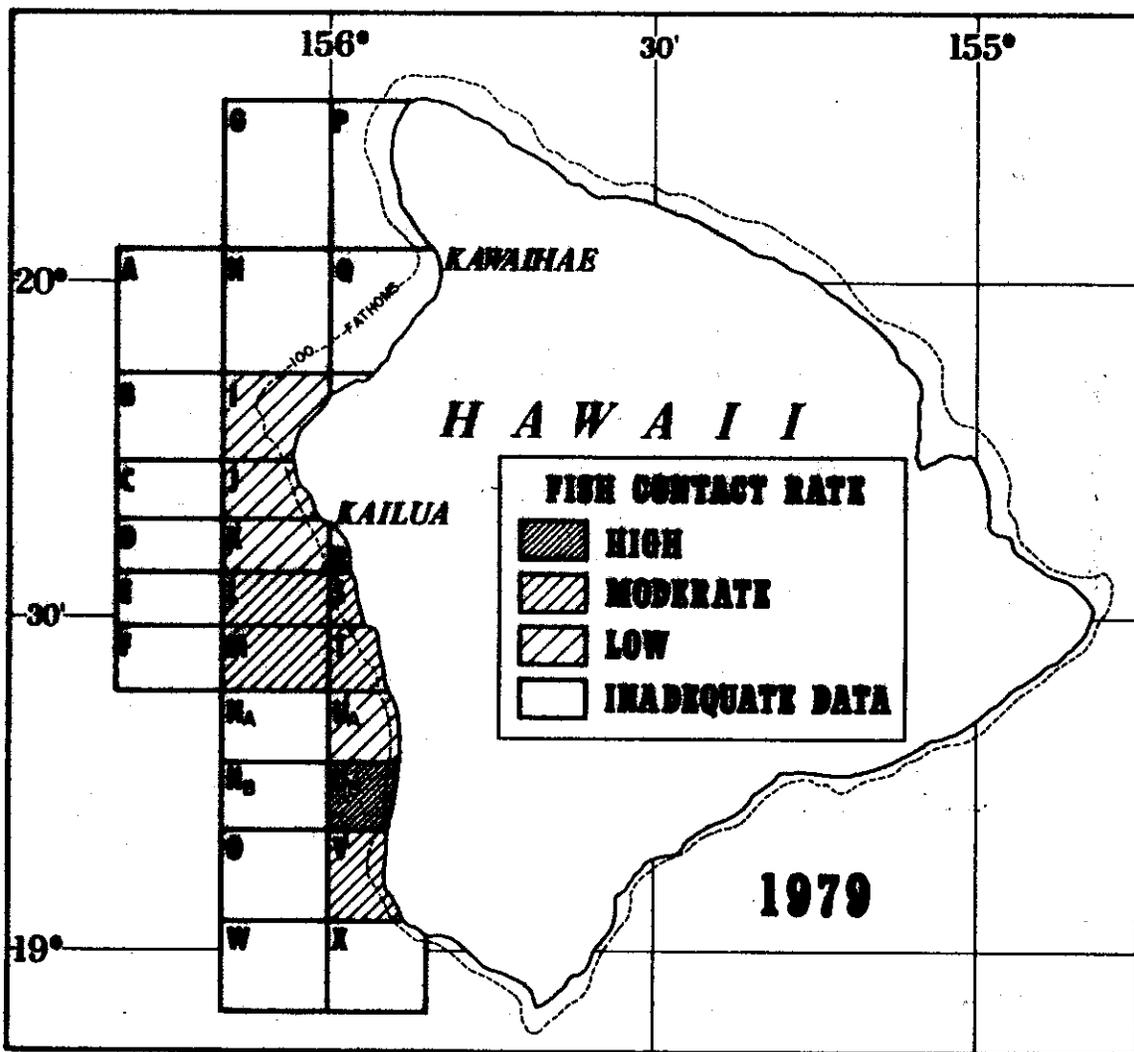


Figure 1.--Strike rate in various fishing areas.

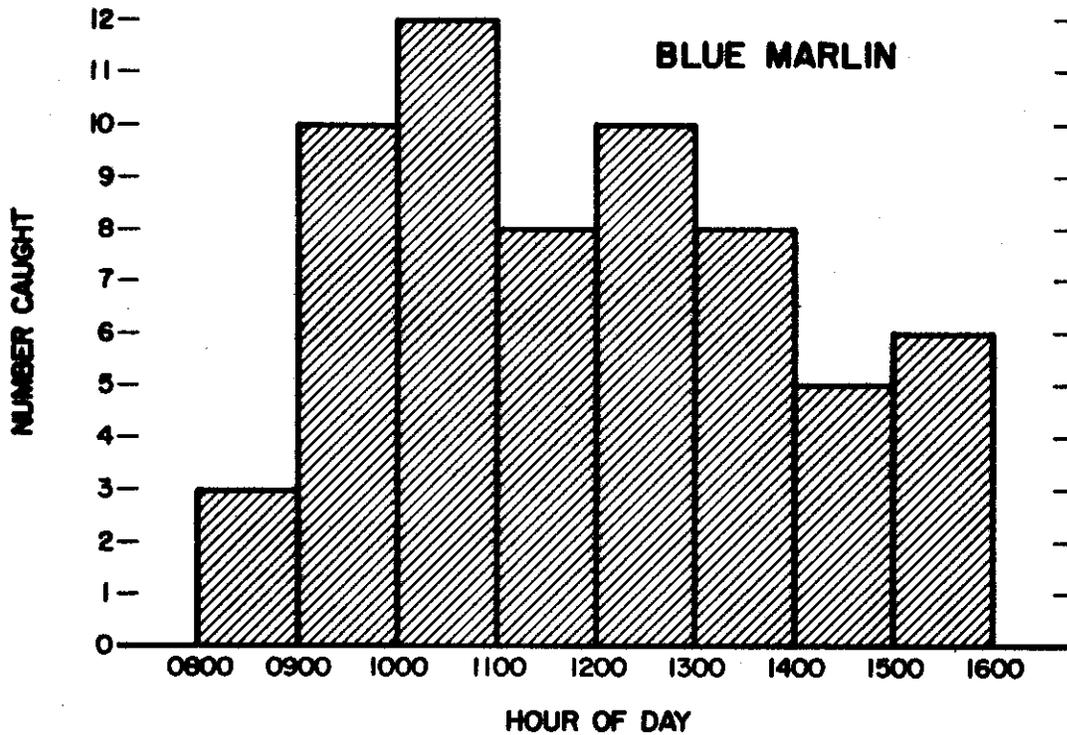


Figure 2.--Number of blue marlin caught by hour of day, Hawaiian International Billfish Tournament, 1979.

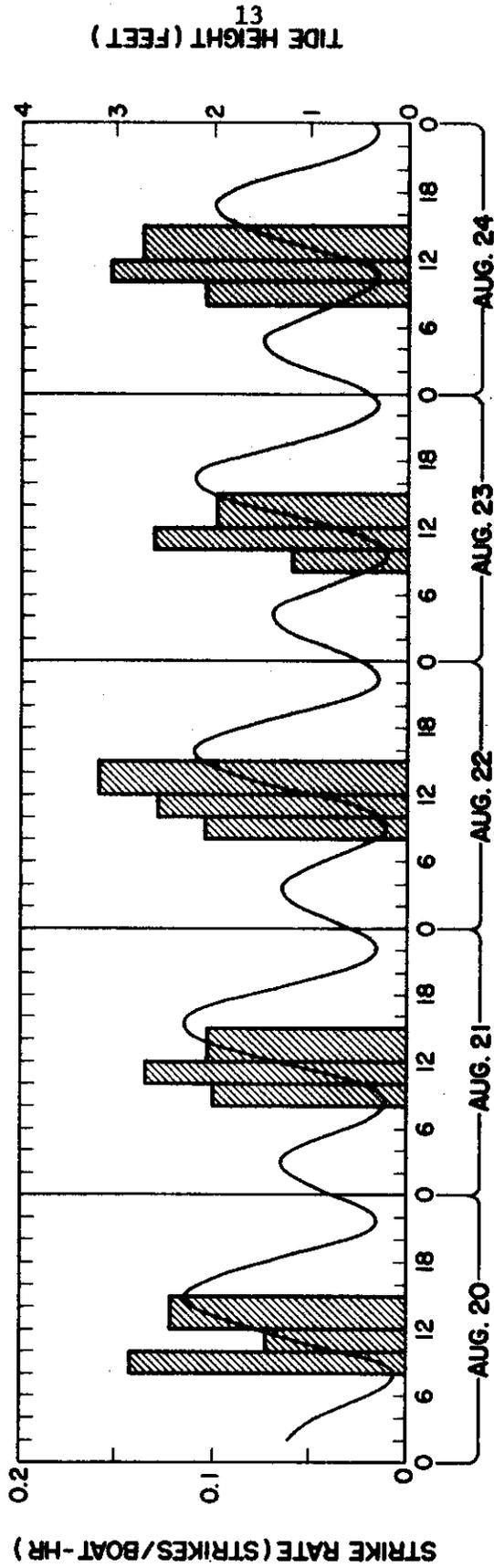


Figure 3.—Strike rates and tide cycle, Hawaiian International Billfish Tournament, 1979.