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The occurrence of large sharks off northeastern U. S.; results of monitoring an annual shark fishing tournament at Bay Shore, New York 1965-1977.

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Abstract

From 1965 through 1977 a total of 5,465 sharks were caught during an annual two-day shark fishing tournament at Bay Shore, New York. Ten species of sharks were represented in the catches. Blue, sandbar, mako and dusky sharks were the most common. Length-weight regressions for these and four other species of sharks are presented. The number of sharks caught per year ranged from 122 to 1,287. The annual catch per boat ranged from 0.8 to 8.6 sharks. Analysis of June surface water temperatures over the 13 year period shows that in years when temperatures were below 17°C the catch was almost exclusively blue sharks. In years when water temperatures were above 17.5°C mako, sandbar, and other species accounted for a higher percentage of the catch. The use of tournament data for monitoring species composition and relative abundance of sharks off the northeast coast is discussed.

Introduction

While elasmobranch fishes currently contribute little to U. S. commercial landings (< 0.05%) several of the larger species of sharks are important as big game to our recreational fisheries. A 1970 survey estimated Atlantic coast anglers caught 1.3 million sharks weighing 23 million pounds (Deuel, 1973). More recent estimates show 1.6 million sharks were caught by east coast anglers in 1975 (Deuel, personal communication). The figures include incidental catches of sharks when fishing effort was directed toward other species. Nevertheless, sharks are important to the economy of local communities. Shark fishing clubs, tournaments, and charter vessels engaged in shark fishing have increased along the east coast in recent years. The growing popularity of this activity is in part due to declining availability and rising costs associated with the fishery for traditional "big game" such as bluefin tuna (Thunnus thynnus), swordfish (Xiphias gladius), and billfishes (Istiophoridae). Only a small percentage of the shark catch is utilized for food, and while some are mounted

for trophies most of the catch is released or otherwise discarded at sea. Consequently statistical information on sharks is difficult to obtain for detailed stock assessments.

Shark studies at the NEFC are concerned with population estimates, migrations, age and growth, food and reproduction. In waters of the northeast coast sharks are currently important to the recreational industry and represent an underutilized resource to commercial fisheries. In order to obtain specimens for study we have worked closely with recreational fishermen and have been particularly fortunate in being able to monitor one of the largest and most successful shark tournaments in the U. S.

The Bay Shore Tuna Club has sponsored an annual two-day shark tournament since 1962. From 1962 through 1964 the tournament was held in late September, and from 1965 through 1977 it was held in late June. The tournament is limited to a maximum of 150 boats and each boat generally has a team of 5 or 6 anglers. The principal fishing area is between 20 and 30 miles south of Bay Shore (Figure 1), but some of the faster boats may travel up to 70 or 80 miles offshore. The boats are not allowed to leave the harbor before 0600 and must return by 1800 each day. The principal fishing method is by "chumming," i.e., the boat is allowed to drift and sharks are attracted to the baits by casting diced fish (chum) overboard. Normally each boat fishes two to four lines.

When the tournament was first organized, Bay Shore Tuna Club officials recognized its usefulness to research and initiated rules and data collecting procedures that would be useful to scientists. For example, all fish caught become the property of the tournament with the understanding that they will be available for scientific observations prior to any other disposition of the catch. In addition, weigh-out procedures on the dock are designed to help biologists as much as possible. As each fish is landed biologists in cooperation with the weighmaster routinely obtain data on weight, length, sex, and fishing location. Each shark is then assigned a specimen number which negates the need for duplicating this information during examination of stomachs, etc. Obtaining this information has at times required tournament participants to wait up to two hours to weigh-out their catches. Their cooperation has been outstanding and the information generated by their interest provides the basis of this report.

Catch Data

From 1965 through 1977 a total of 5,465 sharks representing ten species were caught during an annual two-day sport fishing tournament at Bay Shore, New York. Ten species were represented in the catch (Table 1). National Marine Fisheries Service biologists have worked closely with the participants during the tournament to obtain information on the species composition and relative abundance of large sharks in this area and to obtain samples for biological studies. From 1965 through 1975 anglers were asked to bring in all sharks for examination even though specimens under 100 pounds were ineligible in the tournament. Routine measurements including fork length to the nearest centimeter, and round weight to the nearest pound, were obtained for all sharks landed. From these and supplementary data, length-weight regressions

were calculated using the non-linear least squares method of Pienaar and Thomson (1969). The constants for the length-weight regressions for eight species of sharks are provided in Table 2. The regression lines are shown graphically in Figures 2 and 3.

The annual mean catch per boat (C/B) varied from a maximum of 8.6 sharks in 1977 to 0.8 sharks in 1966 and 1968 (Table 4). For those years when weather permitted fishing on two days, up to 90% of the catch was taken in the first day. The lower catch rates on the second day were, however, related more to the activities of the fishermen than to a reduction in the number of sharks due to fishing mortality. Tournament rules required that all boats return to the same dockage area following the first day's fishing. Consequently, anglers were quite willing to bring in their entire catch on that day. However, on the second day some anglers who felt they were not in contention in the tournament returned directly to their home ports and information on their catches was not available. Moreover, the annual catch and C/B for 1976 and 1977 includes fishermen's reports of tagged and released fish while those for the period 1965-75 includes only landed fish. Despite these differences and recognizing that the information is limited in terms of time and area covered, the tournament data provides a basis for evaluating trends in shark abundance. For example, although the catch figures for 1977 include fishermen's reports of released fish and could be somewhat exaggerated, the total catch of 1,287 sharks is not unreasonable. Additional information from commercial longline fishermen and the activities of our cooperative shark taggers during June and July also indicate blue sharks were more abundant off our northeast coast in 1977 than in the past ten to fifteen years.

Tagging

In 1976 and 1977, as part of an ongoing NMFS cooperative shark tagging program, tournament anglers were asked to tag and release all sharks under 100 pounds and to provide catch information on daily log forms provided by NMFS biologists. A total of 548 tournament-caught sharks were subsequently tagged and released (Table 3). Nine of these had been recaptured by mid-August 1977. Seven of the returns were from blue sharks that were recovered within 100 miles of the tagging site after less than two months at liberty. They showed local movements along the coast toward the northeast. Another blue shark was recaptured in the same area where it was tagged a year earlier. The remaining recapture from a tournament tagged fish came from a sandbar shark that was caught 400 miles southwest of the tagging site after ten months. Previous results from the NMFS cooperative tagging program have demonstrated west to east trans-Atlantic movements of tagged blue sharks covering nearly 3,000 miles, and recaptures after six years at liberty. Tagged sandbar sharks have shown movements of over 1,000 miles along the east coast and have been recovered after 12 years at liberty.

Species Composition

At the Bay Shore tournament blue sharks represented 77.5% of the total catch of all years, followed by sandbar 12.8%, mako 8.0%, dusky 0.7%, white 0.5% and tiger sharks 0.2%. Other species accounted for 0.4% (Table 3). These catches are representative of the species composition and relative abundance of

the larger sharks off Long Island in late spring. However, it should be noted that June is a transition month in which water temperatures and the species composition of sharks vary in different years. Figure 4 shows the relationship between surface water temperatures obtained from airborne radiation temperature surveys (ART) and the species composition of sharks taken during the tournament. From 1965 through 1968 June surface water temperatures in the fishing area were generally below 17.0°C and blue sharks dominated the catch. Similarly the years 1972 and 1977 were characterized by cooler surface waters and a dominance of blue sharks. In warmer years when temperatures in late June were above 17.5°C, sandbar, mako, and other species represented a higher percentage of the catch. The apparent inconsistencies in this trend in the tournament data for the years 1973 and 1974 can be explained by changes in water temperatures which occurred between the times of the ART flights and the tournaments. In 1973 the flight was made on June 19 and surface temperatures were near 16.0°C. Temperatures reported by tournament fishermen on July 1 were near 20°C. In 1974 the first scheduled day of the tournament was cancelled because a storm accompanied by high winds moved through the area. This seemed to have affected local conditions since fishermen reported cooler temperatures (around 16°C) during the tournament than were recorded by the ART flight ten days earlier. The interest among fishermen in the relationship between surface temperatures and fishing success offers an opportunity for more detailed studies. Many fishermen have installed continuous temperature sensors on their boats and in the future we plan to supply bathythermograph equipment to selected boats for obtaining temperature profiles on the fishing grounds.

References

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Deuel, David G. 1973. 1970 Salt-water angling survey. U. S. Dept. Comm., Nat. Mar. Fish. Serv. Current Fishery Statistics No. 6200. 54 pp.

Pienaar, L. V. and J. A. Thomson. 1969. Allometric weight-length regression model. J. Fish. Res. Bd. Can. 26:123-131.

Table 1. List of common and scientific names of sharks taken at Bay Shore New York, Tournaments in June (1965-1977).

Family Name	Common Name	Scientific Name
Odontaspidae	Sand tiger	Odontaspis taurus (Rafinesque)
Alopiidae	Thresher shark	Alopias vulpinus (Bonnaterre)
Lamnidae	White shark	Carcharodon carcharias (Linnaeus)
	Shortfin mako	Isurus oxyrinchus Rafinesque
Carcharhinidae	Sandbar shark	Carcharhinus milberti (Valenciennes)
	Dusky shark	Carcharhinus obscurus (Lesueur)
	Tiger shark	Galeocerdo cuvieri (Peron and Lesueur)
	Blue shark	Prionace glauca (Linnaeus)
Sphyrnidae	Scalloped hammerhead	Sphyrna lewini (Griffith and Smith)
	Smooth hammerhead	Sphyrna zygaena (Linnaeus)

Table 2. Length-weight relationship for western North Atlantic sharks, assuming the model weight = a × length^b. Length is fork length in centimeters; weight is round weight in pounds. (Iterative least squares computer program after Pienaar and Thomson, 1969).

Species	Constants a	b	Sex	Sample Size	Fork Length Range
Isurus oxyrinchus	$.1792277\times10^{-4}$	3.052905	Male	267	81-249
I. oxyrinchus	$.2786844\times10^{-5}$	3.410942	Female	242	75-337
Carcharodon carcharias	$.2767796\times10^{-5}$	3.450544	Male	33	117-192
C. carcharias	$.1696860\times10^{-4}$	3.086143	Female	27	120-221
Carcharhinus obscurus	$.2527473\times10^{-4}$	2.988525	Male	63	79-188
C. obscurus	$.1422324\times10^{-4}$	2.660080	Female	76	83-280
C. milberti	$.2356001\times10^{-3}$	2.534628	Male	528	48-183
C. milberti	$.3288244\times10^{-4}$	2.958901	Female	804	48-201
Prionace glauca	$.9443421\times10^{-5}$	3.069141	Male	1,258	102-279
P. glauca	$.6566453\times10^{-5}$	3.147970	Female	833	60-260
Galeocerdo cuvieri	$.1233993\times10^{-5}$	3.561327	Pooled	34	107-318
Sphyrna lewini	$.3741500\times10^{-4}$	2.936761	Pooled	44	80-214
S. zygaena	$.6666007\times10^{-5}$	3.184439	Pooled	25	45-234

Table 3. Bay Shore (N. Y.) Shark Tournament catch of each species by year.

Year	Blue	Mako	Sandbar	Dusky	White	Tiger	Other[a]	Total Catch
1965	910	3	2		2		1 Thr	918
1966	125				4			129
1967	354		1		1			356
1968	143	2	5	3	2			155
1969	380	87	9	2				478
1970	77	94	72		4	1	1 Sm H	249
1971	117	8	155	11	3		2 Sm H, 1 Sc H	297
1972	117		4	1				122
1973	98	31	100	5	1	1	4 Sm H	240
1974	297	36	4		4		1 ST	342
1975	216	117	148	1	1	5	4 Sm H, 2 Sc H	494
1976	184	45	154	4	4	2	4 Thr, 1 H	398[b]
1977	1216	13	46	10		1	1 Un	1287[c]
Total	4234	436	700	37	26	10	22	5465
%	77.5	8.0	12.8	.7	.5	.2	.4	

[a]Key to species: H = Unidentified hammerhead, Sc H = Scalloped hammerhead, Sm H = Smooth hammerhead, ST = Sand tiger, Thr = Thresher, Un = Unidentified shark.

[b]Includes 230 sharks tagged and released.

[c]Includes 318 sharks tagged and released and 622 sharks reported released without tags.

Table 4. Bay Shore, New York Shark Tournament - Sharks Caught per day per boat, 1965-1977.

Year	No. Boats Fishing	No. Sharks 1st Day	No. Sharks 2nd Day	Total No. Sharks	% Catch 1st Day	C/B 1st Day	C/B 2nd Day	Total C/B
1965	111	649	269	918	70.7	5.8	2.4	8.2
1966	162	79	50	129	61.2	.5	.3	.8
1967	180	294	62	356	82.6	1.6	.3	1.9
1968	190	140	15	155	90.3	.7	.1	.8
1969	144	352	126	478	73.6	2.4	.9	3.3
1970	141	149	100	249	59.8	1.0	.7	1.7
1971	145	152	145	297	51.1	1.0	1.0	2.0
1972	141	122	canc.	122	--	.8	--	.8
1973	139	240	canc.	240	--	1.7	--	1.7
1974	140	342	canc.	342	--	2.4	--	2.4
1975	143	293	201	494	59.3	2.0	1.4	3.4
1976	148	247	161	398	62.1	1.7	1.0	2.7
1977	150	1067	220	1287	82.9	7.1	1.5	8.6
Total	1934	4126	1339	5465				

PRINICIPAL FISHING AREA, BAY SHORE SHARK TOURNAMENT

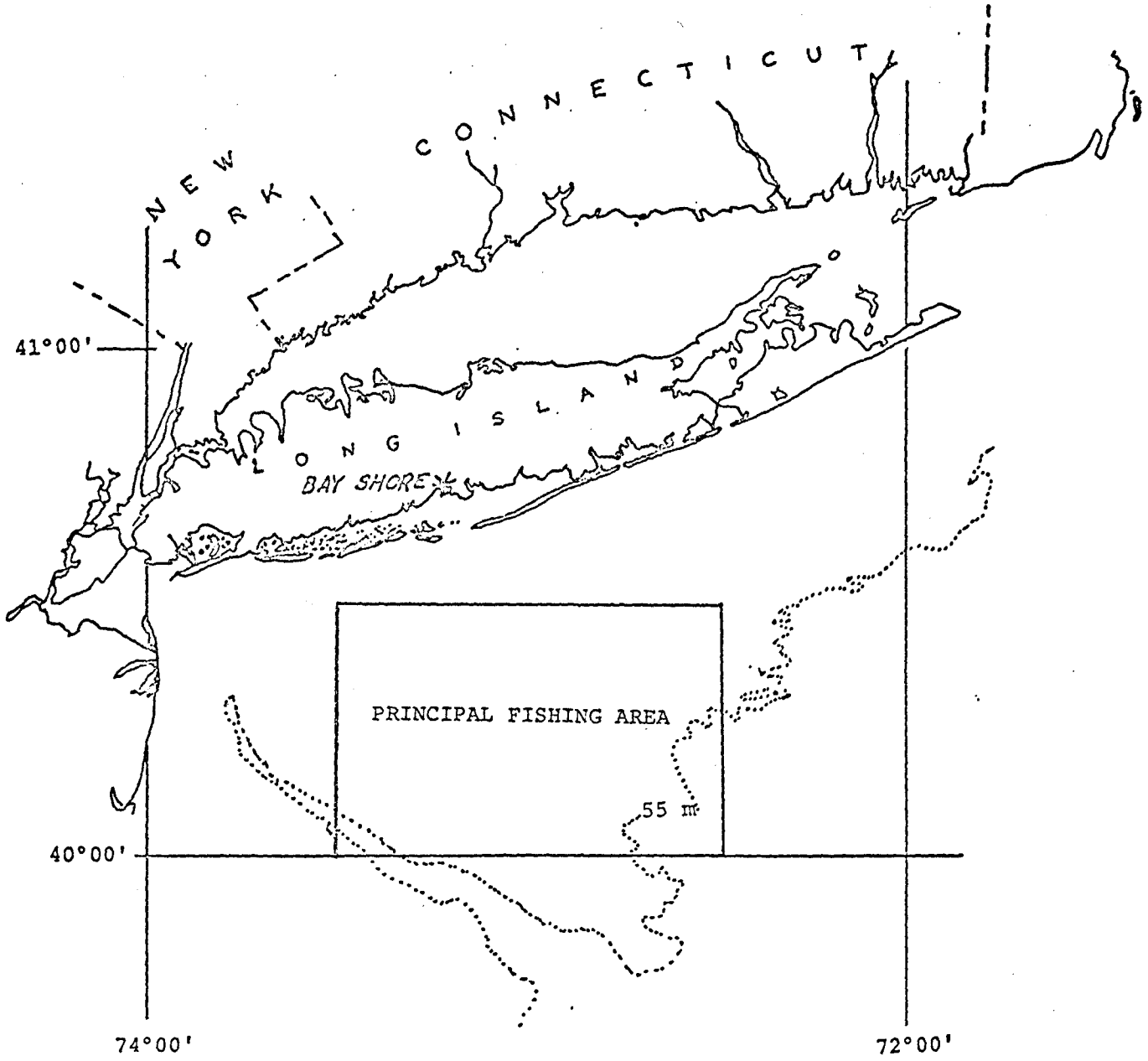

Figure 1.

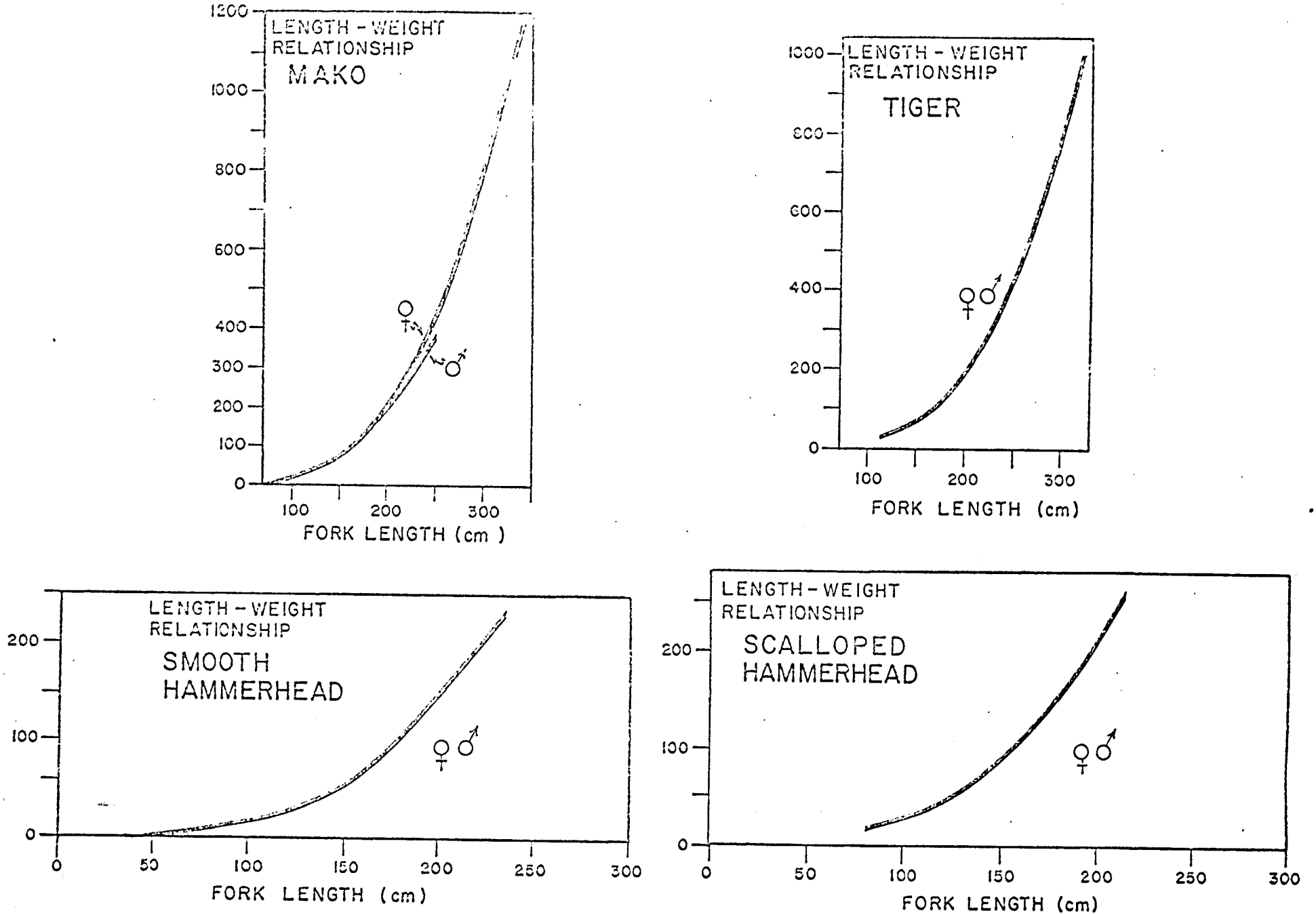
LENGTH - WEIGHT RELATIONSHIP
MAKO
1200
1000
800
600
400
300
200
100
0
100
200
300
FORK LENGTH (cm)
WEIGHT (lbs)
LENGTH - WEIGHT RELATIONSHIP
TIGER
1000
800
600
400
200
0
100
200
300
FORK LENGTH (cm)
LENGTH - WEIGHT RELATIONSHIP
SMOOTH HAMMERHEAD
200
100
0
0
50
100
150
200
250
300
FORK LENGTH (cm)
LENGTH - WEIGHT RELATIONSHIP
SCALLOPED HAMMERHEAD
200
100
0
0
50
100
150
200
250
300
FORK LENGTH (cm)

Figure 2.

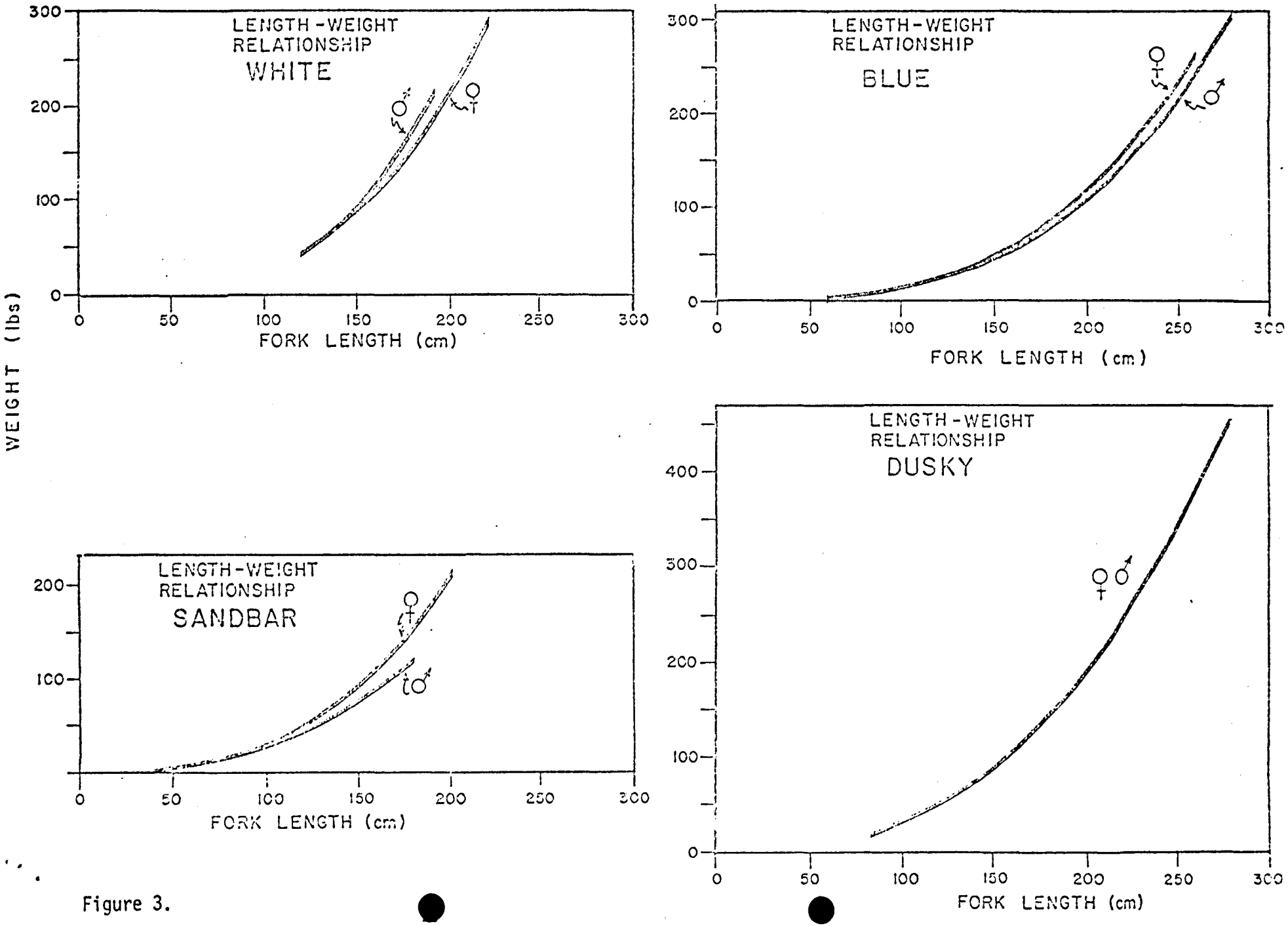
LENGTH-WEIGHT
RELATIONSHIP
WHITE
LENGTH-WEIGHT
RELATIONSHIP
BLUE
LENGTH-WEIGHT
RELATIONSHIP
SANDBAR
LENGTH-WEIGHT
RELATIONSHIP
DUSKY
WEIGHT (lbs)
FORK LENGTH (cm)
0
50
100
150
200
250
300
400

Figure 3.

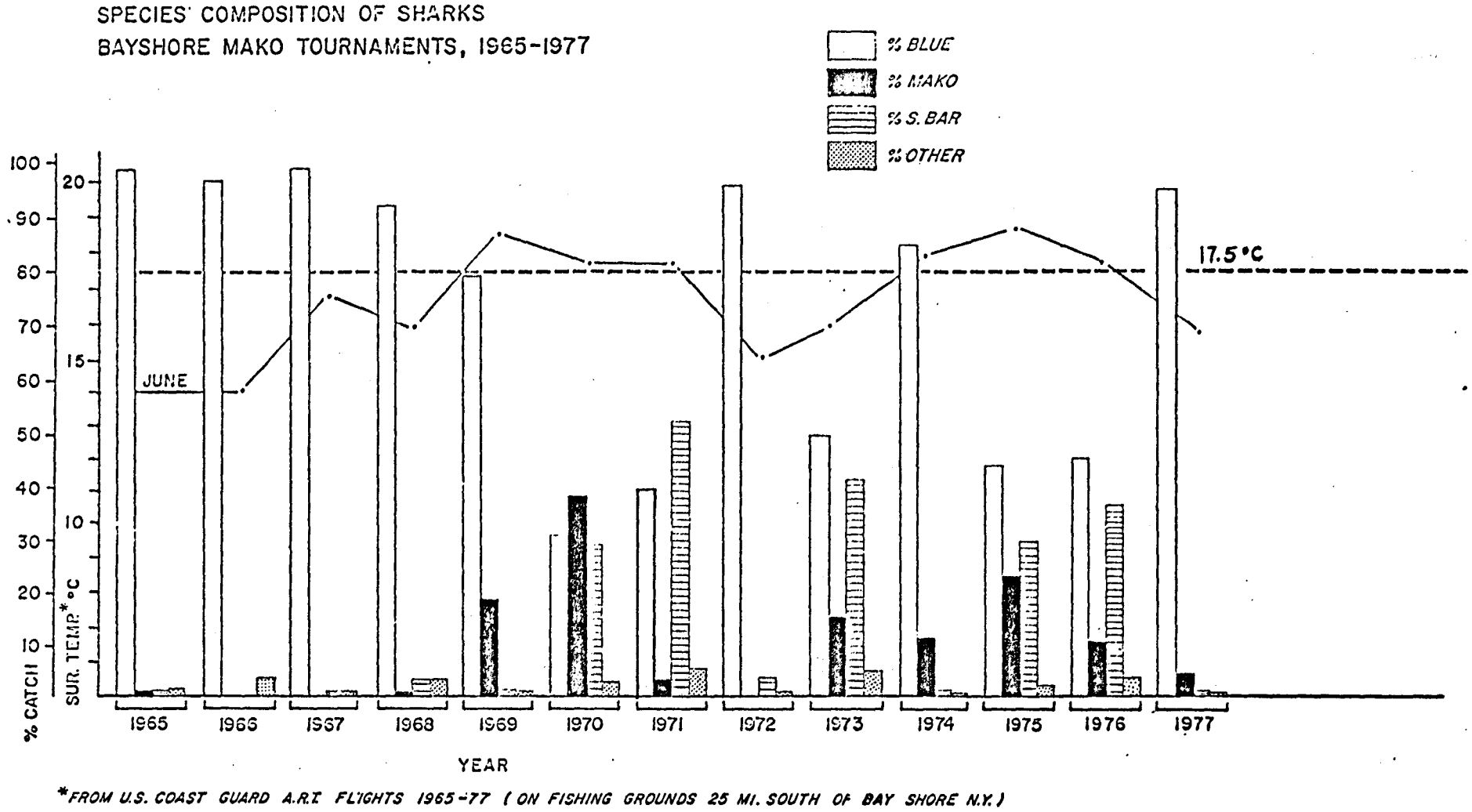
SPECIES' COMPOSITION OF SHARKS
BAYSHORE MAKO TOURNAMENTS, 1965-1977
% BLUE
% MAKO
% S. BAR
% OTHER
17.5 °C
JUNE
% CATCH
SUR. TEMP.* °C
100
90
80
70
60
50
40
30
20
10
20
15
10
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
YEAR
*FROM U.S. COAST GUARD A.R.I. FLIGHTS 1965-77 (ON FISHING GROUNDS 25 MI. SOUTH OF BAY SHORE N.Y.)

Figure 4.