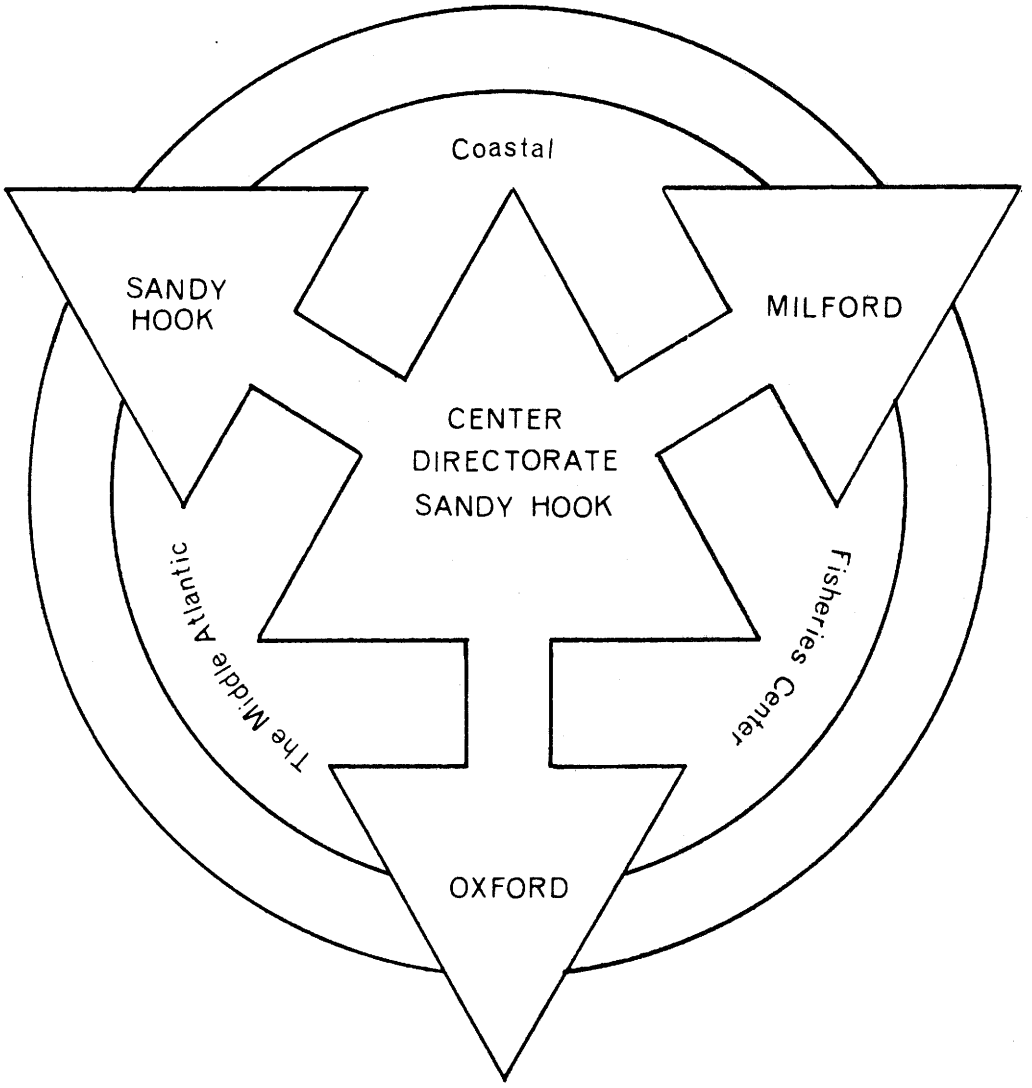
A PRELIMINARY REPORT ON THE FISHERY FOR BLUEFIN TUNA (Thunnus thynnus) OFF NEW JERSEY IN RELATION TO THE CATCHES MADE BY CHARTER AND PARTY BOAT ANGLERS DURING 1975.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region

MIDDLE ATLANTIC COASTAL FISHERIES CENTER



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A Preliminary Report on the Fishery for Bluefin Tuna (Thunnus thynnus) off New Jersey in Relation to the Catches Made by Charter and Party Boat Anglers During 1975

By

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INTRODUCTION

For constructive fishery management and wise conservation policies to be implemented we must fully understand the fishery resource including the distribution of the various species, their migratory routes by seasons, growth, food, predators, competitors, spawning areas, etc. Among the most pressing problems of an exploited fish popualtion is to determine how a fishery of given intensity affects the numbers and sizes of fish within the population. To determine this we must have measurements of the numbers caught and their sizes, and the intensity of fishing.

The Middle Atlantic Coastal Fisheries Center has initiated a program to design a sampling scheme that can be used to conduct a uniform canvassing of fish species utilized by recreational anglers with a determinant of the biological characteristics of the catch. We began a pilot study during July of 1974 in Ocean City, Maryland. It included the commercial fishery as well as the recreational fishery and ran for about a year. During the summer of 1975 we initiated a survey along the New Jersey coast which dealt with only the party and charter boats. This paper is a result of the analysis of the bluefin tuna data for the 1975 season.

METHODS

A detailed survey was made of the bay and ocean shoreline to determine the location of every party[1/] and charter boat[2/] in New Jersey. The northern most boat was located at Bayonne, the southern most at Cape May. No boats were included that docked along the shore of Delaware Bay. The original list of boats made late in May contained 102 party and 229 charter boats. While some of these boats were sailing daily, many of them, especially the charter boats, had not yet begun to sail, though their captains said they would do so during the summer season. Nonetheless, the boats that actually sailed were about 3 percent less for party boats and 8 percent less for charter boats than those that reported intentions to sail. In all, 65 full day party boats, 34 half-day party boats and 213 charter boats sailed during the summer season (Table 1). Of these, 3 full day party and 6 charter boats were not sampled because they were located in isolated locations.

1/ These fishing boats are usually from 40 to 120 feet long and carry 20 to 120 anglers. Space is sold to the general public until either the boat is filled to capacity or the scheduled sailing time is reached. The captain usually determines the type of fishing and the areas to be fished. The fee ranges from $7 to $35 depending on duration of the trip or distance from port, and includes bait but not tackle. Trip lengths are usually eight hours for a full day and four hours for a half day. These boats are also called head boats, open boats and party packets.

2/ These are fishing boats usually from 30 to 85 feet long that are hired for the exclusive use of from 1 to 80 anglers. With the advice of the captain, the anglers determine what type of fishing they will do. The fee ranges from $90 to $600 or more a day and usually includes tackle and bait.

The coast of New Jersey was divided into six sampling areas beginning at Perth Amboy and ending at Cape May (Figure 1). These areas were selected in such a way as to divide the number of boats into six nearly equal groups, to maintain geographical groupings by ports and to include at least one major inlet in each (Figure 2). This division resulted in having from 29 to 77 boats in an area (Table 1). Each area was then divided into ports or sub-areas. These were convenient groupings of boats which a field person could easily reach by walking from one to the next as they returned to dock.

Direct contact, complete fishing-trip interviews were made either at the dock as the various boats returned, or aboard a boat while the anglers were engaged in fishing. Ports or sub-areas were selected at random, without replacement, and were weighed in relation to the number of party and charter boats located there. A sampling schedule was determined at the beginning of the season for each port. A die was rolled to determine which boat to sample first if two or more arrived at a port simultaneously. The die was also rolled to determine the angler who would be interviewed first as a party boat unloaded. After the first randomly chosen interview, as many anglers as possible would be interviewed in turn as they left the boat.

An interview form was completed for each boat trip (Figure 3). In nearly all cases all the anglers on a charter boat would be included in an interview, and the entire catch identified, counted and weighed. As many as possible of the anglers on a party boat would be interviewed and their catch identified, counted and weighed. Their catch would then be expanded by the total number of anglers on the boat. In addition, length-weight data (Figure 4) and length frequency data (Figure 5) were obtained during the interviews.

The sampling was carried on every day during the summer season and at night on occasion. Scheduled interviewing was carried on every day from 11:00 a.m. to 7:00 p.m. Field people worked eight hours a day, five days a week, including weekends and holidays. They received two consecutive days off each week. The days off for those people working adjoining areas were staggered so as not to be the same.

A count was made of all the boats, by type, that fished from a port when that particular port was sampled (Figure 6). From the total number of boats known to sail from there, we could determine the fraction of boats that actually sailed that day. This fraction was computed during each interview day over all the ports throughout the state. At the same time, boats moving through the various inlets were counted at randomly selected one-hour intervals (without replacement) from 7 o'clock in the morning to 8 o'clock in the evening (Figure 6). Boats were divided into six categories -- full day party, half day party, charter, private fishing, private cruising, and commercial. From this we obtained the total number of trips made by each boat category over the season. This was checked against the port count. Fishing locations were recorded and tabulated by use of a grid (Figure 7) and key fishing areas were located with respect to the grid (Figure 8) for purposes of analyzing catch by area.

Field people received two weeks of training at Sandy Hook Laboratory in identifying the various species of fishes found along the New Jersey coast. At the same time they measured and weighed several hundred specimens of different species using both laboratory and field equipment. Prior to scheduled sampling on July 12 they spent another two weeks collecting biological data in the field.

All of the data collected during this survey was entered directly on forms designed for eventual automatic data processing (ADP). Computer cards were punched directly from the data forms and verified. An audit program was prepared and the data processed through three times. Various listing and analysis programs were written in FORTRAN IV to be used in an IBM 360 computer.

RESULTS

From July 13, the earliest time we have data, to September 20, the end of the summer fishing season, we estimate there were 5,245 bluefin tuna caught from party and charter boats fishing out of New Jersey ports (Table 2). The total estimated weight of these fish is 42,437 kg (93,558 lbs). The data show that as the season progressed the total catch by party boat anglers steadily increased until the end of the season[3/]. The catch by charter boat anglers was highest during mid-July and again late in August and the beginning of September. The seasonality of the catch, however, was governed to a large degree by the method of fishing (Table 3).

When the tuna first arrive along the coast in June, they seem to be swimming rapidly and spread out in schools of various sizes. During the early part of the season these fish are caught primarily by trolling. The ones that were caught by chumming are taken indicentally to catches of bluefish which are being sought at the time. Even those which are caught by chumming seem to be from individual schools that move through the chum slick rather quickly, not lingering for any length of time to feed on the chum. Normally, chumming for bluefin tuna starts the second week in July and continually increases in intensity throughout the season.

The catch rates for tuna by anglers chumming from party boats are shown in Figures 9-14. All of the tuna caught using this technique were close inshore off northern New Jersey. During mid-July the few fish that were caught were off the Mud Hole and Manasquan Ridge (see Figure 8 for fish grounds). From late July to mid-August the tuna were caught between

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3/ Although we know of several bluefin tuna caught by anglers after September 20, none were encountered after this date during our scheduled sampling time at the various ports.

the Shrewsbury Rocks and Klondike, while later in August and September they were spread out between Sandy Hook and Manasquan Ridge.

The catch rates for tuna by anglers chumming from charter boats are shown in Figures 15-20. The catches made by these anglers were nearly three times as great as those for party boat anglers that chummed. This is explained in part by the fact that, except late in the season when a few party boats go expressly for bluefin, nearly all of the tuna caught on party boats are incidental to the bluefish catch. While many tuna are also caught incidental to bluefish by charter boat anglers, many of the charter trips are made just for tuna, some boats sailing a third of the time for them. Bluefin tuna caught while chumming from charter boats are taken over a much larger area than those caught from party boats. Still, most of them were from the northern parts of the state and from 2 to 10 miles offshore. During mid-July the tuna were caught off Barnegat Ridge; later in the month, farther to the north off the Tolten Lump and the Klondike. Through early and mid-August they were caught from off Barnegat Light to Sandy Hook; later in the month much higher catches were made within this same area. During September tuna were caught in the Mud Hole and off Manasquan Ridge.

The catch rates for tuna by anglers trolling from charter boats are shown in Figures 21-26. More tuna were caught by anglers trolling than by chumming, though, on the average, troll-caught fish were smaller in size. The catches by anglers that trolled were from off the entire state. As stated above, most of the tuna fishing early in the season is by trolling. Nearly 50 percent of the tuna taken by trolling were taken during the middle two weeks in July. These fish were caught from the Five Fathom Light Buoy to Shrewsbury Rocks. Good catches were made at irregular locations throughout this area indicating various schools were widely distributed.

By late July- early August catches were more scattered and to the north. Fish caught off southern New Jersey were all offshore, while those off northern New Jersey were both inshore and offshore. By August, catches were all north of Barnegat Ridge and the best ones were offshore. By late August- early September only a few fish were caught off northern New Jersey by trolling.

The size composition of the bluefin tuna catch is shown in Figure 27[4/]. During middle July there were more one than two year old fish by a ratio of 3.5:1. By late July- early August the one year old fish declined somewhat but still predominated at a ratio of 2:1. During mid-August one's and two's were equally represented. By late August- early September two year old fish dominated the catch by a ratio of 3.5:1, and by mid-September only two year old fish were caught.

The catch by age class was computed by using the data from Figure 27 (Table 4). The catch of tuna was about equally divided between one and two year old fish. Other age fish made up less than three percent of the total.

The total estimated catch for the recreational tuna fishery in New Jersey during 1975 is 10,435 fish weighing 72,128.8 kg. (159,016.8 lbs.) (Table 5). The numbers of fish caught by party and charter boat anglers during the beginning of the season were obtained by questioning a number

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4/ The dotted lines in Figure 27 connect the estimated mean size of the fish during the summer.

of captains. Since the vast majority of these were troll-caught fish and somewhat smaller in size than those during mid-July, we used an average weight somewhat smaller than our July data indicated to compute the aggregate weight of these specimens. The private boat catch was computed as being 35 percent of the party and charter boat catch.

ACKNOWLEDGEMENTS

We wish to thank Michele Cox for her preparation of the figures and Charles Morrison for developing computer programs used in auditing, listing and analyzing the data.

TABLE 1. The number of party and charter boats sailing five or more times out of New Jersey ports from Bayoone to Cape May during the 1975 summer season.

	BOAT TYPES			
Areas	Full-Day Party	Half-Day Party	Charter	Total
1	11[1/]	3	29	43
2	10	4	21	35
3	14	8	44	66
4	6	5	66[2/]	77
5	10	5	13[3/]	29
6	14[4/]	9	39[5/]	62
Total	65	34	213	312

1/ This includes 2 party boats not sampled.
2/ This includes 2 charter boats not sampled.
3/ This includes 2 charter boats not sampled.
4/ This includes 1 party boat not sampled.
5/ This includes 2 charter boats not sampled.

TABLE 2. Estimated catches of bluefin tuna by numbers and weights by two-week intervals from July 13 to September 20 for party and charter boats in New Jersey.

Boat Type			
Party Boat	July 13 - July 26	42	290.64
	July 27 - Aug. 9	52	494.00
	Aug. 10 - Aug. 23	85	875.50
	Aug. 24 - Sept. 6	268	2,730.92
	Sept. 7 - Sept. 20	341	3,652.11
		788	8,043.17
Charter Boat	July 13 - July 26	1,392	6,723.84
	July 27 - Aug. 9	840	6,859.53
	Aug. 10 - Aug. 23	678	5,782.59
	Aug. 24 - Sept. 6	1,350	13,054.10
	Sept. 7 - Sept. 20	197	1,973.94
		4,457	34,394.00
	Total	5,245	42,437.17
			(93,557.94 lbs.)

TABLE 3. Estimated catches of bluefin tuna by numbers and weights from July 13 to September 20 for party and charter boats in New Jersey by fishing type.

Boat Type				
Party boat	chumming	July 13 - July 26	42	290.64
		July 27 - Aug. 9	52	494.00
		Aug. 10 - Aug. 23	85	875.50
		Aug. 24 - Sept. 6	268	2,730.92
		Sept. 7 - Sept. 20	341	3,652.11
			788	8,043.17
Party boat	trolling	(no tuna caught)	0	0
Charter boat	chumming	July 13 - July 26	108	573.48
		July 27 - Aug. 9	118	4,330.60
		Aug. 10 - Aug. 23	281	2,292.96
		Aug. 24 - Sept. 6	1,210	12,015.30
		Sept. 7 - Sept. 20	197	1,973.94
			1,914	17,650.41
Charter boat	trolling	July 13 - July 26	1,284	6,150.36
		July 27 - Aug. 9	722	6,064.80
		Aug. 10 - Aug. 23	397	3,489.63
		Aug. 24 - Sept. 6	140	1,038.80
		Sept. 7 - Sept. 20	0	0
			2,543	16,743.59

TABLE 4. Estimated number of bluefin tuna by age caught off New Jersey by party and charter boat anglers during 1975.

Party (Both Types)	Year Class I	Year Class II	Older Fish	Total
6/15 - 6/28	8	2		10
6/29 - 7/12	21	7		28
7/13 - 7/26	32	10		42
7/27 - 8/9	35	17		52
8/10 - 8/23	45	40		85
8/24 - 9/6	62	206		268
9/7 - 9/20	0	341		341
Total Party	203	623		826
Charter				
6/15 - 6/28	307	93		400
6/29 - 7/12	844	256		1100
7/13 - 7/26	1068	324		1392
7/27 - 8/9	569	271		840
8/10 - 8/23	343	312	23	678
8/24 - 9/6	291	962	97	1350
9/7 - 9/20	0	197		197
Total Charter	3422	2415	120	5957
Grand Total	3625	3038	120	6783

Table 5. Total number of fishing trips and total estimated number and weight of bluefin tuna taken during 1975. Private boat trips are determined from inlet counts while the party and charter trips are derived from port counts.

Boat Type and Date	Number of Trips	Number of Bluefin	Weight (kg.)
Full-Day Party			
6/15 - 6/28		(10)[1]	61.0
6/29 - 7/12		(28)[1]	182.0
7/13 - 7/26	633	42	290.6
7/27 - 8/9	761	52	494.0
8/10 - 8/23	799	68	688.2
8/24 - 9/6	751	268	2730.9
9/7 - 9/20	715	341	3652.1
Total	3659	826	8098.8
Half-Day Party			
7/12 - 9/20	3369	17	187.3
Charter			
6/15 - 6/28		400[1]	1240.0
6/29 - 7/12		1100[1]	3850.0
7/13 - 7/26	1324	1392	6723.8
7/27 - 8/9	1685	840	6859.5
8/10 - 8/23	1607	678	5782.6
8/24 - 9.6	1274	1350	13054.1
9/7 - 9/20	1136	197	1973.9
Total	7026	5957	39,483.9
Party and Charter Total	14,054	6,783	47,770.1
Private Fishing			
7/12 - 9/20	104,223	3,652[2]	24,358.8
GRAND TOTAL	118,277	10,435	72,128.8

1 / The catches between June 15 and July 12 are estimated from conversations with party and charter boat captains.

2 / The private boat catch is assumed to be 35 per cent of the party and charter boat catch.

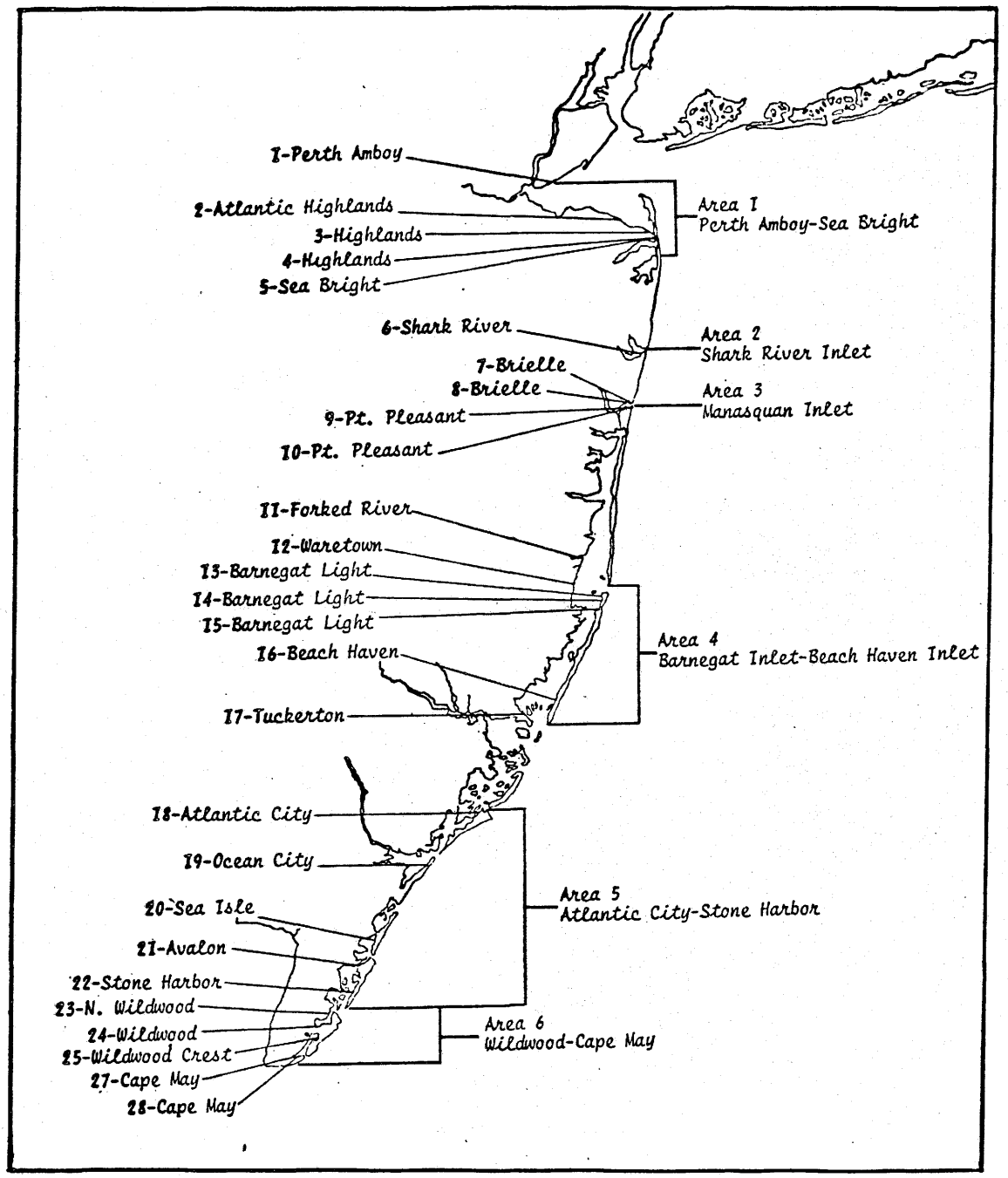

Figure 1. Map of New Jersey's coast showing the six large geographical areas and the 28 ports or subareas.

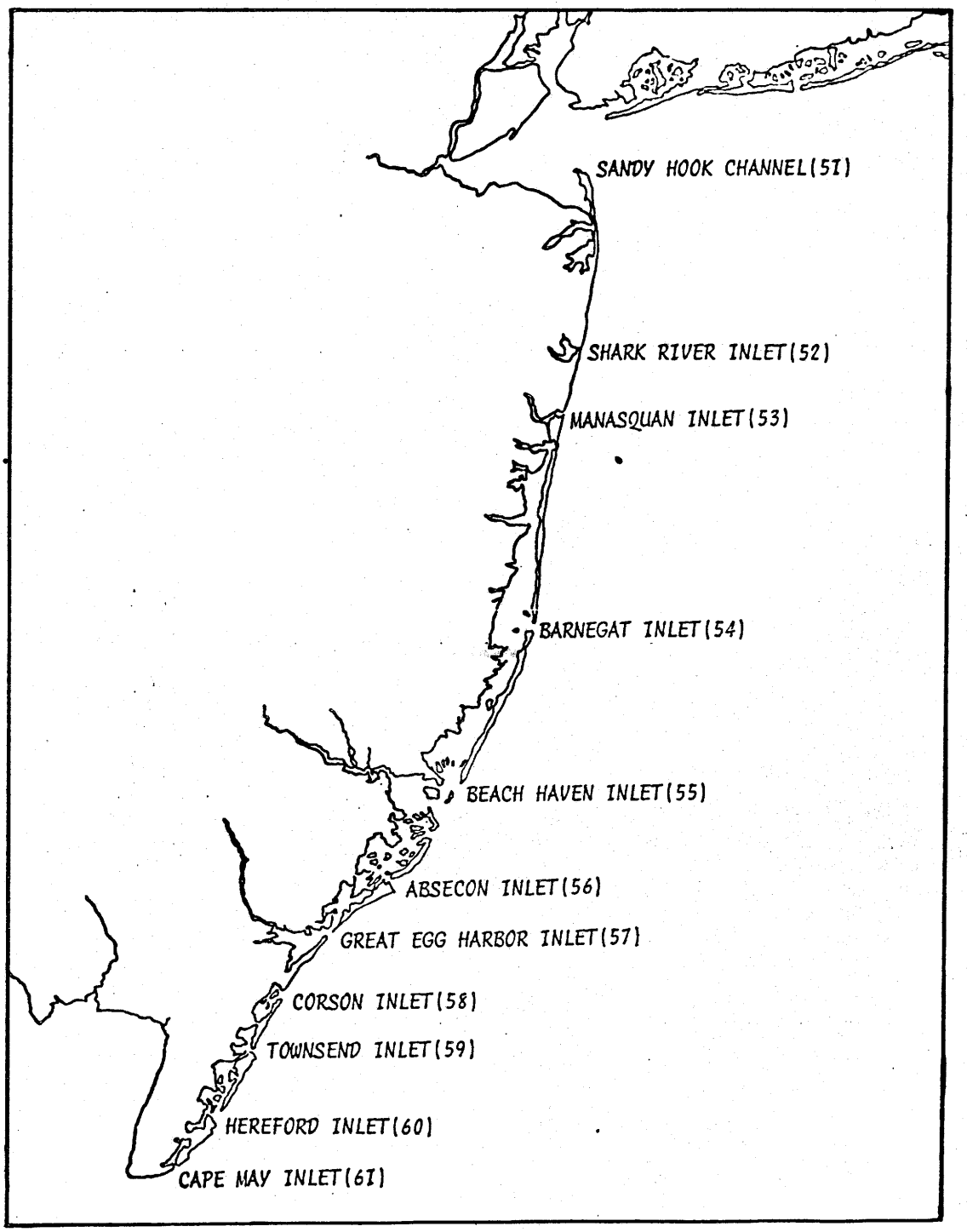

Figure 2. Map of New Jersey's coast showing the various inlets used in the study.

Interview Form - NJ - 1975-76

Sampler:_____

Date (Mo, Day, Yr) 1–6 | Port 7–8 | Inter. No 9–10 | Boat Type 11: Full Day Party 1, ½ Party 2, Full Day Charter 3, ½ Charter 4, Private 5 | Water Temp °C: Surface 12–15, Bottom 16–17 | Time of Day 18: Day 1, Night 2, Both 3

Fishing Type 19: Bottom 1, Troll 2, Chum 3, Other 4, Tub 5 | Number of Anglers 20–22 | Number of Rods 23–25

Fishing Location: _____ 26–28

Departure Time 29–32 | Date (Mo, Day) 33–36 | Returning Time 37–40 | Date (Mo, Day) 41–44

Time Spent Fishing 45–47 (to nearest ½ hour)

Day Cl 76: WD 0, WE 1

MPH Wind Vel 48: 0-10 1, 11-20 2, 21-30 3, 31-40 4, 40 + 5

Wind Dir 49: N-E 1, SE-S 2, SW-W 3, NW 4, Varib 5, None 6

Weather 50: Clear 1, L Cloud 2, H Cloud 3, Fog 4, Rain 5, Sleet 6, Snow 7

Air Temp °F 51: 0-10 0, 11-20 1, 21-30 2, 31-40 3, 41-50 4, 51-60 5, 61-70 6, 71-80 7, 81-90 8, 90 + 9

Comments: _____ 77–80

Number of Separate cards 52–53

Fish Species	54 Code	57 Number Retained	60 Number Discarded	63 Number Weighed	66 Weight	70 No. Anglers Sharing Catch	72 Angler Interview No.	74–75

Figure 3. Interview form used during study.

Biological Data Form - N.J.

Sampler _____

Date			Port	Water Temperature °c	
Mo.	Day	Yr.		Surface	Bottom
1		6	7 8	9 12	14

Species _____ (15 17)

Fishing Location _____ (18 20)

CARDS (32 33)

Number	Length (cm)	Weight (kg)	Sex	Gonad Condition	Comments
21	23	26	30	31	34–80
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					

Figure 4. Length-weight data form used during study.

Length Frequency Form (Punch Strips) - N. J.

Punch Strip No. ______________ Sampler ______________

Date		
Mo.	Day	Yr.

1 6

Port

7 8

Water Temperature °c	
Surface	Bottom
.	.

9 12 14

Species ______________ 15 17

Fishing Location ______________ 18 20

cards 45 46

Length (cm)	Numbers	Length (cm)	Numbers	Length (cm)	Numbers	Length (cm)	Numbers
0		0		0		0	
1		1		1		1	
2		2		2		2	
3		3		3		3	
4		4		4		4	
5		5		5		5	
6		6		6		6	
7		7		7		7	
8		8		8		8	
9		9		9		9	
0		0		0		0	
1		1		1		1	
2		2		2		2	
3		3		3		3	
4		4		4		4	
5		5		5		5	
6		6		6		6	
7		7		7		7	
8		8		8		8	
9		9		9		9	
0		0		0		0	
1		1		1		1	
2		2		2		2	
3		3		3		3	
4		4		4		4	
5		5		5		5	
6		6		6		6	
7		7		7		7	
8		8		8		8	
9		9		9		9	

Figure 5. Length-frequency data form used during study.

Boat and Trip Counts - N.J.

Date		
Mo	Day	Yr

1 6

Type of Count		
Inlet		1
Port		2

7

Sampler _____

Beginning Time Inlet

8 11

Wind Vel. MPH		
0 - 10		1
11 - 20		2
21 - 30		3
31 - 40		4
40 +		5

12

Wind Dr.		
N-E		1
SE - S		2
SW - W		3
NW		4
Varib.		5
None		6

13

Weather		
Clear		1
L. Cloud		2
H. Cloud		3
Fog		4
Rain		5
Sleet		6
Snow		7

14

Air Temp °C		
0 - 10		0
11-20		1
21-30		2
31-40		3
41-50		4
51-60		5
61-70		6
71-80		7
81-90		8
90+		9

15

Port

16 17

Total No. of Boats at Port				
Day-Pt.	½ Day-Pt	Day-Ch.	½ Day-Ch	

18 20 22 24 25

Fishing Trips by Boat				
Day-Pt.	½ Day-Pt	Day-Ch.	½ Day-Ch	

26 28 30 32 33

Boat Trip Tally

	Day Pt.	Half Day Pt.	Day Ch.	Half Day Ch.
A.M.				
Total				
P.M.				
Total				
G.Total				

Inlet

34 35

Boats Departing from Inlet						
Day-Pt.	1/2 Day-Pt.	Day-Ch.	1/2 Day-Ch	Pri. Fish	Pri. Cruise	Comm.

36 38 40 42 44 47 50 51

Day Cl	
WD	0
WE	1

76

Time of Day	
Day	1
Night	2

77

Boats Returning To Inlet						
Day-Pt.	1/2 Day-Pt.	Day-Ch.	1/2 Day-Ch.	Pri. Fish	Pri. Cruise	Comm.

52 54 56 58 60 63 66 67

Inlet Tally

Boats Departing From Inlet							Boats Returning To Inlet						
Party	½ Pt	Ch	½ Ch	Pri-F	Pri-C	Com	Party	½ Pt.	Ch.	½ Ch	Pri-F	Pri-C	Com

Figure 6. Port count and inlet count form used during study.

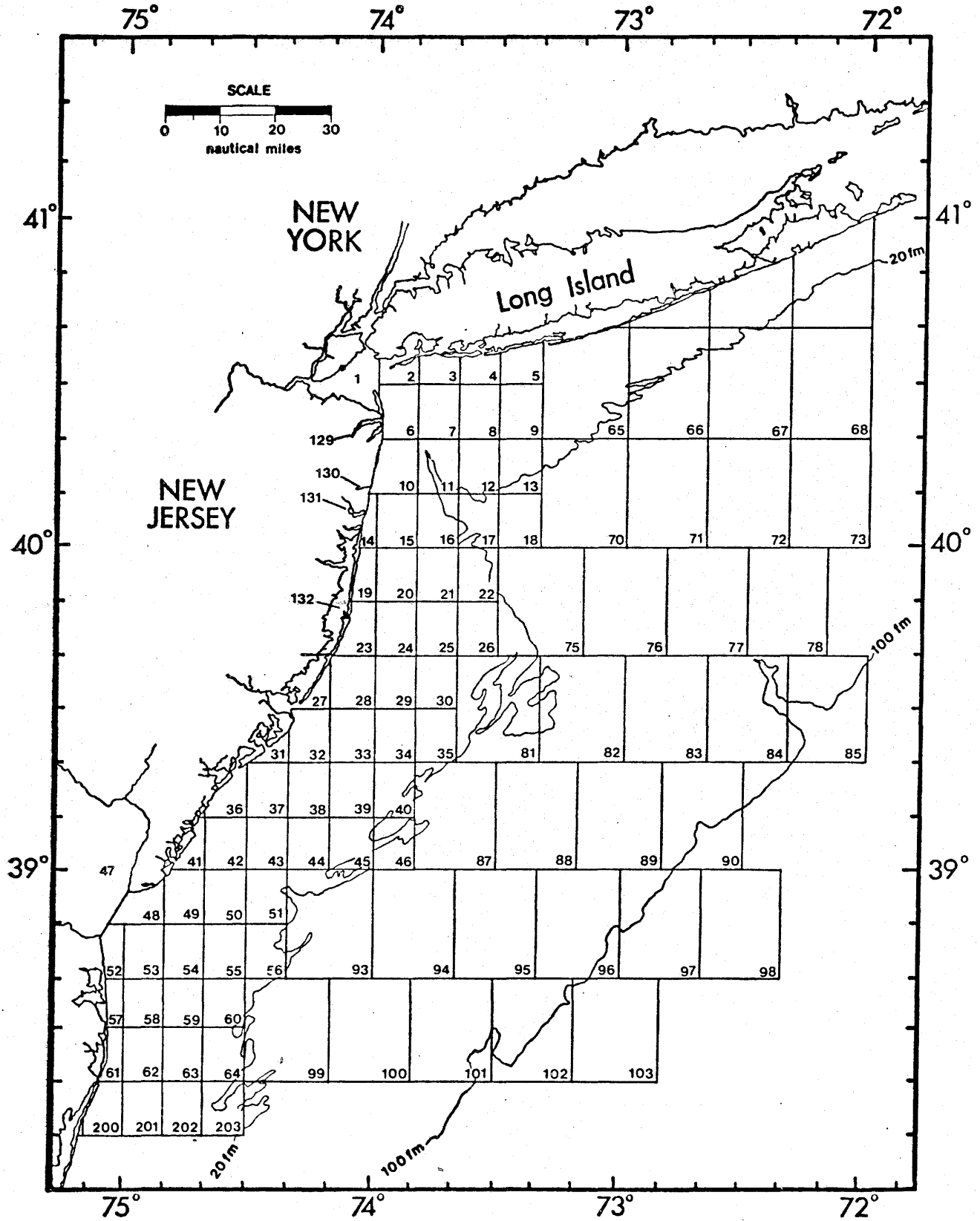

Figure 7. Map showing blocks used to describe fishing areas. Those inshore of about the 20 fathom(40m)contour are 10 minute squares, those offshore of this contour are 20 minute squares.

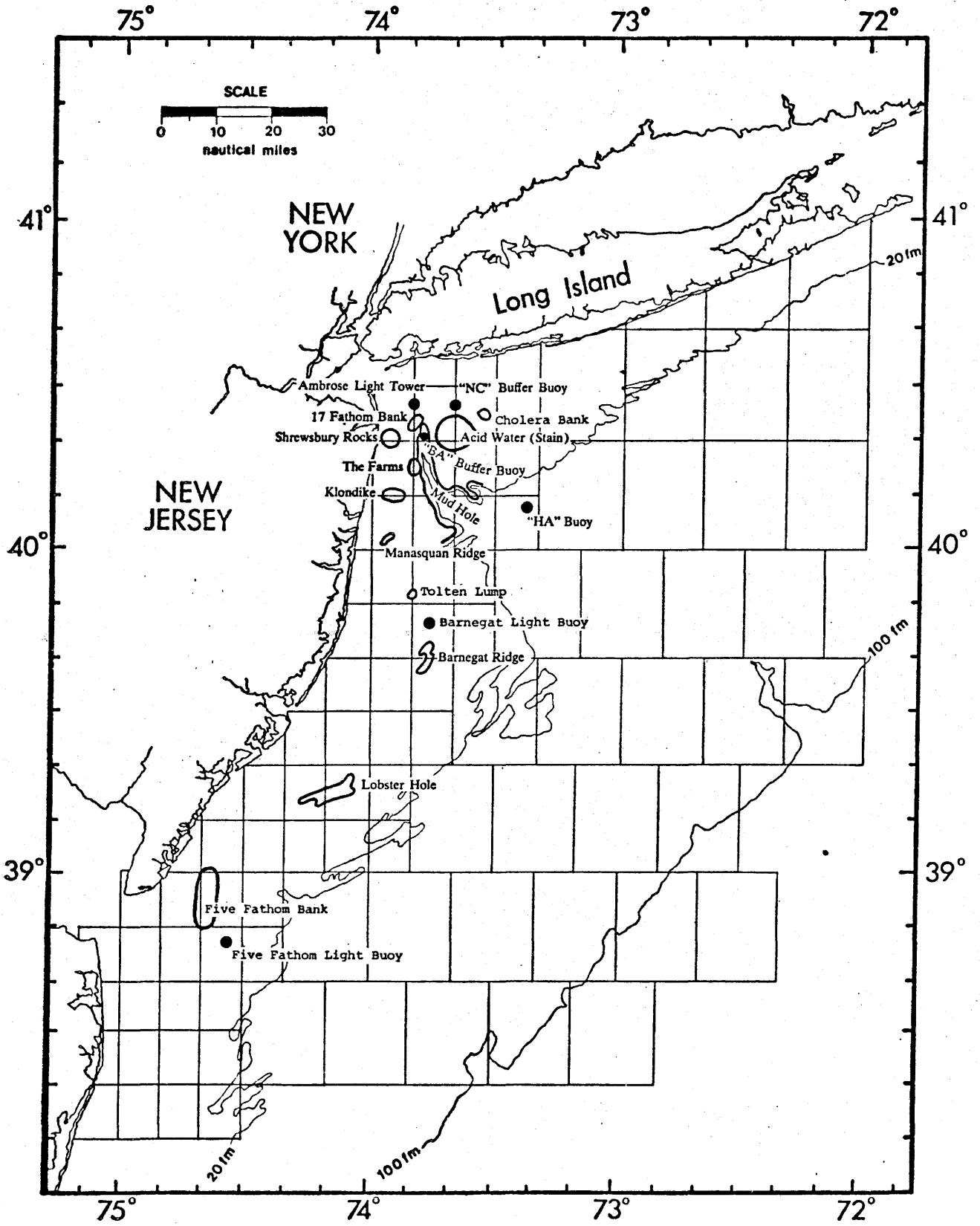

Figure 8. Map showing the principal fishing grounds for bluefin tuna along the New Jersey coast.

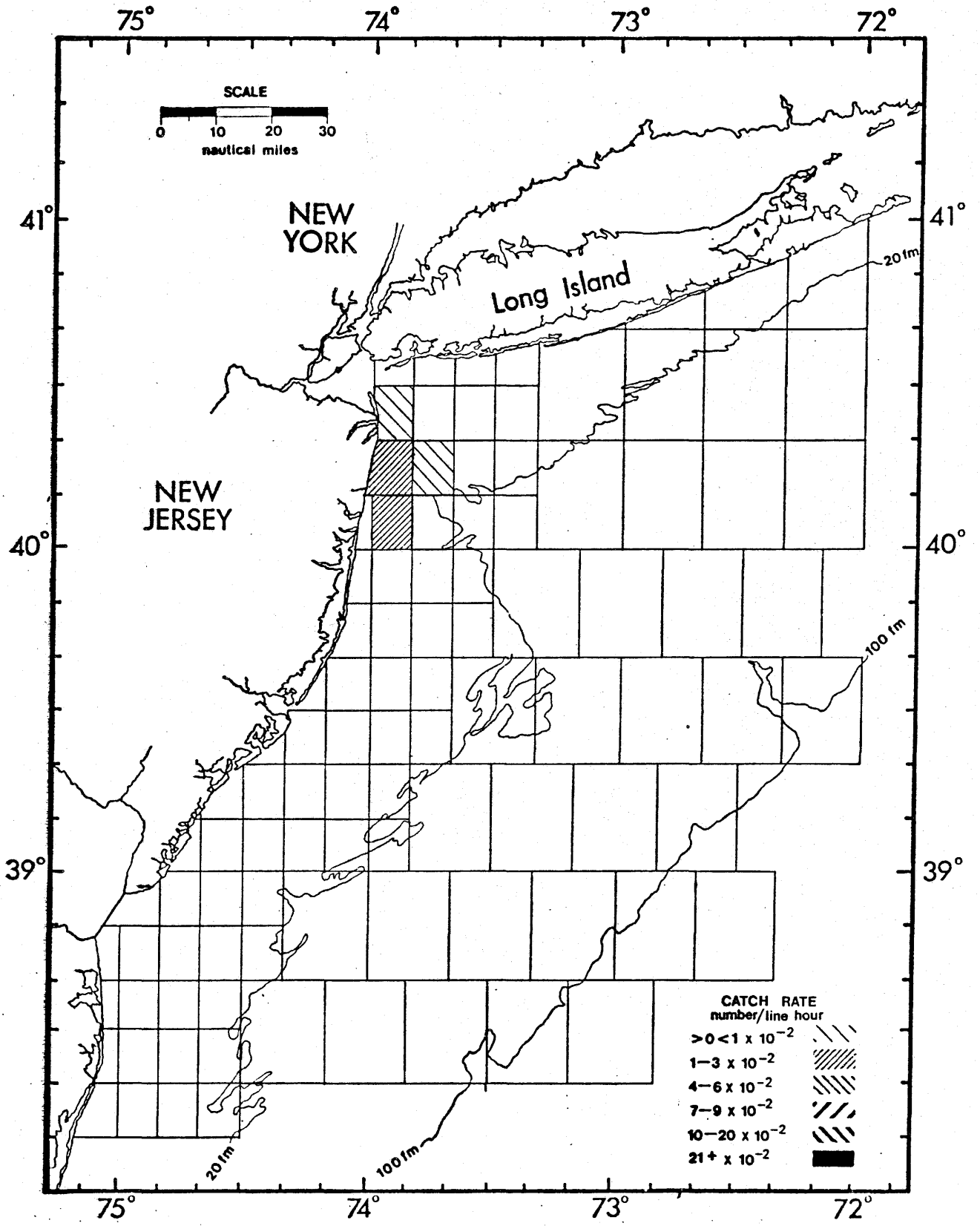

Figure 9. The catch rate of bluefin tuna for full day party boat anglers during period from July 12 to September 20, 1975.

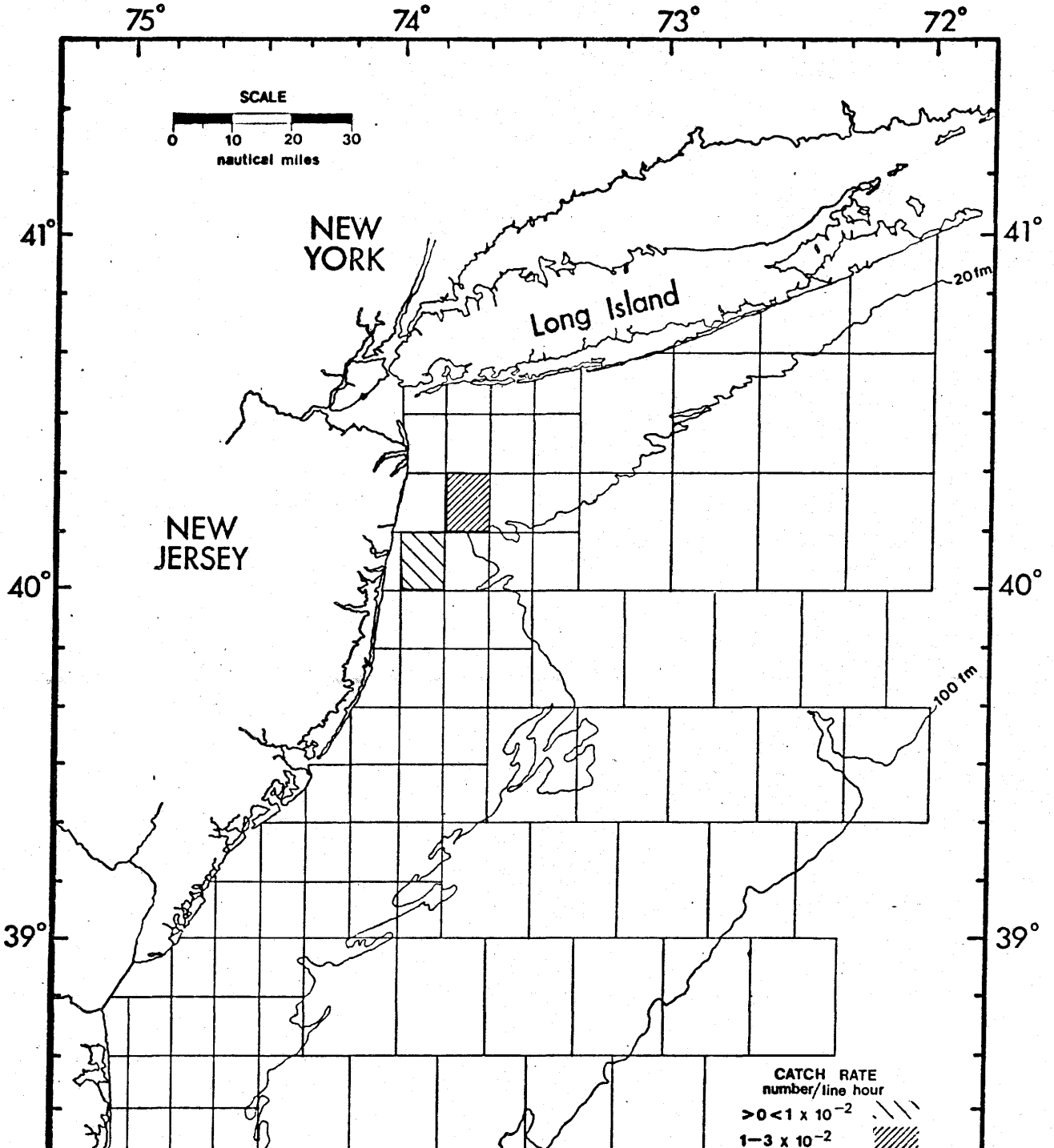

Figure 10. The catch rate of bluefin tuna for full day party boat anglers during period from July 13 to July 26, 1975.

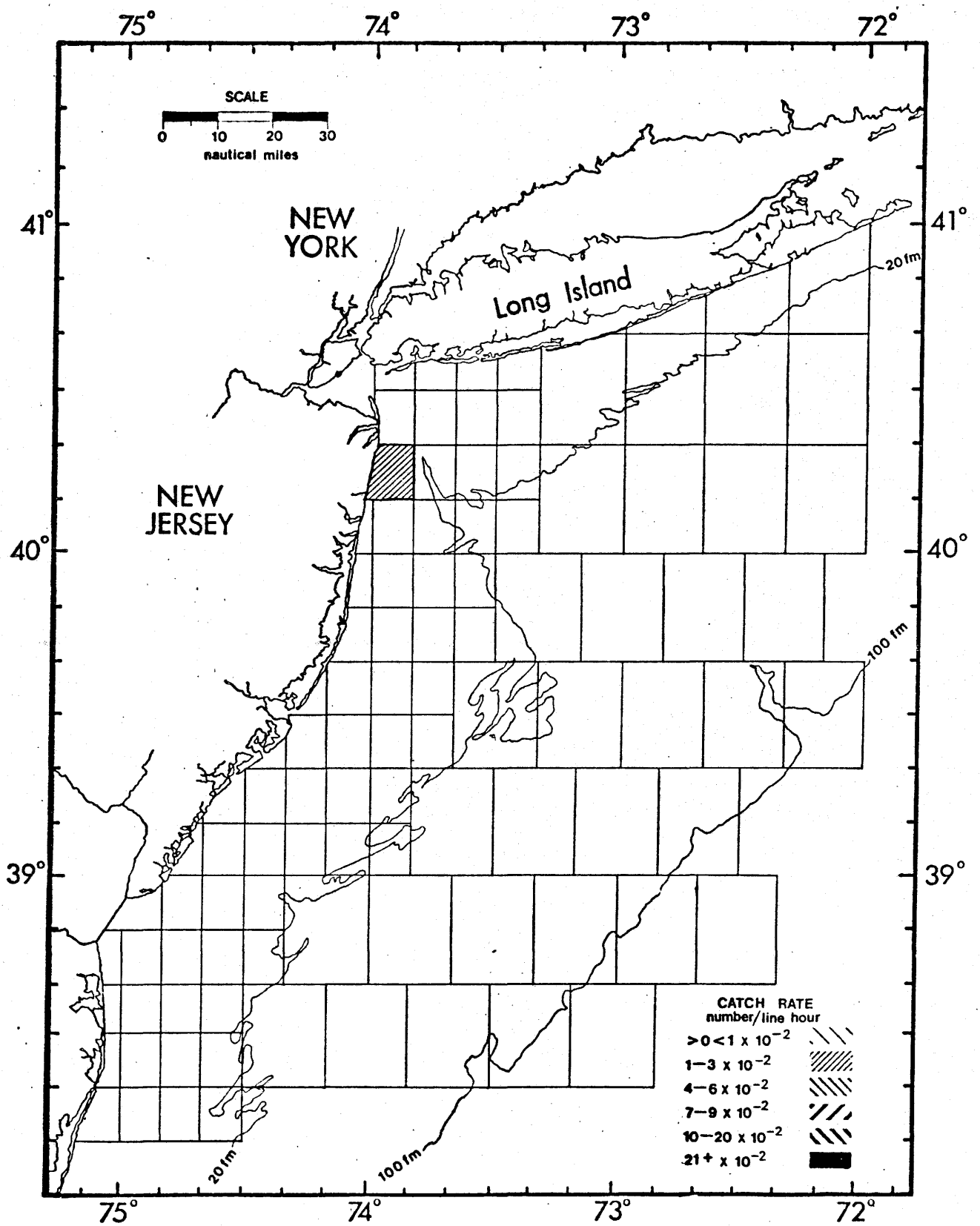

Figure 11. The catch rate of bluefin tuna for full day party boat anglers during period from July 27 to August 9, 1975.

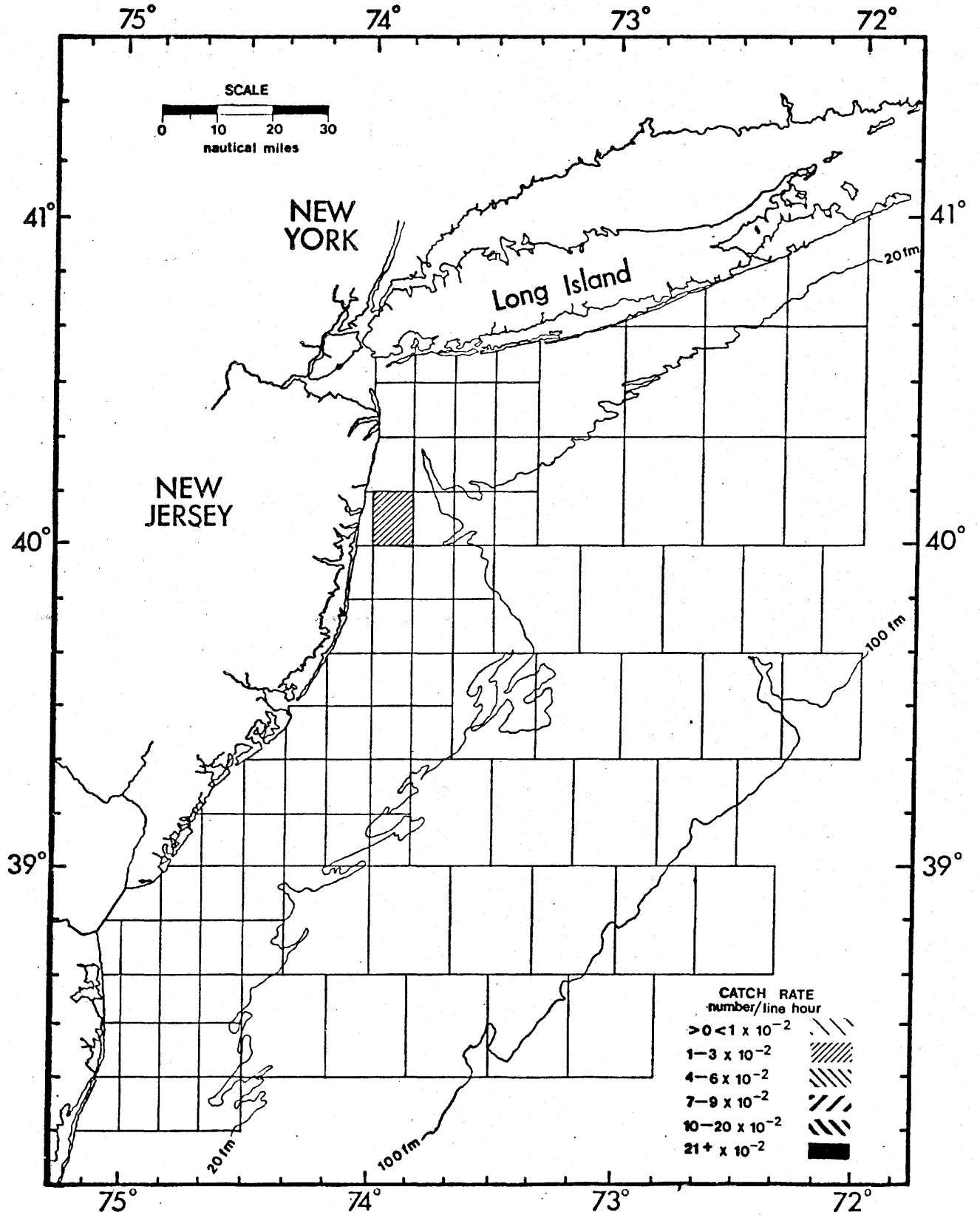

Figure 12. The catch rate of bluefin tuna for full day party boat anglers during period from August 10 to August 23, 1975.

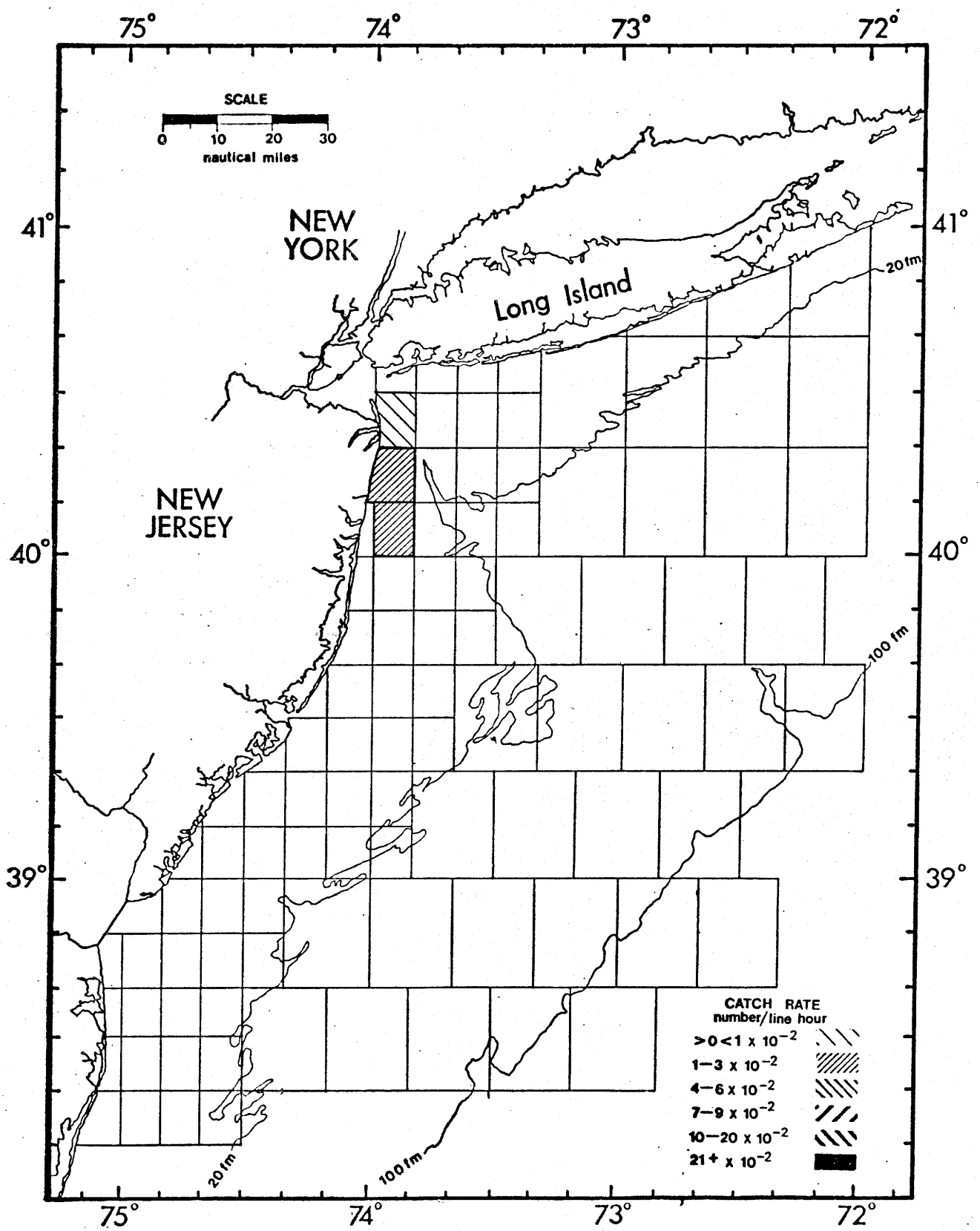

Figure 13. The catch rate of bluefin tuna for full day party boat anglers during period from August 24 to September 6, 1975.

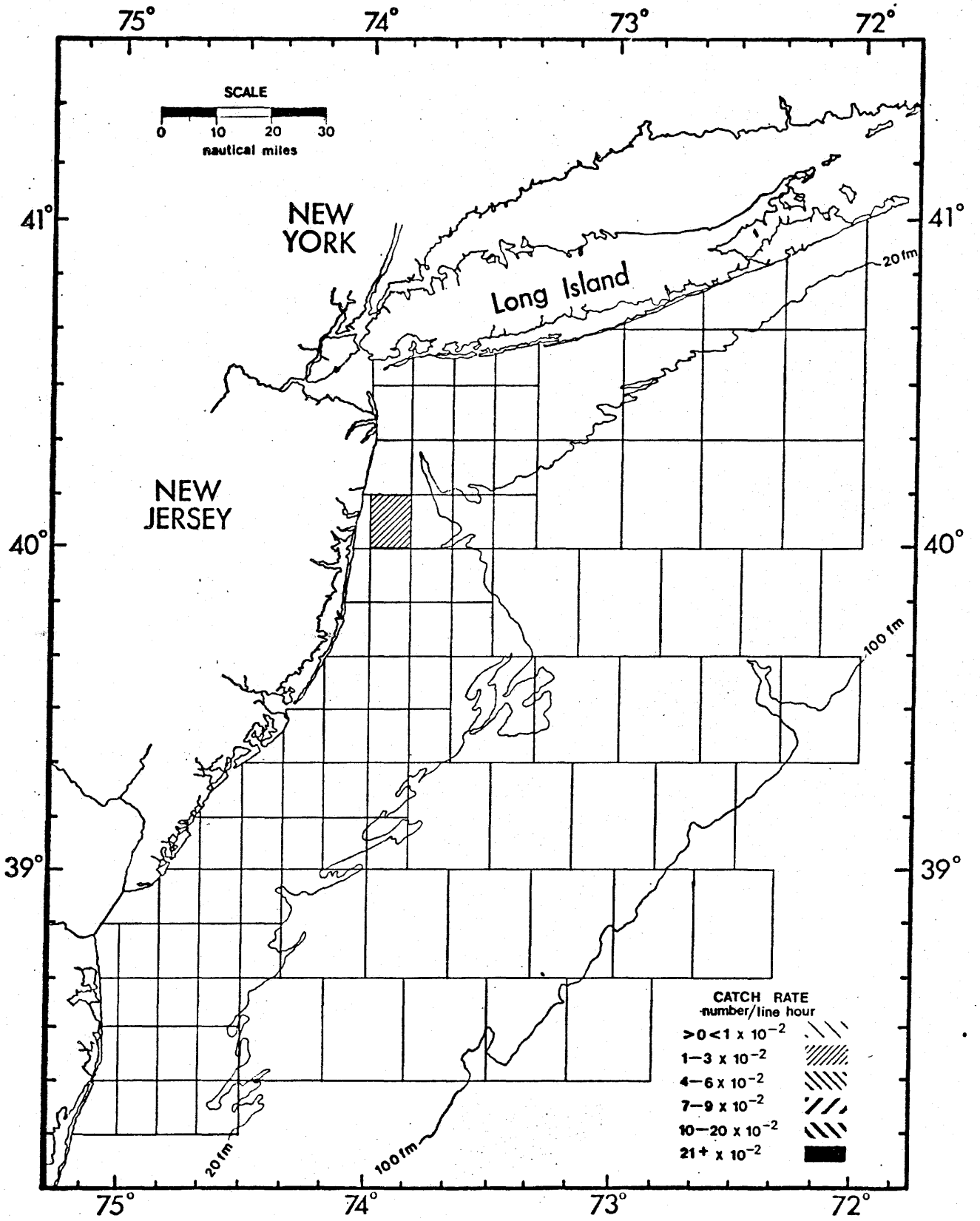

Figure 14. The catch rate of bluefin tuna for full day party boat anglers during period from September 7 to September 20, 1975.

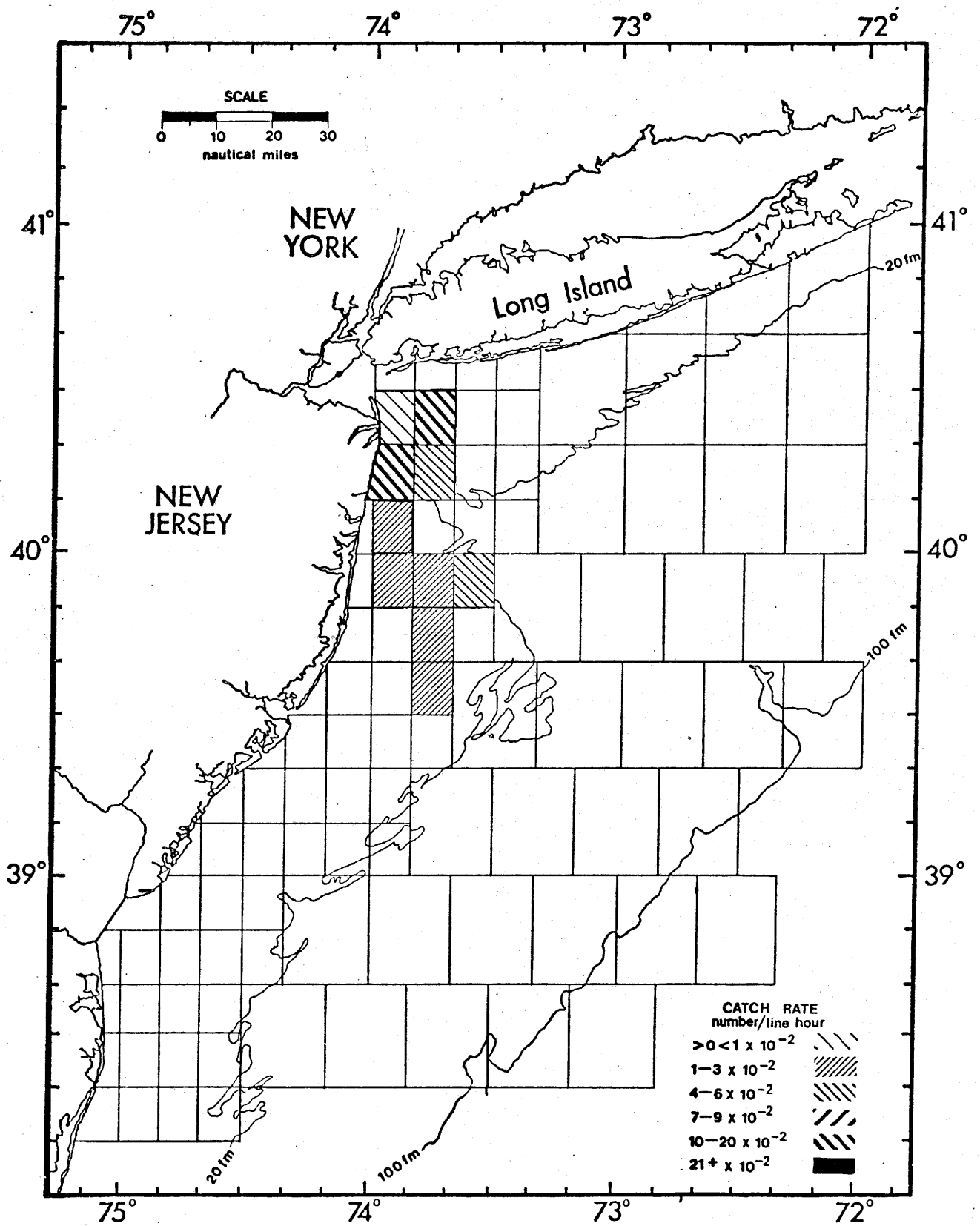

Figure 15. The catch rate of bluefin tuna for charter boat anglers chumming during period from July 12 to September 20, 1975.

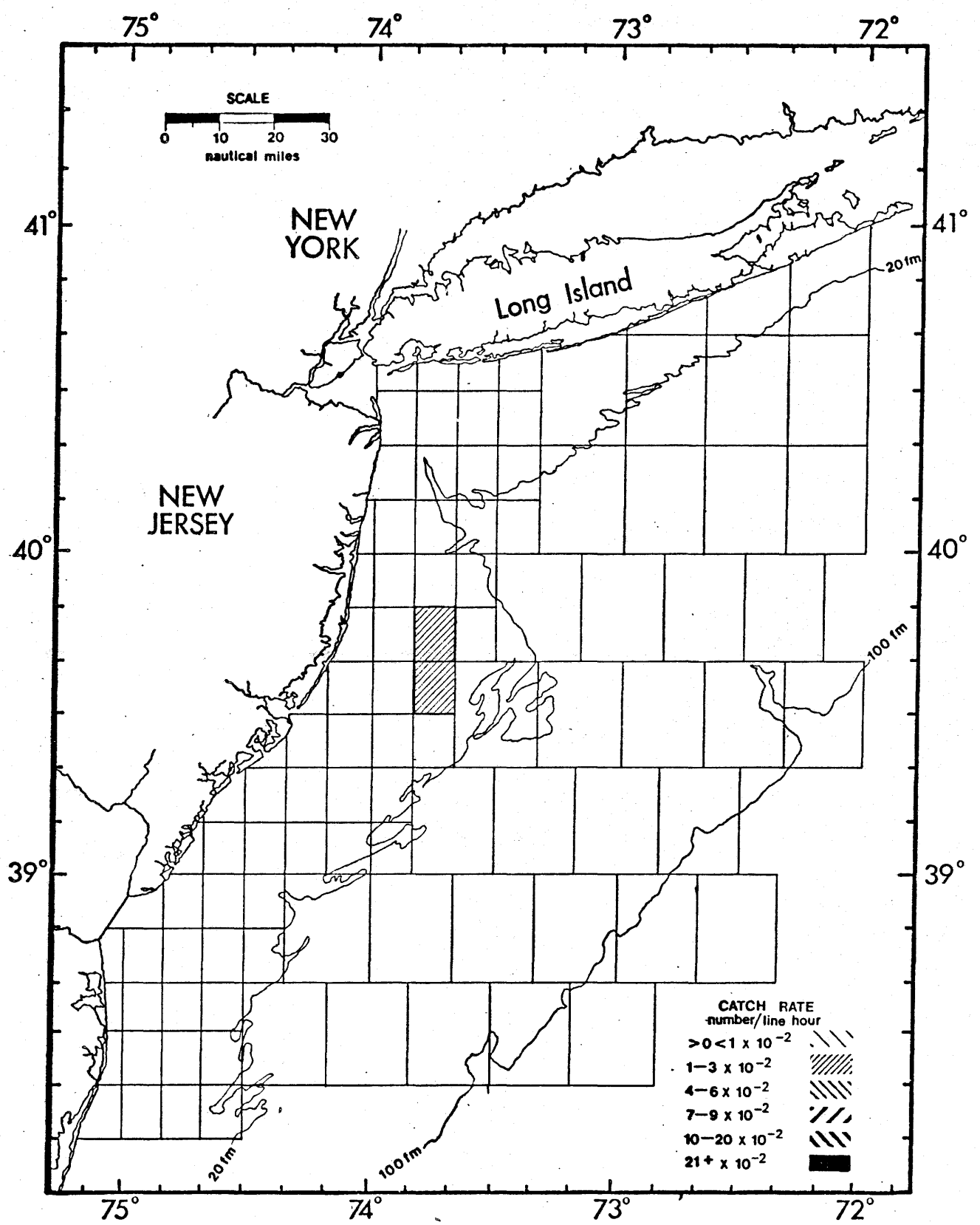

Figure 16. The catch rate of bluefin tuna for charter boat anglers chumming during period from July 13 to July 26, 1975.

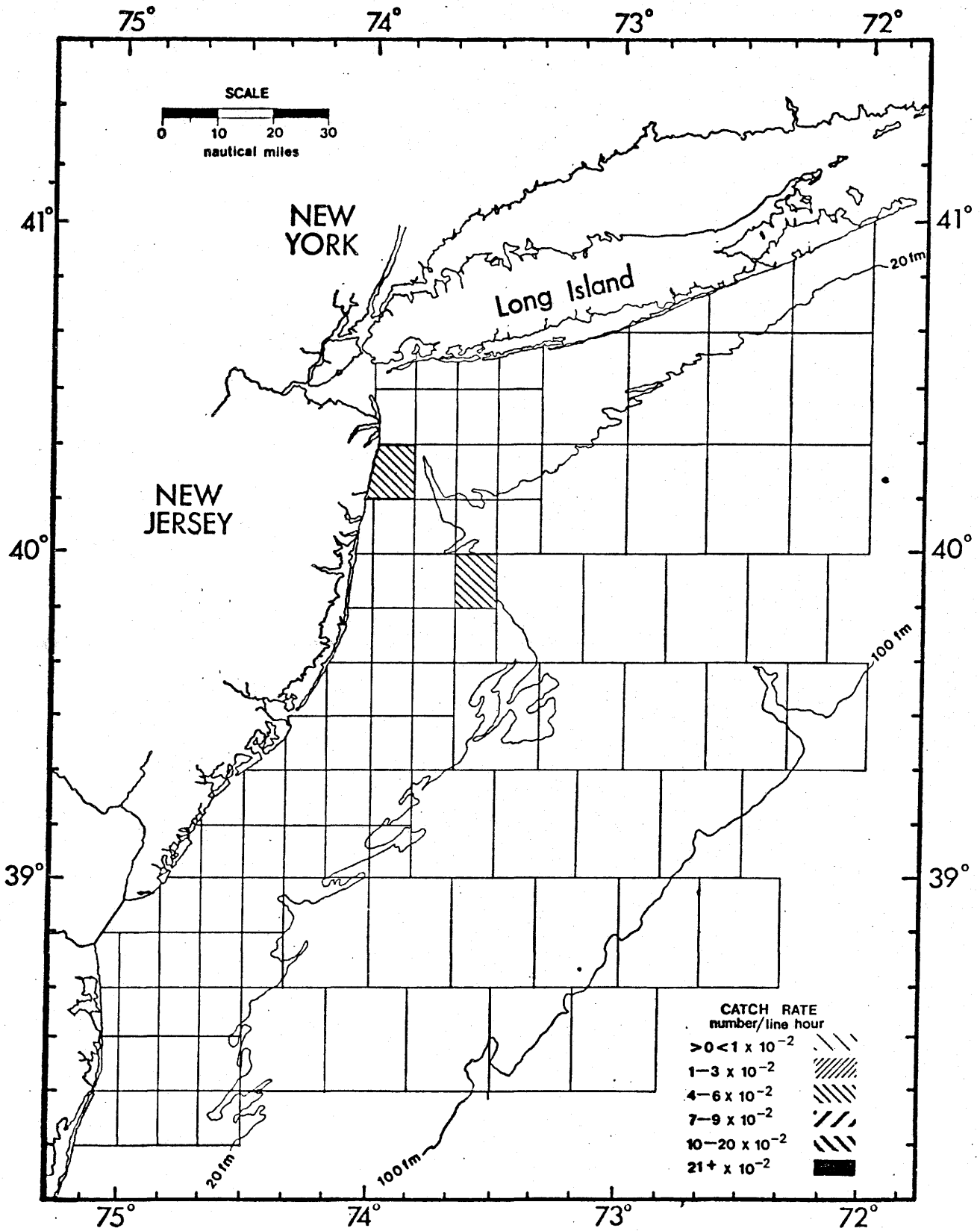

Figure 17. The catch rate of bluefin tuna for charter boat anglers chumming during period from July 27 to August 9, 1975.

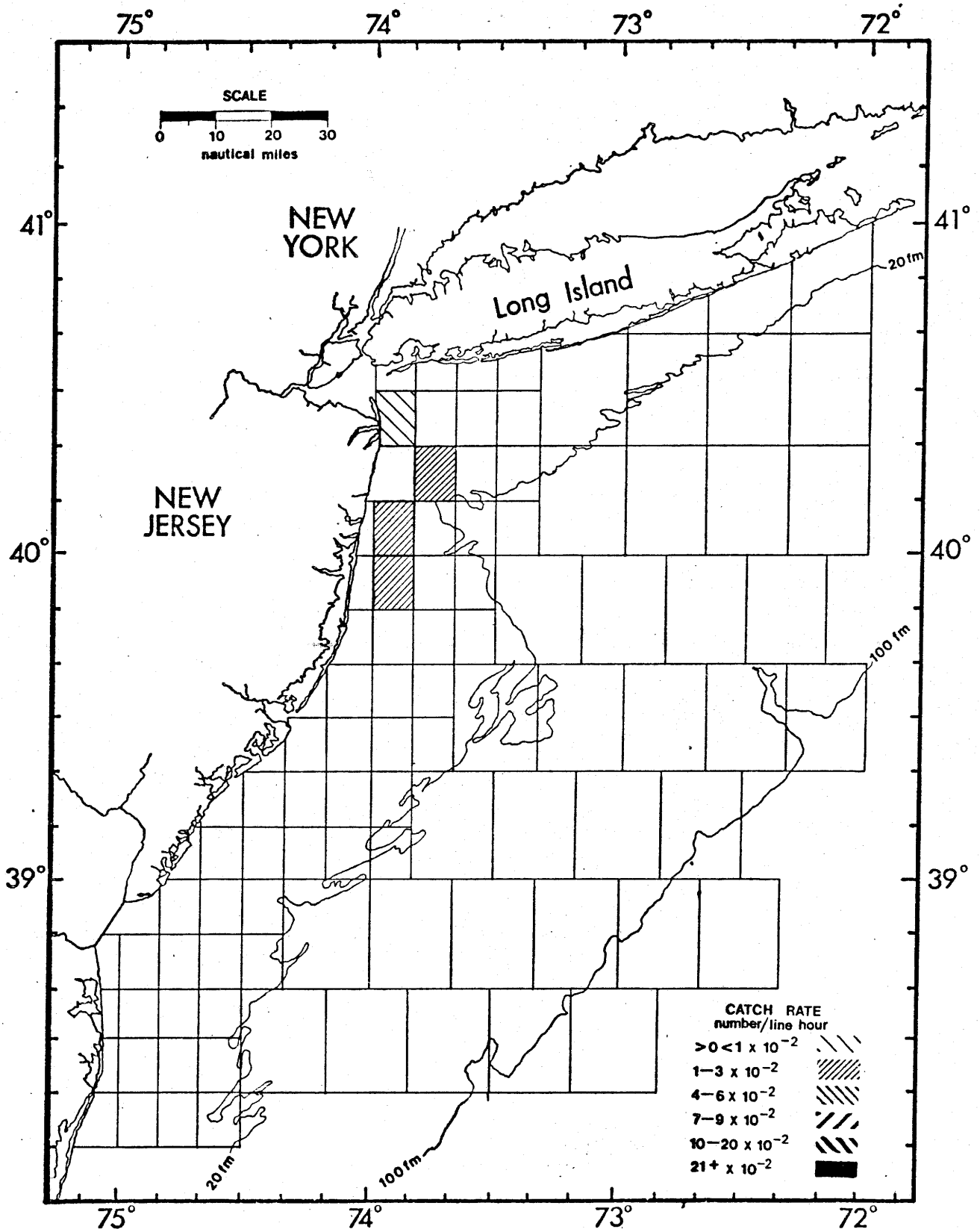

Figure 18. The catch rate of bluefin tuna for charter boat anglers chumming during period from August 10 to August 23, 1975.

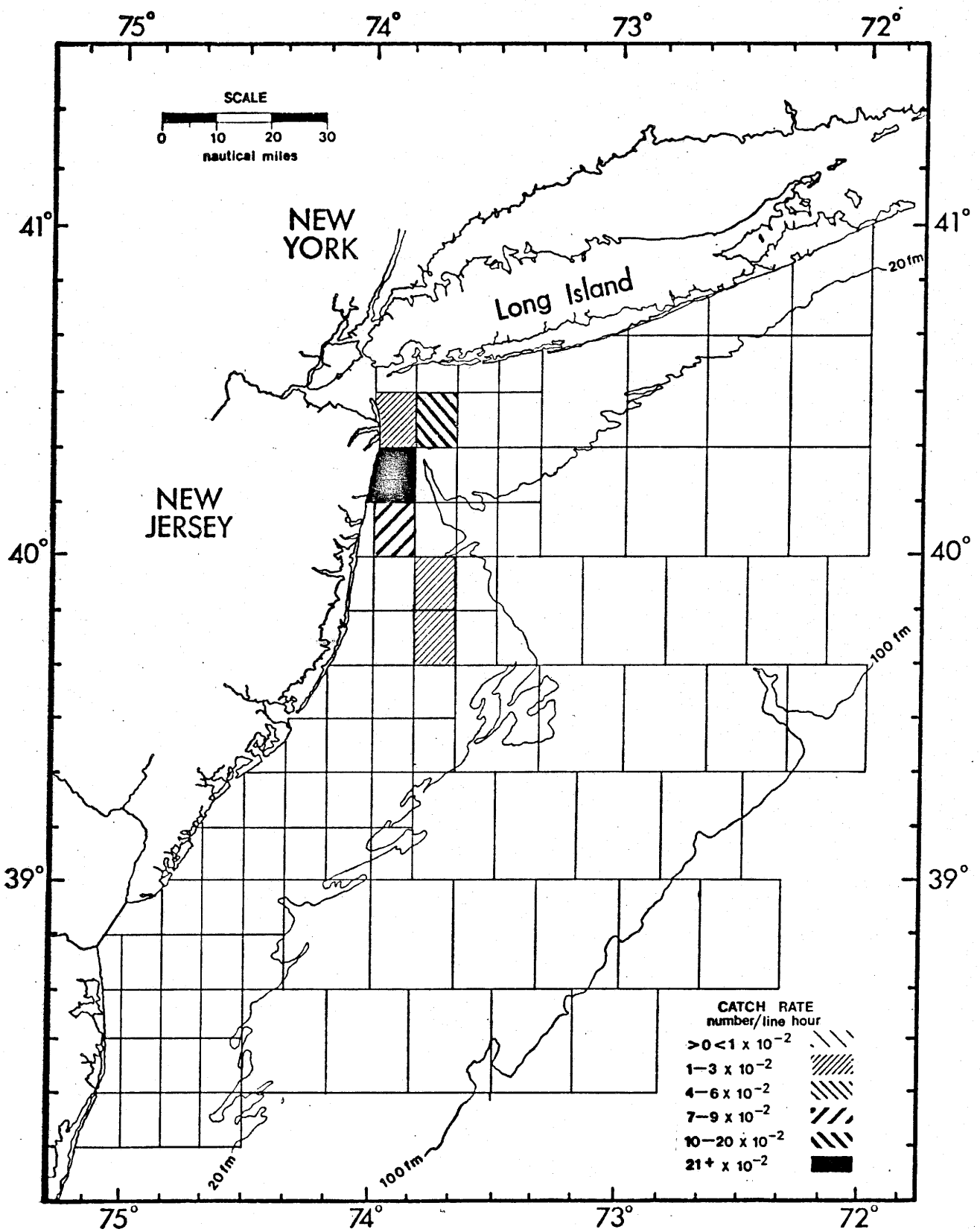

Figure 19. The catch rate of bluefin tuna for charter boat anglers chumming during period from August 24 to September 6, 1975.

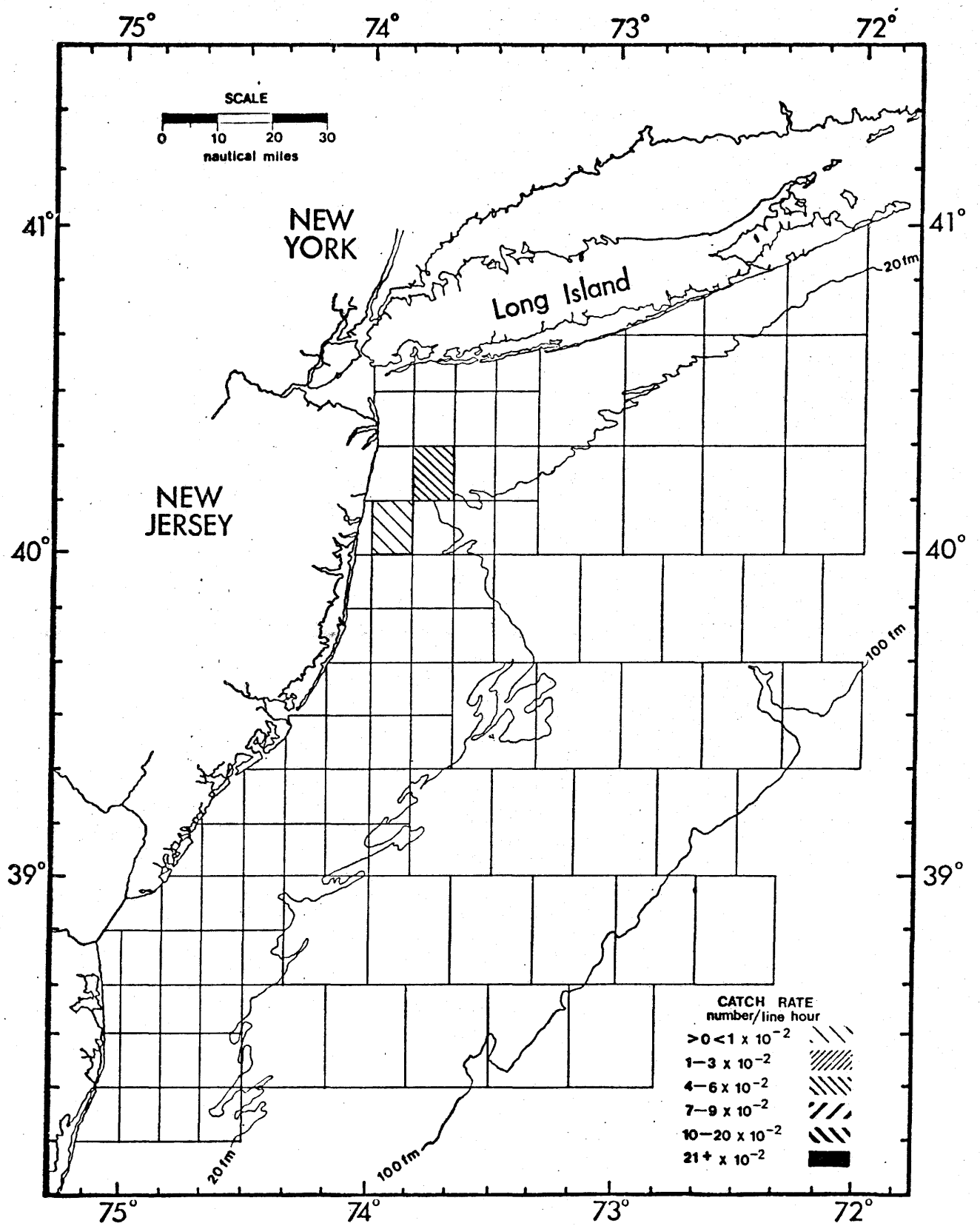

Figure 20. The catch rate of bluefin tuna for charter boat anglers chumming during period from September 7 to September 20, 1975.

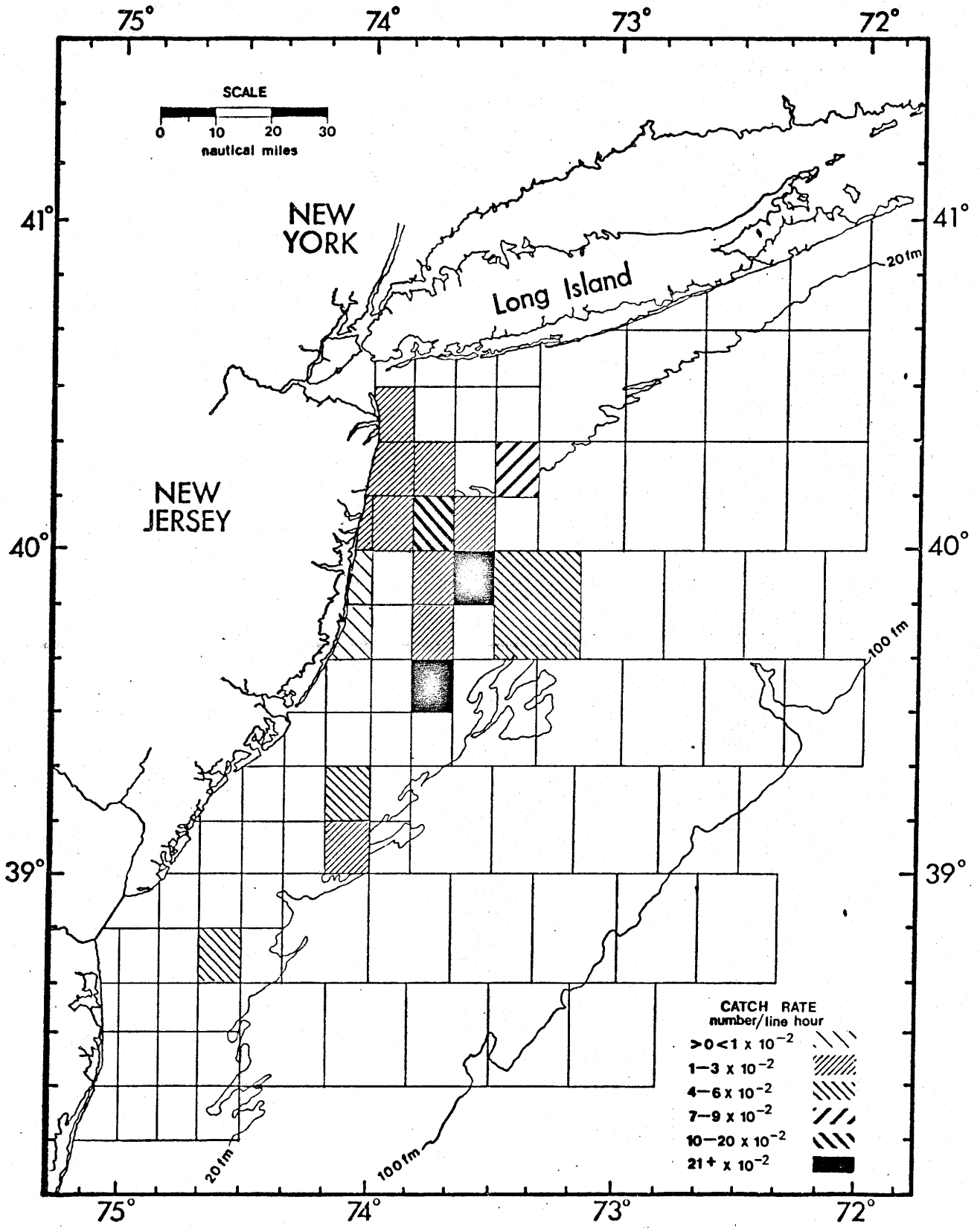

Figure 21. The catch rate of bluefin tuna for charter boat anglers trolling during period from July 12 to September 20, 1975.

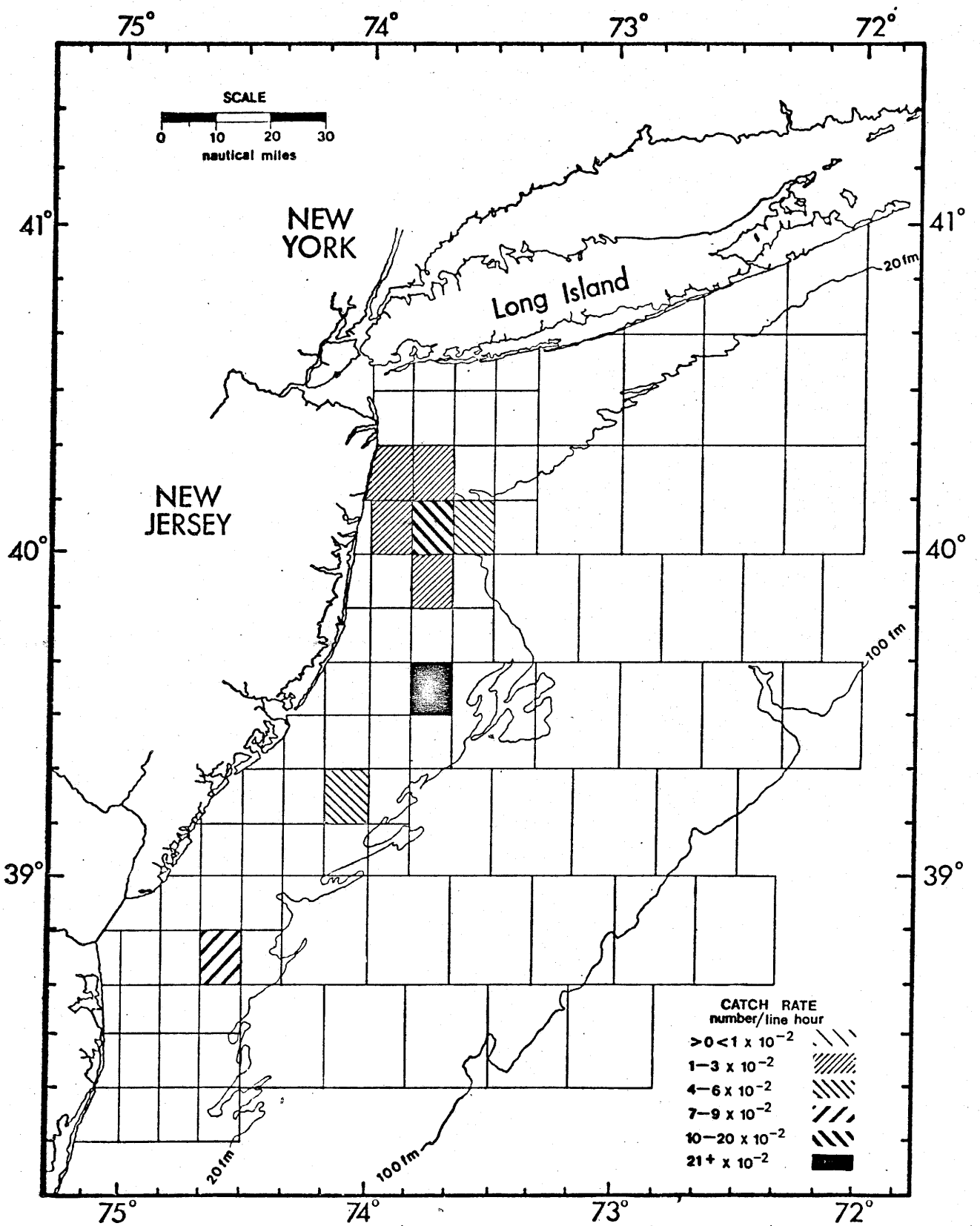

Figure 22. The catch rate of bluefin tuna for charter boat anglers trolling during period from July 13 to July 26, 1975.

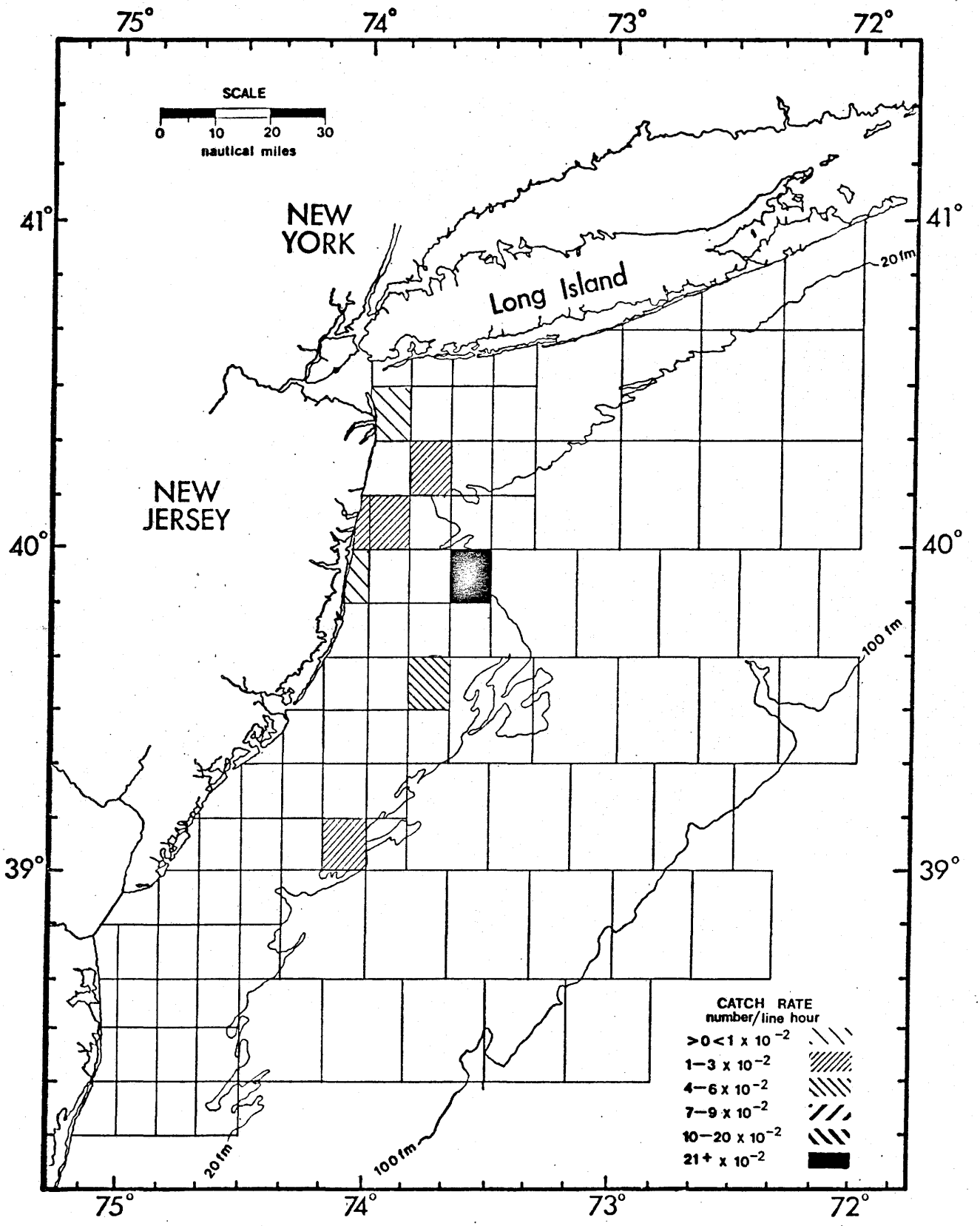

Figure 23. The catch rate of bluefin tuna for charter boat anglers trolling during period from July 27 to August 9, 1975.

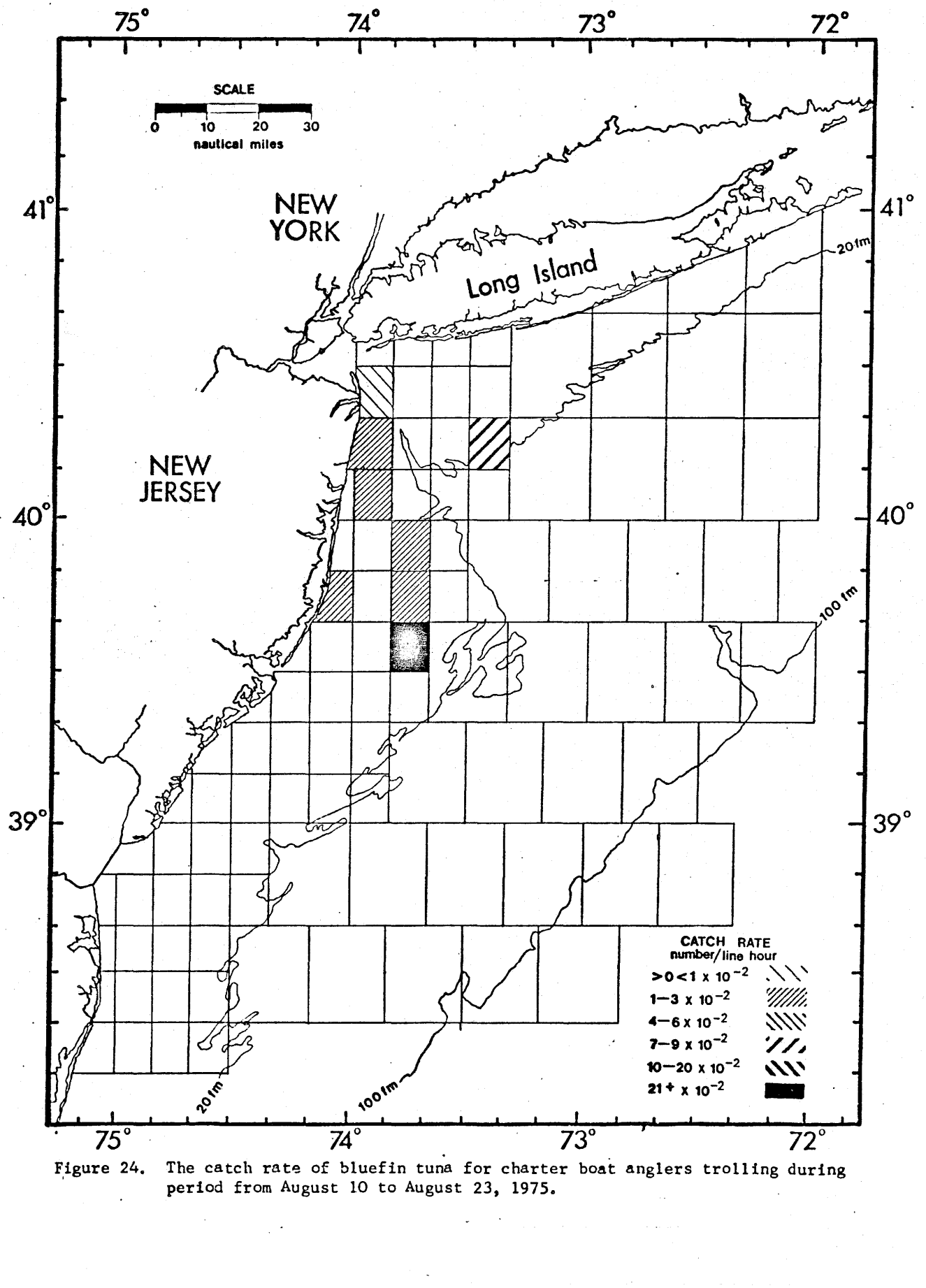

Figure 24. The catch rate of bluefin tuna for charter boat anglers trolling during period from August 10 to August 23, 1975.

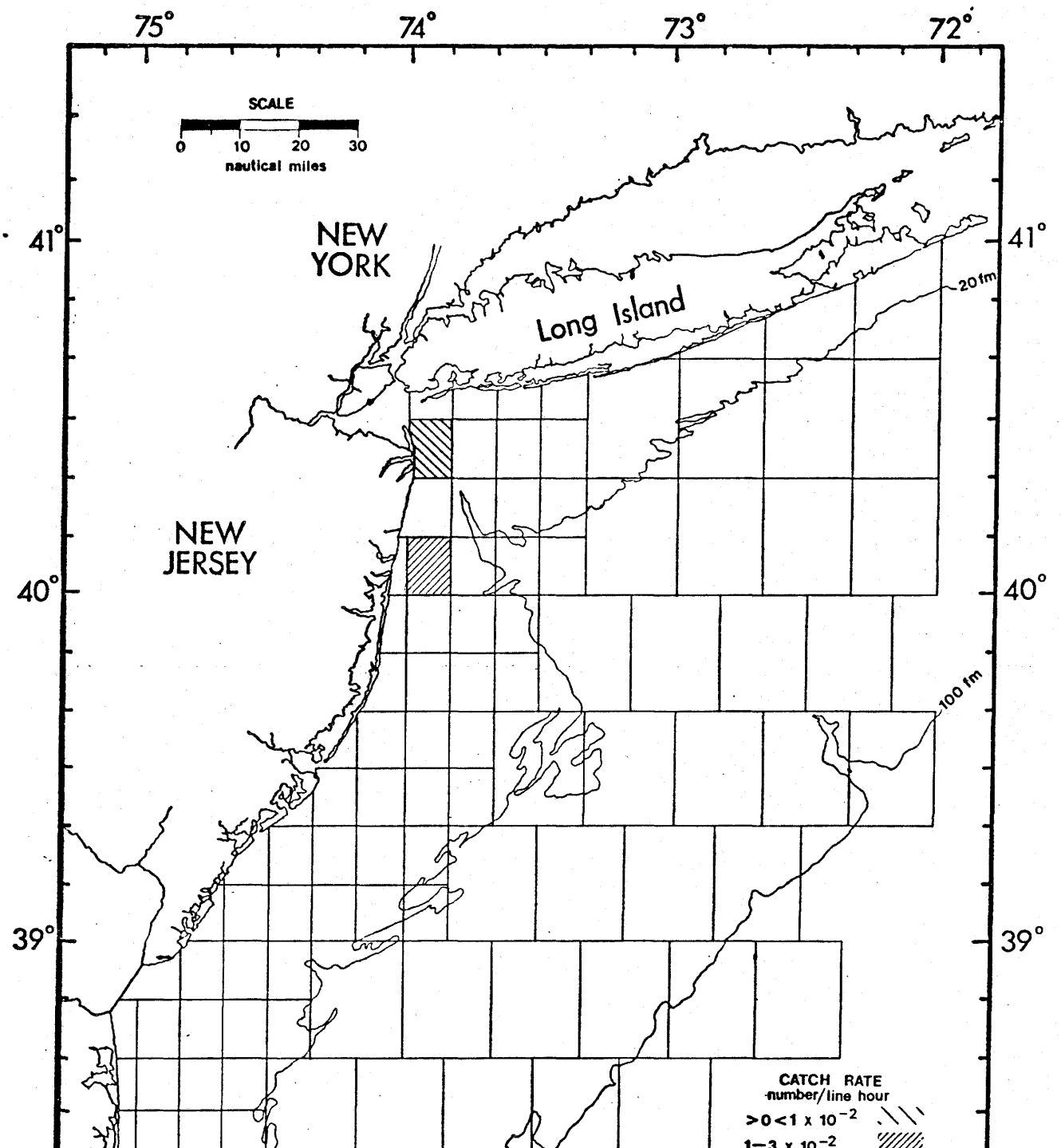

Figure 25. The catch rate of bluefin tuna for charter boat anglers trolling during period from August 24 to September 6, 1975.

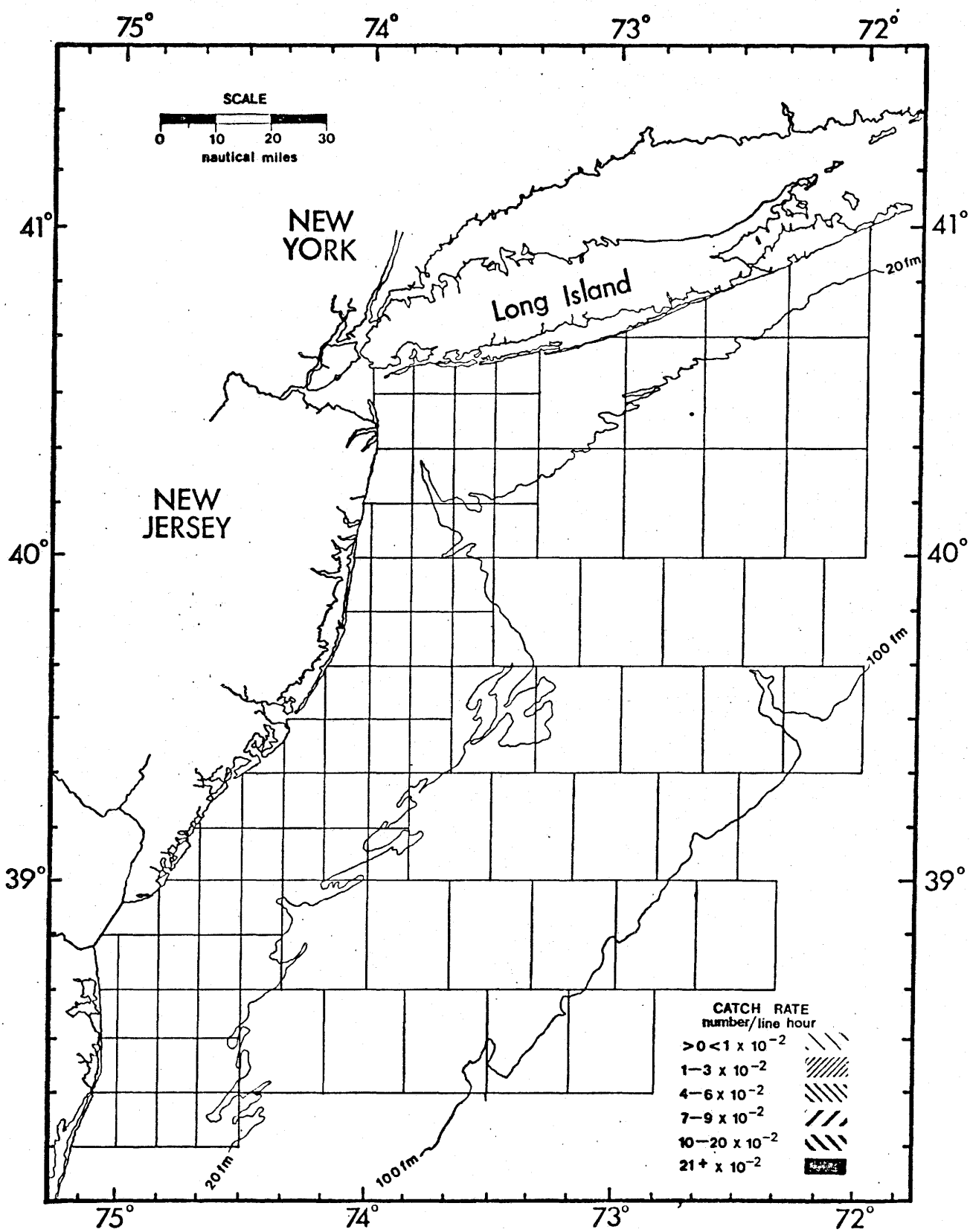

Figure 26. The catch rate of bluefin tuna for charter boat anglers trolling during period from September 7 to September 20, 1975.

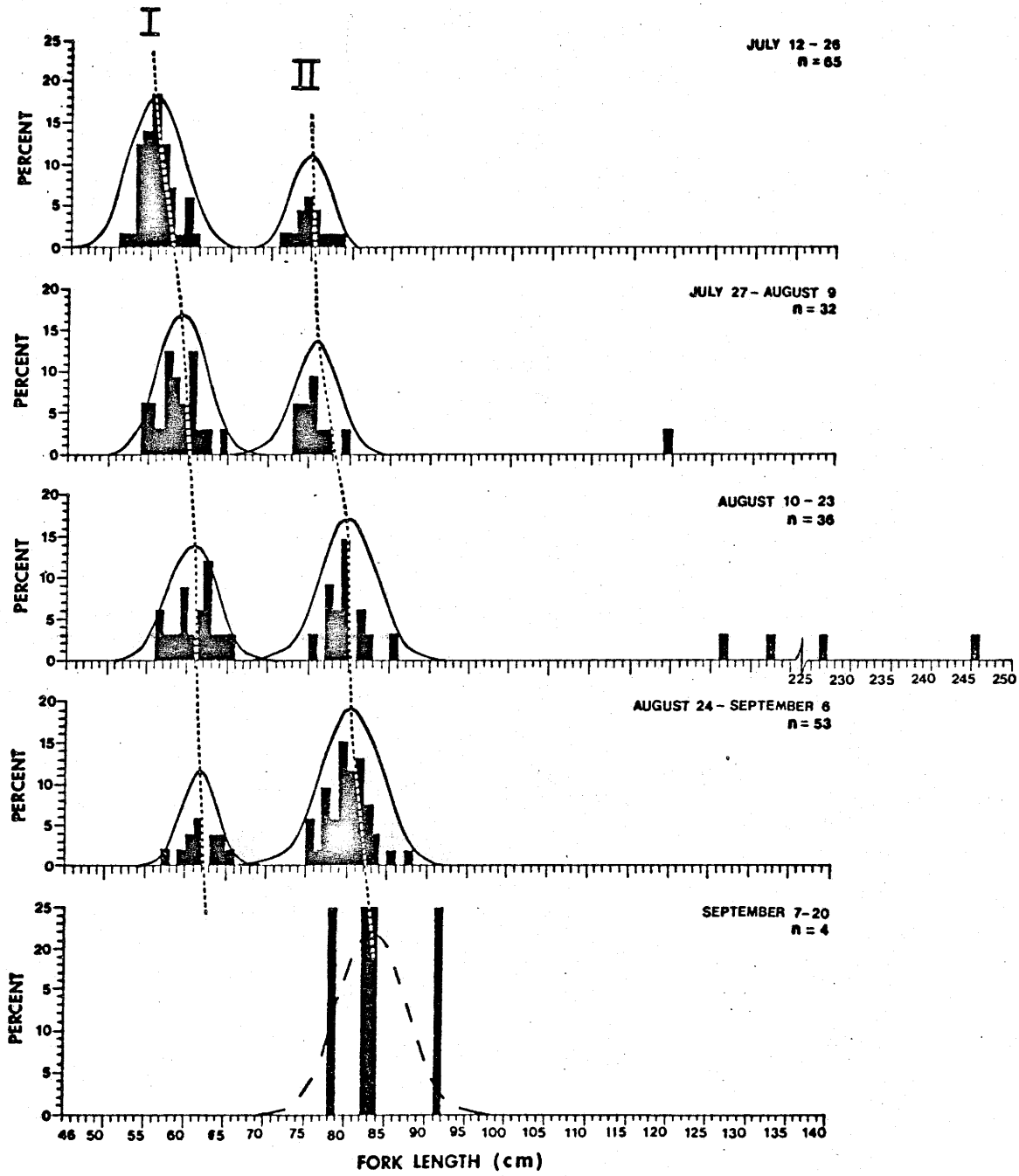

Figure 27. Size composition of bluefin tuna caught by anglers off New Jersey in 1975. Normal curves are fitted by a method devised by Sette and modified by Walford.

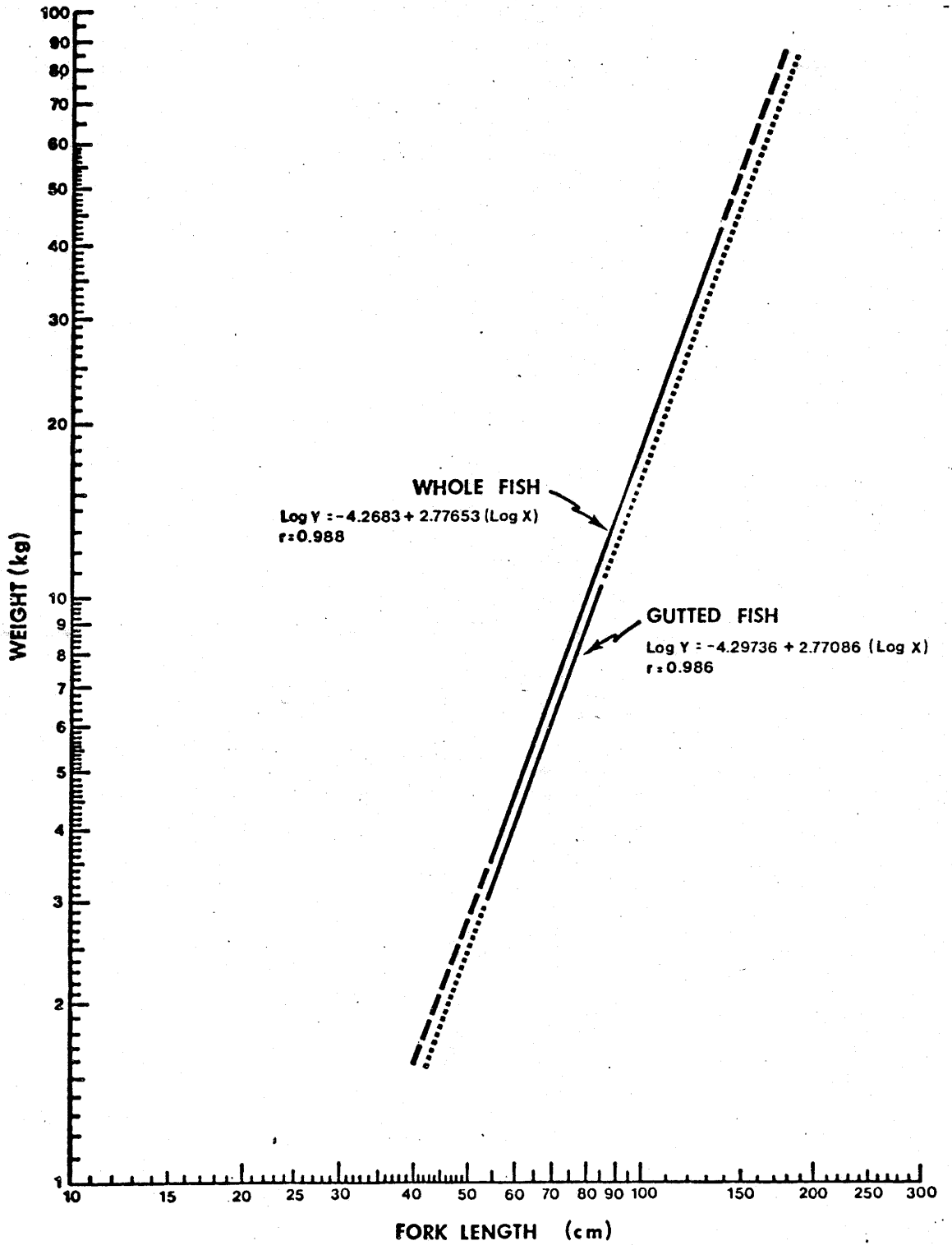

Figure 28. Length-weight regression for whole and gutted bluefin tuna collected off New Jersey in 1975.