JACK MACKEREL EGGS, PACIFIC COAST, 1951-54

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EXPLANATORY NOTE

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United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner

JACK MACKERAL EGGS, PACIFIC COAST

1951-54

by

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CONTENTS

ABSTRACT

This report contains the results of quantitative sampling of eggs of jack mackerel, Trachurus symmetricus, off California and Baja California during 1951 through 1954. Annual distribution charts are included.

JACK MACKEREL EGGS, PACIFIC COAST, 1951-1954

This report contains the results of quantitative sampling of eggs of jack mackerel, Trachurus symmetricus, for the years 1951 through 1954. This report may be considered as an extension of information given by Ahlstrom (1953 and 1954) and Ahlstrom and Kramer (1955 and 1956).

The plankton hauls from which the eggs were taken were made at monthly intervals by agencies participating in the California Cooperative Oceanic Fisheries Investigations which is sponsored by the California Marine Research Committee, and which comprises the following organizations: The Scripps Institution of Oceanography of the University of California, the California Department of Fish and Game, the Hopkins Marine Station of Stanford University, the California Academy of Sciences and the South Pacific Fishery Investigations of the U. S. Fish and Wildlife Service.

The data are presented in six tables:

1a. Monthly totals of jack mackerel eggs for 1951-1954.

1b. Regional distribution of jack mackerel eggs for 1951-1954.

2. Jack mackerel eggs by stage for selected stations in 1951.

3. Jack mackerel eggs for 1951.

4. Jack mackerel eggs for 1952.

5. Jack mackerel eggs for 1953.

6. Jack mackerel eggs for 1954.

These tables give the standard numbers of eggs (see below).

The author wishes to express his gratitude to Dr. E. H. Ahlstrom for the aid given in identifying the material, and assistance in the preparation of this manuscript. Mr. James R. Thrailkill has prepared the figures. The Staff, South Pacific Fishery Investigations have contributed materially to the routine tasks associated with the collection and preliminary processing of the data. My wife, Paula Farris, has helped with the laborious proofreading of this report.

AREA COVERED

The area covered by each of the cruises is given by Ahlstrom (1953 and 1954) and Ahlstrom and Kramer (1955 and 1956). An idea of the location of the several stations occupied during the period 1951 through 1954 may be gained from figure 1. However, the exact location of each station at each occupancy is given by the Staff, South Pacific Fishery Investigations (1952, 1953, 1954 and 1955).

METHODS OF SAMPLING

The methods of sampling are given by Ahlstrom (1952:3-6) and Ahlstrom (1953:4-7).

The plankton net is obliquely hauled from a depth of approximately 140 meters (200 meters of wire out) to the surface. The angle of stray of the towing wire from the vertical is kept as close as possible to 45°. The angle of stray is measured continuously during a haul by means of an inclinometer riding free on the wire. The plankton samples are preserved in their entirety for later examination. Fish eggs and larvae separated from the hauls are standardized to the number under 10 square meters of sea surface.

The manner of designating cruises was changed in 1953 from a system of consecutive numbers to a code based on the year and the month; a conversion table has been given by Thrailkill (1956). The new system used herein gives the year (the first two numbers) and the month (the last two numbers). Thus, 5102 refers to the February cruise of 1951.

In tables 3 to 6, a dash (-) indicates that the station was not occupied or if occupied the sample subsequently was spoiled or broken; NQ - haul not quantitative; U - sample unavailable either because it had been mislaid or used in special studies.

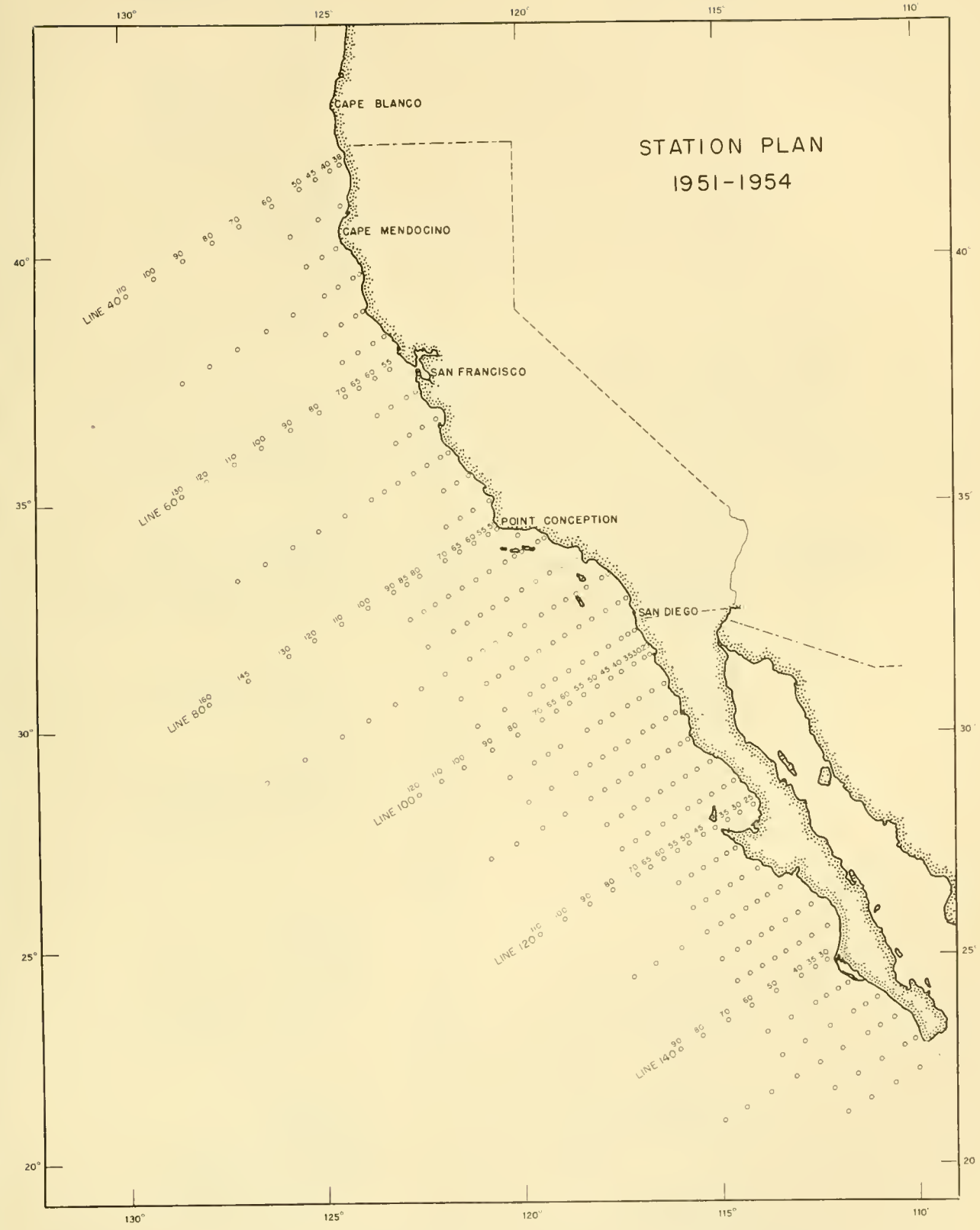

Figure 1.--Station plan, 1951-1954, of the California Cooperative Oceanic Fisheries Investigations.

Table 1a.--Monthly totals of jack mackerel eggs for 1951-1954

Year	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1951	0	9,186	56,217	32,405	22,346	26,559	11,053	2,387	7	1	0	0	160,161
1952	423	8,116	14,148	23,695	62,303	27,407	19,034	1,506	729	0	0	0	157,361
1953	0	5,084	20,624	64,808	57,435	36,411	14,653	1,297	0	53	0	0	200,365
1954	35	6,395	10,826	33,209	46,693	24,637	4,570	558	-*	6	-	0	126,929

*A dash (-) indicates that there was no cruise.

Table 1b.--Regional distribution of jack mackerel eggs for 1951-1954

	Northern California Lines 40-73		Southern California Lines 77-93		Northern Baja California Lines 97-107		Central Baja California Lines 110-120		Southern Baja California Lines 123-157		All areas	
Year	Total	Percent	Total	Percent	Total	Percent	Total	Percent	Total	Percent	Total	Percent
1951	14,589	9	71,743	45	41,060	26	32,251	20	518	1	160,161	100
1952	1,845	1	73,949	47	68,839	44	11,572	7	1,156	1	157,361	100
1953	1,813	1	43,046	22	100,924	50	49,679	25	4,903	2	200,365	100
1954	4,457	4	59,294	47	42,367	33	13,202	10	7,609	6	126,929	100

THE STAGES OF JACK MACKEREL EGG DEVELOPMENT

The continuum of egg development is divided into a series of arbitrarily but rather precisely defined stages (fig. 2). The primary reason for staging eggs is to determine the relationship between rate of development and temperature. This is needed in order to determine the number of days' spawning represented in each sample. The method is also useful for determining the period of the day during which spawning takes place.

Only selected stations are given since stations were deleted for various reasons, among which were poor preservation of material making staging unreliable and poor temperature records.

Figure 2.--The stages of jack mackerel egg development.

Stage I:	Unfertilized eggs or fertilized eggs prior to cell division.
Stage II:	Begins when the first cell becomes visible on the yolk and ends at the completion of the blastodisc formation (about 256 cell stage).
Stage III:	Starts at the completion of blastodisc formation and is terminated when the germ ring has migrated to its greatest diameter (halfway up the egg).
Stage IV:	Begins as the germ ring moves upward over the greatest diameter and stops when the germ ring lies over the oil globule, prior to blastopore closure.
Stage V:	Begins at blastopore closure and terminates when the tail starts to separate from the yolk.
Stage VI:	Begins when the tail bud comes free of the yolk and stops when the posterior eighth of the body is free of the yolk.
Stage VII:	Begins when the posterior eighth of the body is free of the yolk and stops when the posterior quarter of the body is free of the yolk.
Stage VIII:	Begins when the posterior quarter of the body is free of the yolk, and ends as the tip of the tail approaches the chin. The tail portion of the embryo begins to rotate out of the embryonic plane and the fin-fold is moderately wide.
Stage IX:	Is characterized by the tip of the tail laterally approaching the head. The oil globule comes to lie in the anterio-vertical portion of the yolk sac. The fin-fold is wide and fully formed. At the termination of the stage, the embryo hatches.
Disintegrate:	All jack mackerel eggs whose internal structure is such that staging is impossible fall into this category.

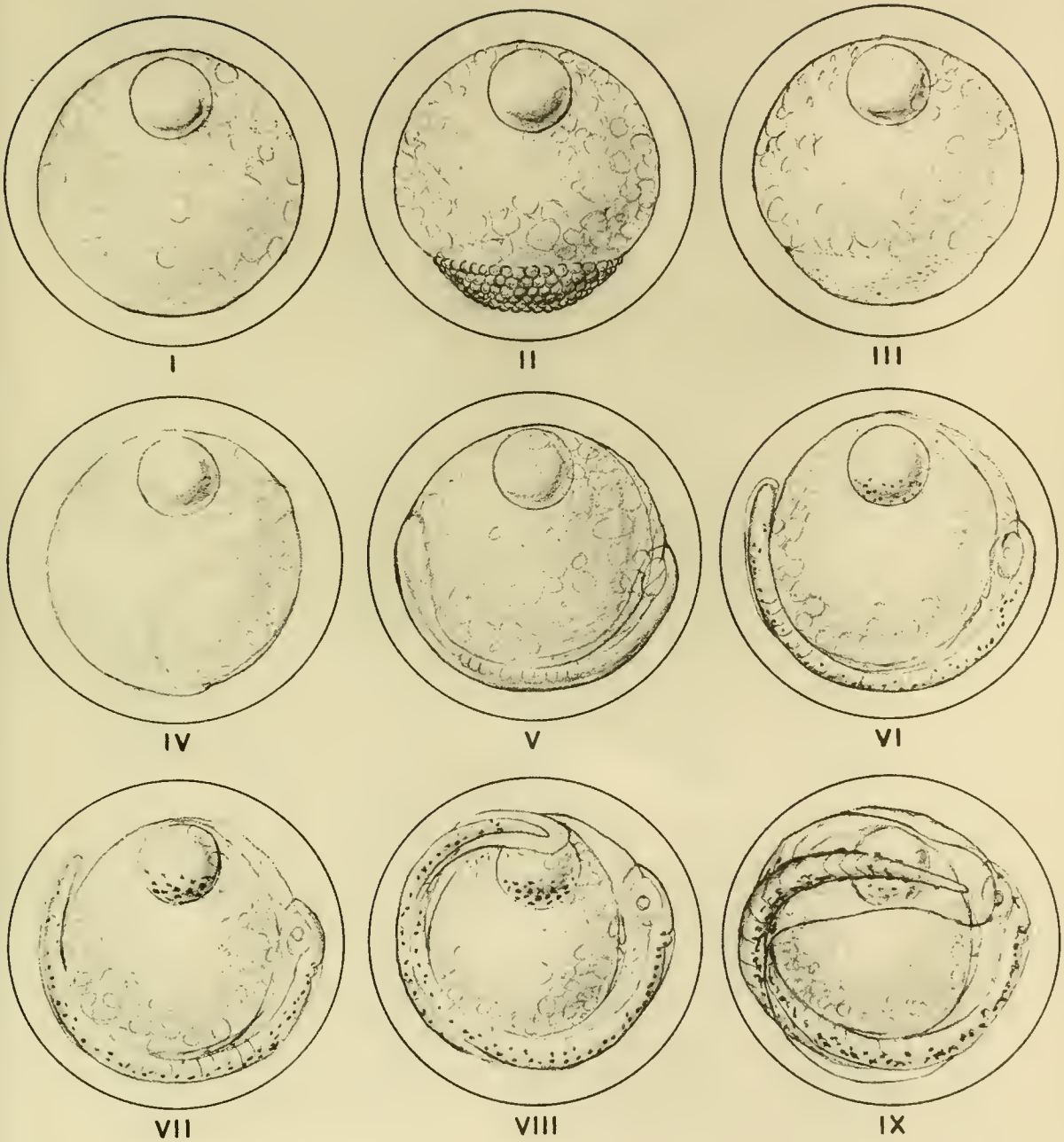
I
II
III
IV
V
VI
VII
VIII
IX

Table 2.--Record of jack mackerel eggs by stages of development for selected stations occupied in 1951

Stage:	I	II	III	IV	V	VI	VII	VIII	IX	Dis.	Total
Station											
Cruise 5103:											
80.55	15	98	94	76	100	63	0	89	0	6	541
.90	45	0	247	0	121	45	0	40	0	0	498
.100	1	66	0	18	0	14	0	4	0	8	111
.110	0	64	0	40	16	20	0	12	0	95	247
85.90	2	0	114	0	212	0	122	0	21	0	471
90.100	0	0	0	146	0	433	0	75	0	0	654
.110	0	21	0	28	89	5	0	74	0	0	217
.120	7	291	0	0	218	0	119	0	0	0	635
93.70	0	0	362	38	98	201	0	161	0	28	888
.80	0	0	1,060	93	979	0	298	135	0	0	2,565
.90	17	0	231	0	372	0	516	0	7	0	1,143
97.70	0	100	0	0	77	0	74	151	0	0	402
.90	0	1,385	0	427	0	277	0	244	0	0	2,333
100.60	0	312	0	0	15	0	0	48	0	0	375
.70	1	0	32	0	22	0	0	9	0	0	64
.80	20	29	0	232	0	297	0	236	0	0	814
.90	0	9	0	45	0	0	0	14	0	0	68
.100	0	0	0	0	0	48	0	43	0	0	91
103.40	0	190	0	28	0	19	0	0	0	0	237
.50	8	312	0	225	0	62	0	22	0	0	629
.60	0	37	0	0	40	0	108	144	0	0	329
.70	0	0	338	388	33	0	49	77	0	0	885
.80	0	0	234	121	670	217	0	0	0	0	1,242
107.40	74	0	311	328	0	286	0	168	0	0	1,167
.60	38	116	0	91	0	59	0	13	0	2	319
.70	0	0	1,472	0	198	0	0	87	0	0	1,757
.80	0	27	0	0	7	7	0	7	0	2	50
110.50	0	14	0	0	19	0	21	19	0	0	73
.60	15	269	0	199	0	67	0	0	0	0	550
.70	0	339	0	77	0	0	59	0	0	0	475
.80	0	2	0	0	0	0	0	0	0	0	2
113.50	14	0	318	0	207	0	927	74	0	0	1,540
.60	10	0	369	0	343	0	185	0	0	0	907
.70	12	0	604	478	0	159	0	36	0	7	1,296
117.60	0	0	140	0	198	0	0	815	0	0	1,153
.70	416	1,392	0	770	489	677	0	100	0	0	3,844
120.35	0	36	0	0	12	0	0	14	0	0	62
.60	0	0	0	5	0	5	0	2	0	0	12
123.50	0	0	0	0	8	0	0	2	0	0	10
127.60	0	5	0	0	5	0	0	0	0	0	10
130.40	0	6	0	0	1	0	0	0	0	0	7
Total	695	5,120	5,926	3,853	4,549	2,961	2,478	2,915	28	148	28,673

Table 2.--Record of jack mackerel eggs by stages of development for selected stations occupied in 1951

Stage:	I	II	III	IV	V	VI	VII	VIII	IX	Dis.	Total
Station											
Cruise 5104:											
70.110	9	543	0	61	17	0	0	121	0	0	751
73.61	0	0	73	0	0	0	12	0	0	0	85
77.55	0	0	3	0	0	7	3	3	0	0	16
80.55	0	3	0	5	0	25	0	5	0	0	38
.60	0	15	0	0	0	18	0	10	0	0	43
.70	0	15	0	5	13	0	3	0	0	1	37
.100	0	1	0	0	6	6	0	5	0	0	18
.110	0	18	0	7	3	0	13	0	7	0	48
.120	1	51	0	17	40	0	0	24	0	0	133
.130	0	1	16	7	21	10	0	9	0	3	67
87.60	13	36	0	0	7	0	3	0	0	0	59
.70	0	246	0	38	3	17	0	5	0	0	309
.90	0	507	222	15	254	15	0	15	0	0	1,028
90.37	0	11	0	23	0	0	11	3	0	0	48
.53	0	12	0	0	17	0	0	0	0	0	29
.60	0	0	61	0	72	0	0	0	0	0	133
.80	7	64	0	123	61	2	0	74	0	0	331
.90	19	132	0	89	26	2	0	12	0	0	280
.100	1	83	75	0	13	0	0	28	0	0	200
.110	6	0	234	0	68	0	0	97	0	6	411
93.70	0	104	0	362	173	0	0	104	0	5	748
97.50	6	432	0	0	133	0	64	4	0	16	655
.70	0	181	0	140	0	6	0	18	0	0	345
.80	0	0	59	0	0	21	0	16	0	1	97
.90	0	4	0	0	8	0	0	3	0	0	15
100.40	3	52	0	0	104	108	0	28	0	0	295
.60	3	19	0	24	0	239	1	62	0	0	348
.90	0	75	0	7	0	9	0	12	0	0	103
.100	0	212	0	133	0	0	59	0	0	0	404
.110	0	46	0	0	13	0	3	0	0	0	62
.120	0	6	0	0	9	0	0	4	0	0	19
103.50	22	367	0	54	9	116	0	18	0	22	608
.60	2	2	515	0	300	0	0	342	0	2	1,163
.70	0	18	0	0	157	0	0	115	0	0	290
.80	3	113	0	84	0	0	80	1	0	0	281
107.40	0	49	0	0	12	0	0	21	0	0	82
.60	21	168	0	0	6	0	0	2	0	0	197
.70	0	0	128	0	26	0	8	0	0	0	162
110.50	5	219	0	0	68	0	0	7	0	5	304
.70	0	27	68	0	57	0	0	12	0	0	164
.80	0	41	0	17	0	9	0	2	0	0	69
.90	0	5	0	18	12	0	7	0	0	0	42
.100	5	348	0	0	54	0	0	43	0	0	450

Table 2.--Record of jack mackerel eggs by stages of development for selected stations occupied in 1951

Stage:	I	II	III	IV	V	VI	VII	VIII	IX	Dis.	Total
Station											
Cruise 5104 (cont'd):											
113.50	44	353	0	104	37	26	0	11	0	35	610
.60	58	424	0	6	0	12	0	4	0	0	504
.70	0	0	153	0	179	0	0	74	0	9	415
117.40	0	6	0	0	8	0	1	0	0	0	15
.50	0	18	0	0	11	0	0	0	0	0	29
.60	43	726	0	460	0	0	54	0	0	0	1,283
.70	2	137	0	0	215	0	0	81	0	17	452
Total	273	5,890	1,607	1,799	2,212	648	322	1,395	7	122	14,275
Cruise 5105:											
70.90	1	7	5	0	0	0	0	0	0	0	13
.100	1	257	0	8	149	35	14	8	1	21	494
.110	0	79	3	60	40	0	16	1	0	0	199
77.65	0	18	0	5	5	0	0	0	0	0	28
80.55	0	5	0	1	0	10	0	0	0	0	16
83.55	0	77	0	5	24	3	0	8	0	0	117
.70	4	580	12	49	16	8	0	8	0	37	714
87.70	3	39	3	53	87	289	238	192	54	17	975
.80	11	520	0	365	150	121	38	35	11	81	1,332
.90	21	137	17	119	216	21	104	198	13	277	1,123
90.53	22	461	30	165	56	42	8	122	0	4	910
.60	5	741	0	45	163	17	0	66	37	3	1,077
.70	3	47	73	24	24	63	0	14	1	3	252
.80	4	25	31	0	31	0	2	23	0	4	120
.90	0	10	75	0	45	0	9	0	0	5	144
.100	0	70	33	2	39	0	59	70	0	6	279
.110	1	35	72	21	57	3	15	1	0	0	205
.120	33	124	0	206	29	29	84	0	0	1	506
93.40	0	5	0	0	47	42	2	25	0	0	121
.60	3	465	24	376	19	237	0	8	0	17	1,149
.80	1	188	120	71	95	76	19	24	0	7	601
.90	0	0	198	0	150	0	52	21	0	0	421
97.50	11	204	24	162	215	58	8	69	0	13	764
.60	238	373	24	34	49	11	0	13	3	3	748
.70	0	0	24	0	15	0	5	0	0	0	44
.80	1	10	0	0	11	0	0	10	0	0	32
.90	0	19	5	0	1	12	10	0	0	0	47
100.40	7	219	25	460	52	68	1	21	0	1	854
.50	2	330	0	54	430	362	0	250	10	4	1,442
.70	3	0	14	5	0	3	0	0	0	0	25

Table 2.--Record of jack mackerel eggs by stages of development for selected stations occupied in 1951

Stage:	I	II	III	IV	V	VI	VII	VIII	IX	Dis.	Total
Station											
Cruise 5105 (cont'd):											
100.90	0	0	16	0	18	0	0	1	0	0	35
.120	0	10	0	0	10	0	16	24	0	0	60
103.35	2	0	0	0	12	8	0	22	0	2	46
.40	0	0	108	3	42	7	25	133	0	5	323
.50	0	1	0	13	11	5	0	3	0	0	33
.80	0	0	179	1	114	0	7	33	0	0	334
107.40	6	101	11	3	1	6	0	0	0	0	128
.50	1	7	206	10	40	0	0	5	0	0	269
.70	1	58	0	0	67	0	6	57	0	12	201
.80	9	212	0	84	187	114	0	0	0	11	617
110.35	0	9	0	2	6	5	2	1	0	3	28
.40	0	50	1	25	56	19	5	9	1	0	166
.50	7	11	213	1	138	0	19	15	1	1	406
.70	0	3	5	6	6	10	16	1	1	0	48
.80	0	30	12	0	38	0	0	0	2	0	82
.90	0	7	52	0	29	16	1	15	4	0	124
113.60	1	1	56	1	36	0	0	0	0	1	96
.70	0	20	32	4	19	3	69	360	3	16	526
117.40	1	15	1	6	0	0	0	3	0	0	26
.70	12	470	7	9	13	0	0	0	0	6	517
120.35	2	2	29	0	43	27	0	0	0	0	103
.50	0	54	7	9	90	58	37	41	0	1	297
Total	417	6,106	1,747	2,467	3,191	1,788	887	1,910	142	562	19,217
Cruise 5106:											
60.80	0	8	0	8	8	17	17	8	0	0	66
70.55	45	61	0	0	30	0	0	30	0	0	166
.100	0	54	0	7	0	25	0	46	0	0	132
97.40	1	7	0	1	0	0	0	0	0	0	9
100.70	12	27	0	5	0	1	0	5	0	0	50
107.50	1	31	0	0	0	13	0	94	0	0	139
.60	0	0	40	56	0	33	0	5	0	0	134
.70	2	0	0	28	2	0	15	0	0	0	47
.80	0	6	0	0	8	0	0	8	0	2	24
110.60	12	7	2	0	269	0	5	107	0	0	402
.90	0	10	0	0	0	32	0	2	0	0	44
120.70	0	0	3	29	0	0	13	0	0	0	45
.80	0	19	0	0	17	0	8	0	0	0	44
Total	73	230	45	134	334	121	58	305	0	2	1,302

Table 2.--Record of jack mackerel eggs by stages of development for selected stations occupied in 1951

Stage:	I	II	III	IV	V	VI	VII	VIII	IX	Dis.	Total
Station											
Cruise 5107:											
47.55	6	28	0	0	3	0	0	0	0	0	37
73.51	6	0	0	0	12	3	3	0	0	0	24
90.100	5	32	0	18	0	5	0	0	0	0	60
100.70	0	5	0	10	0	0	5	0	0	0	20
.100	2	2	0	0	2	0	9	0	0	0	15
120.45	0	5	0	4	0	2	0	0	0	0	11
Total	19	72	0	32	17	10	17	0	0	0	167
Cruise 5108:											
67.65	5	8	0	0	0	0	0	0	0	0	13
70.51	2	2	0	0	0	0	0	0	0	0	4
97.70	0	10	0	0	5	0	0	0	0	0	15
100.40	0	2	0	0	2	0	0	0	0	0	4
Total	7	22	0	0	7	0	0	0	0	0	36

RECORD OF JACK MACKEREL EGGS, 1951

Jack mackerel eggs were collected from February until October, although only negligible amounts were taken during September and October (table 1a). The month of peak occurrence was March, when nearly one-third of the total number of eggs were obtained.

A partial regional analysis (table 1b) indicates that over half the eggs were spawned off California and that very few eggs were spawned to the south of Point San Eugenio (below station line 120).

Of the four years reported, 1951 may be characterized as having a northern distribution accompanied by early spawning.

The quantitative distribution (annual standard haul totals) of jack mackerel eggs is given in figure 3.

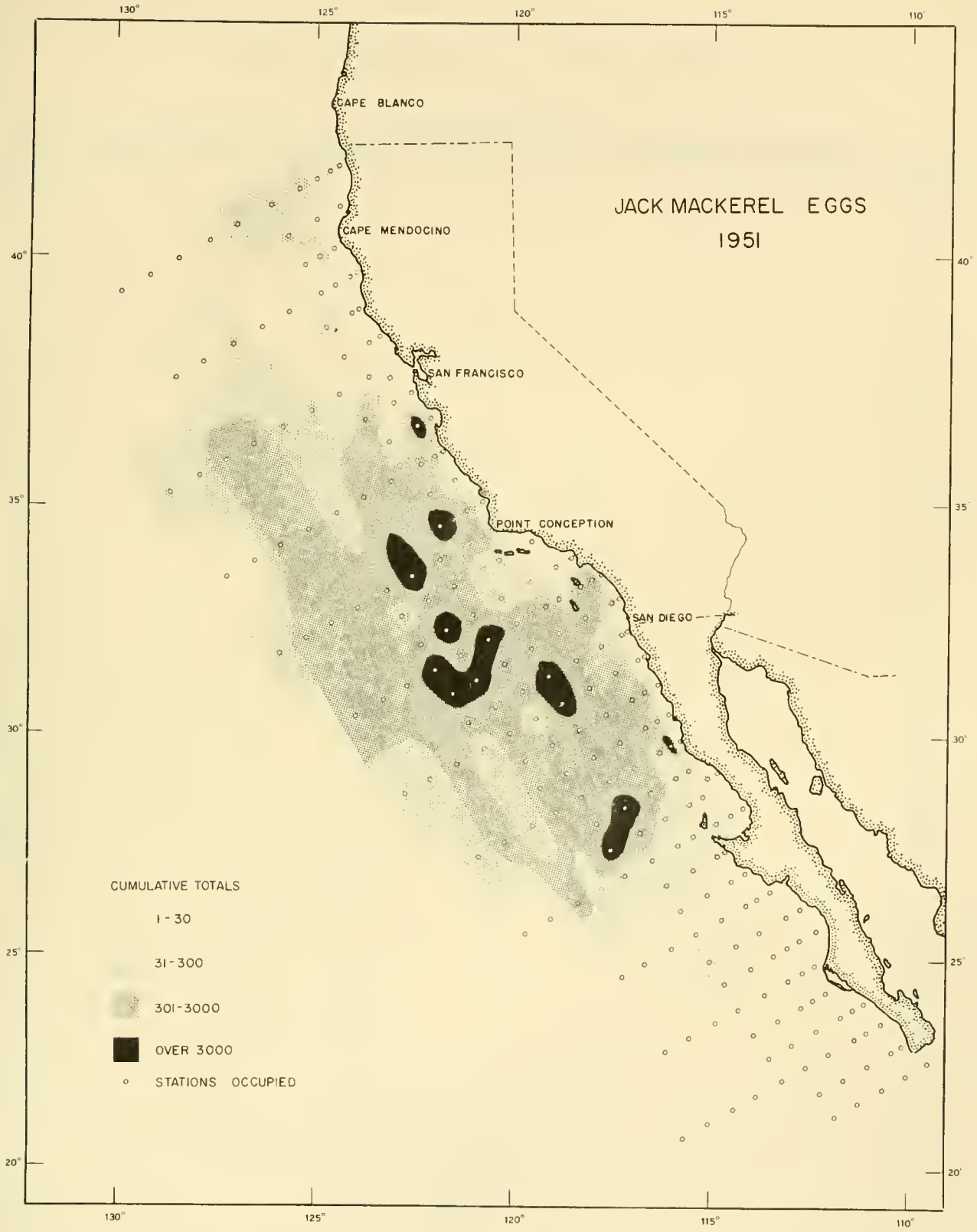

Figure 3.--Jack mackerel eggs, 1951: distribution and relative abundance.

Table 3.--Record of jack mackerel eggs, 1951

Station	Cruise number 5101	5102	5103	5104	5105	5106	5107	5108	5109	5110	5111	5112
40.38	-	-	-	-	-	-	-	0	-	-	-	-
.40	-	-	-	-	-	-	-	2	-	-	-	-
.45	-	-	-	-	-	-	0	-	-	-	-	-
.50	-	-	-	-	-	-	47	2	-	-	-	-
.60	-	-	-	-	-	-	46	20	-	-	-	-
.70	-	-	-	-	-	-	NQ	230	-	-	-	-
.80	-	-	-	-	-	-	3	17	-	-	-	-
.90	-	-	-	-	-	-	0	-	-	-	-	-
.100	-	-	-	-	-	-	0	-	-	-	-	-
.110	-	-	-	-	-	-	0	-	-	-	-	-
43.42	-	-	-	-	-	-	-	0	-	-	-	-
.50	-	-	-	-	-	-	NQ	0	-	-	-	-
.60	-	-	-	-	-	-	61	0	-	-	-	-
47.50	-	-	-	-	-	-	-	0	-	-	-	-
.55	-	-	-	-	-	-	37	-	-	-	-	-
.60	-	-	-	-	-	-	U	0	-	-	-	-
50.47	-	-	-	-	-	-	-	0	-	-	-	-
.50	-	-	-	-	-	-	-	U	-	-	-	-
.55	-	-	-	-	-	-	0	-	-	-	-	-
.60	-	-	-	-	-	-	0	0	-	-	-	-
.70	-	-	-	-	-	-	0	0	-	-	-	-
.80	-	-	-	-	-	-	0	0	-	-	-	-
.90	-	-	-	-	-	-	38	-	-	-	-	-
.100	-	-	-	-	-	-	14	-	-	-	-	-
.110	-	-	-	-	-	-	7	-	-	-	-	-
53.52	-	-	-	-	-	-	-	0	-	-	-	-
.54	-	-	-	-	-	-	0	-	-	-	-	-
.55	-	-	-	-	-	-	-	0	-	-	-	-
.64	-	-	-	-	-	-	70	-	-	-	-	-
.65	-	-	-	-	-	-	-	0	-	-	-	-
57.51	-	-	-	-	-	-	-	U	-	-	-	-
.54	-	-	-	-	-	-	0	-	-	-	-	-
.55	-	-	-	-	-	-	-	0	-	-	-	-
.64	-	-	-	-	-	-	23	-	-	-	-	-
.65	-	-	-	-	-	-	-	0	-	-	-	-
60.55	-	-	-	-	-	-	-	0	-	-	0	-
.60	0	-	-	0	0	6	0	0	0	0	0	-
.70	-	-	-	0	0	0	23	0	0	0	0	-
.80	-	-	-	0	5	66	49	0	0	0	0	-
.90	-	-	-	0	9	10	74	0	0	-	0	-
.100	-	-	-	0	0	318	0	-	-	-	0	-
.110	-	-	-	0	0	886	0	-	-	-	-	-
.120	-	-	-	-	-	235	0	-	-	-	-	-
.130	-	-	-	-	-	51	-	-	-	-	-	-

(-) - Station not occupied
(U) - Sample unavailable
(NQ) - Sample not quantitative

Table 3.--Record of jack mackerel eggs, 1951

Station	Cruise number											
	5101	5102	5103	5104	5105	5106	5107	5108	5109	5110	5111	5112
61.55	U	-	-	0	0	0	1	-	-	-	-	-
63.52	-	-	-	-	-	-	-	0	-	-	0	0
.55	-	-	-	-	-	-	-	0	-	-	0	0
.57	U	-	-	0	0	26	0	-	-	-	-	-
.65	-	-	-	-	-	-	-	16	-	-	-	-
.67	U	-	-	0	-	214	98	-	-	-	-	-
67.50	-	-	-	-	-	-	-	100	-	-	0	0
.55	U	-	-	0	0	3796	0	12	-	-	0	0
.65	0	-	-	0	0	U	0	13	-	-	0	0
70.51	-	-	-	-	-	-	-	4	-	-	0	0
.55	0	-	-	0	0	166	0	-	-	-	-	-
.60	U	-	-	0	0	1375	39	7	0	0	0	0
.70	0	-	-	0	0	1011	29	0	0	0	0	0
.80	U	-	-	8	6	1382	7	0	0	0	0	0
.90	U	-	-	0	13	184	0	-	0	0	-	-
.100	-	-	-	18	494	132	0	-	-	-	-	-
.110	-	-	-	751	199	0	1	-	-	-	-	-
.120	-	-	-	-	-	4	0	-	-	-	-	-
.130	-	-	-	-	-	0	-	-	-	-	-	-
73.50	-	-	-	-	-	-	-	0	-	-	0	0
.51	U	-	-	0	0	0	24	-	-	-	-	-
.60	-	-	-	-	-	-	-	0	U	0	0	0
.61	U	-	-	85	0	1480	545	-	-	-	-	-
77.50	-	-	-	-	-	-	-	0	U	0	0	0
.55	0	-	-	16	0	270	1138	0	U	0	0	0
.65	0	-	-	3	28	596	4110	0	0	0	0	0
80.51	-	-	-	-	-	-	-	0	1	0	0	0
.55	U	0	541	38	16	124	NQ	0	0	0	0	-
.60	U	0	1658	43	-	664	NQ	6	0	0	0	0
.70	U	24	2410	37	-	274	135	0	0	0	0	0
.80	U	1969	1950	0	-	677	3	3	0	0	0	0
.90	U	939	498	0	-	10	1	-	0	0	0	0
.100	-	1408	111	18	-	23	3	-	0	0	0	-
.110	-	U	247	48	-	14	0	-	-	-	-	-
.120	-	0	1029	133	-	-	-	-	-	-	-	-
.130	-	0	U	67	-	-	-	-	-	-	-	-
83.43	-	-	-	-	-	-	-	-	-	-	0	0
.55	-	0	-	0	117	0	-	-	0	0	-	-
.60	U	0	-	0	13	205	-	-	-	0	-	-
.70	U	-	-	0	714	766	-	-	-	-	-	-
.80	U	-	-	0	-	427	-	-	-	-	-	-
.90	U	-	-	0	-	44	-	-	-	-	-	-
85.38	-	-	-	-	-	-	-	0	0	0	0	0
.40	-	-	0	-	-	-	U	0	0	0	0	0

Table 3.--Record of jack mackerel eggs, 1951

Station	Cruise number											
	5101	5102	5103	5104	5105	5106	5107	5108	5109	5110	5111	5112
85.50	-	-	0	-	-	-	-	U	U	0	0	0
.60	-	-	-	-	-	-	-	26	-	0	0	-
.70	-	-	0	-	-	-	-	75	-	-	-	-
.80	-	-	5290	-	-	-	-	18	-	-	-	-
.90	-	-	471	-	-	-	-	-	-	-	-	-
87.35	0	0	-	0	6	52	-	0	-	-	-	-
.40	U	0	-	0	0	0	-	-	-	-	-	-
.50	-	-	-	0	55	U	-	-	-	-	-	-
.60	U	-	-	59	14	U	-	-	-	-	-	-
.70	U	-	-	309	975	145	-	-	-	-	-	-
.80	U	-	-	1908	1332	159	-	-	-	-	-	-
.90	0	-	-	1028	1123	0	-	-	-	-	-	-
90.28	-	-	-	-	-	-	-	0	0	0	0	-
.30	U	0	0	0	2	251	324	33	0	0	0	-
.37	U	0	0	48	40	108	267	544	1	0	0	0
.45	0	0	0	0	0	U	NQ	39	0	0	0	0
.53	U	0	0	29	910	11	2	6	0	0	0	0
.60	U	9	U	133	1077	1318	118	343	0	0	0	0
.70	U	0	2950	870	252	16	31	65	0	0	0	-
.80	U	403	U	331	120	158	8	0	-	-	-	-
.90	U	0	2790	280	144	10	61	0	-	-	-	-
.100	U	0	654	200	279	422	60	U	-	-	-	-
.110	U	0	217	411	205	181	282	-	-	-	-	-
.120	U	0	635	1829	506	-	-	-	-	-	-	-
93.27	-	-	-	-	-	-	-	1	0	0	0	0
.30	U	0	0	0	0	0	174	U	0	0	0	0
.40	U	0	0	0	121	1	72	199	0	0	-	0
.50	0	0	0	520	295	U	37	147	0	0	0	0
.60	0	0	U	1570	1149	266	-	0	-	-	-	-
.70	0	1165	888	748	0	127	-	0	-	-	-	-
.80	U	756	2565	469	601	U	39	0	-	-	-	-
.90	0	0	1143	1479	421	106	87	-	-	-	-	-
97.30	-	-	-	-	-	-	-	0	0	1	0	0
.32	0	0	0	41	61	5	180	0	0	0	0	NQ
.40	0	0	0	76	6	9	87	U	4	0	0	0
.50	U	U	0	655	764	994	325	106	U	0	0	0
.60	U	1972	U	2560	748	1282	219	8	-	-	-	-
.70	U	U	402	345	44	125	117	15	-	-	-	-
.80	U	0	U	97	32	107	353	0	-	-	-	-
.90	0	0	2333	15	47	43	125	-	-	-	-	-
100.29	-	-	-	-	-	-	-	U	0	0	0	0
.30	U	0	0	3	8	0	-	0	0	0	0	0
.40	U	0	0	295	854	25	223	4	0	0	0	0
.50	U	0	0	2222	1442	93	73	0	0	0	0	0

Table 3.--Record of jack mackerel eggs, 1951

Station	Cruise number											
	5101	5102	5103	5104	5105	5106	5107	5108	5109	5110	5111	5112
100.60	U	532	375	348	2140	293	95	5	0	0	0	0
.70	U	9	64	0	25	50	20	51	0	0	-	0
.80	U	0	814	30	8	99	872	-	0	0	0	-
.90	0	0	68	103	35	10	84	-	0	0	-	-
.100	U	-	91	404	14	-	15	-	-	-	-	-
.110	U	-	-	62	30	-	-	-	-	-	-	-
.120	0	-	-	19	60	-	-	-	-	-	-	-
103.30	-	-	-	-	-	-	-	-	0	0	0	0
.35	-	-	0	1275	46	132	-	-	1	0	0	0
.40	U	-	237	0	323	37	-	-	0	0	0	0
.50	U	-	629	608	33	131	-	-	-	-	-	-
.60	0	-	329	1163	10	263	-	-	-	-	-	-
.70	0	-	885	290	42	94	-	-	-	-	-	-
.80	U	-	1242	281	334	-	-	-	-	-	-	-
105.32	-	-	-	-	-	-	-	0	-	-	-	-
.35	0	0	-	-	-	-	-	78	-	-	-	-
.40	-	0	-	-	-	-	-	0	-	-	-	-
.50	-	0	-	-	-	-	-	0	-	-	-	-
.60	-	0	-	-	-	-	-	5	-	-	-	-
.70	-	0	-	-	-	-	-	-	-	-	-	-
.80	-	0	-	-	-	-	-	-	-	-	-	-
.90	-	0	-	-	-	-	-	-	-	-	-	-
107.32	-	-	-	-	-	-	-	-	0	0	0	0
.35	-	-	0	25	17	25	-	-	U	0	0	0
.40	0	-	1167	82	128	2	-	-	0	0	0	0
.50	U	-	U	818	269	139	-	-	-	-	-	-
.60	U	-	319	197	1	134	-	-	-	-	-	-
.70	0	-	1757	162	201	47	-	-	-	-	-	-
.80	0	-	50	41	617	24	-	-	-	-	-	-
110.33	-	-	-	-	-	-	-	U	0	0	0	0
.35	0	0	9430	0	28	5	-	2	0	0	0	0
.40	0	0	0	0	166	U	-	21	U	0	0	0
.50	0	0	73	304	406	7	-	0	0	0	0	0
.60	0	0	550	1520	78	402	-	18	0	0	0	0
.70	0	0	475	164	46	421	-	-	-	-	-	-
.80	0	0	2	69	82	260	34	-	-	-	-	-
.90	0	0	0	42	124	44	6	-	-	-	-	-
.100	0	0	0	450	25	0	-	-	-	-	-	-
.110	0	-	U	172	0	0	-	-	-	-	-	-
113.35	0	0	0	0	6	2	-	-	-	-	-	-
.40	U	0	U	35	6	3	-	-	-	-	-	-
.50	0	0	1540	610	14	0	-	-	-	-	-	-
.60	U	0	907	504	96	1591	-	-	-	-	-	-
.70	0	0	1296	415	526	119	-	-	-	-	-	-

Table 3.--Record of jack mackerel eggs, 1951

Station	Cruise number											
	5101	5102	5103	5104	5105	5106	5107	5108	5109	5110	5111	5112
115.27	-	-	-	-	-	-	-	U	0	0	0	0
.30	-	-	-	-	-	-	-	135	0	0	0	0
.35	-	-	-	-	-	-	-	U	0	0	0	0
.40	-	-	-	-	-	-	-	U	0	0	0	0
.50	-	-	-	-	-	-	-	0	-	-	-	-
.60	-	-	-	-	-	-	-	U	-	-	-	-
117.35	0	0	0	0	0	0	-	-	-	-	-	-
.40	0	0	0	15	26	0	-	-	-	-	-	-
.50	U	0	0	29	17	0	-	-	-	-	-	-
.60	0	0	1153	1283	5	45	-	-	-	-	-	-
.70	0	0	3844	452	517	0	-	-	-	-	-	-
120.25	-	-	-	-	-	-	-	U	0	0	0	0
.30	-	-	-	-	-	-	-	0	0	0	0	0
.35	0	0	62	0	103	0	0	0	0	0	0	0
.45	U	0	0	2	0	4	11	0	0	0	0	0
.50	0	0	0	2	297	0	0	0	-	0	0	0
.60	U	0	12	134	0	21	26	0	0	0	0	0
.70	0	0	0	227	7	45	0	0	0	0	0	0
.80	U	0	0	65	10	44	0	7	0	0	0	-
.90	0	0	0	0	0	559	0	0	0	0	0	-
.100	0	0	U	0	0	0	-	-	-	-	-	-
.110	0	-	0	0	0	0	-	-	-	-	-	-
123.37	-	-	-	-	-	-	-	4	0	0	0	0
.40	0	0	0	0	66	4	0	0	0	0	0	0
.50	0	0	10	41	1	0	3	0	-	0	-	-
.60	U	0	0	72	12	43	0	0	-	-	-	-
127.34	-	-	-	-	-	-	-	U	0	0	0	-
.40	0	0	0	U	0	0	0	0	0	0	0	-
.50	0	0	0	4	0	10	0	0	-	0	-	-
.60	U	0	10	2	7	0	0	0	-	-	-	-
130.30	-	-	-	-	-	-	-	0	0	0	0	-
.35	0	0	0	0	0	U	0	0	NQ	0	0	-
.40	0	0	7	0	0	0	0	U	0	0	0	-
.50	0	0	0	0	19	0	0	0	0	0	0	-
.60	0	0	0	22	0	0	0	0	0	0	0	-
.70	0	0	0	17	0	0	-	-	0	0	-	-
.80	U	0	4	0	0	U	-	-	-	-	-	-
.90	-	-	-	-	-	0	-	-	-	-	-	-
133.25	-	-	-	-	-	-	-	0	0	0	0	-
.30	0	0	U	0	20	0	0	0	U	0	0	-
.40	0	0	4	0	8	0	3	0	-	-	-	-
.50	0	0	0	8	8	0	0	0	-	-	-	-
.60	0	0	1	42	29	0	-	-	-	-	-	-

Table 3.--Record of jack mackerel eggs, 1951

Station	Cruise number											
	5101	5102	5103	5104	5105	5106	5107	5108	5109	5110	5111	5112
137.23	-	-	-	-	-	-	-	0	U	0	0	-
.30	-	-	-	-	-	-	-	0	U	0	0	-
.35	0	0	0	0	0	0	0	-	-	-	-	-
.40	0	0	0	0	0	0	0	0	-	-	-	-
.50	0	0	0	0	4	0	0	0	-	-	-	-
.60	0	0	0	0	5	0	-	-	-	-	-	-
140.30	-	-	-	-	-	-	-	-	0	-	-	-
.35	-	-	0	-	-	0	-	-	0	-	-	-
.40	-	-	0	-	-	0	-	-	0	-	-	-
.50	-	-	20	-	-	0	-	-	0	-	-	-
.60	-	-	0	-	-	0	-	-	0	-	-	-
.70	-	-	0	-	-	0	-	-	0	-	-	-
.80	-	-	0	-	-	0	-	-	-	-	-	-
.90	-	-	-	-	-	0	-	-	-	-	-	-
143.30	-	-	3	-	-	0	-	-	0	-	-	-
.35	-	-	5	-	-	0	-	-	0	-	-	-
.40	-	-	0	-	-	0	-	-	-	-	-	-
.50	-	-	U	-	-	0	-	-	-	-	-	-
.60	-	-	-	-	-	0	-	-	-	-	-	-
147.20	-	-	0	-	-	-	-	-	0	-	-	-
.25	-	-	0	-	-	0	-	-	U	-	-	-
.30	-	-	0	-	-	0	-	-	0	-	-	-
.40	-	-	0	-	-	0	-	-	-	-	-	-
.50	-	-	-	-	-	0	-	-	-	-	-	-
.60	-	-	-	-	-	0	-	-	-	-	-	-
150.19	-	-	-	-	-	-	-	-	0	-	-	-
.25	-	-	0	-	-	0	-	-	0	-	-	-
.30	-	-	0	-	-	0	-	-	0	-	-	-
.40	-	-	0	-	-	0	-	-	0	-	-	-
.50	-	-	0	-	-	0	-	-	0	-	-	-
.60	-	-	0	-	-	0	-	-	0	-	-	-
.70	-	-	0	-	-	0	-	-	0	-	-	-
.80	-	-	0	-	-	0	-	-	0	-	-	-
.90	-	-	-	-	-	0	-	-	0	-	-	-
.100	-	-	-	-	-	-	-	-	0	-	-	-
153.16	-	-	-	-	-	-	-	-	0	-	-	-
.20	-	-	0	-	-	0	-	-	0	-	-	-
.30	-	-	0	-	-	0	-	-	-	-	-	-
.40	-	-	0	-	-	0	-	-	-	-	-	-
.50	-	-	0	-	-	0	-	-	-	-	-	-
157.10	-	-	0	-	-	0	-	-	0	-	-	-
.20	-	-	0	-	-	0	-	-	0	-	-	-
.30	-	-	0	-	-	0	-	-	-	-	-	-
.40	-	-	0	-	-	0	-	-	-	-	-	-
.50	-	-	0	-	-	0	-	-	-	-	-	-
Total	0	9186	56217	32405	22346	26559	11053	2387	7	1	0	0

RECORD OF JACK MACKEREL EGGS, 1952

Spawning began in January, rose to a peak in May and ceased by the end of September.

A partial regional analysis indicates that the center of spawning was more compact than in 1951 with over 90 percent of the spawning occurring off southern California and northern Baja California (station lines 77-107). The record shows less spawning off central and northern California (lines 40-73) and off central and southern Baja California (lines 110-157).

The quantitative distribution (annual standard haul totals) of jack mackerel eggs is given in figure 4.

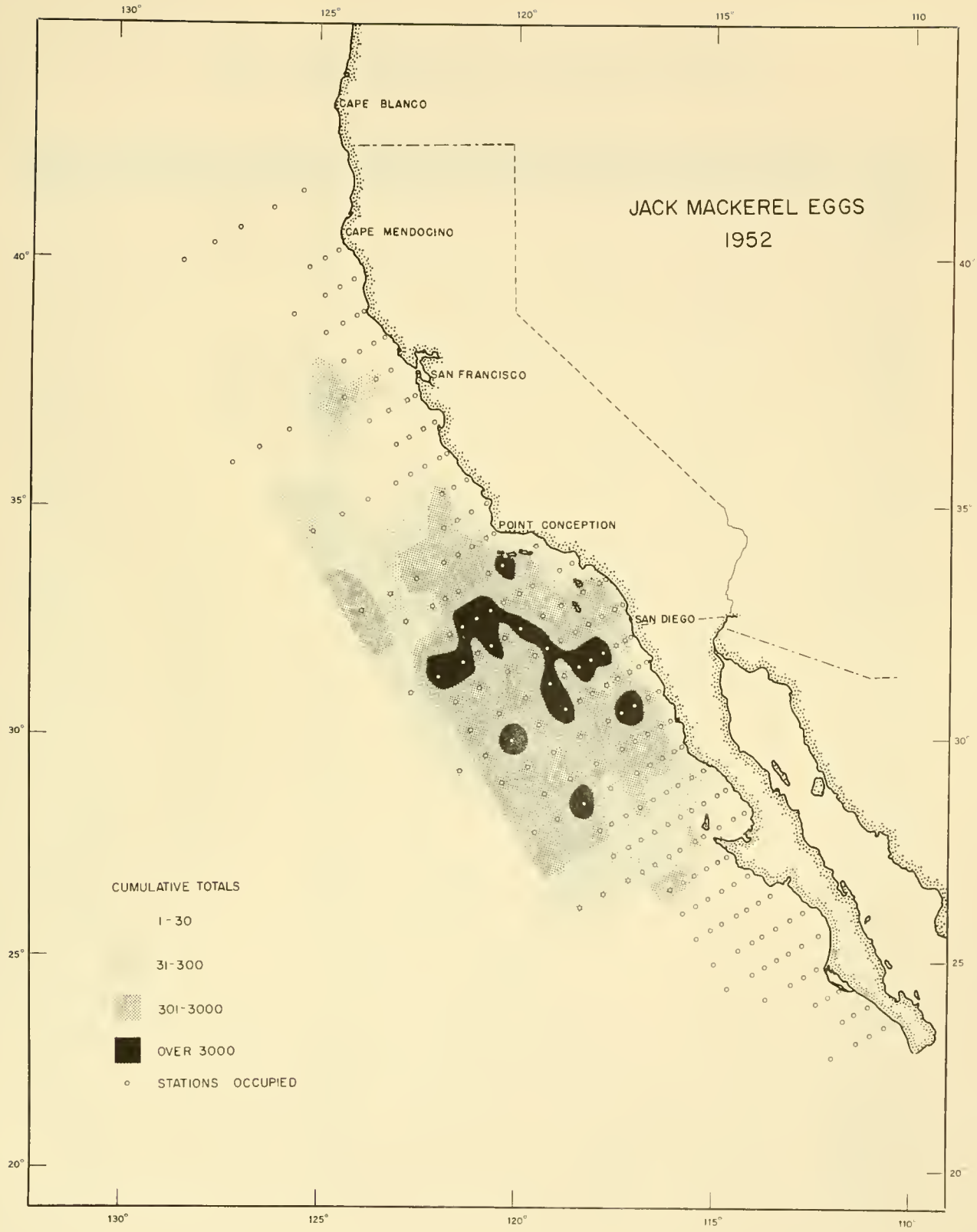

Figure 4.--Jack mackerel eggs, 1952: distribution and relative abundance.

Table 4.--Record of jack mackerel eggs, 1952

Station	Cruise number										
	5201	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211
40.38	-	-	-	-	-	-	U	-	-	-	-
.50	-	-	-	-	-	-	0	-	-	-	-
.60	-	-	-	-	-	-	0	-	-	-	-
.70	-	-	-	-	-	-	6	-	-	-	-
.80	-	-	-	-	-	-	0	-	-	-	-
.90	-	-	-	-	-	-	0	-	-	-	-
43.42	-	-	-	-	-	-	U	-	-	-	-
.50	-	-	-	-	-	-	NQ	-	-	-	-
47.50	-	-	-	-	-	-	0	-	-	-	-
.55	-	-	-	-	-	-	0	-	-	-	-
.60	-	-	-	-	-	-	0	-	-	-	-
50.47	-	-	-	-	-	-	U	-	-	-	-
.50	-	-	-	-	-	0	0	-	-	-	-
.55	-	-	-	-	-	-	0	-	-	-	-
.60	-	-	-	-	-	-	0	-	-	-	-
.70	-	-	-	-	-	-	0	-	-	-	-
53.52	-	-	-	-	-	0	-	-	-	-	-
.55	-	-	-	-	-	0	0	-	-	-	-
.60	-	-	-	-	-	-	0	-	-	-	-
.65	-	-	-	-	-	0	0	-	-	-	-
57.51	-	-	-	-	-	0	0	-	-	-	-
.55	-	-	-	-	-	0	0	-	-	-	-
.60	-	-	-	-	-	-	0	-	-	-	-
.65	-	-	-	-	-	0	U	-	-	-	-
60.55	-	-	-	0	-	0	NQ	0	0	0	0
.57	-	-	-	-	-	-	0	-	-	-	-
.60	-	-	-	0	-	U	36	-	0	0	0
.65	-	-	-	-	-	0	NQ	-	-	-	-
.70	-	-	-	0	-	0	327	-	0	0	0
.80	-	-	-	U	U	NQ	-	-	0	0	0
.90	-	-	-	0	U	0	30	-	0	0	0
.100	-	-	-	-	U	5	-	-	0	0	0
.110	-	-	-	-	-	-	-	-	0	0	0
63.52	-	-	-	0	U	0	0	0	0	0	0
.55	-	-	-	0	U	0	28	0	0	0	0
.60	-	-	-	-	U	0	22	-	-	-	-
.65	-	-	-	-	U	0	0	-	-	-	-
67.50	-	-	-	0	0	U	NQ	0	0	-	-
.55	-	-	-	0	U	0	9	0	0	0	0
.60	-	-	-	-	-	0	6	-	-	-	-
.65	-	-	-	-	-	0	0	0	0	0	0

Table 4.--Record of jack mackerel eggs, 1952

Station	Cruise number 5201	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211
70.51	-	-	-	-	-	-	0	0	0	-	0
.55	-	-	-	0	U	U	-	-	-	-	-
.60	-	-	-	0	U	0	0	0	0	0	0
.65	-	-	-	-	U	0	U	-	-	-	-
.70	-	-	-	0	U	0	16	0	0	0	0
.75	-	-	-	-	-	U	-	-	-	-	-
.80	-	-	-	0	U	25	3	0	0	0	0
.90	-	-	-	0	U	226	0	-	-	-	-
.100	-	-	-	-	U	159	-	-	-	-	-
73.50	-	-	-	0	U	0	0	0	0	0	-
.55	-	-	-	-	U	0	30	-	-	-	-
.60	-	-	-	0	U	NQ	689	228	0	0	-
77.50	-	-	-	0	U	0	19	0	0	-	-
.55	-	-	-	0	U	0	U	6	0	0	0
.60	-	-	-	-	U	0	171	-	-	-	-
.65	-	-	-	-	U	NQ	791	U	0	0	0
80.51	0	0	U	0	U	0	0	U	0	0	0
.55	0	0	0	0	U	33	0	0	0	0	0
.60	0	0	0	0	U	1070	28	85	0	0	0
.65	-	-	-	-	-	2300	30	-	-	-	-
.70	0	0	0	0	U	1970	0	35	0	0	0
.75	-	-	-	-	-	NQ	-	-	-	-	-
.80	0	U	371	0	U	10	3	14	0	0	0
.85	-	-	-	-	U	-	-	-	-	-	-
.90	0	6	NQ	0	U	239	13	0	0	0	0
.100	0	11	-	0	223	U	162	0	0	0	0
.110	0	-	-	-	-	-	-	-	-	-	-
83.43	-	-	-	-	U	46	-	-	-	-	-
.55	-	-	-	0	3060	U	-	-	-	-	-
.60	-	-	-	0	U	840	-	-	-	-	-
.65	-	-	-	-	U	-	-	-	-	-	-
.70	-	-	-	39	U	1820	-	-	-	-	-
.75	-	-	-	-	U	356	-	-	-	-	-
.80	-	-	-	0	U	98	-	-	-	-	-
.85	-	-	-	-	U	-	-	-	-	-	-
.90	-	-	-	0	U	64	-	-	-	-	-
85.38	0	0	0	-	-	-	5	0	0	0	0
.40	0	0	0	-	-	-	0	U	0	0	0
.45	-	-	-	-	-	-	9	-	-	-	-
.50	0	0	0	-	-	-	10	0	0	0	0
.55	-	-	-	-	-	-	115	-	-	-	-

Table 4.--Record of jack mackerel eggs, 1952

Station	Cruise number										
	5201	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211
85.60	0	0	0	-	-	-	324	0	3	0	0
.70	0	0	0	-	-	-	65	-	-	-	-
.80	-	-	-	-	-	-	85	-	-	-	-
.90	-	-	-	-	-	-	0	-	-	-	-
87.35	-	-	-	0	U	0	-	-	-	-	-
.40	-	-	-	0	U	5	-	-	-	-	-
.45	-	-	-	-	U	U	-	-	-	-	-
.50	-	-	-	0	1038	0	-	-	-	-	-
.55	-	-	-	-	633	538	-	-	-	-	-
.60	-	-	-	35	2265	382	-	-	-	-	-
.65	-	-	-	-	3070	-	-	-	-	-	-
.70	-	-	-	100	6180	784	-	-	-	-	-
.75	-	-	-	-	5770	-	-	-	-	-	-
.80	-	-	-	124	415	536	-	-	-	-	-
.90	-	-	-	0	-	-	-	-	-	-	-
90.28	0	0	0	0	125	36	6	0	0	0	0
.30	0	0	0	0	249	13	40	6	471	0	0
.37	0	0	0	0	390	11	161	197	0	-	0
.45	0	0	0	0	606	U	18	U	0	0	0
.53	0	0	0	0	81	416	145	81	3	0	0
.60	0	0	0	0	3560	261	30	0	6	0	0
.65	-	-	-	-	168	745	-	-	-	-	-
.70	0	11	0	0	1141	2910	0	11	0	0	0
.75	-	-	-	-	992	-	-	-	-	-	-
.80	0	505	1370	0	1610	194	9	-	-	-	-
.90	0	309	4470	132	752	650	3	-	-	-	-
.100	-	-	-	205	-	74	0	-	-	-	-
93.27	0	0	0	34	5	U	5	3	2	0	0
.30	0	U	0	1525	0	236	111	0	0	0	0
.35	-	-	-	-	732	27	38	-	-	-	-
.40	0	U	0	680	772	14	263	17	15	0	0
.45	-	-	-	-	782	U	282	-	-	-	-
.50	0	0	0	22	396	15	445	548	0	0	0
.55	-	-	-	-	1590	109	1365	-	-	-	-
.60	0	0	0	241	523	132	286	-	-	-	-
.65	-	-	-	-	157	69	-	-	-	-	-
.70	0	0	1039	82	45	380	120	-	-	-	-
.75	-	-	-	-	71	-	-	-	-	-	-
.80	-	-	-	168	57	69	268	-	-	-	-
.90	-	-	-	626	-	-	6	-	-	-	-

Table 4.--Record of jack mackerel eggs, 1952

Station	Cruise number										
	5201	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211
97.30	0	U	0	-	0	0	0	0	0	-	0
.32	0	0	0	942	-	U	51	0	0	0	0
.35	-	-	-	-	103	71	-	-	-	-	-
.40	0	U	0	1168	472	1052	1130	U	198	0	0
.45	-	-	-	-	2090	U	4620	-	-	-	-
.50	0	0	0	4730	134	371	455	248	11	0	0
.55	-	-	-	-	195	202	859	-	-	-	-
.60	0	0	494	1290	261	849	2410	-	-	-	-
.65	-	-	-	-	28	522	-	-	-	-	-
.70	7	448	1231	U	36	35	57	-	-	-	-
.75	-	-	-	-	35	-	-	-	-	-	-
.80	-	-	-	37	756	76	20	-	-	-	-
.90	-	-	-	20	183	107	6	-	-	-	-
100.29	0	-	0	0	0	0	0	0	0	0	0
.30	-	U	0	0	U	0	0	0	0	0	0
.35	-	-	-	-	-	149	0	-	-	-	-
.40	0	0	0	1072	106	100	57	0	0	0	0
.45	-	-	-	-	U	180	66	-	-	-	-
.50	0	31	0	696	1262	151	609	0	12	0	0
.55	-	-	-	-	696	56	70	-	-	-	-
.60	-	227	1769	2650	421	201	90	0	0	0	0
.65	-	-	-	-	116	71	-	-	-	-	-
.70	0	0	756	453	0	15	71	0	0	0	0
.75	-	-	-	-	17	-	-	-	-	-	-
.80	0	1190	1375	452	72	385	0	0	0	0	0
.90	331	U	299	U	480	116	14	-	-	-	-
.100	-	-	-	82	-	96	65	-	-	-	-
103.30	-	-	-	9	U	0	-	0	0	0	0
.35	-	-	-	505	59	5	-	9	3	0	0
.40	-	-	-	48	3440	U	-	0	0	0	0
.45	-	-	-	-	3510	-	-	-	-	-	-
.50	-	-	-	1015	264	U	-	-	-	-	-
.55	-	-	-	-	NQ	U	-	-	-	-	-
.60	-	-	-	0	50	U	-	-	-	-	-
.65	-	-	-	-	27	73	-	-	-	-	-
.70	-	-	-	343	41	38	-	-	-	-	-
.75	-	-	-	-	368	227	-	-	-	-	-
.80	-	-	-	63	358	60	-	-	-	-	-
.90	-	-	-	101	193	107	-	-	-	-	-

Table 4.--Record of jack mackerel eggs, 1952

Station	Cruise and number										
	5201	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211
105.32	0	0	0	-	-	-	0	-	-	-	-
.35	85	0	0	-	-	-	205	-	-	-	-
.40	0	0	0	-	-	-	438	-	-	-	-
.45	-	-	-	-	-	-	99	-	-	-	-
.50	0	27	0	-	-	-	171	-	-	-	-
.55	-	-	-	-	-	-	102	-	-	-	-
.60	0	4460	333	-	-	-	45	-	-	-	-
.70	0	891	148	-	-	-	153	-	-	-	-
.80	0	0	-	-	-	-	115	-	-	-	-
.90	-	-	-	-	-	-	253	-	-	-	-
107.32	-	-	-	0	0	0	-	6	0	0	0
.35	-	-	-	118	0	269	-	0	5	0	0
.40	-	-	-	0	91	412	-	0	0	-	-
.45	-	-	-	-	374	114	-	-	-	-	-
.50	-	-	-	251	850	43	-	-	-	-	-
.55	-	-	-	-	-	12	-	-	-	-	-
.60	-	-	-	205	426	U	-	-	-	-	-
.65	-	-	-	-	-	183	-	-	-	-	-
.70	-	-	-	875	236	91	-	-	-	-	-
.80	-	-	-	141	508	51	-	-	-	-	-
110.33	0	0	-	0	4	0	0	0	0	0	0
.35	0	0	0	0	65	U	3	0	0	0	0
.40	0	0	0	126	48	137	U	0	0	0	0
.45	-	-	-	-	79	504	-	-	-	-	-
.50	0	0	0	56	112	435	5	0	0	0	0
.55	-	-	-	-	-	144	-	-	-	-	-
.60	-	0	2	U	133	81	3	0	0	0	0
.65	-	-	-	-	-	U	-	-	-	-	-
.70	0	U	4	121	3779	203	72	-	-	-	-
.80	0	0	-	1036	43	78	0	-	-	-	-
.90	0	0	-	356	160	45	0	-	-	-	-
113.30	-	0	43	0	0	0	0	0	0	0	0
.35	-	0	0	0	117	0	6	0	-	-	0
.40	-	0	0	0	21	229	0	0	0	0	0
.45	-	-	-	-	94	118	0	-	-	-	-
.50	-	0	0	-	245	20	0	-	-	-	-
.55	-	-	-	-	124	490	23	-	-	-	-
.60	-	0	36	99	19	29	0	-	-	-	-
.65	-	-	-	44	41	22	-	-	-	-	-
.70	-	0	-	183	9	114	0	-	-	-	-

Table 4.--Record of jack mackerel eggs, 1952

Station	Cruise number										
	5201	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211
115.27	0	-	-	-	-	-	-	U	-	-	-
.30	-	-	-	-	-	-	-	U	-	-	-
.35	0	-	-	-	-	-	-	U	-	-	-
.40	0	-	-	-	-	-	-	-	-	-	-
.50	0	-	-	-	-	-	-	-	-	-	-
.60	0	-	-	-	-	-	-	-	-	-	-
.70	0	-	-	-	-	-	-	-	-	-	-
117.26	-	0	0	0	0	0	0	0	0	0	0
.30	-	0	0	0	0	0	0	0	0	0	0
.35	-	0	3	0	0	0	0	0	-	-	0
.40	-	0	0	0	0	0	40	0	0	0	0
.45	-	-	-	16	2	0	15	-	-	-	-
.50	-	0	0	20	121	0	0	-	-	-	-
.55	-	-	-	6	18	84	0	-	-	-	-
.60	-	U	14	0	5	U	0	-	-	-	-
.65	-	-	-	0	18	38	-	-	-	-	-
.70	-	0	-	0	13	53	3	-	-	-	-
120.25	0	0	0	7	0	0	0	12	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0
.35	0	0	0	0	0	0	0	0	0	0	0
.37	-	-	-	-	-	-	U	-	-	-	-
.40	-	-	-	0	0	0	-	-	-	-	-
.45	0	0	0	9	305	0	0	0	0	0	0
.50	0	0	0	0	9	0	0	0	0	0	0
.55	-	-	-	15	15	13	0	-	-	-	-
.60	0	0	0	69	81	13	0	0	0	0	0
.65	-	-	-	0	39	121	-	-	-	-	-
.70	0	0	0	15	100	0	0	0	0	0	0
.80	0	0	0	68	110	0	0	0	0	0	0
.90	0	0	142	U	0	0	0	0	0	0	0
123.37	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0
.45	-	-	-	0	0	0	0	-	-	-	-
.50	0	0	0	40	36	25	0	0	0	0	0
.55	-	-	-	39	606	49	-	-	-	-	-
.60	0	0	249	61	16	5	0	-	-	-	-
127.34	0	-	0	U	0	0	0	0	0	0	0
.40	0	-	0	0	0	0	0	0	0	0	-
.45	-	-	-	0	0	0	0	-	-	-	-
.50	0	-	0	0	0	0	0	0	0	0	-
.55	-	-	-	0	0	0	-	-	-	-	-
.60	0	0	0	0	0	0	0	-	-	-	-

Table 4.--Record of jack mackerel eggs, 1952

Station	Cruise number										
	5201	5202	5203	5204	5205	5206	5207	5208	5209	5210	5211
130.30	0	0	0	U	0	0	0	U	0	0	0
.35	0	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0	0
.45	-	-	-	U	0	0	0	-	-	-	-
.50	0	0	0	3	0	0	0	0	0	0	0
.55	-	-	-	27	0	0	-	-	-	-	-
.60	0	0	0	0	0	0	0	0	0	0	0
.70	0	-	-	-	-	-	-	-	-	-	-
.80	0	-	-	-	-	-	-	-	-	-	-
133.25	0	0	0	0	0	U	-	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0
.35	-	-	-	0	0	0	0	-	-	-	-
.40	0	0	0	0	0	0	0	-	-	-	-
.45	-	-	-	0	0	0	0	-	-	-	-
.50	0	0	0	0	0	NQ	U	-	-	-	-
.60	0	-	-	0	-	-	-	-	-	-	-
137.23	0	0	0	0	0	U	0	0	0	0	0
.30	0	0	0	0	0	0	0	0	0	0	0
.35	-	-	-	0	0	0	0	-	-	-	-
.40	0	0	0	0	0	0	0	-	-	-	-
.45	-	-	-	0	0	0	0	-	-	-	-
.50	0	0	U	0	0	0	0	-	-	-	-
.60	0	-	-	0	-	-	-	-	-	-	-
140.30	-	0	-	-	-	-	-	-	-	-	-
.35	-	0	-	-	-	-	-	-	-	-	-
.40	-	0	-	-	-	-	-	-	-	-	-
.50	-	0	-	-	-	-	-	-	-	-	-
143.26	-	0	-	-	-	-	-	-	-	-	-
.30	-	0	-	-	-	-	-	-	-	-	-
.35	-	0	-	-	-	-	-	-	-	-	-
147.20	-	0	-	-	-	-	-	-	-	-	-
.25	-	0	-	-	-	-	-	-	-	-	-
.30	-	0	-	-	-	-	-	-	-	-	-
150.19	-	0	-	-	-	-	-	-	-	-	-
.25	-	0	-	-	-	-	-	-	-	-	-
.30	-	0	-	-	-	-	-	-	-	-	-
.40	-	0	-	-	-	-	-	-	-	-	-
Total	423	8116	14148	23695	62303	27407	19034	1506	729	0	0

RECORD OF JACK MACKEREL EGGS, 1953

Spawning began in February. The peak came in April this year. No eggs were collected in September but a small number were taken during October.

Half of the eggs were taken from off northern Baja California (station lines 97-107) with the two adjacent regions contributing 46 percent. Of the four years studied, this one has the lowest number of eggs off California, indicating a more southern distribution than usual.

The quantitative distribution (annual standard haul totals) is given in figure 5.

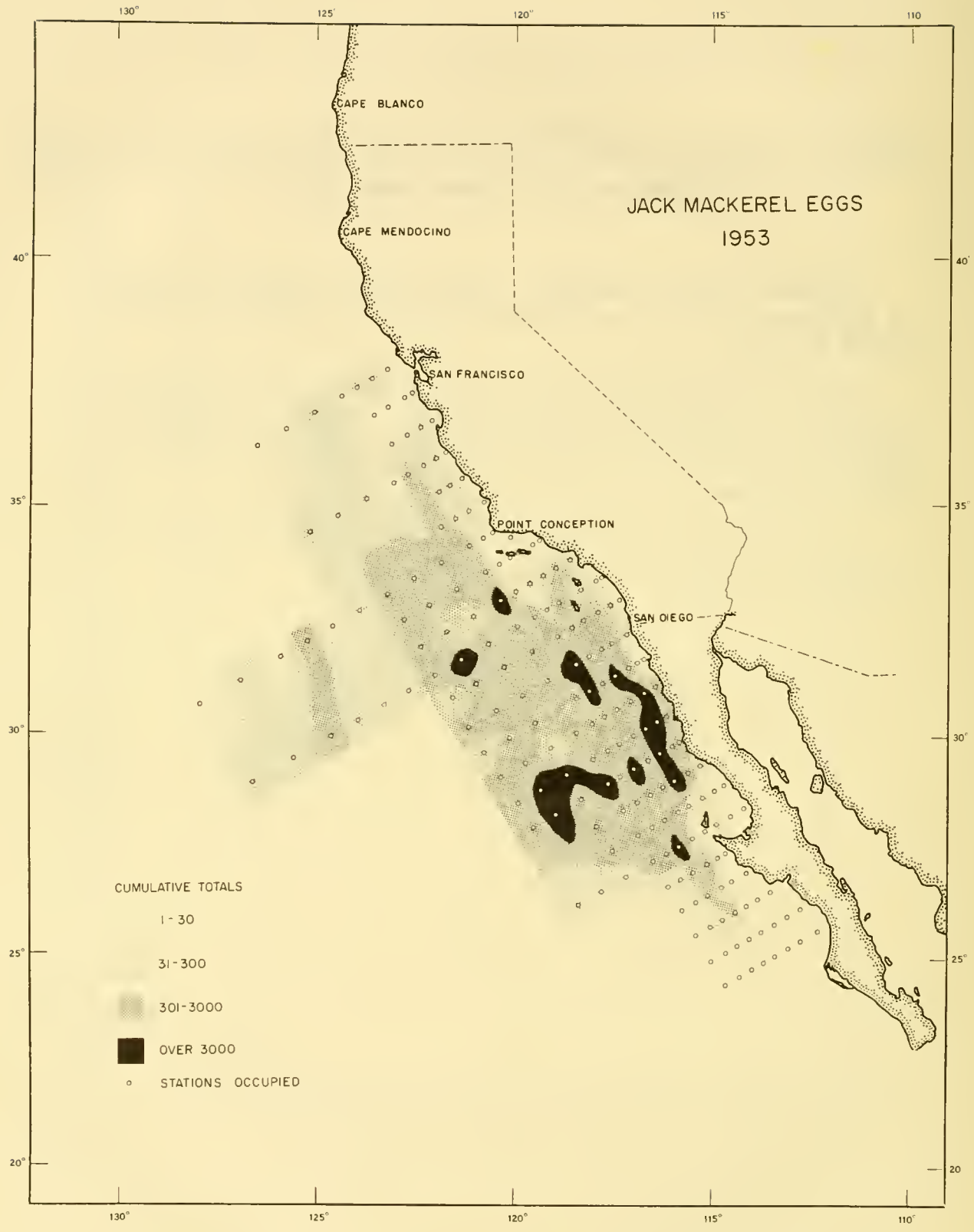

Figure 5.--Jack mackerel eggs 1953: distribution and relative abundance.

Table 5.--Record of jack mackerel eggs, 1953

Station	Cruise number 5301	5302	5303	5304	5305	5306	5307	5308	5309	5310	5311	5312
60.55	-	-	-	0	0	0	0	0	-	-	-	-
.60	-	-	-	0	0	96	0	0	-	-	-	-
.65	-	-	-	-	U	33	-	-	-	-	-	-
.70	-	-	-	0	0	-	0	23	-	-	-	-
.80	-	-	-	0	0	-	0	44	-	-	-	-
.90	-	-	-	0	0	-	0	15	-	-	-	-
.100	-	-	-	-	0	-	0	0	-	-	-	-
63.52	-	-	-	0	0	5	0	0	-	-	-	-
.55	-	-	-	0	U	0	0	-	-	-	-	-
.60	-	-	-	-	0	0	-	-	-	-	-	-
.65	-	-	-	-	0	0	-	-	-	-	-	-
67.50	-	-	-	0	-	0	-	0	-	-	-	-
.55	-	-	-	U	-	0	16	57	-	-	-	-
.60	-	-	-	-	-	6	0	-	-	-	-	-
.65	-	-	-	-	0	62	18	0	-	-	-	-
70.51	-	-	-	0	0	0	0	-	-	-	-	-
.55	-	-	-	0	0	70	18	46	-	-	-	-
.60	-	-	-	8	0	55	6	0	-	-	-	-
.65	-	-	-	-	0	798	-	-	-	-	-	-
.70	-	-	-	0	0	0	6	0	-	-	-	-
.80	-	-	-	0	U	63	10	16	-	-	-	-
.90	-	-	-	0	0	37	-	-	-	-	-	-
.100	-	-	-	-	0	85	-	-	-	-	-	-
73.50	-	-	-	U	0	14	0	0	-	-	-	-
.55	-	-	-	-	0	66	0	-	-	-	-	-
.60	-	-	-	0	0	127	13	0	-	-	-	-
77.50	-	-	-	0	0	8	0	0	-	-	-	-
.55	-	-	-	0	0	84	0	0	-	-	-	-
.60	-	-	-	-	0	123	60	-	-	-	-	-
.65	-	-	-	0	0	156	483	0	-	-	-	-
80.51	0	0	0	0	0	0	0	0	-	-	-	-
.55	NQ	0	0	0	0	U	0	0	-	-	-	-
.60	0	0	0	0	18	610	47	15	-	-	-	-
.70	0	0	0	0	0	204	418	3	-	-	-	-
.80	0	0	0	0	1432	12	0	13	-	-	-	-
.90	0	-	0	0	1020	69	0	0	-	-	-	-
.100	0	-	0	0	238	21	0	0	-	-	-	-
.110	-	-	-	U	3	-	-	-	-	-	-	-
.120	-	-	-	192	129	-	-	-	-	-	-	-
.130	-	-	-	0	15	-	-	-	-	-	-	-
.145	-	-	-	152	65	-	-	-	-	-	-	-
.160	-	-	-	0	0	-	-	-	-	-	-	-
81.46	-	-	-	-	-	-	-	-	0	-	0	0
82.47	-	-	-	-	-	-	-	-	0	0	0	0

Table 5.--Record of jack mackerel eggs, 1953

Station	Cruise number 5301	5302	5303	5304	5305	5306	5307	5308	5309	5310	5311	5312
83.40	-	-	0	-	0	0	0	0	0	0	0	0
.43	0	0	0	0	0	0	0	0	0	0	0	0
.48	0	0	0	0	17	7	0	0	0	0	0	0
.51	0	0	0	0	3	0	0	0	0	0	0	0
.55	0	0	0	0	0	0	0	0	0	0	0	0
.60	0	0	0	0	11	44	2310	0	-	-	0	0
.70	-	-	-	0	0	378	-	-	-	-	-	-
.80	-	-	-	U	676	700	-	-	-	-	-	-
.90	-	-	-	0	194	392	-	-	-	-	-	-
85.39	0	0	0	0	25	0	U	0	0	-	0	0
.40	0	0	0	0	0	0	77	0	0	-	0	0
.45	0	0	0	0	0	U	12	0	0	-	0	0
.50	0	0	0	0	0	0	0	0	0	-	0	0
.55	0	0	0	0	NQ	43	U	0	0	-	0	-
.60	0	0	0	0	100	500	1490	10	-	-	0	-
87.35	0	0	0	0	10	267	NQ	0	0	-	0	0
.40	U	0	0	0	0	0	389	0	0	-	0	0
.45	-	0	0	0	0	11	120	0	0	-	0	0
.50	-	0	0	0	46	U	0	0	0	-	-	0
.55	0	0	0	U	112	U	21	0	0	-	0	0
.60	0	0	-	0	7660	159	11	18	0	-	0	-
.70	-	-	-	0	262	U	-	-	-	-	-	-
.80	-	-	-	0	89	-	-	-	-	-	-	-
.90	-	-	-	0	221	117	-	-	-	-	-	-
90.28	0	0	0	0	0	0	0	-	-	36	-	0
.30	0	0	0	0	0	0	24	0	-	0	-	0
.37	0	0	0	5	-	0	204	19	-	0	-	0
.45	0	0	0	0	246	88	17	24	-	0	-	0
.50	-	-	0	-	124	19	6	42	-	0	-	0
.53	0	0	-	-	-	-	-	-	-	-	-	-
.55	-	-	0	0	184	56	757	U	-	0	-	0
.60	0	0	0	0	118	26	179	6	-	0	-	0
.70	0	0	0	U	306	NQ	158	0	-	0	-	-
.80	0	0	0	9	4650	126	-	-	-	-	-	-
.90	0	-	0	U	658	U	-	-	-	-	-	-
.100	-	-	-	0	79	U	-	-	-	-	-	-
.110	-	-	-	3	169	-	-	-	-	-	-	-
.120	-	-	-	37	224	-	-	-	-	-	-	-
.130	-	-	-	252	55	-	-	-	-	-	-	-
.145	-	-	-	157	94	-	-	-	-	-	-	-
.160	-	-	-	0	162	-	-	-	-	-	-	-
93.27	0	0	-	0	U	0	0	0	-	3	-	0
.30	0	0	0	0	15	222	U	0	-	0	-	0

Table 5.--Record of jack mackerel eggs, 1953

Station	Cruise number											
	5301	5302	5303	5304	5305	5306	5307	5308	5309	5310	5311	5312
93.35	-	-	-	0	276	410	259	11	-	-	-	-
.40	0	0	NQ	0	69	522	1062	8	-	0	-	0
.45	-	-	-	0	1880	345	638	-	-	-	-	-
.50	0	0	0	0	2490	68	122	0	-	0	-	0
.55	-	-	-	0	-	24	-	-	-	-	-	-
.60	NQ	0	-	0	1358	510	-	-	-	-	-	-
.70	-	-	-	0	-	745	-	-	-	-	-	-
.80	-	-	-	386	-	118	-	-	-	-	-	-
.90	-	-	-	57	-	37	-	-	-	-	-	-
97.30	0	0	0	0	24	28	0	0	-	0	-	0
.32	0	0	-	-	-	-	-	-	-	-	-	-
.35	-	-	0	0	512	479	144	14	-	0	-	0
.40	0	0	0	99	570	852	147	0	-	0	-	0
.45	-	-	-	227	1356	616	40	-	-	-	-	-
.50	0	0	-	925	3650	5460	355	137	-	0	-	0
.60	0	0	-	33	584	1220	-	-	-	-	-	-
.70	-	-	-	0	376	183	-	-	-	-	-	-
.80	-	-	-	185	-	198	-	-	-	-	-	-
.90	-	-	-	626	-	123	-	-	-	-	-	-
100.29	U	0	0	0	5	0	0	0	-	0	-	0
.30	0	0	17	0	0	0	122	0	-	0	-	0
.35	-	-	-	1390	59	336	0	50	-	-	-	-
.40	0	0	4280	37	102	85	24	112	-	3	-	0
.45	-	-	-	98	252	310	93	-	-	-	-	-
.50	0	0	148	46	180	1390	1360	27	-	11	-	0
.55	-	-	-	24	331	964	-	10	-	-	-	-
.60	0	0	0	0	440	426	49	0	-	0	-	0
.70	0	0	101	177	224	716	52	0	-	0	-	0
.80	0	1360	90	11	63	103	24	U	-	-	-	0
.90	0	-	-	24	81	57	-	-	-	-	-	-
103.30	-	-	-	0	2781	0	0	0	-	0	-	0
.35	-	-	-	1675	2321	0	U	U	-	0	-	0
.40	-	-	-	82	492	1260	812	127	-	0	-	0
.45	-	-	-	125	1730	201	-	-	-	-	-	-
.50	-	-	-	U	588	701	-	-	-	-	-	-
.55	-	-	-	127	416	1930	-	-	-	-	-	-
.60	-	-	-	56	120	999	-	-	-	-	-	-
.70	-	-	-	92	36	146	-	-	-	-	-	-
.80	-	-	-	512	327	260	-	-	-	-	-	-
.90	-	-	-	16	269	34	-	-	-	-	-	-
105.32	0	0	0	-	-	-	-	-	-	-	-	-
.35	0	0	0	-	-	-	-	-	-	-	-	-
.40	0	0	1971	-	-	-	-	-	-	-	-	-

Table 5.--Record of jack mackerel eggs, 1953

Station	Cruise number											
	5301	5302	5303	5304	5305	5306	5307	5308	5309	5310	5311	5312
105.50	0	332	2880	-	-	-	-	-	-	-	-	-
.60	0	0	5110	-	-	-	-	-	-	-	-	-
.70	0	-	U	-	-	-	-	-	-	-	-	-
.80	0	-	501	-	-	-	-	-	-	-	-	-
107.32	-	-	-	0	386	0	0	U	-	0	-	0
.35	-	-	-	4350	296	202	228	0	-	0	-	0
.40	-	-	-	2641	326	1068	1750	327	-	0	-	0
.45	-	-	-	617	79	1615	-	-	-	-	-	-
.50	-	-	-	86	198	56	-	-	-	-	-	-
.55	-	-	-	327	473	36	-	-	-	-	-	-
.60	-	-	-	U	U	842	-	-	-	-	-	-
.70	-	-	-	16100	U	725	-	-	-	-	-	-
.80	-	-	-	2220	1030	-	-	-	-	-	-	-
.90	-	-	-	855	35	-	-	-	-	-	-	-
110.33	-	0	732	131	NQ	40	0	0	-	0	-	0
.35	-	0	371	472	159	509	0	70	-	0	-	0
.40	-	0	724	4560	U	170	262	16	-	0	-	0
.45	-	-	-	1620	118	44	-	-	-	-	-	-
.50	0	862	576	1930	147	48	0	37	-	0	-	0
.55	-	-	-	2350	65	52	-	-	-	-	-	-
.60	U	470	1035	1760	55	18	24	U	-	0	-	0
.70	U	-	1138	406	47	0	-	-	-	-	-	-
.80	0	-	-	4450	63	-	-	-	-	-	-	-
.90	-	-	-	165	306	-	-	-	-	-	-	-
113.30	-	0	U	44	0	4	0	0	0	0	-	0
.35	0	0	0	1610	11	U	106	0	0	0	-	0
.40	-	0	0	3980	166	71	46	0	-	0	-	0
.45	-	-	0	362	60	600	-	-	-	-	-	-
.50	0	17	48	1250	321	15	-	-	-	-	-	-
.55	-	-	79	493	6	3	-	-	-	-	-	-
.60	-	1015	158	99	55	696	-	-	-	-	-	-
.70	-	-	-	353	U	0	-	-	-	-	-	-
117.26	-	0	0	0	0	0	0	0	0	0	-	0
.30	-	0	0	0	0	0	0	0	0	0	-	0
.35	-	0	0	0	0	0	52	U	0	0	-	-
.40	0	0	0	41	0	229	2	0	0	0	-	-
.45	-	-	0	824	1035	89	-	-	-	-	-	-
.50	U	625	19	130	459	298	-	-	-	-	-	-
.55	-	-	0	165	128	383	-	-	-	-	-	-
.60	-	175	646	192	93	153	-	-	-	-	-	-
.70	-	-	-	930	164	0	-	-	-	-	-	-
120.25	0	0	0	0	0	0	U	0	0	0	-	0
.30	0	0	0	0	0	0	0	U	0	0	-	0

Table 5.--Record of jack mackerel eggs, 1953

Station	Cruise number											
	5301	5302	5303	5304	5305	5306	5307	5308	5309	5310	5311	5312
120.35	0	0	0	13	194	0	0	0	0	0	-	0
.40	-	-	0	7	12	U	-	-	-	-	-	-
.45	0	0	0	33	171	0	0	0	-	0	-	0
.50	0	112	0	730	2160	U	7	U	-	0	0	0
.55	-	-	0	276	153	0	-	-	-	-	-	-
.60	U	116	0	348	422	0	3	0	-	0	-	0
.70	0	0	-	0	60	0	0	0	-	0	-	0
.80	0	0	-	43	71	0	0	0	-	0	-	0
.90	-	-	-	0	229	17	0	0	-	0	-	0
123.37	0	0	0	0	0	0	U	0	-	0	-	0
.40	-	0	0	0	0	32	0	0	-	0	-	0
.45	-	0	0	0	404	0	0	0	-	-	-	-
.50	-	0	0	0	2420	0	0	0	-	0	-	0
.55	-	-	0	0	147	6	-	-	-	-	-	-
.60	-	-	0	0	157	6	-	-	-	-	-	-
127.34	0	0	0	0	0	0	0	0	-	0	-	0
.40	-	0	0	U	0	0	0	0	-	0	-	0
.45	-	0	0	0	126	0	0	0	-	-	-	-
.50	-	0	0	0	525	495	0	0	-	0	-	0
.55	-	-	0	0	0	0	-	-	-	-	-	-
.60	-	-	0	0	29	0	-	-	-	-	-	-
130.30	-	0	0	0	0	0	-	0	-	0	-	0
.35	0	0	0	0	0	0	0	0	-	0	-	0
.40	U	0	0	0	0	4	0	0	-	0	-	0
.45	-	0	0	0	482	3	0	0	-	-	-	-
.50	-	0	0	0	0	14	0	0	-	0	-	0
.55	-	-	0	0	0	34	-	-	-	-	-	-
.60	0	0	0	0	0	0	0	0	-	NQ	-	0
133.25	0	0	0	0	0	0	0	0	-	0	-	0
.30	0	0	0	0	U	0	0	0	-	0	-	0
.35	-	-	0	0	0	0	0	0	-	-	-	-
.40	0	0	0	0	0	0	0	0	-	0	-	0
.45	-	-	0	0	0	7	-	-	-	-	-	-
.50	0	-	0	0	0	7	-	-	-	-	-	-
.55	-	-	-	0	0	-	-	-	-	-	-	-
.60	-	-	-	0	0	-	-	-	-	-	-	-
137.23	0	0	0	0	0	0	0	0	-	0	-	0
.30	0	U	0	0	U	0	0	0	-	-	-	0
.35	-	-	0	0	U	0	-	-	-	-	-	-
.40	0	-	0	0	0	0	-	-	-	-	-	-
.45	-	-	0	0	U	5	-	-	-	-	-	-
.50	0	-	0	0	0	0	-	-	-	-	-	-
.55	-	-	-	0	0	-	-	-	-	-	-	-
.60	-	-	-	0	0	-	-	-	-	-	-	-
Total	0	5084	20624	64808	57435	36411	14653	1297	0	53	0	0

RECORD OF JACK MACKEREL EGGS, 1954

A few eggs were taken in January of this year. Over a third of the eggs were taken in May, the peak month. There is some uncertainty as to when spawning ceased since there were no cruises during September and November. However, only a negligible number of eggs were taken during October and records from previous years are consistent with the supposition that no spawning occurred after October.

Like 1951, over half of the spawning occurred off California with the largest proportion occurring off southern California. A relatively large number of eggs taken off southern Baja California (station lines 123-157) is indicative of the wide dispersal of eggs during this year.

The quantitative distribution (annual standard haul totals) of jack mackerel eggs is given in figure 6.

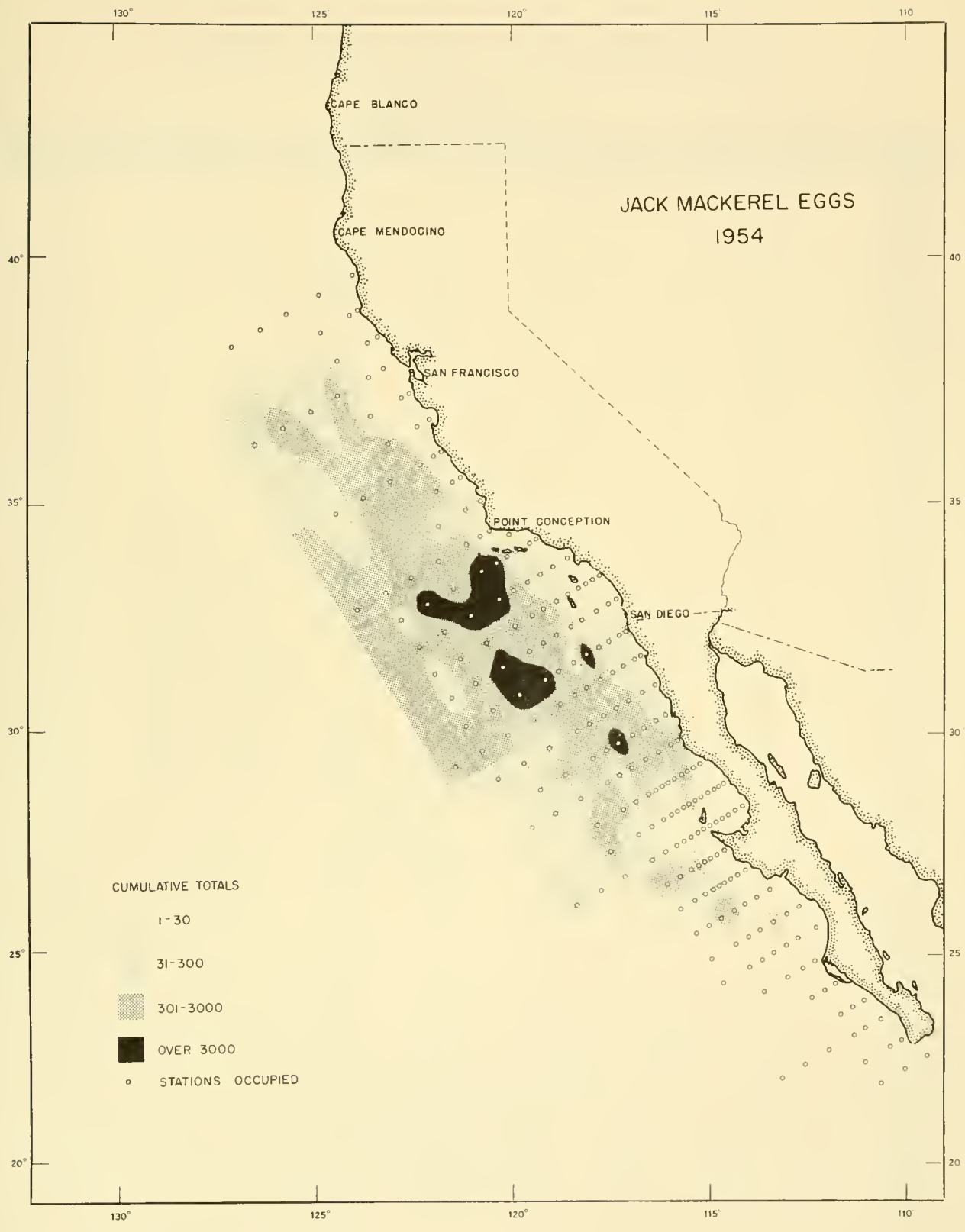

Figure 6.--Jack mackerel eggs, 1954: distribution and relative abundance.

Table 6.--Record of jack mackerel eggs, 1954

Station	Cruise number									
	5401	5402	5403	5404	5405	5406	5407	5408	5410	5412
50.47	-	-	-	-	-	0	-	-	-	-
.50	-	-	-	-	-	U	-	-	-	-
.60	-	-	-	-	-	12	-	-	-	-
.70	-	-	-	-	-	0	-	-	-	-
.80	-	-	-	-	-	0	-	-	-	-
.90	-	-	-	-	-	0	-	-	-	-
.100	-	-	-	-	-	U	-	-	-	-
53.52	-	-	-	-	-	0	-	-	-	-
.55	-	-	-	-	-	0	-	-	-	-
.65	-	-	-	-	-	18	-	-	-	-
57.51	-	-	-	-	-	0	-	-	-	-
.55	-	-	-	-	-	0	-	-	-	-
.65	-	-	-	-	-	0	-	-	-	-
60.55	-	-	-	0	0	0	U	0	-	-
.60	-	-	-	0	0	0	0	U	-	-
.70	-	-	-	0	0	404	134	0	-	-
.80	-	-	-	0	U	0	59	0	-	-
.90	-	-	-	0	180	71	148	U	-	-
.100	-	-	-	-	-	43	7	0	-	-
63.52	-	-	-	0	0	0	0	0	-	-
.55	-	-	-	0	0	0	21	0	-	-
.65	-	-	-	-	-	0	-	-	-	-
67.50	-	-	-	0	0	0	0	0	-	-
.55	-	-	-	0	0	0	0	0	-	-
.65	-	-	-	-	-	482	0	0	-	-
70.51	-	-	-	-	0	34	0	0	-	-
.55	-	-	-	0	5	0	17	U	-	-
.60	-	-	-	0	40	750	U	0	-	-
.70	-	-	-	0	340	22	0	U	-	-
.80	-	-	-	-	400	6	0	0	-	-
.90	-	-	-	0	5	20	-	-	-	-
.100	-	-	-	-	-	U	-	-	-	-
73.50	-	-	-	0	0	U	NQ	0	-	-
.55	-	-	-	-	-	-	-	0	-	-
.60	-	-	-	0	1165	74	NQ	U	-	-
77.50	0	0	0	0	NQ	0	U	31	0	-
.55	0	0	0	0	28	2	82	0	0	-
.65	-	-	-	0	0	NQ	285	U	-	-
80.51	0	0	0	0	0	0	0	0	0	0
.55	0	0	0	7	0	22	0	0	0	0
.60	0	0	0	0	19	863	73	0	0	0
.70	0	U	0	0	518	NQ	60	U	U	0
.80	0	0	0	0	1220	33	157	0	0	0

Table 6.--Record of jack mackerel eggs, 1954

Station	Cruise number									
	5401	5402	5403	5404	5405	5406	5407	5408	5410	5412
80.90	0	-	0	7	581	45	0	0	U	0
.100	0	-	-	-	-	347	-	0	-	-
.110	0	-	-	-	-	-	-	-	-	-
82.47	0	0	U	0	0	0	0	0	0	0
83.40	0	0	0	0	0	U	0	0	0	0
.43	0	0	0	0	0	U	0	0	0	0
.48	0	U	0	0	U	24	0	5	U	0
.51	0	U	0	0	0	1	0	0	0	0
.55	0	0	0	0	8210	0	U	0	0	0
.60	0	0	0	0	1032	4250	245	9	0	0
.70	-	-	-	0	39	602	-	-	-	-
.80	-	-	-	49	4730	137	-	-	-	-
.90	-	-	-	0	87	41	-	-	-	-
85.39	-	0	0	0	0	0	NQ	0	0	0
.40	0	0	0	0	0	-	23	0	0	0
.45	0	0	0	0	23	1190	0	U	0	0
.50	0	0	0	0	U	2870	0	U	0	0
.55	0	0	0	0	610	U	15	0	0	0
.60	0	0	0	0	2140	2130	127	U	0	0
87.35	0	0	U	0	0	0	13	0	0	0
.40	0	0	0	0	0	0	0	9	NQ	0
.45	0	0	0	0	25	231	0	0	0	0
.50	0	0	0	0	79	143	0	0	U	0
.55	0	0	0	0	100	970	0	0	U	0
.60	0	0	0	126	5400	394	0	0	0	0
.70	-	-	-	3250	232	-	-	-	-	-
.80	-	-	-	424	14	92	-	-	-	-
.90	-	-	-	324	42	39	-	-	-	-
90.28	0	U	0	0	0	6	0	0	0	0
.30	0	0	0	0	0	U	0	2	0	0
.33	-	-	-	-	0	0	-	-	-	-
.37	0	0	0	0	0	0	U	0	0	0
.41	-	-	-	-	0	0	-	-	-	-
.45	0	0	0	0	26	0	0	62	U	0
.50	-	-	-	-	7	812	-	-	0	0
.55	0	0	0	0	33	297	176	12	U	-
.60	0	0	0	536	73	236	795	8	0	0
.70	0	0	0	1030	368	313	0	60	0	0
.80	0	0	-	231	185	91	-	-	-	-
.90	0	-	-	46	191	-	-	-	-	-
.100	0	-	-	-	-	-	-	-	-	-
.110	0	-	-	-	-	-	-	-	-	-

Table 6.--Record of jack mackerel eggs, 1954

Station	Cruise number									
	5401	5402	5403	5404	5405	5406	5407	5408	5410	5412
93.27	0	0	0	0	0	0	0	U	0	0
.30	0	0	0	0	U	15	0	0	0	0
.35	-	-	-	0	0	0	0	24	-	-
.40	0	0	0	0	0	NQ	18	0	3	0
.45	-	-	-	0	10	0	131	U	0	-
.50	0	0	-	0	176	36	985	94	0	0
.55	-	-	-	558	522	103	-	-	3	-
.60	0	0	-	1820	200	259	-	-	-	-
.70	-	-	0	2870	212	31	-	-	-	-
.80	-	-	-	444	51	-	-	-	-	-
.90	-	-	-	237	20	NQ	-	-	-	-
97.30	0	0	0	0	0	0	312	0	0	0
.32	0	0	0	-	7	0	0	0	0	0
.36	-	-	-	-	55	145	-	-	-	-
.40	0	0	0	0	31	91	5	34	0	0
.45	-	-	-	0	584	2990	U	6	0	-
.50	0	0	0	U	51	84	24	9	0	0
.55	-	-	-	258	46	223	-	-	0	-
.60	0	0	0	3550	37	173	-	-	-	-
.70	-	-	2420	1020	133	40	-	-	-	-
.80	-	-	-	961	132	33	-	-	-	-
.90	-	-	-	231	36	98	-	-	-	-
100.29	0	0	0	0	0	0	0	0	0	0
.30	0	U	0	3	3	0	0	136	0	0
.35	-	-	0	69	23	0	3	0	-	-
.40	0	26	44	0	218	0	0	0	0	0
.45	-	-	0	116	337	0	267	0	0	-
.50	0	0	539	260	57	0	88	19	0	NQ
.55	-	-	799	626	366	92	-	-	0	-
.60	0	0	585	225	385	57	79	6	0	0
.70	0	129	1990	99	52	26	31	0	0	0
.80	0	524	1350	61	55	27	14	-	0	NQ
.90	0	-	174	524	415	19	-	-	0	0
.100	-	-	-	903	84	-	-	-	-	-
103.30	0	0	0	12	0	0	0	0	0	0
.35	0	15	46	0	0	U	0	0	0	0
.40	0	7	699	795	1419	52	0	0	0	0
.45	-	0	0	193	952	97	-	-	-	-
.50	0	30	U	1220	816	25	-	-	-	-
.55	-	-	0	298	157	39	-	-	-	-
.60	0	204	180	321	336	0	-	-	-	-
.70	-	-	-	114	59	0	-	-	-	-
.80	-	-	-	122	17	25	-	-	-	-
.90	-	-	-	NQ	54	-	-	-	-	-

Table 6.--Record of jack mackerel eggs, 1954

Station	Cruise number									
	5401	5402	5403	5404	5405	5406	5407	5408	5410	5412
107.32	0	0	73	0	0	0	0	0	0	0
.35	0	0	97	0	0	26	U	0	0	0
.40	0	45	0	44	39	436	0	0	0	0
.45	-	86	0	U	372	0	-	-	-	-
.50	-	4610	0	298	156	34	-	-	-	-
.55	-	-	23	546	U	70	-	-	-	-
.60	0	225	264	112	0	7	-	-	-	-
.70	-	-	-	244	157	82	-	-	-	-
.80	-	-	-	135	158	-	-	-	-	-
110.33	0	0	25	584	1400	92	0	0	0	0
.35	0	0	0	807	591	U	0	0	0	0
.40	0	U	0	292	51	15	16	0	0	0
.45	-	0	24	69	143	27	44	0	0	-
.50	0	0	87	194	455	36	52	0	0	0
.55	-	-	0	33	91	U	-	-	0	-
.60	0	57	16	34	298	57	34	0	0	0
.70	11	-	0	193	70	U	-	-	-	-
.80	0	-	U	60	14	42	-	-	-	-
.90	0	-	-	0	14	-	-	-	-	-
.100	0	-	-	-	-	-	-	-	-	-
113.30	0	3	0	0	0	0	0	24	0	0
.32	-	-	0	41	0	0	-	-	-	-
.35	0	0	0	374	18	U	0	0	0	0
.37	-	-	195	527	22	6	-	-	-	-
.40	0	0	0	52	148	26	15	0	0	0
.42	-	-	0	U	58	U	-	-	-	-
.45	-	0	0	134	12	U	-	-	-	-
.47	-	-	0	178	19	0	-	-	-	-
.50	0	7	66	652	0	3	-	-	-	0
.55	-	-	0	207	36	18	-	-	-	-
.60	-	166	1118	13	0	51	-	-	-	0
.70	-	-	-	135	1025	37	-	-	-	-
117.26	0	-	0	5	0	U	0	0	0	0
.28	-	-	0	0	0	0	-	-	-	-
.30	0	U	0	0	0	U	0	0	0	0
.32	-	-	0	0	U	0	-	-	-	-
.35	0	0	0	0	0	0	0	8	0	0
.37	-	-	0	U	0	U	-	-	-	-
.40	0	261	0	63	0	0	0	0	0	0
.42	-	-	0	0	33	0	-	-	-	-
.45	-	0	0	0	64	0	-	-	-	-
.47	-	-	0	0	0	0	-	-	-	-
.50	0	0	U	0	0	0	-	-	-	0

Table 6.--Record of jack mackerel eggs, 1954

Station	Cruise number									
	5401	5402	5403	5404	5405	5406	5407	5408	5410	5412
117.55	-	0	0	0	21	48	-	-	-	-
.60	-	0	0	17	0	0	-	-	-	0
.70	-	-	-	115	71	342	-	-	-	-
120.25	0	0	U	0	0	U	0	0	0	0
.27	-	-	NQ	0	0	0	-	-	-	-
.30	0	0	0	0	0	0	0	U	0	0
.32	-	-	0	0	0	0	-	-	-	-
.35	0	0	0	0	0	0	0	0	0	0
.37	-	0	0	0	0	U	-	-	-	-
.40	-	0	0	0	U	0	-	-	-	0
.42	-	0	0	0	0	0	-	-	-	-
.45	0	0	0	U	0	0	0	0	0	0
.47	-	-	0	U	0	U	-	-	-	-
.50	0	0	0	U	0	U	0	0	0	0
.55	-	0	0	U	0	112	-	-	NQ	-
.60	0	0	0	0	36	U	0	0	0	0
.70	0	0	12	174	U	83	15	0	0	0
.80	0	0	0	-	21	U	0	0	0	0
.90	-	-	0	-	200	87	0	0	0	0
.120	0	-	-	-	-	-	-	-	-	-
123.37	0	0	0	0	0	0	0	0	0	0
.40	0	U	0	0	0	0	0	0	0	0
.42	-	0	0	U	0	0	-	-	-	-
.45	-	0	0	U	24	0	0	0	0	0
.47	-	-	U	U	1005	0	-	-	-	-
.50	0	0	0	U	176	0	0	0	0	0
.55	-	-	0	61	2060	0	-	-	0	0
.60	0	-	0	0	1235	0	-	-	-	-
127.34	0	0	0	0	0	0	0	0	NQ	0
.37	-	-	0	U	0	0	-	-	-	-
.40	0	0	U	U	29	NQ	0	0	0	0
.42	-	-	0	U	45	0	-	-	-	-
.45	-	0	0	U	66	3	0	0	0	0
.47	-	-	0	55	5	0	-	-	-	-
.50	0	0	0	68	0	0	0	0	0	0
.55	-	-	0	232	0	0	-	-	0	0
.60	0	-	0	23	0	0	-	-	-	-
130.30	0	0	0	0	0	0	0	0	0	0
.35	0	0	0	0	0	0	0	0	0	0
.40	0	0	0	0	0	0	0	0	0	0
.45	-	0	0	645	0	0	0	0	0	-
.50	0	0	0	403	0	0	0	0	0	0

Table 6.--Record of jack mackerel eggs, 1954

Station	Cruise number 5401	5402	5403	5404	5405	5406	5407	5408	5410	5412
130.55	-	0	0	0	0	0	-	-	0	-
.60	0	0	0	0	0	0	0	0	0	0
.110	0	-	-	-	-	-	-	-	-	-
133.25	0	0	0	0	0	0	0	0	0	0
.30	0	0	0	0	0	0	0	U	0	0
.35	-	0	0	1450	0	0	0	0	-	-
..40	0	0	0	0	0	U	0	0	-	-
.45	-	-	0	0	0	0	-	-	-	-
.50	0	-	0	0	0	0	-	-	-	-
.60	-	-	-	0	0	-	-	-	-	-
137.23	0	0	0	0	0	0	0	0	0	0
.30	24	0	0	0	0	0	0	0	0	0
.35	-	-	0	0	0	0	-	-	-	-
.40	0	-	0	0	0	0	-	-	-	-
.45	-	-	0	0	0	0	-	-	-	-
.50	0	-	0	0	0	0	-	-	-	-
.60	-	-	-	0	0	-	-	-	-	-
.140	0	-	-	-	-	-	-	-	-	-
140.30	0	-	-	-	-	-	-	-	-	0
.35	0	-	-	-	-	-	-	-	-	0
.40	0	-	-	-	-	-	-	-	-	0
.50	0	-	-	-	-	-	-	-	-	-
.110	0	-	-	-	-	-	-	-	-	-
143.26	0	-	-	-	-	-	-	-	-	0
.30	0	-	-	-	-	-	-	-	-	0
.35	0	-	-	-	-	-	-	-	-	0
147.20	0	-	-	-	-	-	-	-	-	0
.25	0	-	-	-	-	-	-	-	-	0
.30	0	-	-	-	-	-	-	-	-	0
.90	0	-	-	-	-	-	-	-	-	-
150.19	0	-	-	-	-	-	-	-	-	0
.25	0	-	-	-	-	-	-	-	-	0
.30	0	-	-	-	-	-	-	-	-	0
.40	0	-	-	-	-	-	-	-	-	-
.50	0	-	-	-	-	-	-	-	-	-
.60	0	-	-	-	-	-	-	-	-	-
153.16	-	-	-	-	-	-	-	-	-	0
.20	-	-	-	-	-	-	-	-	-	0
.30	-	-	-	-	-	-	-	-	-	0
157.10	-	-	-	-	-	-	-	-	-	0
.20	-	-	-	-	-	-	-	-	-	0
.30	-	-	-	-	-	-	-	-	-	0
Total	35	6395	10826	33209	46693	24637	4570	558	6	0

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